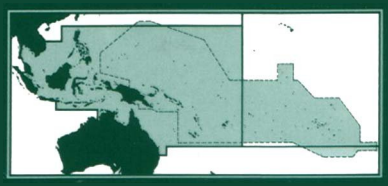
FAO SPECIES IDENTIFICATION GUIDE FOR FISHERY PURPOSES

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THE LIVING MARINE RESOURCES OF THE

WESTERN CENTRAL PACIFIC



Volume 2. Cephalopods, crustaceans, holothurians and sharks



FFA South Pacific Forum Fisheries Agency

Food and Agriculture Organization of the United Nations

NORAD Norwegian Agency for International Development

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THE LIVING MARINE RESOURCES OF THE WESTERN CENTRAL PACIFIC

VOLUME 2

Cephalopods, crustaceans, holothurians and sharks

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South Pacific Forum Fisheries Agency (FFA)

and the

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SUMMARY

This multivolume field guide covers the species of interest to fisheries of the major marine resource groups exploited in the Western Central Pacific. The area of coverage includes FAO Fishing Area 71 and the southwestern portion of Fishing Area 77 corresponding to the South Pacific Commission mandate area. The marine resource groups included are seaweeds, corals, bivalves, gastropods, cephalopods, stomatopods, shrimps, lobsters, crabs, holothurians, sharks, batoid fishes, chimaeras, bony fishes, estuarine crocodiles, sea turtles, sea snakes, and marine mammals. The introductory chapter outlines the environmental, ecological, and biogeographical factors influencing the marine biota, and the basic components of the fisheries in the Western Central Pacific. Within the field guide, the sections on the resource groups are arranged phylogenetically according to higher taxonomic levels such as class, order, and family. Each resource group is introduced by general remarks on the group, an illustrated section on technical terms and measurements, and a key or guide to orders or families. Each family generally has an account summarizing family diagnostic characters, biological and fisheries information, notes on similar families occurring in the area, a key to species, a checklist of species, and a short list of relevant literature. Families that are less important to fisheries include an abbreviated family account and no detailed species information. Species in the important families are treated in detail (arranged alphabetically by genus and species) and include the species name, frequent synonyms and names of similar species, an illustration, FAO common name(s), diagnostic characters, biology and fisheries information, notes on geographical distribution, and a distribution map. For less important species, abbreviated accounts are used. Generally, this includes the species name, FAO common name(s), an illustration, a distribution map, and notes on biology, fisheries, and distribution. Each volume concludes with its own index of scientific and common names.

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CEPHALOPODS

INTRODUCTION AND GENERAL REMARKS

by M.C. Dunning, M.D. Norman, and A.L. Reid

Living cephalopods include nautiluses, bobtail and bottle squids, pygmy cuttlefishes, cuttlefishes, squids, and octopuses. While they may not be as diverse a group as other molluscs or as the bony fishes in terms of number of species (about 600 cephalopod species described worldwide), they are very abundant and some reach large sizes. Hence they are of considerable ecological and commercial fisheries importance globally and in the Western Central Pacific.

REMARKS ON MAJOR GROUPS OF COMMERCIAL IMPORTANCE

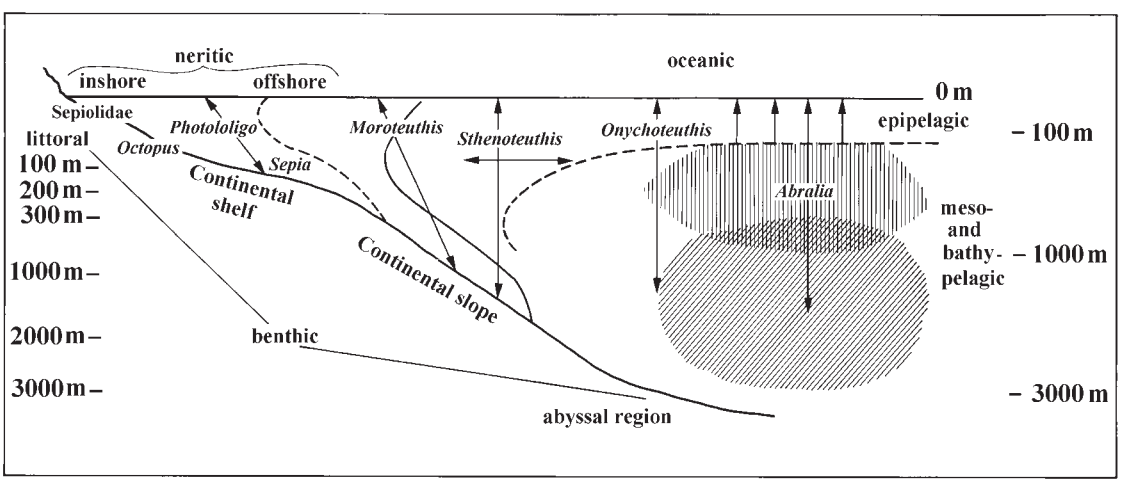
Nautiluses (Family Nautilidae)

Nautiluses are the only living cephalopods with an external shell throughout their life cycle. This shell is divided into chambers by a large number of septae and provides buoyancy to the animal. The animal is housed in the newest chamber. A muscular hood on the dorsal side helps close the aperture when the animal is withdrawn into the shell. Nautiluses have primitive eyes filled with seawater and without lenses. They have arms that are whip-like tentacles arranged in a double crown surrounding the mouth. Although they have no suckers on these arms, mucus associated with them is adherent. Nautiluses are restricted to deeper continental shelf and slope waters of the Indo-West Pacific and are caught by artisanal fishers using baited traps set on the bottom. The flesh is used for food and the shell for the souvenir trade. Specimens are also caught for live export for use in home aquaria and for research purposes.

Squids (Order Teuthida)

The 2 suborders, Myopsida, “covered-eyed”, nearshore (neritic) squids, and Oegopsida, “open-eyed”, oceanic (pelagic) squids, occur in the oceans and seas of the world and the species reaching larger sizes form the basis of major fisheries. Some squids are demersal or epibenthic at some period of their life cycle, but most species are pelagic, living off the bottom in the water column where they are caught using a variety of fishing gear such as trawls, lift nets, and jigs. FAO’s Yearbook of Fishery Statistics records about 2 169 000 t of squids taken worldwide in 1995, with around 159 000 t taken from the Western Central Pacific.

The suborder Myopsida is represented in the Western Central Pacific by the very speciose Family Loliginidae which includes 4 genera and is important in many small- and large-scale fisheries. Like all myopsids, the loliginids are demersal, predominantly near-shore or shelf species, frequently feeding near or on the bottom. These squid occur in schools and are often caught in large spawning aggregations. Some species tolerate reduced salinities and more turbid estuarine situations (e.g. *Loliolus* spp.) while others occur in clear waters around coral reefs (e.g. *Sepioteuthis lessoniana*). In some species, the spawning season is extended with peaks in early summer and autumn. Many small- to medium-sized eggs are encapsulated in gelatinous strings attached to shells, corals, and other substrates. Loliginid squids are opportunistic carnivores and grow rapidly. All species so far studied have life spans of less than one year; for the small tropical species, only a few months.



major ocean habitats showing indicative distributions of abundant cephalopods

(after Packard et al., 1972)

Our knowledge of the taxonomy of the Indo-West Pacific loliginids remains poor. This is especially true for members of the genus *Photololigo* which includes the majority of the large commercially important species. The present set of diagnostic morphological characters (fin shape and relative length, sucker dentition, hectocotylus structure) may be highly variable, differ between the sexes, change with growth and do not always ensure a reliable identification of species. In many cases, these characters have been inadequately defined in the type descriptions (many from the mid 1800s), type reference material is poorly preserved and had poor geographic locality information. Several poorly known and new, unnamed species are referred to in the recent literature and "seasonal forms" with different life history characteristics and of questionable taxonomic status and distribution have also been described. This poor state of taxonomic knowledge has been highlighted previously by various researchers but little progress has been made. Current and future fisheries assessments of the loliginid resource and subsequent decisions concerning the management of the stocks are dependent on accurate identification of species. Therefore, there is an urgent need for a substantial cooperative regionwide taxonomic study of the genus *Photololigo* using classical morphology supported by modern techniques including allozyme electrophoresis and DNA analysis.

Oceanic squids of various families of the suborder Oegopsida occur in the tropical Western Central Pacific but do not form a significant component of current reported fisheries catches. However, in some areas, arrow squid of the family Ommastrephidae are taken in localized artisanal fisheries (i.e. *Sthenoteuthis oualaniensis* in Melanesia and the Philippines) and their fisheries resource potential has been considered as large by some authors. In contrast to the loliginids, the taxonomy of this group is relatively well known.

Cuttlefishes (Family Sepiidae)

Cuttlefishes occur on the continental shelf and upper continental slope of tropical and temperate areas in all oceans. All are demersal and are believed to be more active at night. Many of the larger species of cuttlefish are important to fisheries in the Western Central Pacific. Fishing activity ranges from local, or subsistence fisheries to major export industries. Cuttlefish are targetted using a variety of gear including jigs and lures, baited and unbaited traps (sometimes with mangrove branches as attractants to spawning females), and spears. They are also an important component of finfish and prawn trawl bycatch in the area. They are used primarily for human consumption, but also as bait and are marketed fresh, frozen or dried. In 1995, FAO's Yearbook of Fishery Statistics reports 96 198 t of cuttlefish (and bobtail squids) from the Western Central Pacific (about 44% of the total world catch of cuttlefish for that year). This figure comprises 42 700 t caught off Thailand, 37 000 t from Viet Nam and 2 836 t caught in the Philippines. The taxonomy and biology of the cuttlefish in the area is generally poorly known and in need of review. While some, particularly commercial species, can be easily recognized, others which may occur in catches are not well defined by simple external morphological characters.

Octopuses (Order Octopoda)

The order Octopoda contains 2 suborders: the finned "cirrate" octopuses (suborder Cirrata) and the finless familiar "incirrate" octopuses (suborder Incirrata). The "cirrate" octopuses are soft and semigelatinous. All occur in deep water, possess paired fins on the mantle, deep webs, and rows of sensory papillae ("cirri") adjacent to the suckers. These octopuses are rarely captured and, due to the soft flesh, are of no economic value. The "incirrate" octopuses include the familiar bottom-living octopuses and a range of pelagic species. All lack the fins and sensory cirri of the cirrate octopuses. All incirrate octopuses brood their young, either in lairs, within their webs, within the mantle, or using an egg case (as in the argonauts). Incirrate octopuses are found in all marine waters of the world from intertidal reefs to the deepest ocean trenches.

The benthic octopuses (family Octopodidae) of the continental shelf are the primary targets of commercial fisheries. FAO's Yearbook of Fishery Statistics reports about 247 600 t of octopods taken worldwide in 1995 (about 10% of the total world catch of cephalopods) for which reported catches from the Western Central Pacific accounted for about 8% (24 487 t). The majority are harvested for human consumption as the bycatch of demersal trawl fisheries. They are also caught in artisanal fisheries by trapping, spearing, and using baited hooks or lures with certain species collected primarily as bait for finfish fisheries. They are marketed fresh, frozen, or dried. The taxonomy of this family is very poor. There are a large number of undescribed or poorly-defined species occurring in the Western Central Pacific, a number of which form the basis of local and commercial fisheries. Inappropriate species names are frequently used including many European names, species which only occur in the Atlantic Ocean (e.g. *Octopus macropus*, *O. vulgaris*). Much of this confusion has originated from poorly preserved reference material and use of limited, ill-defined distinguishing characters. Recent research working with live animal attributes and biology has clarified some the taxonomic problems. However, the majority of species in the Western Central Pacific (more than 40 species) still lack formal descriptions or any detailed information on biology, distribution, or importance to fisheries.

PRINCIPAL MEASUREMENTS AND METHODS USEFUL FOR IDENTIFICATION

External characteristics and measurements used

Orientation, arm numbering, and external morphological terms are illustrated in Figure 1. Orientation is relative to the resting animal, the arms and arm/tentacle crown being anterior. The body or mantle is considered posterior. The upper surface of the resting animal is considered dorsal and the underside ventral. Arms are numbered as left or right, commencing from the dorsal arms.

The mantle length is the standard length measurement for all cephalopods (except *Nautilus* where shell diameter is used). In squids and cuttlefishes, the measurement is made along the dorsal surface from the posteriormost point to the anteriormost point of the mantle. In octopuses, mantle length is measured from the midpoint between the eyes to the posterior tip of the mantle along the dorsal surface.

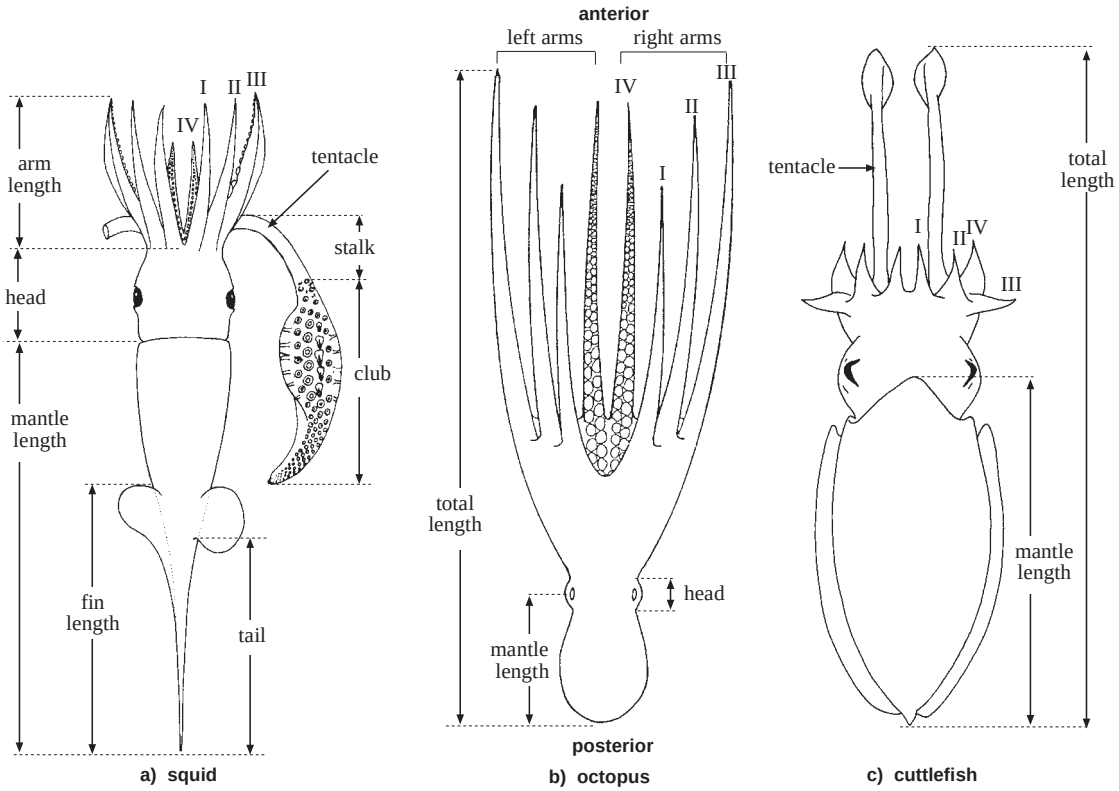


Fig. 1 measurements, arm numbering, and major external features of cephalopods in dorsal view

Determining sex

In most squids and some cuttlefishes, the sex of specimens can be determined externally by examining the arms to find modifications in maturing and mature males (hectocotylization). Modifications include change in normal sucker arrangement or loss of suckers, increased sucker size, or thickening or lengthening of sucker stalks, protective membranes, and their supports. For many squids and cuttlefishes, one or both of the ventral arms are modified although in some species, no external modification is apparent. In some groups such as the bobtail squids, these modifications may occur to dorsal rather than (or as well as) ventral arms. The modified arms are used to gather spermatophores from the mantle cavity of the males and transfer them to the mouth region or sometimes in squids, inside the dorsal or ventral mantle of the female.

The sex of benthic octopuses can be determined externally by examining the third arms to find the modified arm developed in maturing and mature males. This is typically the third arm on the right-hand side (left in some genera). It consists of a modified tip with a channel or gutter (the **spermatophore groove**) running along the edge of the arm. In copulation, the spermatophores are shunted along this groove to the modified tip. This tip usually consists of a spoon or club-like structure (**ligula**) and a short tongue-like flap (**calamus**). This tip inserts spermatophores directly into the oviducts of the female octopus.

In poor material, for immature specimens or for species which lack hectocotylized arms, dissection of the mantle cavity is necessary to determine sex (see below).

Internal structures in the mantle cavity

In identifying certain species or determining the sex of damaged or immature animals, it is necessary to dissect open the mantle cavity, exposing the funnel-mantle locking apparatus, gills, and reproductive structures.

Figure 2a shows the mantle cavity of typical squids (oegopsids) of both sexes, opened with a mid-ventral longitudinal cut along the length of the mantle. The funnel and mantle elements of the locking apparatus are visible just inside the mantle immediately posterior to the funnel opening itself. Males are recognized by the spermatophoric complex [including Needham's sac (also called the spermatophoric sac) which stores fully formed spermatophores in mature squid and the coiled spermatophoric organ] and penis-like structure on the left side (right in ventral view) of the midline. Females possess paired nidamental glands (white elongate structures) and paired white oviducal glands and oviducts in the anterior part of the mantle. In myopsid squids (such as *Photololigo*), only a single oviducal gland and oviducts is present on the left-hand side of the animal and paired accessory nidamental glands are present anterior to the nidamental glands.

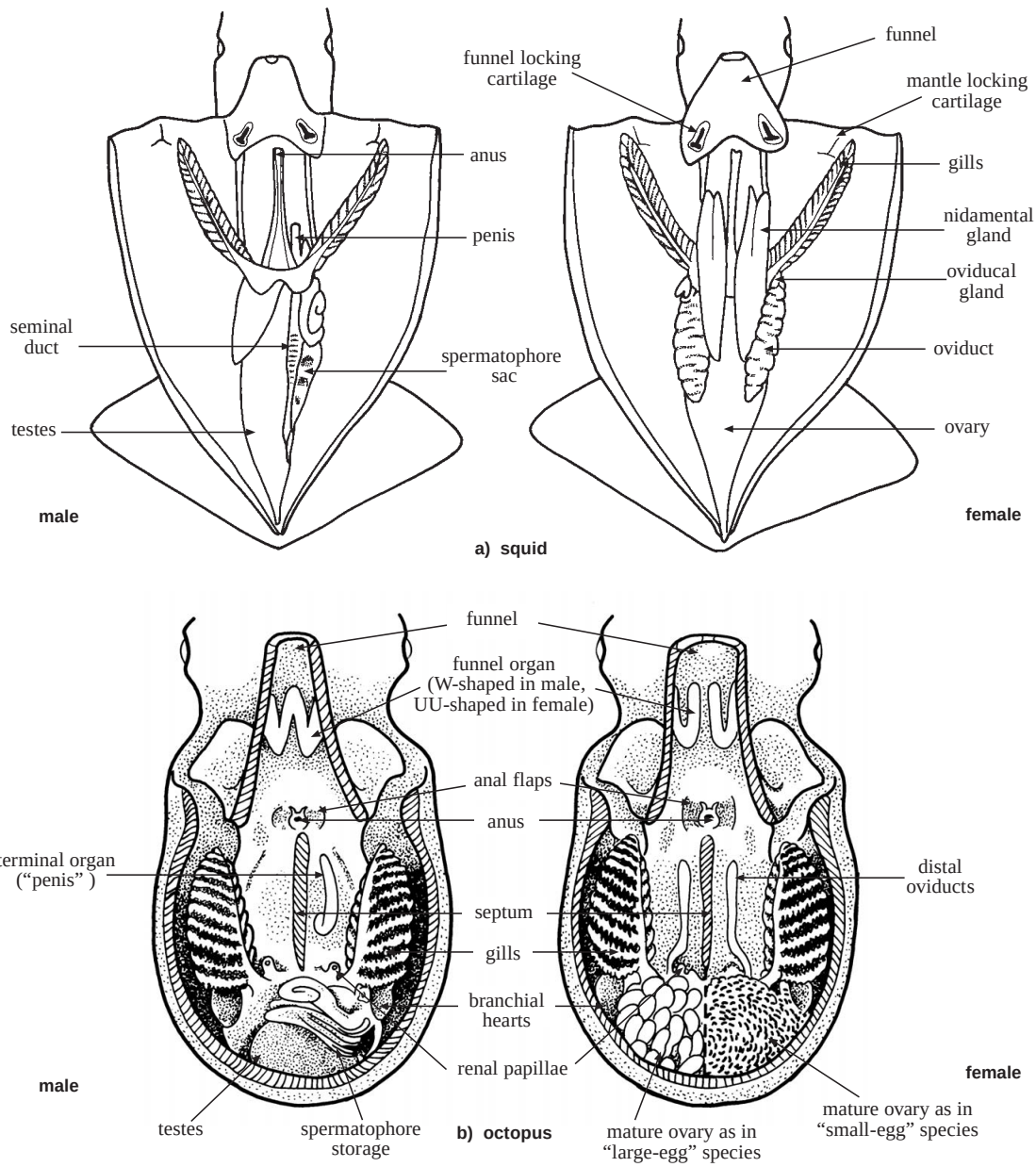


Fig. 2 major features of the mantle cavity of a typical squid and octopus

To examine the contents of the mantle cavity of a cuttlefish, a median longitudinal incision needs to be made through the mantle on the ventral side of the animal. Mature females can readily be distinguished from males by the presence of a pair of leaf-shaped creamy yellow nidamental glands (Fig. 4). Eggs may also be seen in the ovary, below and posterior to the nidamental glands. In immature females, the nidamental glands may be greatly reduced in size or visible only as two short slits. The shape of the male and female genital openings on the left side of the mantle cavity also differs slightly between the sexes.

The open mantle cavity of an octopod is illustrated in Figure 2b for both sexes. There are 2 gills, each consisting of distinct leaves (**lamellae**) in an inner and outer series. Males are recognized by the penis-like structure (**terminal organ**) on the left side (right in ventral view) of the central septum, while females possess paired oviducts on either side of the septum.

Removing internal shells (gladii and cuttlebones)

Squid - In fresh and preserved specimens, the gladius (Fig. 9) may be removed by making a mid longitudinal incision along the length of the dorsal mantle and peeling away the skin laterally. Care must be taken at the posterior end to ensure that all of the skin and muscle tissue is removed from around the cone.

Cuttlefish - The cuttlebone (Fig. 10) can easily be removed from a fresh animal by making a median longitudinal incision along the length of the dorsal mantle, and 2 shorter incisions at the anterior end of the mantle (Fig. 3). The skin can then be peeled open to reveal the cuttlebone.

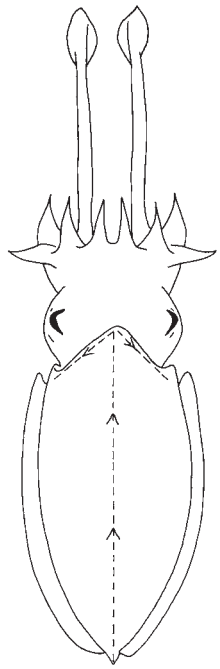


Fig. 3 cuttlefish in dorsal view (broken line indicates suggested incision for dissection)

GLOSSARY OF TECHNICAL TERMS

Accessory nidamental glands - glands of unknown function consisting of tubules containing symbiotic bacteria. Found in cuttlefishes and loliginid squids. Occur in both sexes, anterior to the nidamental glands in females; rudimentary in males (Fig. 4).

Afferent blood vessels - vessels leading towards the gills.

Anal flaps - pair of fleshy papillae that arise on either side of the anus (Fig. 5).

Anal pad - ovoid pads of unknown function, appear glandular, lie either side of the rectum, just behind the anal opening (Fig. 5).

Anterior - toward the head end or toward the arm tips of cephalopods.

Anus - opening of the alimentary canal, or gut, through which undigested remains of food are expelled.

Arm formula - the relative order of arm lengths from longest to shortest, e.g. "I II III IV" is arms decreasing in length from the dorsal pair (arm pair I) to the ventral pair (pair IV), "IV= III=II I" is dorsal pair shorter than all other, equal length, arms (note: arms are numbered in Arabic numerals by some authors, i.e. 2 or II, 3 or III).

Arm - one of the 8 fixed appendages surrounding the mouth of squids, octopuses, and cuttlefishes (see also **tentacles**).

Armature - refers to the presence and arrangement of suckers and/or hooks on the arms and tentacular clubs of cephalopods.

Benthic - bottom dwelling, living on or near the bottom of sea (= demersal).

Branchial - pertaining to the gills.

Branchial canal - canal between afferent and efferent blood vessels.

Buccal membrane - thin web of tissue that encircles the mouth, reinforced by 6 to 8 buccal supports (Fig. 6).

Buccal membrane connectives - muscular bands that connect the supports of the buccal membrane to the bases of the arms (Fig. 6).

Calamus - tongue-like projection at base of ligula on hectocotylized arm of male octopuses (Fig. 7).

Calcareous - chalky, calcified by deposition of calcium salts (calcium carbonate).

Carpus - the proximal zone of (small) suckers (and knobs) on the tentacular club (Fig. 8).

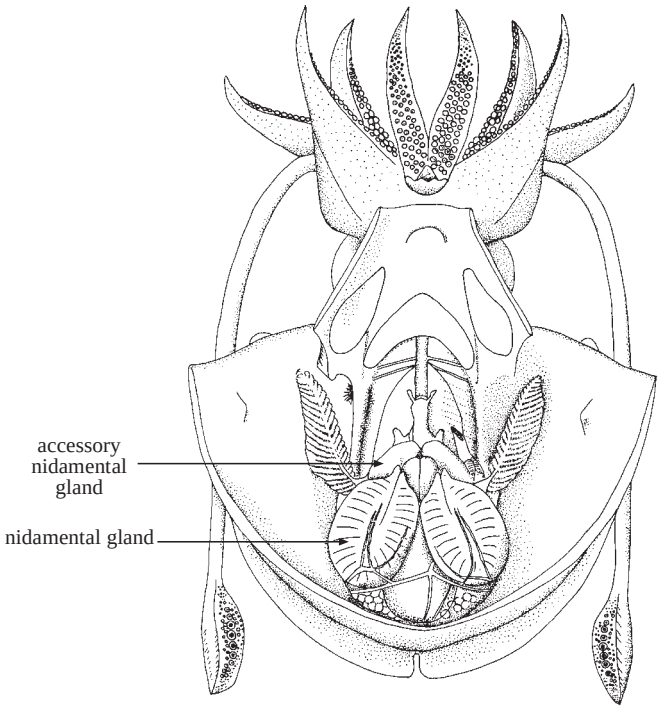


Fig. 4 mantle cavity of female cuttlefish (opened ventrally)

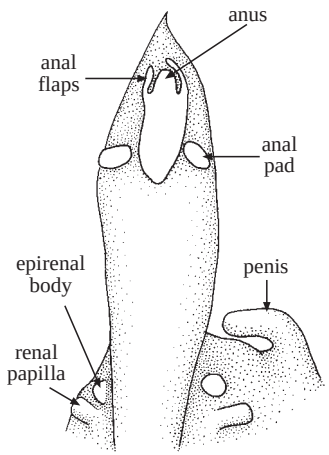


Fig. 5 anterior end of mantle cavity of a sepiolid

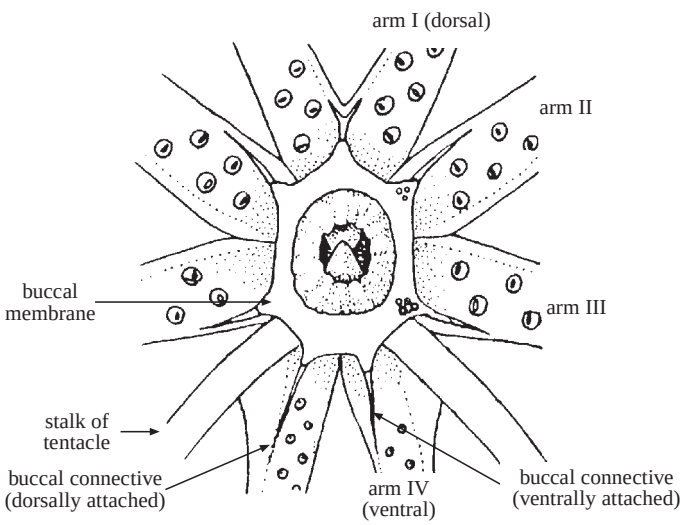


Fig. 6 diagram of oral surface of brachial crown and buccal membrane of a squid

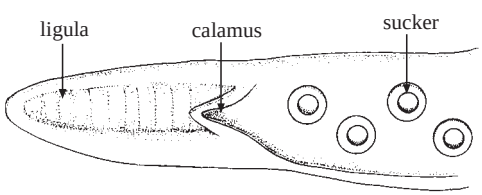


Fig. 7 tip of hectocotylized arm in a male octopus

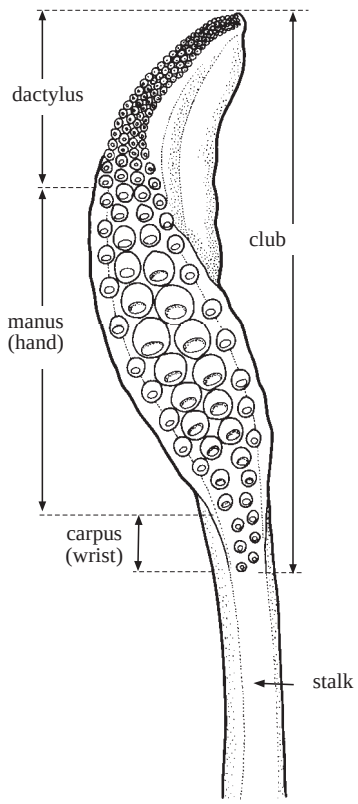


Fig. 8 distal end of tentacle of a squid

Chitin(ous) - a horny polysaccharide substance (fingernail-like) that forms the sucker rings, hooks and beaks of cephalopods.

Chromatophores - pigment-filled, generally flat muscular sacs in the skin under individual nervous control that collectively provide the background colour, colour patterns, and colour play of cephalopods (never ovoid or embedded in muscle tissue as light organs may be).

Club-fixing apparatus - the mechanism of suckers and knobs on the carpal region of the tentacular club that permits the 2 clubs to be locked together during capture of prey (see also **carpus**).

Cone, conus - the spoon-like or cup-like conical posterior terminus of the gladius or cuttlebone (Figs 9 and 10).

Cone flag - lateral extensions of the gladius developed from the cone (Fig. 9).

Corneal membrane - the very thin, transparent skin that covers the eyes of myopsid squids and cuttlefish (Fig. 11b).

Cuttlebone - calcareous supporting plate in the dorsal part of the mantle of cuttlefishes. Organ used to maintain buoyancy. Consists of many thin plates, or **septae**, arranged in a thick bundle. The system of plates is called the **phragmocone** (= sepion). The septae are interconnected by supporting poles and pillars which are visible on the ventral side of the cuttlebone as **striae**) (Fig. 10).

Dactylus - the distal, terminal section of the tentacular club in squids and cuttlefishes, often characterized by suckers of reduced size (Fig. 8).

Distal - away from the body or point of origin; toward the peripheral parts (opposite of **proximal**).

Dorsal shield - hard calcareous dorsal surface of the cuttlebone.

Efferent blood vessels - vessels leading away from the gills.

Epipelagic - living in the surface waters of the ocean.

Epirenal bodies - glandular structures of unknown function which lie on either side of the renal papillae (Fig. 5).

Fins - the pair of muscular flaps that arise along the lateral or dorsolateral surface of the mantle of sepioids, teuthoids, and cirrate octopods; used for locomotion, steering and stabilization.

Foveola - transverse membranous fold of skin that forms a pocket in the funnel groove of some oegopsid squids (e.g. some ommastrephids) (Fig. 12).

Funnel - the ventral, subconical tube through which water is expelled from the mantle cavity during locomotion and respiration (Fig. 13) (reproductive and waste products and the ink also pass through the funnel).

Funnel locking apparatus - the combination of the funnel locking cartilage (or component) and the mantle locking cartilage (or component); also called the **funnel-mantle locking apparatus**. It is found laterally at the ventral mantle opening joining the posterior extension of the funnel to the mantle in squids and cuttlefishes (Fig. 13). The cartilages may be very simple in structure such as in loliginid squids or highly complex such as in the ommastrephids (illustrated in Fig. 13). The apparatus may also involve a partial or complete muscular fusion between the funnel and mantle elements such as in the ommastrephid *Sthenoteuthis oualaniensis*, the bobtail squid *Sepiadarium kochii*, and all cranchiid squids.

Funnel locking cartilage - the cartilaginous groove, pit, pocket, or depression on each ventrolateral side of the posterior part of the funnel that joins with the mantle locking cartilage to lock the funnel and mantle together during locomotion, so water is expelled only through the funnel and not around the mantle opening (Figs 13 and 14; see also **mantle locking cartilage**).

Genital opening - exit duct for products formed in the reproductive tract; through which pass eggs and spermatophores.

Gills - paired structures each consisting of many lamellae through which gas exchange occurs. **How to count gill lamellae:** to identify some octopuses, it is necessary to count the number of gill lamellae on each side of each gill (= per **demibranch**, an inner and outer demibranch on each gill). Count per demibranch excludes the central terminal (anterior) lamella, e.g. gill count of 10 refers to 10 lamellae on each side of each gill. The animal illustrated in Fig. 15 has a gill count of 10.

Gladius (pl. = **gladii)** - the feather or rod-shaped chitinous supporting structure (or shell) in the dorsal midline of squids and sepioids other than cuttlefish (= pen) (Fig. 9).

Hectocotylus - the part of 1 (or more) arm(s) of male cephalopods modified for transferring spermatophores to the female; modifications may involve suckers, sucker stalks, protective membranes, trabeculae in squids and cuttlefishes or a distinct ligula/calamus on tip of the modified arm in octopods.

Hooks - chitinous, claw-like structures derived from the suckers on the arms and/or clubs of some oegopsids (Fig. 16).

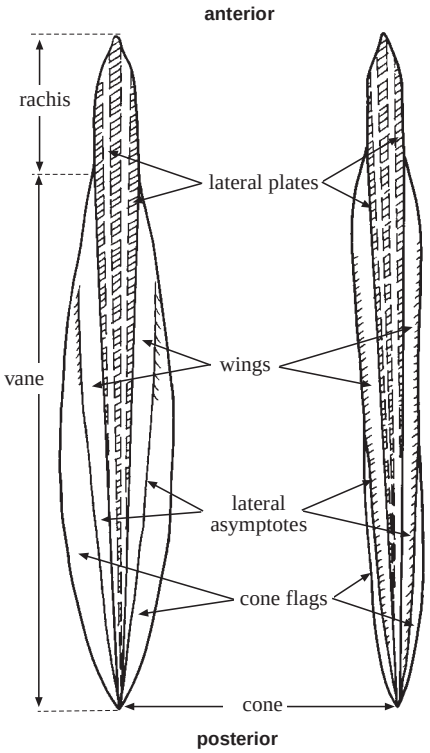


Fig. 9 examples of gladii

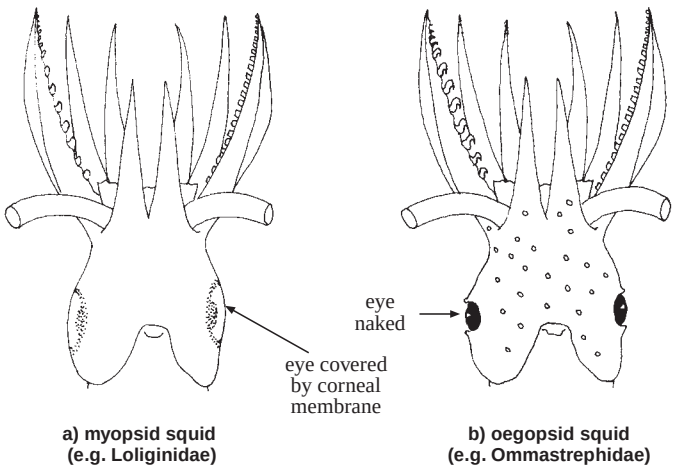


Fig. 11 head, eyes, and arms in ventral view

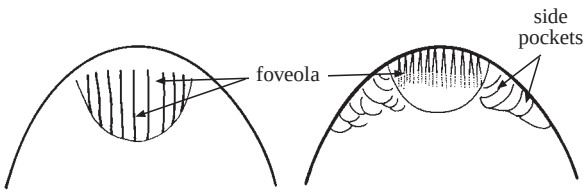


Fig. 12 funnel groove of squids

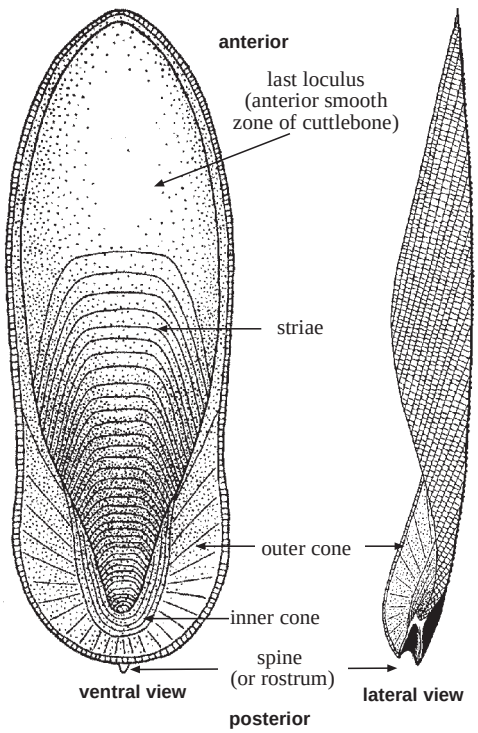
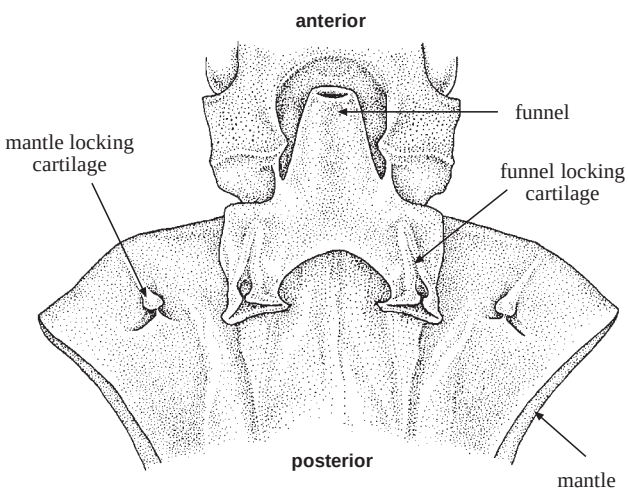


Fig. 10 cuttlebone



(illustration: K.Hollis/ABRS)

Fig. 13 internal view of anterior mantle (*Ornithoteuthis*)

Ink sac - the structure that stores the ink of cephalopods; it lies ventrally along the intestine or is embedded in the digestive gland (hepatopancreas) and empties anteriorly via a duct into the rectum.

Inner cone - forked limbs on the ventral side of the cuttlebone, between the inner side of the outer cone and the phragmocone; usually extends to the anterior end of the striated zone (Fig. 10).

Keel - a flattened, muscular extension along the aboral surface of some arms and tentacular clubs to render them more hydrodynamic (= swimming membrane) (Fig. 16); also a narrow longitudinal ridge on the keel of some cuttlebones.

Last loculus - anterior part of the cuttlebone that is smooth, not striated below (Fig. 10).

Lateral ridge - muscular keel along the lateral mantle of some octopuses.

Light organ - a simple or complex structure that produces bioluminescence by intrinsic (self-generated) or extrinsic (bacterial) means. May be present in the skin, on the eyes, embedded in muscle in the mantle, head, arms, tentacles or on the viscera (= photophore) (Fig. 17).

Ligula - spoon- or club-like tip of the modified (hectocotylized) arm of octopuses (Fig. 7).

Mantle - the fleshy (muscular) tubular or sac-like body of cephalopods; provides propulsion through jet-like expulsion of water; contains the viscera.

Mantle locking cartilage - the cartilaginous ridge, knob or swelling on each side of the ventrolateral, internal surface of mantle that locks into the funnel component of the funnel-mantle locking apparatus (Figs 13 and 14, see also **funnel locking cartilage**).

Manus - central or “hand” portion of club between the dactylus distally and the carpus proximally (Fig. 8).

Medial (median) - pertaining to a structure located towards, on, or along the midline.

Mesopelagic - living in the middle layers of the water column in oceanic waters.

Neritic - inhabiting the sea over the continental shelf; arbitrarily taken to be the sea where it is shallower than 200 m.

Nidamental glands - glands inside the mantle of females that secrete a fourth envelope for the eggs. Present in squids (except Enoploteuthidae), sepiolids, sepiadariids, and cuttlefishes. Glands tongue-like and bifurcated in squids, and oval in cuttlefishes (Fig. 4).

Nuchal cartilages - a pair of cartilaginous structures (a mantle element and a neck element) connecting the mantle to the neck dorsally in many cephalopods.

Ocellus - dark false-eye spot; found in “ocellate” octopuses as a pair of ocelli, one spot below each eye on the lateral arm crown between the bases of arms II and III (as in *Octopus cyanea*).

Olfactory organ - organs of smell; in squids, cuttlefish, and vampyromorphs represented by olfactory papillae, while in octopus there are olfactory pits. Positioned on sides of the head near the neck.

Orbit - cavity, or depression housing the eyeball.

Outer cone - rim surrounding the phragmocone in cuttlebones.

Pedicel - a short, tubular stalk that supports a sucker in sepioids and squids (Fig. 18).

Phragmocone - system of plates comprising the cuttlebone.

Pocket - an open depression in the anteroventral surface of the head between the bases of arms III and IV of cuttlefish into which the tentacles are retracted when not in use.

Posterior - away from the arms and tentacles, towards the tail or rear end of mantle.

Protective membrane - thin web-like integument along the lateral angles of the oral surface of the arms and clubs lateral to the suckers, supported by muscular rods called trabeculae (Fig. 19).

Proximal - toward the body or nearest or next to the point of origin or attachment (opposite of **distal**).

Rachis - the thickened central axis of the gladius that generally extends its entire length. Free rachis is the portion that does not support vanes (Fig. 9; see also **vanes, gladius**).

Renal papilla - kidney opening.

Renal sac - kidney.

Secondary fold - on the eyelid, conspicuous in cuttlefishes.

Secondary sexual character - a characteristic of animals which differs between the 2 sexes, but which is not a primary component of the reproductive system, e.g. enlarges suckers, hectocotylized arms.

Spermatophores - encapsulated packets of sperm. Tubular structures manufactured by male cephalopods capable of holding millions of sperm, being transferred intact by a modified arm of the male and attaching to the female (or being inserted into the oviducts of octopuses) until fertilization occurs.

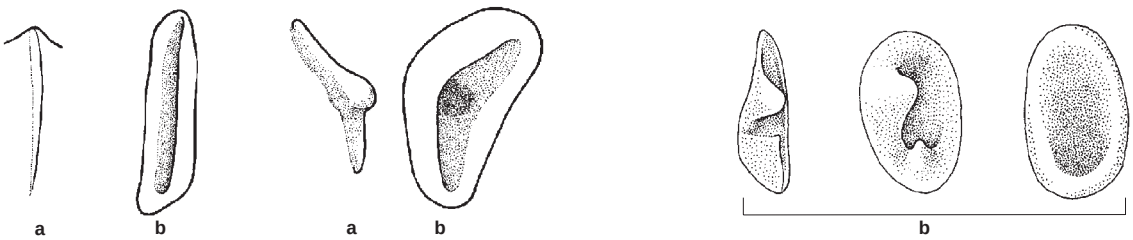


Fig. 14 basic types of mantle locking cartilage (a) and funnel locking cartilage (b)

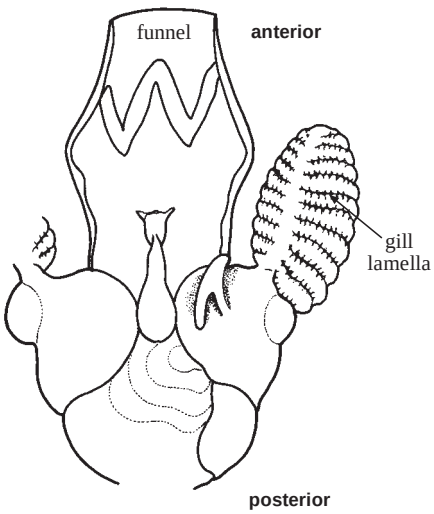


Fig. 15 gills

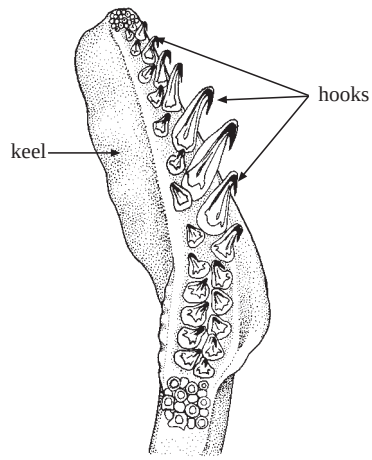


Fig. 16 tentacular club of an onychoteuthid squid

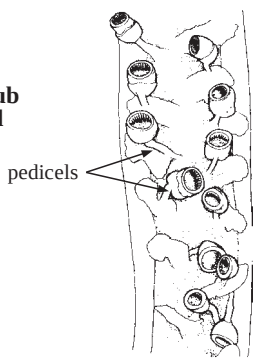


Fig. 18 detail of arm

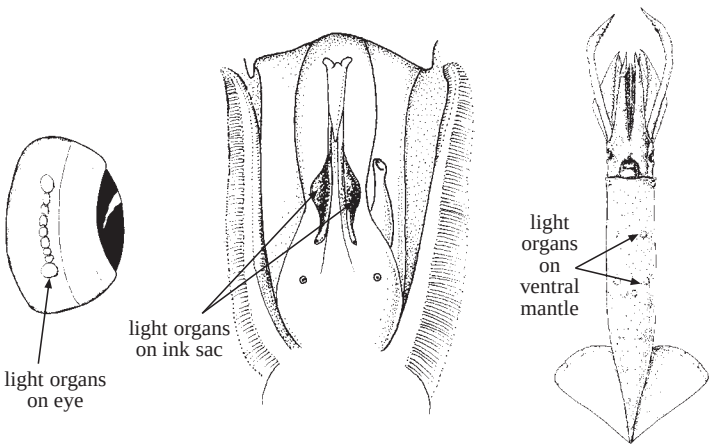


Fig. 17 examples of light organs

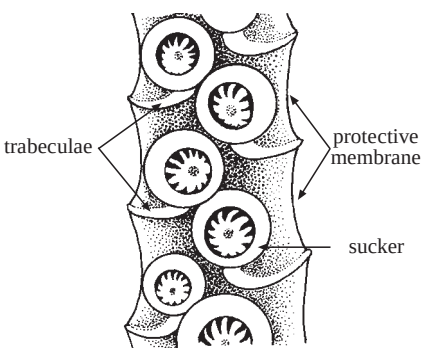


Fig. 19 detail of arm

Spermatophore groove - channel-like groove along the edge of the hectocotylized arm of mature male octopuses along which spermatophores are shunted to the tip for transfer to the female.

Spine - the sharp extension on the posterior tip of the gladius or cuttlebone, dorsal to the outer cone (Fig. 10; also called the rostrum).

Suckers - muscular, suction-cup structures on the arms and tentacles (rarely on the buccal membrane) of cephalopods; stalked and placed on muscular rods that contract (squids and cuttlefishes) (Fig. 20a); sessile and embedded without stalks on the oral surface of the arms of benthic octopuses (Fig. 20b). They are counted in either longitudinal rows (sometimes called "series") or in oblique, transverse rows (Fig. 20c).

Sucker ring - chitinous, often serrated or toothed ring that encircles the opening of suckers of squids and cuttlefishes.

Sulcus - a median longitudinal groove, sometimes flanked by 2 low ridges on the ventral side of the cuttlebone.

Swimming membrane - an elongate, muscular vane along the aboral surface of arms of cephalopods that functions to streamline and support the arms during swimming (= keel).

Tail - the posterior extension of the mantle in some squids, frequently elongate. Fins or tapered terminations of fins may extend posteriorly along the tail.

Tentacles - the 2 elongate, stalked appendages used for prey capture; distal ends contain clubs with suckers (or hooks); stalks usually devoid of suckers. Tentacles in squids can only contract rather than retract into pockets as in cuttlefish.

Tentacular club - terminal portion of a tentacle; armed with suckers (or suckers and/or hooks), used for capturing prey.

Terminal organ - penis-like muscular process of the male reproductive tract in octopuses which passes spermatophores into the base and spermatophore groove of the hectocotylized arm.

Total length - length from posterior tip of mantle to tip of longest arm in octopods or tentacles in squids and cuttlefishes. (Because of the various degrees of contraction of the highly extensible tentacles during capture or fixation/preservation, this is not generally a useful comparative measurement in squids and cuttlefishes).

Trabeculae - muscular rods that support the protective membranes on the arms and clubs of cephalopods; occasionally membranes are reduced and/or trabeculae are elongated, so they extend beyond the edge of the membrane, papilla-like (Fig. 19).

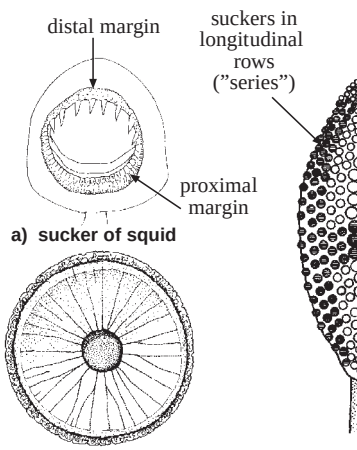
Umbilicus - the central core of the chambered *Nautilus* shell, representing the juvenile shell with its initial coils.

Vane - thin lateral expansion of the gladius that arises from the rachis (Fig. 9; see also **rachis**).

Ventral - the lowermost or belly surface of a cephalopod; the surface on which the funnel is located; opposite the dorsal surface.

Web - a membranous sheet that extends between the arms of many octopuses and some squids and cuttlefish, giving an umbrella-like appearance when the arms are spread out (Fig. 21).

Web depth - distance from mouth to shallowest point of web between adjacent arms in octopods (Fig. 22).



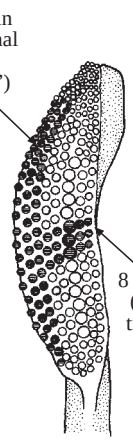


Fig. 20 suckers and how they are counted

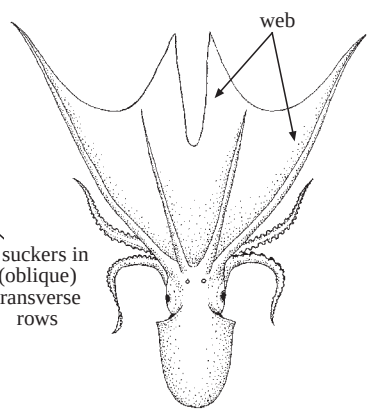


Fig. 21 octopus of the genus *Tremoctopus*, with expanded web

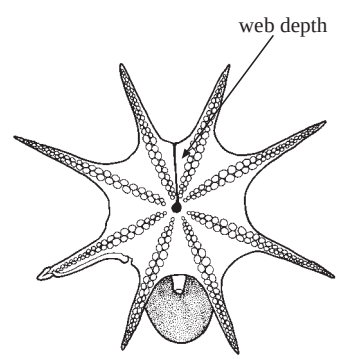


Fig. 22 octopus in oral view

KEY TO FAMILIES OF CEPHALOPODS ENCOUNTERED IN FISHING ACTIVITIES IN THE AREA

(compiled from Nesis, 1987, and Roper et al., 1984)

Note: families and higher taxa which are not treated further in this guide because they are unlikely to be regularly encountered in fishing or research activities are indicated by an asterisk (*). The reader is referred to the general references listed for further information on these groups.

1a. Animal with hard, chambered external shell; numerous (more than 50) slender arms without suckers or hooks (Fig. 23) . . . . . Subclass Nautiloidea: Order Nautilida (monotypic order): **Family Nautilidae** (p. 709)

1b. Shell absent or internal, external shell only present in female argonauts as thin brittle egg case; 8 arms or 8 arms and 2 tentacles always armed with suckers or hooks . . . . . **Subclass Coleoidea** → **2**

2a. Eight arms and 2 tentacles (except in adult Octopoteuthidae which lack tentacles but are otherwise squid-like); suckers with chitinous rings, sometimes modified into hooks; fins always present . . . . . → **3**

2b. Eight arms only; suckers without chitinous rings or hooks; fins absent or present only as short paddles on the sides of the mantle in certain deep-water gelatinous forms . . . . . → **19**

3a. Internal shell (if present) either straight and laminate, coiled and chambered, or rudimentary and straight; pockets present which house the tentacles between arms III and IV. . . . . **(Order Sepiida (= Sepioidea))** → **4**

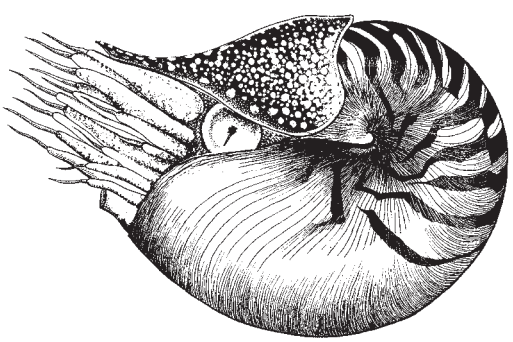
3b. Internal shell straight, feather- or rod-shaped; no pockets present between arms III and IV . . . . . **(Order Teuthida (= Teuthoidea))** → **8**

4a. Internal shell calcified, as flat laminate cuttlebone or coiled chambered shell . . . . . → **5**

4b. Internal shell chitinous (thin and transparent) or absent . . . . . → **6**

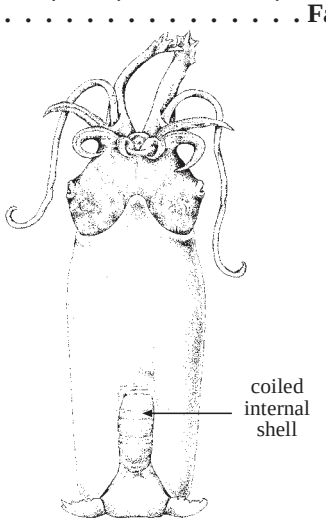
5a. Internal shell coiled, chambered, embedded in posterior mantle (Fig. 24). . . . . **Family Spirulidae** (p. 722)

5b. Internal shell a thick, oval to elongate calcareous plate (the cuttlebone) embedded in the dorsal mantle (Fig. 25) . . . . . **Family Sepiidae** (p. 723)



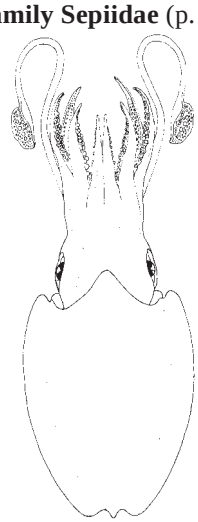
lateral view

Fig. 23 Nautilidae (*Nautilus*)



dorsal view

Fig. 24 Spirulidae (*Spirula*)



dorsal view

Fig. 25 Sepiidae (*Sepia*)

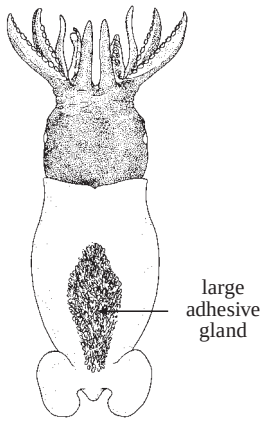
(illustration: K.Hollis/ABRS)

6a. Fins small and restricted to posterior end of mantle; large adhesive gland on dorsal surface of mantle (Fig. 26). . . . . **Family Idiosepiidae** (p. 721)

6b. Fins semicircular to kidney-shaped on lateral mantle, never restricted to posterior mantle; adhesive gland absent . . . . . → **7**

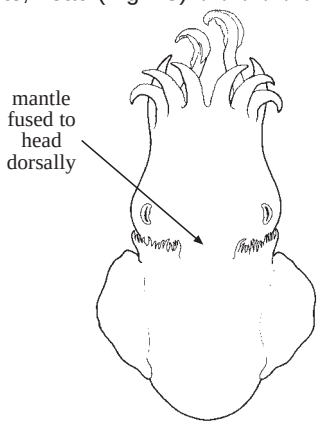
7a. Shell absent; both or only left ventral arm hectocotylized; dorsal border of mantle always fused to head (Fig. 27) . . . . . **Family Sepiadariidae** (p. 719)

7b. Internal thin chitinous shell (gladius) present (except in *Euprymna*); hectocotylus developed on 1 dorsal arm, both dorsal arms (I) or dorsolateral arm (II); dorsal border of mantle free from, or fused to, head (Fig. 28) . . . . . **Family Sepiolidae** (p. 712)



dorsal view

Fig. 26 Idiosepiidae (*Idiosepius*)



dorsal view

Fig. 27 Sepiadariidae (*Sepiadarium*)

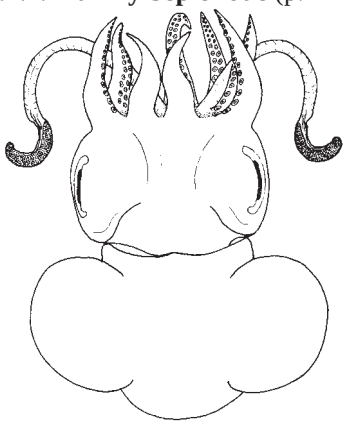

dorsal view

Fig. 28 Sepiolidae (*Rossia*)

8a. Eye covered by transparent membrane (cornea); arms with suckers always in 2 rows; hooks absent; left or both ventral arms (IV) hectocotylized; paired light organs either side of the intestine in many species but no external light organs (Fig. 29) . . . . . (Suborder Myopsida): **Family Loliginidae** (p. 764)

8b. Eye without cornea and in open contact with seawater; arm sucker arrangement variable (dependent on family); many species possessing hooks; hectocotylization present or absent; light organs may be present external on the mantle, head, arms and tentacles and ventral surface of the eyes as well as internally . . . . . **(Suborder Oegopsida)** → **9**

9a. Mantle fused to head dorsally and to the funnel; funnel-mantle locking apparatus absent (Fig. 30) . . . . . **Family Cranchiidae ***

9b. Mantle not fused to head dorsally; funnel-mantle locking apparatus present (although funnel and mantle cartilages are fused in some species) . . . . . → **10**

10a. Mantle-funnel locking apparatus a simple, straight groove and ridge . . . . . → **11**

10b. Mantle-funnel locking apparatus not a simple, straight groove and ridge . . . . . → **16**

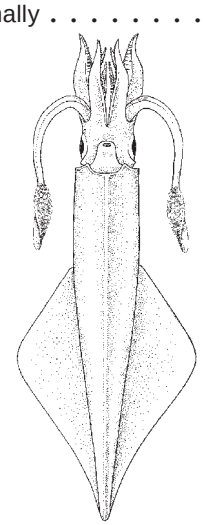

ventral view

Fig. 29 Loliginidae (*Loligo*)

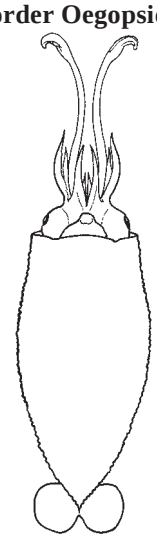

ventral view

Fig. 30 Cranchiidae (*Cranchia*)

11a. Arms with hooks rather than suckers in adults; in juveniles where hooks are absent, suckers are in 4 rows . . . . . → **12**

11b. Arms without hooks, suckers in 2 rows . . . . . → **13**

12a. Tentacles with fully developed clubs present; buccal membrane connectives attach to dorsal sides of ventral arms (IV) (Fig. 31) . . . . . **Family Enoploteuthidae** (p.781)

12b. Tentacles and clubs absent in adults although rudimentary clubs present in larvae or occasionally in juveniles; buccal membrane connectives attach to ventral sides of ventral arms (IV) (Fig. 32) . . **Family Octopoteuthidae ***

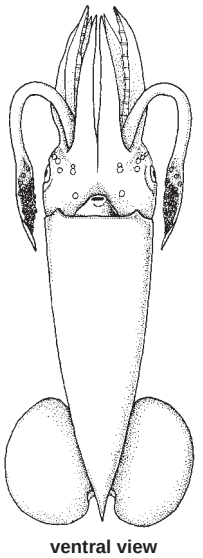


Fig. 31 Enoploteuthidae (*Pterygioteuthis*)

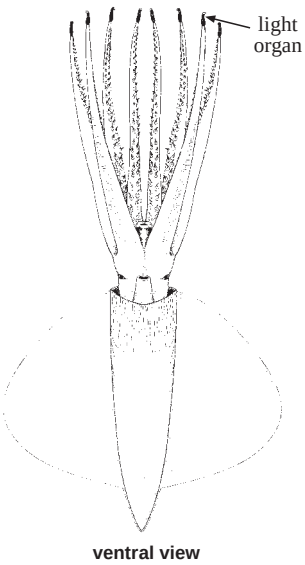


Fig. 32 Octopoteuthidae (*Octopoteuthis*)

13a. Buccal membrane connectives attach to ventral sides of ventral arms (IV) . . . . . → **14**

13b. Buccal membrane connectives attach to dorsal sides of ventral arms (IV) . . . . . → **15**

14a. Hooks present on tentacular clubs (Fig. 33) . . . . . **Family Onychoteuthidae** (p.784)

14b. No hooks on tentacular clubs (Fig. 34) . . . . . **Family Brachioteuthidae ***

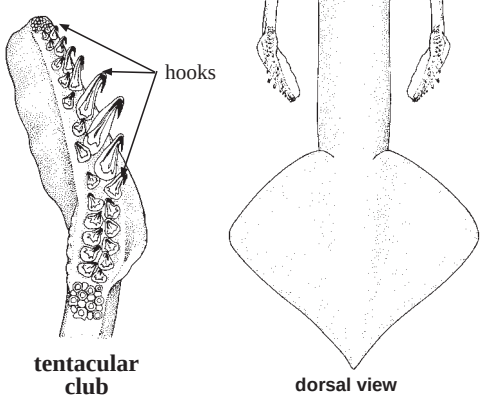


Fig. 33 Oncychoteuthidae (*Onychoteuthis*)

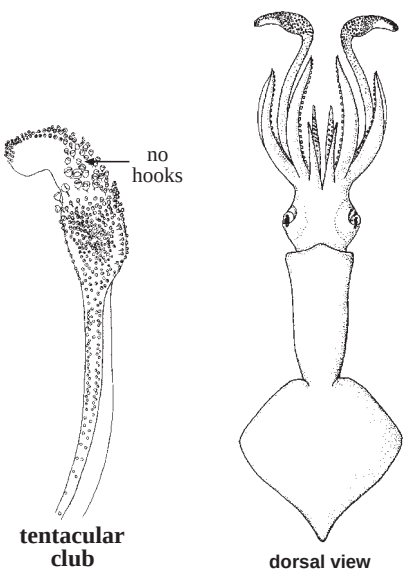


Fig. 34 Brachioteuthidae (*Brachioteuthis*)

15a. Surface of mantle, head and arms covered with many light organs (usually large and distinct); a few small suckers at the proximal end of the manus; left eye considerably larger than right in adults (Fig. 35) . . . . . **Family Histioteuthidae** (p. 787)

15b. Surface of mantle and head without light organs; many small to minute suckers (or suckers and knobs) at proximal end of manus and along tentacle shaft; eyes equal sized (Fig. 36) . . . . . **Family Architeuthidae ***

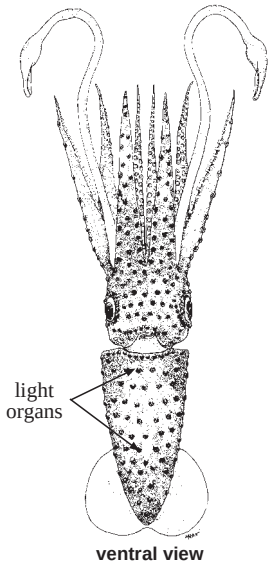


Fig. 35 Histioteuthidae (*Histioteuthis*)

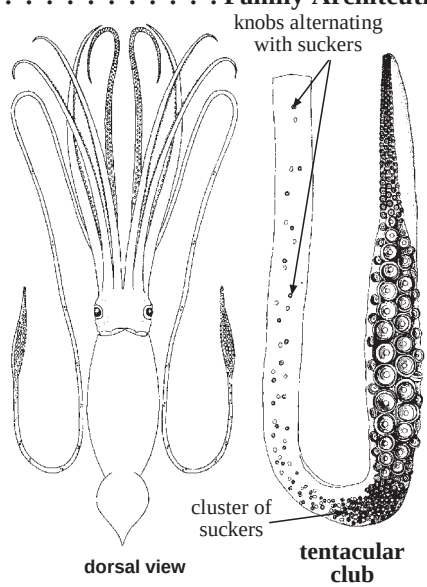


Fig. 36 Architeuthidae (*Architeuthis*)

16a. Funnel locking cartilage with a longitudinal and a transverse groove, ⊥-shaped or ⊣-shaped . . . . . → **17**

16b. Funnel locking cartilage oval with 1 or 2 knobs directed toward centre of concavity . . . . . → **18**

17a. Funnel locking cartilage with a longitudinal groove crossed by a transverse groove at its posterior end, ⊥-shaped; fins less than 60% of mantle length (Fig. 37) . . . . . **Family Ommastrephidae** (p. 788)

17b. Funnel locking cartilage with a longitudinal groove from which a shorter groove branches medially, ⊣-shaped; fin length equal to mantle length (Fig. 38) . . . . . **Family Thysanoteuthidae** (p. 797)

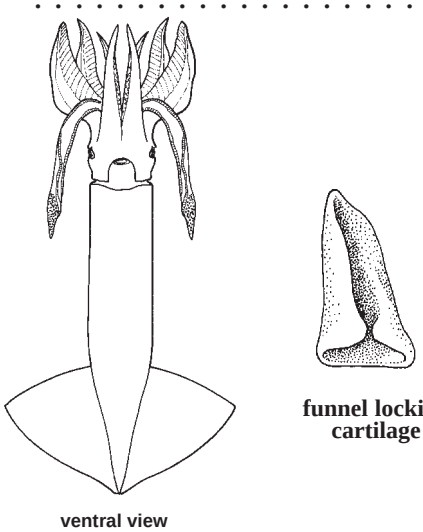


Fig. 37 Ommastrephidae (*Ommastrephes*)

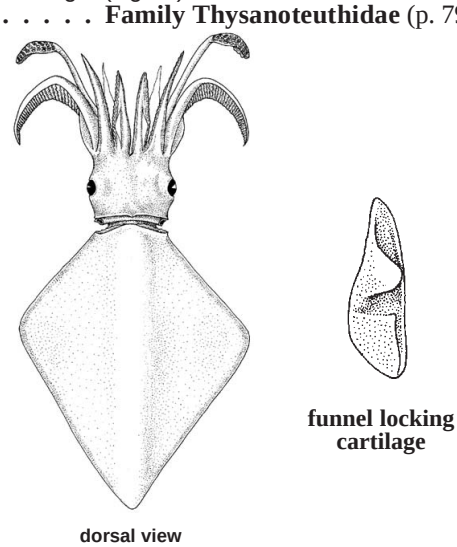


Fig. 38 Thysanoteuthidae (*Thysanoteuthis*)

18a. Club with 4 longitudinal rows of suckers (Fig. 39) . . . . . **Family Chiroteuthidae** (p. 798)

18b. Club with more than 15 longitudinal rows of minute suckers (Fig. 40) . . . . . **Family Mastigoteuthidae** (p. 799)

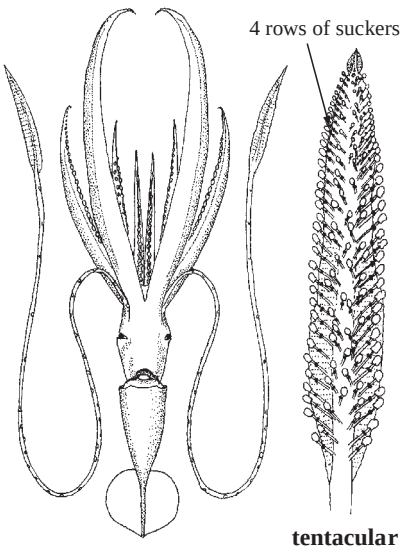


Fig. 39 Chiroteuthidae (*Chiroteuthis*)

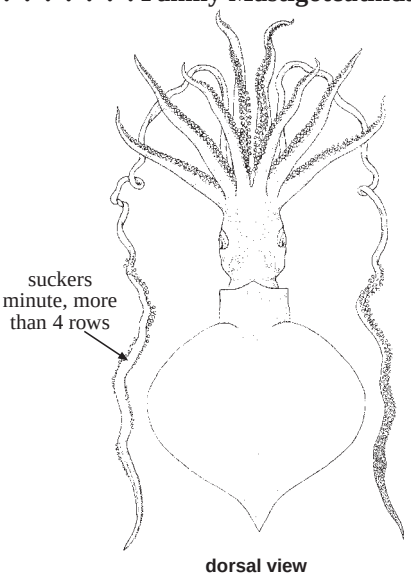


Fig. 40 Mastigoteuthidae (*Mastigoteuthis*)

19a. Suckers stalked, with chitinous rings; fins on posterior mantle, 1 pair in adults, 2 pairs in juveniles; internal shell as a thin broad chitinous plate; pair of small filamentous "tentacles" in pouch between bases of arms I and II; whole animal typically black; 2 transverse pairs of light organs present (Fig. 41) . . . . . Order Vampyromorpha (monotypic order): **Family Vampyroteuthidae**

19b. Suckers sessile (not stalked), without chitinous rings; fins present or absent; internal shell vestige either a U-shaped fin support, a pair of small rods (stylets), or absent; secondary filamentous "tentacles" absent; light organs absent (except around the mouth in some boliteanids); never completely black . . . . . **(Order Octopoda) → 20**

20a. Fins present; body gelatinous; rows of sensory digits of skin (cirri) adjacent to single row of suckers . . . . . **(Suborder Cirrata) ***

20b. Fins absent; body gelatinous to muscular; sensory cirri absent . . . . . **(Suborder Incirrata) → 21**

21a. Body jelly-like; often semitransparent . . . . . **→ 22**

21b. Body firm and muscular; opaque . . . . . **→ 25**

22a. Suckers on arms in 2 rows (Fig. 42) . . **Family Alloposidae ***

22b. Suckers on arms in 1 row . . **→ 23**

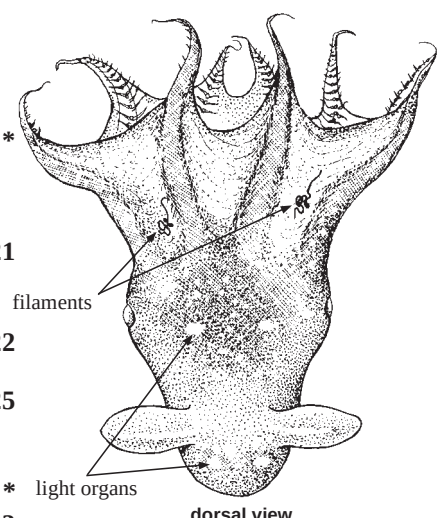


Fig. 41 Vampyroteuthidae (*Vampyroteuthis*)

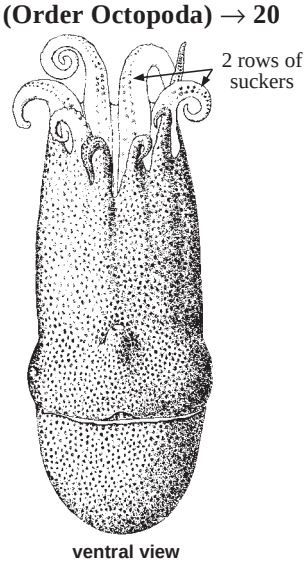


Fig. 42 Alloposidae (*Haliphron*)

23a. Arms short, typically less than mantle length; webs shallow (less than 50% arm length); eyes moderate size and not telescopic (Fig. 43) . . . . . **Family Bolitaenidae ***

23b. Arms longer than mantle length; webs deep (more than 50% of arm length); eyes telescopic or small . . . . . → **24**

24a. Eyes elongate, tubular; mantle opening reduced to 2 separate small lateral slits; mantle and arm musculature enclosed in gelatinous outer coat (Fig. 44) . . . . . **Family Amphitretidae ***

24b Eyes small and normal-shaped; single wide mantle opening; body gelatinous; mantle and arm musculature not enclosed in gelatinous outer coat (Fig. 45)**. . Family Vitreledonellidae ***

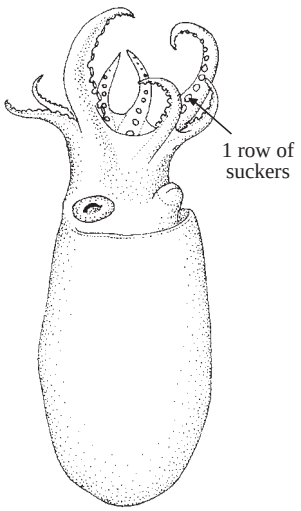


Fig. 43 Bolitaenidae (*Japetella*)

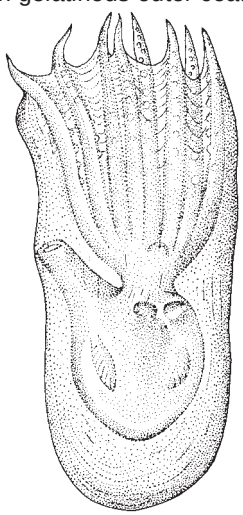


Fig. 44 Amphitretidae (*Amphitretus*)

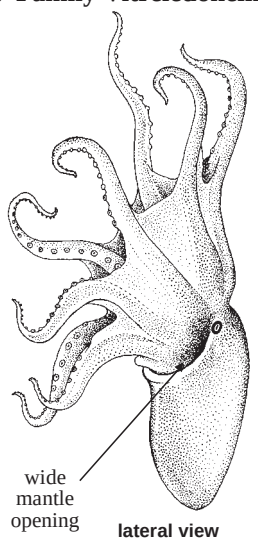


Fig. 45 Vitreledonellidae (*Vitreledonella*)

25a. Funnel-mantle locking apparatus absent; suckers in 1 or 2 rows (Fig. 46) . . . . . **Family Octopodidae** (p. 800)

25b. Funnel-mantle locking apparatus present; suckers in 2 rows . . . . . → **26**

26a. Female housed in thin calcareous shell ("paper nautilus"); thin flared webs on tips of modified first (dorsal) arms in females (in live animal, webs of each modified dorsal arm can cover each entire face of the shell); third left arm modified in male (Fig. 47) . . . . . **Family Argonautidae ***

26b. Shell absent; web (as in *Argonauta*) on tips of dorsal arm absent in females; third right arm modified in males . . . . . → **27**

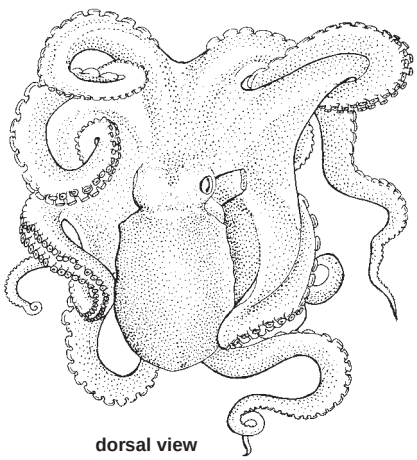


Fig. 46 Octopodidae (*Octopus*)

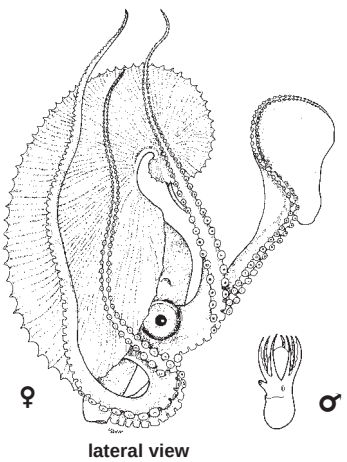
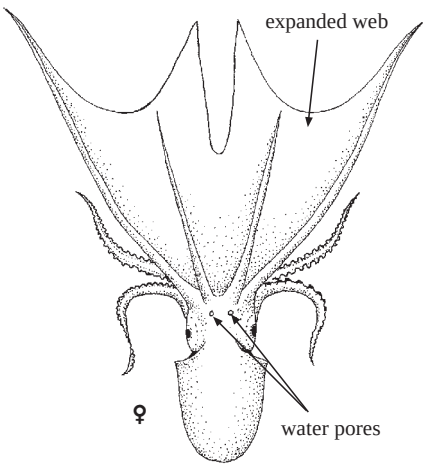


Fig. 47 Argonautidae (*Argonauta*)

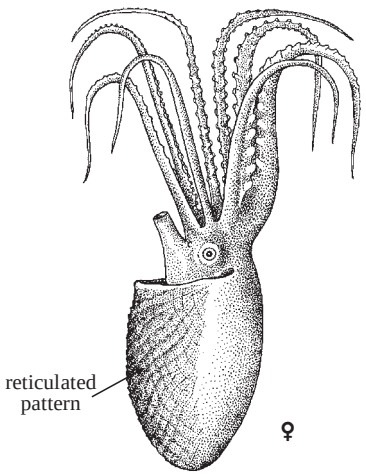
27a. Arms I and II of female joined by very deep thin web; arms I and II longer than other arms; ventral mantle smooth; 2 pairs of open holes on head (cephalic water pores), adjacent to bases of arms I and IV (Fig. 48) . . . . . **Family Tremoctopodidae ***

27b. Web absent; arms I and IV longer than other arms; ventral mantle of female sculptured with keratin-like inclusions in the skin forming a reticulate pattern; 1 pair of cephalic water pores on dorsal surface adjacent to bases of fourth arms (Fig. 49) . . . **Family Ocythoidae ***



dorsal view

Fig. 48 Tremoctopodidae (*Tremoctopus*)



lateral view

Fig. 49 Ocythoidae (*Ocythoe*)

ANNOTATED LIST OF FAMILIES ENCOUNTERED IN FISHING ACTIVITIES IN THE AREA

Classification modified after Nesis (1987), and Clarke and Trueman (1988). Importance to fisheries listed in increasing order as "non-commercial", "minor commercial", "commercial", or "major commercial".

Class CEPHALOPODA Cuvier, 1798

Subclass NAUTILOIDEA Agassiz, 1847

Order NAUTILIDA, **Monotypic Family Nautilidae Blainville, 1825 (minor commercial)** - Chambered nautiluses. Characterized by: COILED PEARLY EXTERNAL CHAMBERED SHELL WITH ANIMAL LIVING IN THE OUTERMOST CHAMBER; 2 PAIRS OF GILLS; MORE THAN 50 SMOOTH "ARMS" WITHOUT SUCKERS; EYES SIMPLE WITHOUT LENSES.

Medium-sized cephalopods with shell diameters reaching 250 mm; occur adjacent to coral reefs at the edge of the continental shelf and upper continental slope; 6 species.

Subclass COLEOIDEA Bather, 1888

Order SEPIOLIDA - Dumpling or bobtail squid and pygmy cuttlefishes. Characterized by: FINS ROUNDED AND TYPICALLY WIDE; CHITINOUS GLADIUS RUDIMENTARY (Sepiolidae) OR GLADIUS ABSENT (Idiosepiidae); ONE OR BOTH DORSAL (Sepiolidae) OR BOTH VENTRAL ARMS (Idiosepiidae) HECTOCOTYLIZED IN MALES; LIGHT ORGANS PRESENT ON THE INK SAC IN SOME SPECIES.

Family SEPIOLIDAE Leach, 1817 (minor commercial) - Dumpling or bobtail squid. Small rounded animals up to 80 mm mantle length; associated with sandy or rubbly substrates and seagrass beds in coastal waters and deeper continental shelf to 60 m; 11 species.

Family IDIOSEPIIDAE Appelöf, 1898 (non-commercial) - Pygmy cuttlefishes. Small animals maturing at less than 20 mm mantle length; occur in shallow seagrass and other inshore habitats; 3 species.

Order SEPIIDA - Cuttlefishes. Characterized by: CALCAREOUS SHELL INTERNAL IN THE MANTLE (except Sepiadariidae); TENTACLES RETRACTILE INTO POCKETS; ARM AND TENTACULAR SUCKERS WITH CHITINOUS RINGS; ONE PAIR OF GILLS WITHOUT BRANCHIAL CANAL BETWEEN AFFERENT AND EFFERENT BLOOD VESSELS; LIVER DIVIDED OR BILOBED; POSTERIOR FIN LOBES FREE.

Family SPIRULIDAE Owen, 1836 (minor commercial) - Ram's horn squid. Small (up to 45 mm mantle length); mesopelagic in warm oceanic waters; a single species.

Family SEPIIDAE Keferstein, 1866 (major commercial) - Cuttlefishes. Medium-sized cephalopods to 500 mm mantle length; demersal species of the continental shelf and upper slope; more than 35 species.

Family SEPIADARIIDAE Naef, 1912 (non-commercial) - Bottle squids. Small cephalopods (less than 50 mm mantle length); nektobenthic in coastal waters to depths of 60 m; 2 species.

Order TEUTHIDA - Squids. Characterized by: CHITINOUS GLADIUS INTERNAL IN THE MANTLE, SIMPLE, ROD- OR FEATHER-LIKE; TENTACLES CONTRACTILE BUT NOT RETRACTILE INTO POCKETS; ARM AND TENTACULAR SUCKERS WITH CHITINOUS RINGS AND/OR HOOKS; ONE PAIR OF GILLS WITH BRANCHIAL CANAL BETWEEN AFFERENT AND EFFERENT BLOOD VESSELS; LIVER UNDIVIDED AND SINGLE LOBED; POSTERIOR FIN LOBES MAY BE JOINED.

Suborder MYOPSIDA Orbigny, 1845 - "covered-eyed" squids

Family LOLIGINIDAE Steenstrup, 1861 (major commercial) - Inshore or pencil squids. Medium-sized cephalopods to 500 mm mantle length; nektonic species of the continental shelf; more than 20 nominal species.

Suborder OEGOPSIDA Orbigny, 1845 - "open-eyed" squids

Family ENOPLOTEUTHIDAE Pfeffer, 1900 (minor commercial) (includes M.R. Clarke's families Enoploteuthidae, Ancistrocheirinae and Pyroteuthinae) - Firefly or enope squids. Small to medium squids to 400 mm mantle length; pelagic species of the continental slope and oceanic waters; 17 species.

Family OCTOPOTEUTHIDAE Berry, 1912 (non-commercial) - Octopus squids. Medium to large squids to 1 700 mm mantle length; meso- to bathypelagic and benthic in oceanic waters; at least 4 species.

Family ONYCHOTEUTHIDAE Gray, 1849 (minor commercial?) - Hooked squids. Medium to large squids to 400 mm mantle length; epi- to mesopelagic in oceanic waters and benthic in continental slope waters; at least 4 species.

Family LEPIDOTEUTHIDAE Naef, 1912 (non-commercial) (includes M.R. Clarke's family Pholidoteuthidae) - Scaled squids. Medium to large squids to 970 mm mantle length; nektobenthic in continental slope and oceanic waters; 3 species.

Family ARCHITEUTHIDAE Pfeffer, 1900 (non-commercial) - Giant squids. Reach maturity at large sizes to 2 000 mm mantle length; mesopelagic in oceanic waters; number of species uncertain.

Family HISTIOTEUTHIDAE Verrill, 1881 (non-commercial) - Jewel squids. Small to medium squids to 200 mm mantle length; mesopelagic to nektobenthic in continental slope and oceanic waters; 4 species.

Family CTENOPTERYGIIDAE Grimpe, 1922 (non-commercial) - Ribbed finned squids. Small to medium squids to 90 mm mantle length; meso-to bathypelagic in oceanic waters; 2 species.

Family BRACHIOTEUTHIDAE Pfeffer, 1908 (non-commercial) - Arm squids. Small to medium squids to 90 mm mantle length; meso- to bathypelagic in oceanic waters; 2 species.

Family OMMASTREPHIDAE Steenstrup, 1857 (commercial) - Arrow squids. Medium to large squids to 600 mm mantle length; nektobenthic in deeper continental shelf and slope waters and epi-mesopelagic in oceanic waters; 9 species.

Family THYSANOTEUTHIDAE Keferstein, 1866 (commercial) - Diamond squids. Large-sized squids reaching 1 000 mm mantle length; epi-mesopelagic in warm oceanic waters; a single species.

Family CHIROTEUTHIDAE Gray, 1849 (non-commercial) - Chiroteuthid squids. Medium to large squids to 800 mm mantle length; mesopelagic to nekto-benthic in oceanic and continental slope waters; 2 species.

Family MASTIGOTEUTHIDAE Verrill, 1881 (non-commercial) - Mastigoteuthid squids. Medium to large squids reaching 1000 mm mantle length; mesopelagic to nekto-benthic in oceanic and continental slope waters; several species.

Family CRANCHIDAE Prosch, 1849 (non-commercial) - Cranch squids. Small to large squids to 800 mm mantle length; epi- to bathypelagic in oceanic waters; many species.

Order VAMPYROMORPHA Pickford, 1939, Monotypic Family VAMPYROTEUTHIDAE Thiele, 1915 (non-commercial) - Vampire squids. Characterized by: EIGHT ARMS ONLY, TENTACLES ABSENT; SINGLE ROW OF SUCKERS STALKED WITH CHITINOUS RINGS; DORSAL MANTLE JOINED TO HEAD; PAIRED, ROUNDED FINS PRESENT; INTERNAL SHELL A CHITINOUS THIN BROAD PLATE; A PAIR OF THIN FILAMENTOUS FILAMENTS IN POUCHES BETWEEN ARMS I AND II; LIGHT ORGANS PRESENT IN THE MANTLE AT THE BASE OF EACH FIN AND MEDIAL TO THE EYE DORSALLY; COLOUR BLACK.

Medium-sized octopuses reaching 130 mm mantle length; mesopelagic in slope and deeper waters; a single species.

Order OCTOPODA Leach, 1818 - Octopuses. Characterized by: EIGHT ARMS ONLY, TENTACLES ABSENT; SINGLE OR PAIRED ROWS OF SUCKERS SESSILE WITHOUT SUCKER RINGS OR HOOKS; DORSAL MANTLE JOINED TO HEAD; FINS PRESENT OR ABSENT; CHITINOUS SHELL VESTIGE EITHER SMALL CARTILAGINOUS RODS OR A U-SHAPED SUPPORT; LIGHT ORGANS GENERALLY ABSENT (PRESENT AROUND THE MOUTH IN BOLITAENIDS).

Suborder INCIRRATA Grimpe, 1916

Superfamily BOLITAENOIDEA

Family BOLITAENIDAE Chun, 1911 (non-commercial) - Small to medium-sized octopuses reaching 150 mm mantle length; meso- to bathypelagic (juveniles epipelagic); 2 species.

Family AMPHITRETIDAE Hoyle, 1886 (non-commercial) - Medium-sized octopuses reaching 90 mm mantle length; meso- to bathypelagic (juveniles epipelagic); a single species.

Superfamily OCTOPODOIDEA

Family OCTOPODIDAE Orbigny, 1845 (major commercial) - Benthic octopuses. Small to medium-sized octopuses reaching 200 mm mantle length; demersal species of the continental shelf and upper slope; more than 30 species.

Superfamily ARGONAUTOIDEA

Family TREMOCTOPODIDAE Brock, 1882 (non-commercial) - Banket octopuses. Medium-sized octopuses reaching 200 mm mantle length (females), 15 mm mantle length (males); epi- to mesopelagic in oceanic waters; 2 species.

Family OCYTHOIDAE Gray, 1849 (non-commercial) - Medium-sized octopuses reaching 200 mm mantle length; epi- to mesopelagic in oceanic waters; a single species.

Family ARGONAUTIDAE Naef, 1912 (non-commercial) - Argonauts or paper nautiluses. Small to medium-sized octopuses reaching 120 mm mantle length (females), less than 20 mm mantle length (males); epi- to mesopelagic in deeper shelf and oceanic waters although occasionally encountered on the shelf; several species.

Family ALLOPOSIDAE Verrill, 1882 (non-commercial) - Jelly octopuses. Medium-sized octopuses reaching 150 mm mantle length; epi- to mesopelagic oceanic octopods; a single species.

LIST OF FAMILIES TREATED IN THIS CONTRIBUTION

Order NAUTILIDA
- NAUTILIDAE - Chambered nautiluses

Order SEPIOLIDA
- SEPIOLIDAE - Bobtail squids
- IDIOSEPIIDAE - Pygmy cuttlefishes

Order SEPIIDA
- SPIRULIDAE - Ram's horn squid
- SEPIIDAE - Cuttlefishes
- SEPIADARIIDAE - Bottle squids

Order TEUTHIDA

Suborder MYOPSIDA
- LOLIGINIDAE - Inshore squids, pencil squids

Suborder OEGOPSIDA
- ENOPLOTEUTHIDAE - Firefly or enope squids
- ONYCHOTEUTHIDAE - Hooked squids
- HISTIOTEUTHIDAE - Jewel squids
- OMMASTREPHIDAE - Arrow squids
- THYSANOTEUTHIDAE - Diamond squids
- CHIROTEUTHIDAE - Chiroteuthid squids
- MASTIGOTEUTHIDAE - Mastigoteuthid squids

Order OCTOPODA
- OCTOPODIDAE - Benthic octopuses

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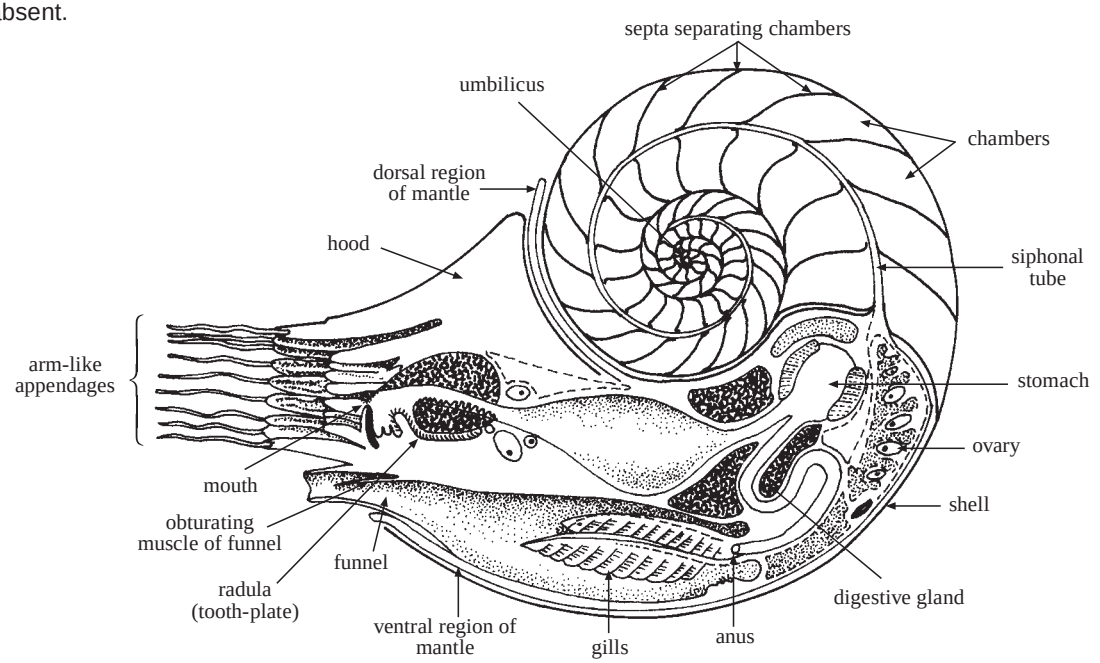
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NAUTILIDAE

Chambered nautiluses

by M.C. Dunning

Diagnostic characters: Coiled, pearly, external shell punctuated with chambers with the animal living in the outermost chamber; 2 pairs of gills; **up to 47 pairs of arm-like appendages** around mouth; **suckers and hooks lacking**; eyes simple, without lenses; funnel (or infundibulum) consisting of 2 lobes which fold together to form a tube-like structure that serves for locomotion. Chromotophores and ink sac absent.

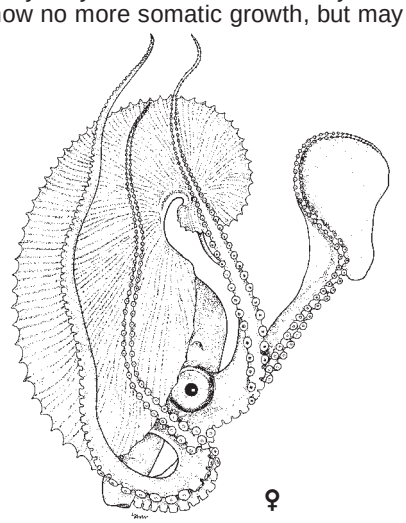


schematic cross-section of a *Nautilus*

Habitat, biology, and fisheries: The nautiloids are represented by 6 living species of *Nautilus*. All of these are found in the tropical Indo-West Pacific. Nautiluses live in association with the bottom, primarily coral reefs, from depths of about 50 to 500 m. They are slow foragers of the deep nektobenthos and are generally found in deeper water during the day and at shallower depths at night. Nautiluses are the longest lived of the extant cephalopods, recent mark-recapture studies indicating they may live for more than 20 years. They exhibit determinate growth, i.e. after reaching maturity they show no more somatic growth, but may live several years after reaching maturity. Egg capsules in natural habitats are unknown but in captivity are laid singly attached to hard substrates and take up to 14 months to hatch in warm water (22° to 25°C). It is hypothesized that they are laid in nature in relatively shallow water (80 to 100 m). At least 2 of these species are of commercial value as food (largely at the artisanal and subsistence levels) and in the specimen shell trade (e.g. Indonesia, Fiji, New Caledonia, and the Philippines). Nautiluses are also collected alive for public display and home aquaria, and for research. They are caught using baited fish traps.

Similar families occurring in the area

Argonautidae: a kind of octopus, the female argonaut produces a white calcareous “shell” in which she resides and eggs are laid and incubated. This “shell” has a single chamber only. Female argonauts have 8 true arms with biserial suckers compared to the many sucker-less arm-like appendages of nautiluses.



Argonautidae

Key to the species of Nautilidae occurring in the area

1a. Umbilicus small, up to 5% of shell diameter . . . . . → ***2***

1b. Umbilicus larger, at least 10% of shell diameter . . . . . → ***3***

2a. Umbilicus covered by a calcareous deposit, the umbilical callus . . . . . → ***4***

2b. Umbilicus without umbilical callus (northeastern Australia). . . . . ***Nautilus stenomphalus***

3a. Umbilicus moderate with sloping umbilical walls and an evenly rounded umbilical shoulder, approximately 16% of shell diameter (New Caledonia, Loyalty Islands) . . . . . ***Nautilus macromphalus***

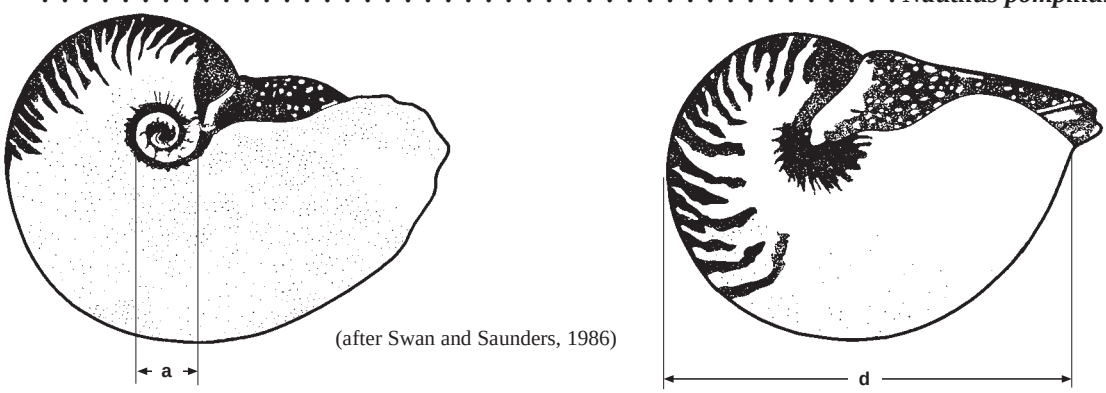
3b. Umbilicus large (approximately 20% shell diameter) with subangular shoulders and vertical walls (Solomon Islands, Papua New Guinea) . . . . . ***Nautilus scrobiculatus***

4a. Umbilicus approximately 5% of shell diameter, brown to reddish brown colour banding from the shell margin to the umbilicus or at least half way . . . . . → ***5***

4b. Umbilicus small, fine yellowish brown colour banding, sometimes greatly reduced (northwestern Australia) . . . . . ***Nautilus repertus***

5a. Fine raised longitudinal growth lines on the shell (found only around Palau, Western Caroline Islands) . . . . . ***Nautilus belauensis***

5b. Shell generally smooth, without growth lines (widespread distribution, Indo-West Pacific) . . . . . ***Nautilus pompilius***



(after Swan and Saunders, 1986)

schematic lateral view of *Nautilus* shells showing the umbilicus width (a) and the shell diameter (d)

List of species occurring in the area

The symbol is given when species accounts are included.

Nautilus belauensis Saunders, 1981
Nautilus macromphalus Sowerby, 1849
Nautilus pompilius Linnaeus, 1758
Nautilus repertus Iredale, 1944
Nautilus scrobiculatus (Lightfoot, 1786)
Nautilus stenomphalus Sowerby, 1849

Reference

Saunders, W.B., and N.H. Landman. 1986. *Nautilus, the biology and paleobiology of a living fossil*. New York, Plenum Press.

Nautilus macromphalus Sowerby, 1849

Frequent synonyms / misidentifications: None / None.

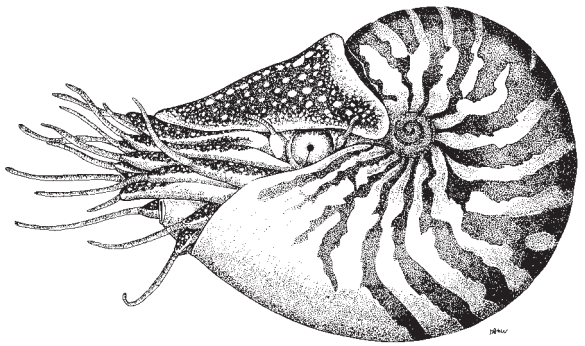
FAO names: En - Bellybutton nautilus; **Fr** - Nautile bouton; **Sp** - Nautilo ombligo.

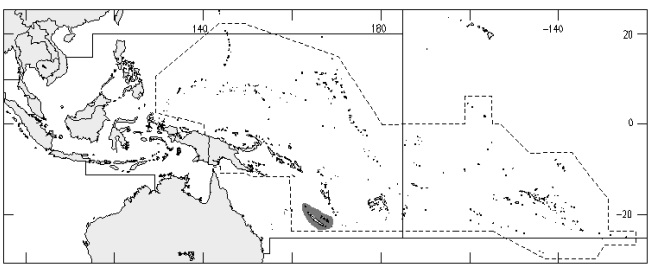
Diagnostic characters: Umbilicus a deep, round shouldered concavity, approximately 16% of shell diameter.

Size: Maximum shell diameter about 160 mm.

Habitat, biology, and fisheries: Inhabits continental shelf and slope waters associated with coral reefs, from the surface to a depth of about 500 m. Consumed by artisanal fishers; also supports a small fishery for public and private aquarium and research trade. Collected alive at a depth of about 65 m on the outer slope of the barrier reef in New Caledonia; in the Coral Sea, trapped at depths between 300 and 400 m.

Distribution: Restricted to New Caledonia and Loyalty Islands.





Nautilus pompilius Linnaeus, 1758

Frequent synonyms / misidentifications: None / None.

FAO names: En - Emperor nautilus; **Fr** - Nautile flammé; **Sp** - Nautilo común.

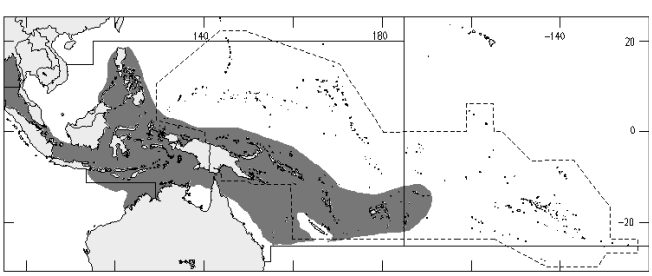
Diagnostic characters: Umbilicus small, filled in with a concretion; brown to reddish brown striped colour pattern, extending to the umbilicus in some specimens or only half way across the shell in others.

Size: Populations of this species reach shell diameters typically between 170 and 180 mm around Fiji and the Philippines.

Habitat, biology, and fisheries: Inhabits deeper continental shelf and slope waters around coral reefs, from near the surface to a depth of about 750 m. Supports shell trade, mostly from beach-drift specimens, and subsistence and artisanal fisheries in the Philippines. Captured in bamboo fish traps at depths from 60 to 240 m.

Distribution: Indo-West Pacific; Andaman Islands, Ambon, the Philippines, New Guinea to Fiji; northeastern Australia. Absent from around New Caledonia where it is replaced by *N. macromphalus*. Sympatric with *N. scrobiculatus* off New Guinea, *N. repertus* off northwestern Australia, and *N. stenomphalus* off northeastern Australia. Replaced by *N. belauensis* around Palau.





SEPIOLIDAE

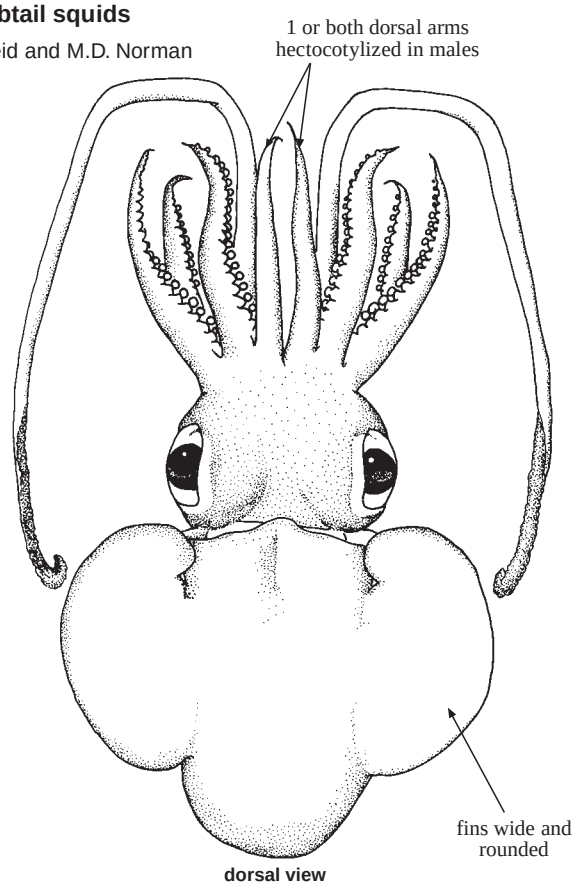
Bobtail squids

by A.L. Reid and M.D. Norman

Diagnostic characters: Small rounded squids (mantle length typically less than 80 mm) with 8 arms and 2 functional retractile tentacles with well-developed clubs. Dorsal mantle free from, or fused to, head. **Ventral mantle attached to funnel by funnel locking apparatus**, mantle edge may cover funnel base. **Fins present, rounded and typically wide. Maximum fin length distinctly longer than length of attachment to mantle.** Suckers spherical, usually larger in males than females. Internal shell chitinous, rudimentary or absent. Frequently with light organ on ink sac. **One or both dorsal arms hectocotylized in males.**

Habitat, biology, and fisheries: Benthic or mesopelagic squids. Mesopelagic species live in midwater over or near the continental slope. Benthic species associate with soft substrates and seagrass beds, typically remaining submerged in soft sediments during the day. Bury using fins and funnel to cover the entire animal with sand or shell, using the arms to rake grains onto the head and mantle. Animals typically emerge at night to forage for benthic and free-swimming crustaceans. A number of sepiolid species are of minor commercial importance throughout the area, harvested primarily as bycatch in trawl fisheries.

Remarks: The taxonomy of many genera within this family is poorly known as most species are identified solely on sexual characters of mature males.



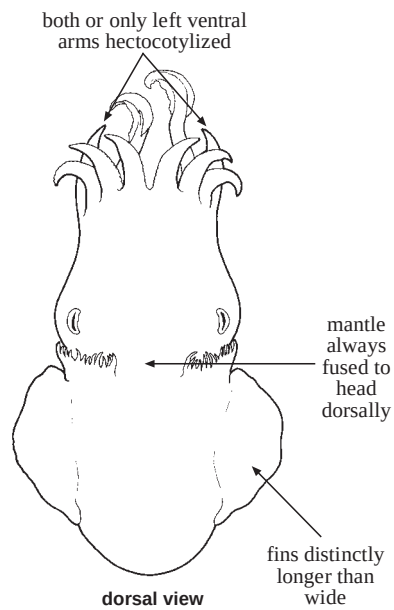
Similar families occurring in the area

Sepiadariidae (bottle squids): no internal shell; no light organs within the mantle cavity; dorsal mantle fused to head in all species; fins elongate, much longer than wide; ventral arms hectocotylized in males.

Key to the genera of Sepiolidae occurring in the area

1a. Only third and fourth arms united by a broad web; anterior edge of ventral mantle not covering funnel base; light organ present or absent; internal shell present or absent; benthic species . . . . . → *2*

1b. All arms except the fourth pair united by a broad web; anterior edge of ventral mantle extends to cover base of funnel, reaching level of eye in certain species; light organ on ventral ink sac; internal shell absent; pelagic or deeper benthic species . . . . . **(subfamily Heteroteuthinae)** → *3*



Sepiadariidae

2a. Dorsal mantle fused to head; nuchal cartilage absent; left dorsal arm hectocotylized; internal shell rudimentary or absent . . . . . **(subfamily Sepiolinae)** → ***4***

2b. Dorsal mantle not fused to head; nuchal cartilage present; left or both dorsal arms hectocotylized; shell present . . . . . **(subfamily Rossinae)** → ***6***

3a. Dorsal mantle fused to head by narrow strip . . . . . ***Sepiolina***
(a single species, *S. nipponensis*, in this genus)

3b. Dorsal mantle not fused to head . . . . . ***Heteroteuthis***
(a single species, *H. weberi*, in the area)

4a. In male, only distal half of left dorsal arm modified: distal suckers modified into a row of column-like structures with tiny, fleshy, slit openings; base of arm with normal suckers and 1 to 3 elongate papillae with or without tiny sucker on tip; arm suckers in 4 or more longitudinal rows; tentacular clubs with many tiny suckers in more than 10 rows; light organ saddle-shaped, a lobe visible on each side of the septum; third arms not bent inwards towards mouth . . . . . ***Euprymna***

4b. In male, entire hectocotylized arm or basal part modified with recesses and projections; arm suckers in 2 longitudinal rows (sometimes more on tips of ventral arms; tentacular clubs with 10 or less rows of small suckers; third arms of male usually greatly bent inward towards mouth; light organ present or absent . . . . . → ***5***

5a. Light organ present on ink sac, saddle-like or in form of 2 "ears"; junction of dorsal mantle and head wide, 33 to 50% of head width; suckers on ends of ventral arms sometimes arranged in 4 to 8 rows; tentacular club suckers usually in 4 to 8 rows . . . . . ***Sepiola***

5b. Light organ absent; junction of dorsal mantle and head narrow, less than 33% of head width; hectocotylized arm widened in basal half in area of copulatory structure, distal part of arm normal; tentacular club suckers in 8 to 10 rows . . . . . ***Inioteuthis***

6a. Anal flaps present; ink sac well developed; vane extends entire length of shell . . . . . ***Rossia***

6b. Anal flaps reduced or absent; ink sac greatly reduced; vane present on posterior half of shell only . . . . . ***Neorossia*** [1/]

List of species occurring in the area

The symbol ♜ is given when species accounts are included.

♜ *Euprymna morsei* (Verrill, 1881)
♜ *Euprymna tasmanica* (Pfeffer, 1884)

♜ *Heteroteuthis weberi* Joubin, 1902

Inioteuthis maculosa Berry, 1918

? *Neorossia* sp.[1/]

♜ *Rossia australis* Berry, 1918
♜ *Rossia bipapillata* Sasaki, 1920

♜ *Sepiola birostrata* Sasaki, 1918
♜ *Sepiola parva* Sasaki, 1913
♜ *Sepiola trirostrata* Voss, 1962

♜ *Sepiolina nipponensis* (Berry, 1911)

References

Okutani, T. 1995. *Cuttlefish and squids of the world in colour*. Tokyo, Japan, Okumura Pringing Co. Ltd., 185 p.

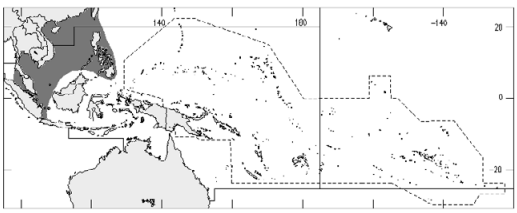
Reid, A. 1991. Taxonomic review of the Australian Rossinae (Cephalopoda: Sepiolidae), with a description of a new species, *Neorossia leptodons* and redescription of *N. caroli* (Joubin, 1902). *Bull. Mar. Sci.*, 19(3):748-831.

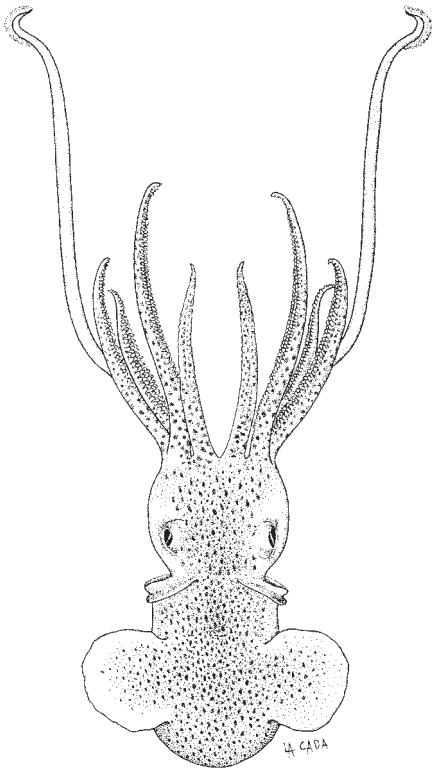
1/ Not yet recorded from the area. Representatives of this genus have been collected off the northwest shelf of western Australia in depths of 690 to 1 277 m, and 1 species, *Neorossia leptodons*, is known from southeastern Australia. Another representative of the genus is known from Taiwan Province of China, so the genus may extend throughout the area in deep water.

Euprymna morsei (Verrill, 1881)

En - Double-ear bobtail squid.

Maximum mantle length 40 mm. Dorsal mantle fused to head. Fins large and round. Arms with 4 longitudinal rows of suckers. **Enlarged suckers of males restricted to ventral rows of arms II to IV**, **approximately 10 on each arm**. Left arm I hectocotylized in distal half as rows of columnar suckers with tiny openings. **Colour**: large black chromatophores over iridescent gold to purple base colour. Taxonomy of genus poorly known, several undescribed or unresolved species in the area. Harvested on a minor scale, primarily as trawl bycatch. Southern Japan and Philippines to at least Indonesia.



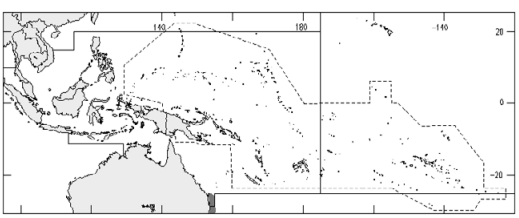


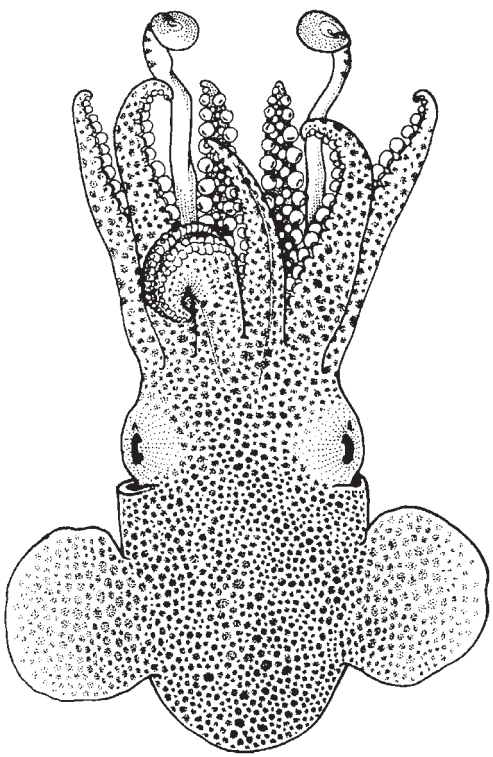
dorsal view

Euprymna tasmanica (Pfeffer, 1884)

En - Southern bobtail squid.

Maximum mantle length 40 mm. Dorsal mantle fused to head. Fins large and round. Arms with 4 longitudinal rows of suckers. **Enlarged suckers of males restricted to ventral rows of arms II and III**, **1 to 3 on each arm.** Left arm I hectocotylized in distal half as rows of columnar suckers with tiny openings. **Colour:** large black chromatophores over iridescent green to gold iridescent base colour. Taxonomy of genus poorly known, several undescribed or unresolved species in the area. No current exploitation. Eastern and southeastern Australia.



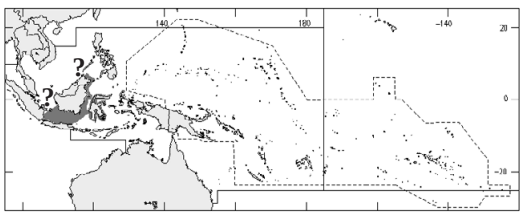


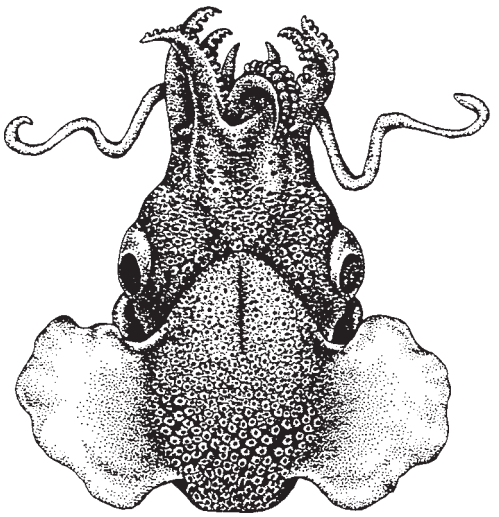
dorsal view

Heteroteuthis weberi Joubin, 1902

En - Stumpy bobtail squid.

Arms of mature male subequal in length, arms II not longer than arms I and IV; suckers reaching to distal tips of arms, **3 enlarged suckers on arms II**, **twice as large as normal suckers.** Depth of web between arms I in males 33 to 50% arm length. Three enlarged suckers present on arms II, approximately twice as large as normal suckers. **Anterior edge of fin extends well beyond anterior edge of mantle.** Ink ejected with a luminous liquid. Females unknown. Bathyl. Known from central Indonesia.



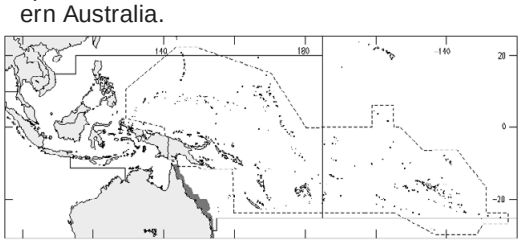


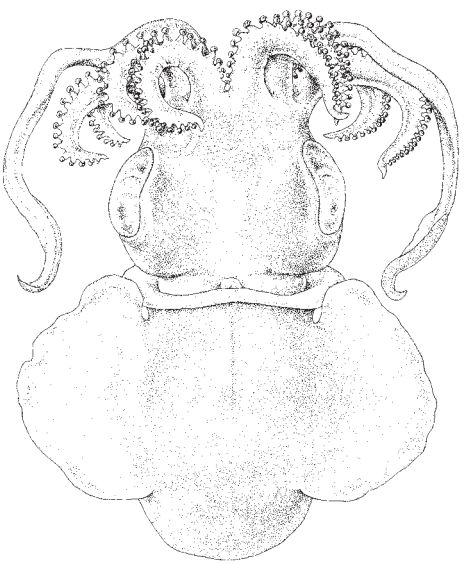
dorsal view

Rossia australis Berry, 1918

En - Big bottom bobtail squid.

Maximum mantle length 34 mm (males) and 63 mm (females). Anterior edge of mantle not fused to head dorsally. Fins large, ovate; attached within anterior 2/3 of mantle. **Nuchal locking cartilage elongate oval, rounded anteriorly; tapering, slightly narrower posteriorly**. Arm suckers biserial, largest suckers of arms II and III larger than those of arms I and IV in both sexes. Dorsal arm pair of males hectocotylized: ventrolateral edge of oral surface bordered by a swollen glandular crest, the inner edge of which forms a deep furrow extending from sucker rows 4 to 6, to sucker rows 8 to 11 (usually 4 to 9); proximal 8 to 10 series of suckers small, next 4 to 8 series enlarged; remaining suckers gradually diminish in size. Tentacular club slender, uniform in diameter; suckers minute; males with 18 to 26 suckers in transverse rows, females with 25 to 33 suckers in transverse rows. A pair of **epirenal bodies present in males only,** near the renal papillae. **Anal pads present** in both sexes, on either side of the rectum. Vane extends entire length of gladius. **Colour:** uniform pinkish. Sandy and muddy substrates to a depth of 670 m. No fisheries importance at present. Found in eastern Australia. A second *Rossia* species is found on the northwest shelf of western Australia.



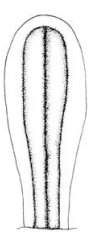


dorsal view of female

(illustration: K.Hollis/ABRS)



tentacular club

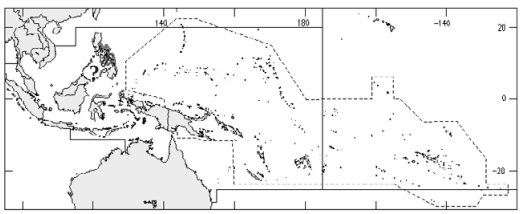


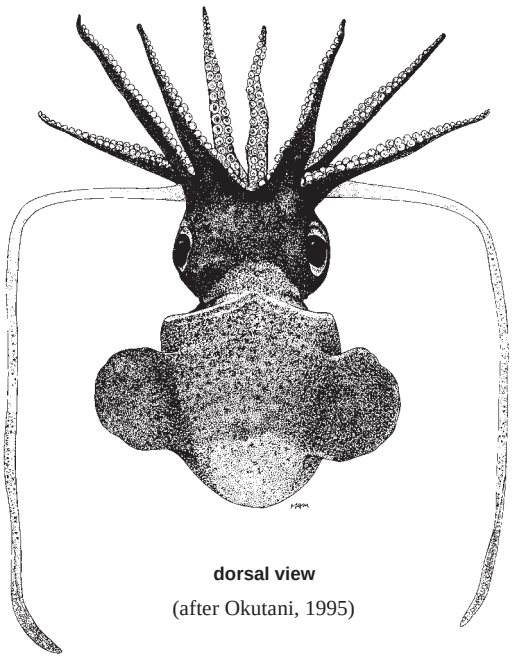
nuchal locking cartilage

Rossia bipapillata Sasaki, 1920

En - Big-eyed bobtail.

Maximum mantle length 50 mm. Mantle short, saccular, width 70 to 80% of mantle length. Fins circular. **Nuchal cartilage oval**. Arm suckers globular; biserial. Tentacular club slender, with more than 25 minute suckers in transverse rows. **Epirenal bodies present in both sexes,** near the renal papillae. Anal pads present. Differs from *R. pacifica* Berry, 1911, in having an oval, rather than elongate, parallel-sided, nuchal locking cartilage, and in the tentacle club suckers, which in *R. pacifica* are arranged in 8 to 10 rows, rather than 25 or more as in *R. bipapillata*. *R. pacifica* does not possess papillae on either side of the anus. Minor fisheries importance at present. Found in Japan and the Philippines.





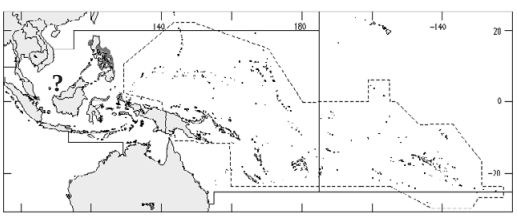
dorsal view

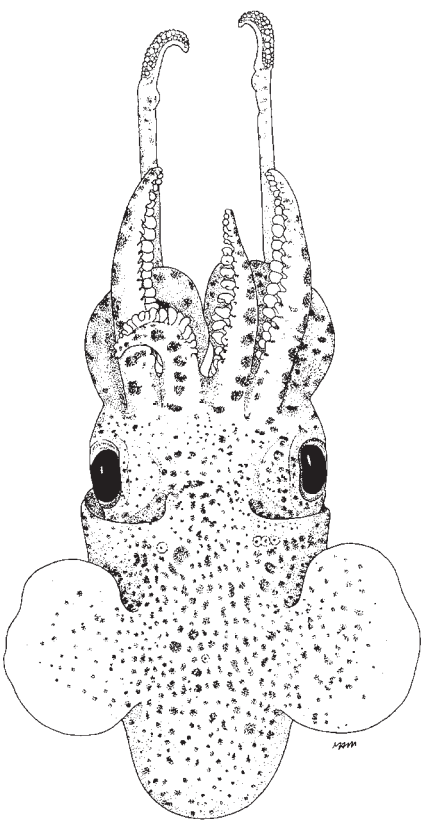
(after Okutani, 1995)

Sepiola birostrata Sasaki, 1918

En - Butterfly bobtail; **Fr** - Sépiole papillon; **Sp** - Sepiola mariposa.

Maximum mantle length approximately 12.5 mm. Arm III in both sexes stout and strongly curved inward (more obviously so in males); ventral suckers of right arm I and arms II to III of males larger than dorsal suckers, those on arms III more markedly enlarged. Left arm I hectocotylized: 2 pairs of normal suckers proximally, followed by **2 long, slender papillae arising ventrolaterally to blunt papilla**; anterior of 2 papillae longer, and thicker; a smooth region distal to modified papillae; remaining distal suckers reduced, borne on swollen, closely packed, prism-like pedicels, together forming a fleshy mound; distal portion of arm twisted and strongly recurved. Tentacular club suckers large; 4 suckers in transverse rows; dorsal suckers larger than ventral suckers. Light organ on each side of ink sac. **Colour** (preserved specimens): mantle and head with many minute brown or black chromatophores. Arms III deep pink; arms I to III with single rows of large chromatophores, arms IV with double row of small chromatophores. Differs from *Sepiola trirostrata* in lacking the blunt, fleshy papilla in addition to the 2 slender hectocotylus papillae. Fisheries significance unknown. Philippines, Singapore.





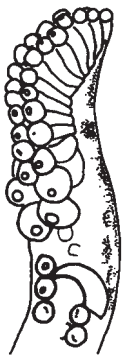
dorsal view

(after Okutani, 1995)

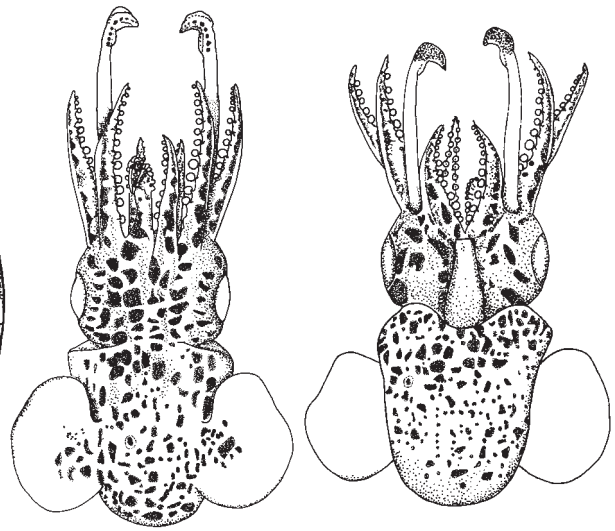
Sepiola parva Sasaki, 1913

En - Spotty bobtail squid.

Maximum mantle length 10 mm. Mantle short, dome-shaped; anterior margin fused dorsally with large head. Fins large, ear-shaped. Arm suckers biserial. Male left arm I **hectocotylized with a hook-like fleshy projection proximally following a few normal suckers**; distal sucker pedicles swollen, forming a fleshy mound. Tentacular club with 8 suckers in transverse rows, with median suckers larger than marginal ones. Subtidal zone in hard substrates. Southern Japan to northern Philippines.



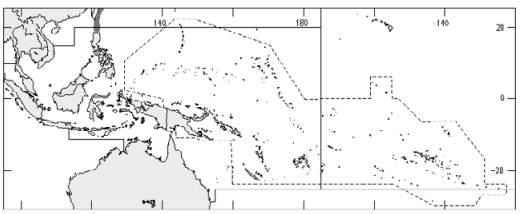
hectocotylus



male **female**

dorsal views

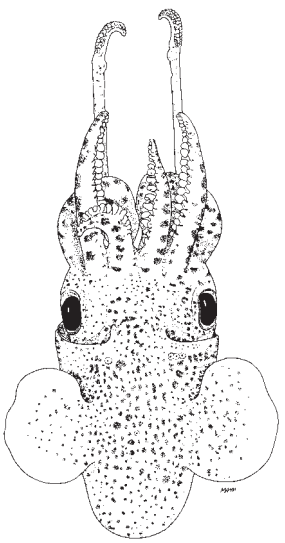
(after Okutani, 1995)



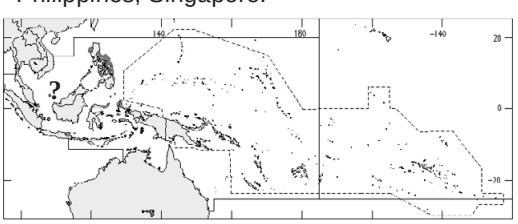
Sepiola trirostrata Voss, 1962

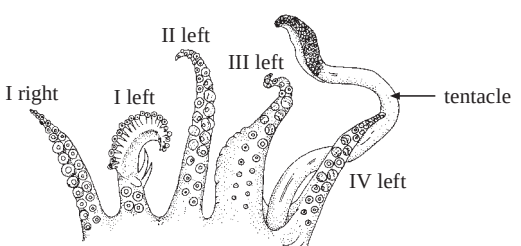
En - Knobby bobtail squid.

Maximum mantle length approximately 12.5 mm. Arm III in both sexes stout and strongly curved inward (more obviously so in males); ventral suckers of right arms I and arms II to III of males larger than dorsal suckers, those on arm III more markedly enlarged. Left arm I hectocotylized: 2 pairs of normal suckers proximally, followed by **a large, blunt, fleshy papilla with 2 long, slender papillae arising ventrolaterally to blunt papilla**; anterior of 2 papillae longer, and thicker; a smooth region distally to modified papillae; remaining distal suckers reduced, borne on swollen, closely packed, prism-like pedicels, together forming a fleshy mound; distal portion of arm twisted and strongly recurved. Tentacular club suckers large; 4 suckers in transverse rows; dorsal suckers larger than ventral suckers. Light organ on either side of ink sac. **Colour** (preserved specimens): mantle and head with many minute brown or black chromatophores. Arms III deep pink; arms I to III with single rows of large chromatophores, arms IV with double row of small chromatophores. Differs from *Sepiola birostrata* in having the blunt, fleshy papilla in addition to the 2 slender hectocotylus papillae. Fisheries significance unknown. Philippines, Singapore.



dorsal view





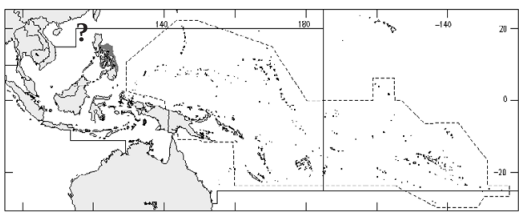
arm arrangement (male)

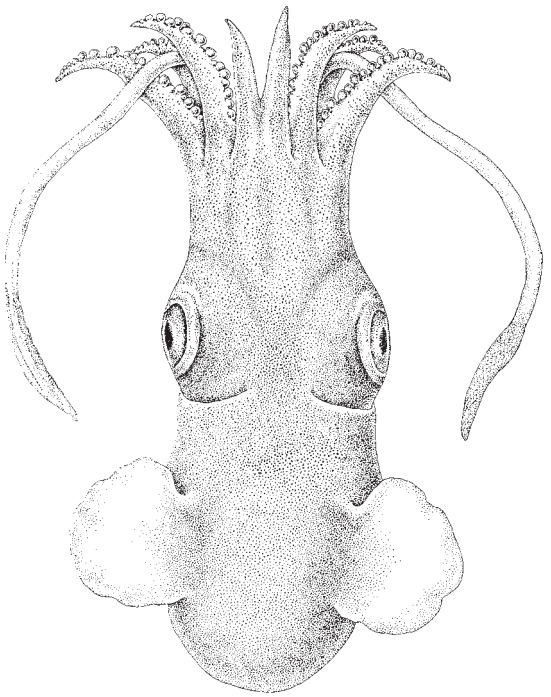
(after Voss, 1963)

Sepiolina nipponensis (Berry, 1911)

En - Japanese bobtail; **Fr** - Sépiole gros yeux; **Sp** - Sepiolina.

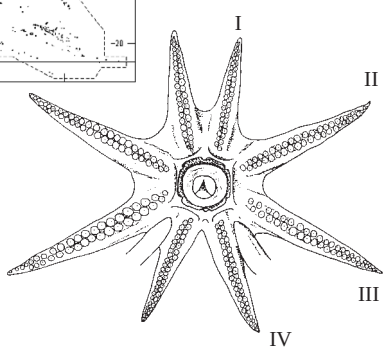
Maximum mantle length 25 mm. Mantle short and dome-shaped; anteriorly **fused to dorsal side of head by a narrow (approximately 3 mm) band**. Fins oval. Arm suckers biserial; in females suckers numerous, small throughout; males with fewer suckers, **enlarged on arms II to III and to a lesser extent, on arms IV**. **Both dorsal arms hectocotylized, thickened**, with no special structure; suckers small, widely spaced, oral surface with transversely grooved ridges. Club same diameter as tentacle stalk; **suckers minute, 13 to 16 suckers arranged in transverse rows**; swimming keel extending for a short distance along stalk. Light organ roundish, on ink sac in mantle cavity; in fresh specimens, visible through mantle. **Colour:** with numerous chromatophores; ventral mantle margin dark and encircled by a silvery iridescent band, approximately 5 mm wide, chromatophores small, evenly peppered over this region. A neritic species occurring on the continental shelf to a depth of 200 m. Light organ excretes a luminous cloud, instead of ink. Fisheries interest undetermined. Found off southern Japan, the Philippines, and the Great Australian Bight.



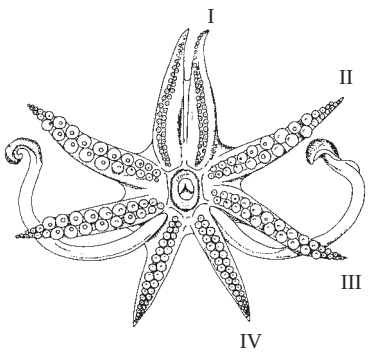


dorsal view

(illustration: K.Hollis/ABRS)



arms of female (oral view)



arms of male (oral view)

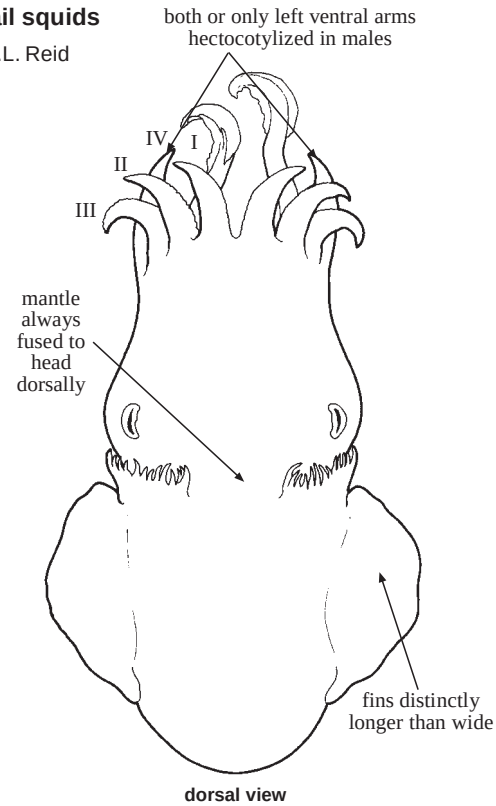
SEPIADARIIDAE

Bottle squids, bottletail squids

by M.D. Norman and A.L. Reid

Diagnostic characters: Small rounded squids (mantle length typically less than 40 mm) with 8 arms and 2 functional retractile tentacles. **Internal shell absent. Light organ absent. Dorsal mantle fused to head. Ventral mantle attached to funnel by fixed ligament or by plug-and-socket type funnel locking apparatus.** Fins present, relatively narrow and kidney-shaped (longer than wide). **Ventral arms hectocotylized in males.**

Habitat, biology, and fisheries: Benthic squids, typically associated with soft substrates and seagrass beds. Bottle squids remain submerged in soft sediments during the day, bury using the fins and funnel to cover the entire animal with sand or shell, using the arms to rake grains onto the head and mantle. Animals emerge at night to forage for benthic and free-swimming crustaceans. There are no records for fisheries harvests of bottle squids in the area. They are likely to be taken infrequently and may be sold as bycatch in trawl fisheries along with bobtail squids (sepiolids).



dorsal view

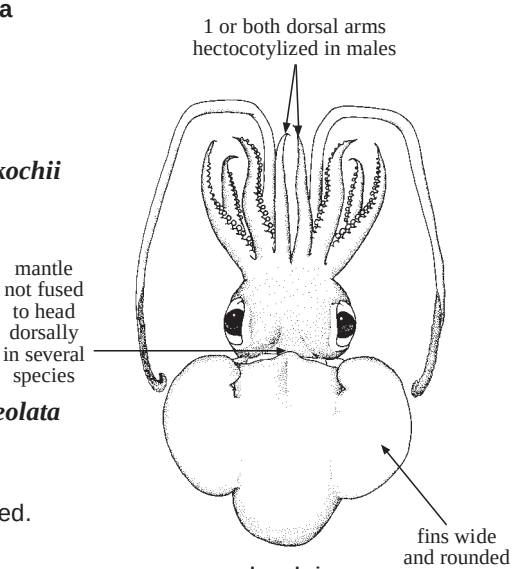
Similar families occurring in the area

Sepiolidae (bobtail squids): fins wide and rounded; dorsal arms hectocotylized in males; an internal shell in most species; light organs within mantle cavity in many species; dorsal mantle not fused to head in many species.

Key to the species of Sepiariidae occurring in the area

1a. Ventral mantle permanently connected with funnel by muscular band in place of funnel locking apparatus; anterior edge of dorsal mantle smooth; fins situated in posterior half of mantle; colour pattern of longitudinal lines absent . . . . . ***Sepiadarium kochii***

1b. Funnel locking apparatus present, consisting of 2 projections fitting into corresponding sockets; anterior edge of dorsal mantle fringed with finger-like projections at border of mantle aperture; fins narrow and elongate, extending along majority of mantle length; colour pattern of narrow longitudinal lines over white to pink base colour on dorsal surfaces . . . . . ***Sepioloidea lineolata***



dorsal view

Sepiolidae

List of species occurring in the area

The symbol ♗ is given when species accounts are included.

♗ *Sepiadarium kochii* Steenstrup, 1881
♗ *Sepioloidea lineolata* (Quoy and Gaimard, 1832)

References

Berry, S.S. 1921. A review of the cephalopod genera *Sepioloidea, Sepiadarium* and *Idiosepius. Rec. South Aust. Mus.*, 1:347-364.

Berry, S.S. 1932. Cephalopods of the genera *Sepioloidea, Sepiardium* and *Idiosepius*. *Philipp. J. Sci.*, 47(1):39-53.

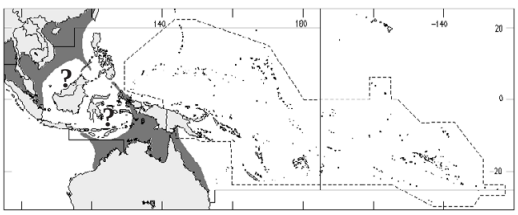
Voss, G.L. 1964. Cephalopods of the Philippines. *Bull. U.S. Natl. Mus.*, (234):180 p.

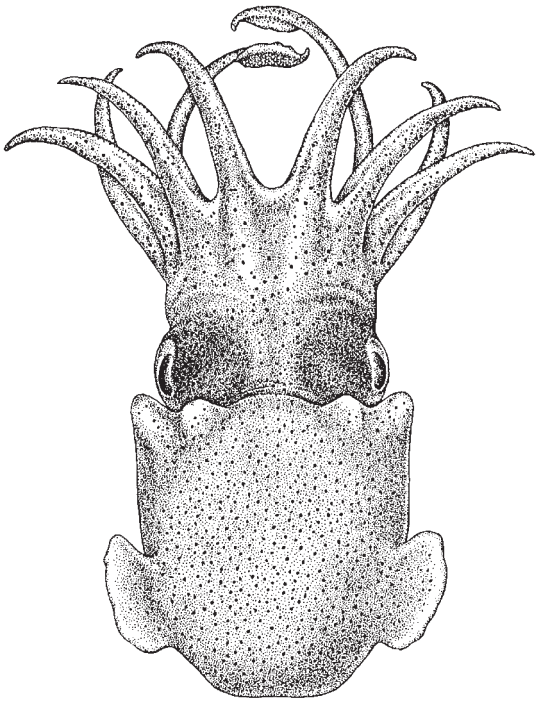
Sepiadarium kochii Steenstrup, 1881

Frequent synonyms / misidentifications: *Sepiadarium malayense* Robson, 1932 / None.

En - Koch's bottle squid.

Maximum mantle length 20 mm. **Mantle fused to head dorsally and to base of both sides of funnel ventrally**. **Fins small and in posterior half of mantle.** Internal shell absent. **Tentacular clubs with 8 rows of minute suckers.** Arms with 2 longitudinal rows of suckers near base, changing to 4 longitudinal rows in last 20 transverse rows. **Left arm IV modified to form hectocotylus of 18 to 20 fleshy low lamellae over distal 60% of arm. Colour:** spotted with large white to orange spots over dorsal surfaces. Found in coastal waters on soft sediments to depths of at least 60 m. Found throughout Indo-Malayan waters from India to Japan.



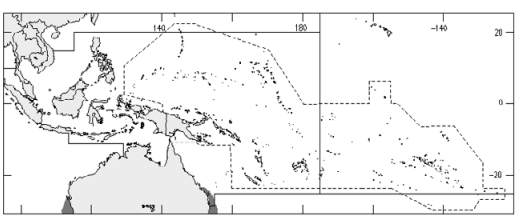


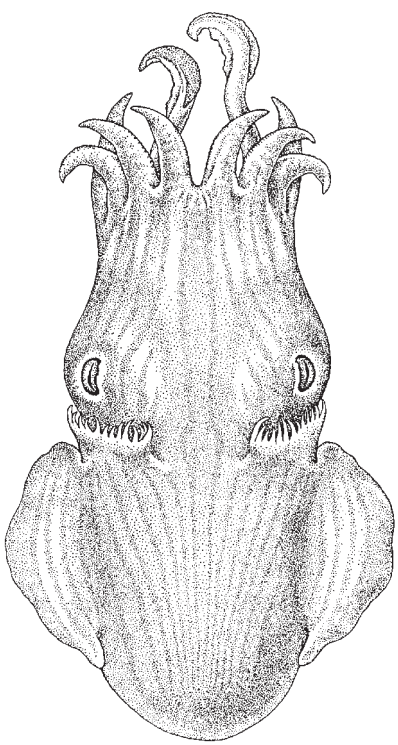
Sepioloidea lineolata (Quoy and Gaimard, 1832)

Frequent synonyms / misidentifications: None / None.

En - Striped (or Tiger) dumpling squid.

Maximum mantle length 40 mm. Mantle fused to head dorsally. **Ventral mantle connected to funnel by cartilaginous locking apparatus of dash-and-dot projections fitting into corresponding double sockets.** Fins elongate and narrow, extending along majority of mantle length. **Anterior margin of mantle aperture on dorsal mantle fringed with finger-like projections.** Internal shell absent. Tentacular clubs with minute suckers in 20 rows. Sides and ventral surfaces of head and mantle with rounded raised bumps. **Colour: white with many narrow longitudinal stripes of pink to black on dorsal and lateral surfaces.** In shallow waters on sand or mud substrates. Found in coastal waters of eastern, southern, and western Australia.





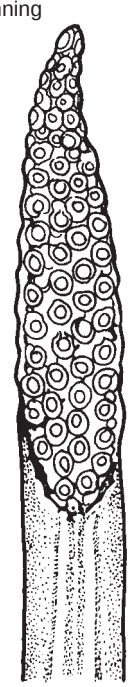
IDIOSEPIIDAE

Pygmy cuttlefish

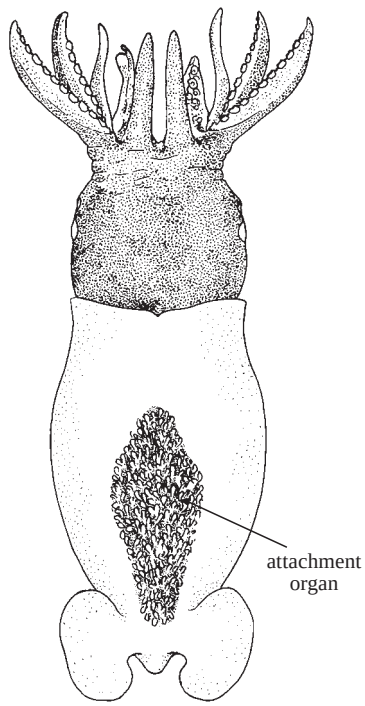
by M.C. Dunning

Diagnostic characters: Very small cephalopods (less than 30 mm mantle length). Mantle elongated and slightly pointed at the posterior end; anterior edge of mantle not fused to head; head prominent with large, bulbous eyes covered by a cornea; nuchal cartilage absent; **funnel locking cartilage oval-shaped** in all species in the Western Central Pacific. **Glandular, oval attachment organ located posteriorly on dorsal surface of mantle**. **Gladius a vestige only. Fins small, kidney-shaped**, attached laterally to the posterior end of the mantle and slightly oblique to the longitudinal body axis. Arms short, with 2 rows of suckers; both ventral arms (IV) of mature males hectocotylized by loss of suckers on most parts of arms and by tips of left ventral arm becoming bilobed. Tentacles short and slender, with tentacular clubs not expanded, supporting 2 to 4 rows of suckers.

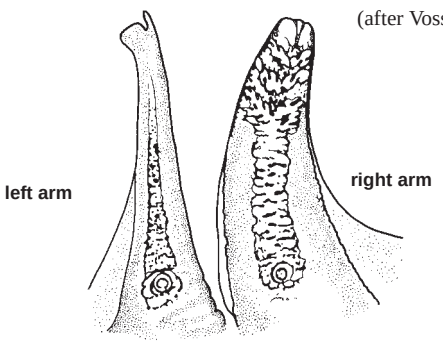
Habitat, biology, and fisheries: Very abundant in shallow tropical coastal environments, particularly inshore seagrass beds and mangrove areas. Species are variously nektonic and planktonic and *Idiosepius pygmaeus* has a life span of less than 3 months. Animals appear to be solitary. Over a few days, each female lays up to 65 solitary eggs attached to hard substrates and then dies; eggs hatch after about 15 days. Of no value to fisheries because of their small size, but may be confused on cursory examination with hatchling and juvenile loliginid squids which also occur in the same inshore habitats.



tentacular club



dorsal view (after Voss, 1963)



ventral arms hectocotylized (oral view)

Similar families occurring in the area

Loliginidae: Idiosepiids are readily separated from juvenile loliginids on close examination by the presence of the dorsal attachment organ and by the lack of a true gladius. *Idiosepius* has fully developed reproductive organs and hectocotylization in males at less than 15 mm mantle length. In Western Central Pacific species, the funnel locking cartilage is deep and oval-shaped compared to the simple straight cartilage in loliginids.

List of species occurring in the area

Idiosepius pygmaeus Steenstrup, 1881 (southern Japan to northern Australia)
Idiosepius paradoxus (Ortmann, 1888) (southern Japan to northern Australia)
Idiosepius thailandicus Chotiyaputta, Okutani, and Chaitiamvong, 1991 (Gulf of Thailand)

References

Chotiyaputta, C., T. Okutani, and S. Chaitiamvong. 1991. A new pygmy cuttlefish from the Gulf of Thailand *Idiosepius thailandicus* n. sp. (Cephalopoda: Idiosepiidae). *Venus (Jap. J. Malacology)*, 50:165-174.

Jackson, G.D. 1988. The use of statolith microstructures to analyze life-history events in the small tropical cephalopod *Idiosepius pygmaeus*. *Fish. Bull. NOAA*, 87:265-272.

Sasaki, M. 1923. On an adhering habit of a pygmy cuttlefish *Idiosepius pygmaeus* Steenstrup. *Annot. Zool. Jap.*, 10:209-213.

SPIRULIDAE

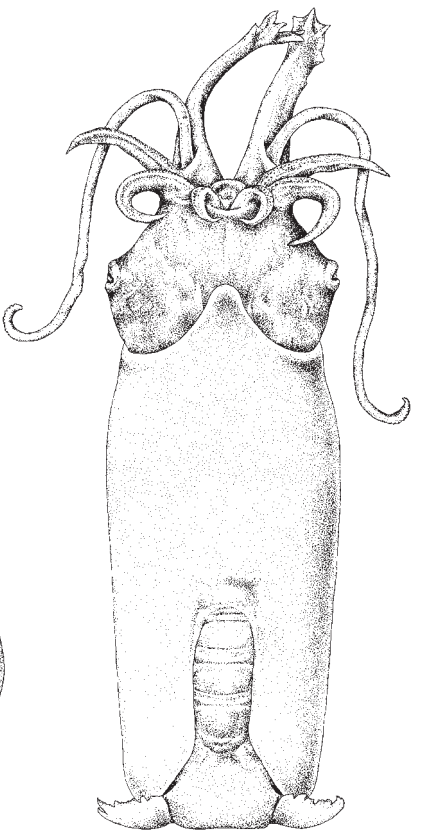
Ram's horn squid

by M.C. Dunning

A single species in the family.

Spirula spirula (Linnaeus, 1758)

Diagnostic characters: A small squid. Characterized by the **spirally-coiled internal shell** located in the posterior end of the animal; shell contains over 30 chambers in adults. Mantle cylindrical, thin and muscular externally; **a pair of small, round fins attached transversely to posterior end of mantle**. A large photophore is located between the fins. Anterior margin of mantle with 3 pronounced projections on the dorsal midline and ventrolaterally on each side of the funnel-mantle locking cartilages. Funnel-mantle locking cartilage simple and straight. Eyes large, equipped with muscular eyelids. Length of arms increases from dorsal to ventral arms; each arm with 4 to 6 rows of small suckers. Non-expanded club on each long tentacle with 16 rows of numerous small suckers. All arms (except between ventral arms), connected with a web. Both ventral arms (IV) of males hectocotylized; left arm tip modified into a very complex organ of unknown function.

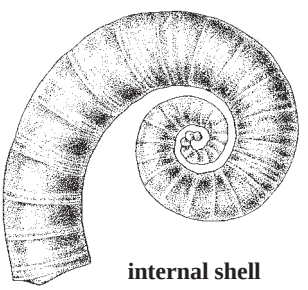


dorsal view of male

(illustration: K.Hollis/ABRS)

Similar families occurring in the area

None. Ram's horn squid is easily distinguished by its spirally-coiled internal shell.



internal shell

Size: Maximum mantle length 45 mm, rarely larger.

Habitat, biology, and fisheries: During the day the animals concentrate at depths between 600 and 700 m. During darkness, the majority of the population occurs at depths less than 300 m. Able to control buoyancy by regulating the pressure of gas contained in the shell. The eggs are small. The capture of young at depths of about 1 000 to 1 750 m suggests that females possibly lay eggs on the bottom on the continental slope. The smallest young known, presumably newly hatched, have a mantle length of about 1.5 mm with 2 shell chambers. Attains sexual maturity at about 30 mm mantle length. No fisheries are based on this species because of its relative scarcity and the small size as well as the tough and thin mantle. The beach collected shells are sold in the shell trade.

Distribution: Found in tropical and subtropical oceanic waters worldwide, where water temperature at 400 m is 10°C or more.

References

Bruun, A. F. 1943. The biology of *Spirula spirula* (L.). *Dana Report, Carlsberg Foundation*, (24):44 p.

Bruun, A. F. 1955. New light on the biology of *Spirula*, a mesopelagic cephalopod. In *Essays in the Natural Sciences in Honour of Captain Allan Hancock*. Los Angeles, University of California Press, pp. 61-72.

Clarke, M.R. 1970. Growth and development of *Spirula spirula*. *J. Mar. Biol. Assoc. U.K.*, 50:53-64.

Denton, E.J. and J.B. Gilpin-Brown. 1971. Further observations on the buoyancy of *Spirula*. *J. Mar. Biol. Assoc. U.K.*, 51:363-373.

Lu, C.C., A. Guerra, F. Palumbo, and W.C. Summers. 1992. Order Sepioidea Naef, 1916. In "Larval" and juvenile cephalopods: A manual for their identification, edited by M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke, and S.V. Boletzky. *Smithson. Contrib. Zool.*, 513:21-36.

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SEPIIDAE

Cuttlefishes

by A.L. Reid

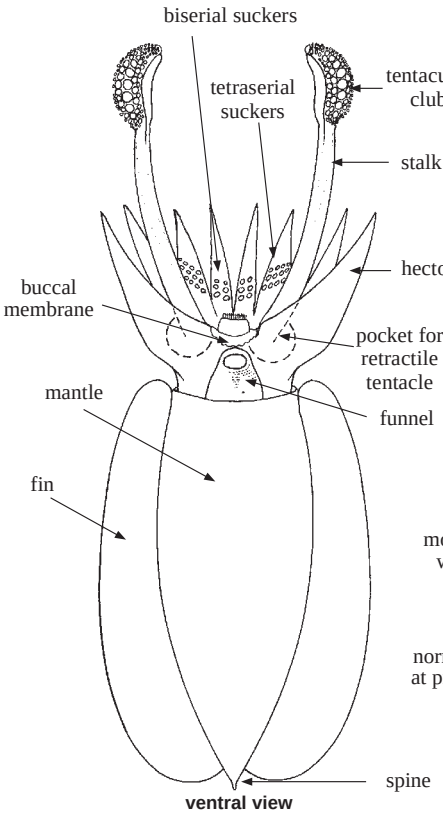
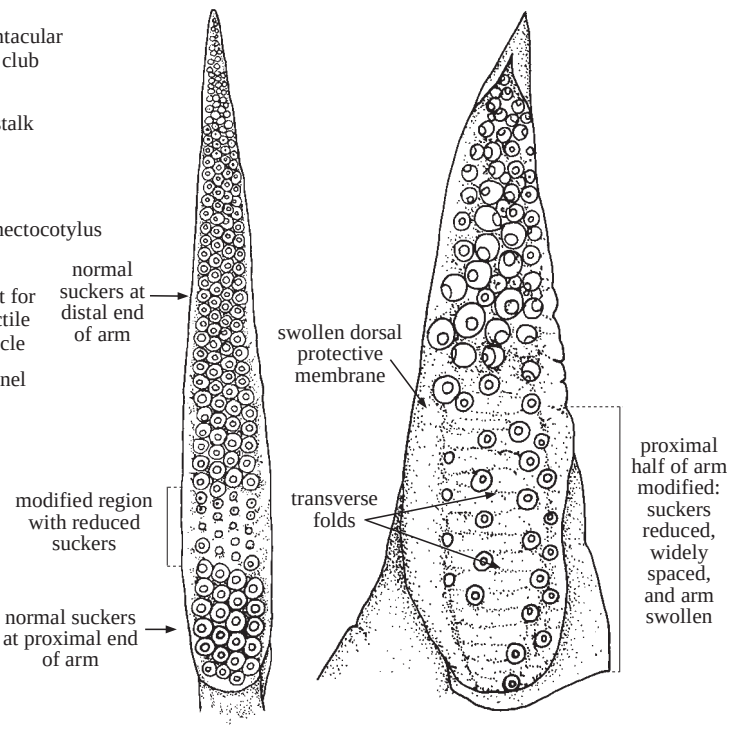
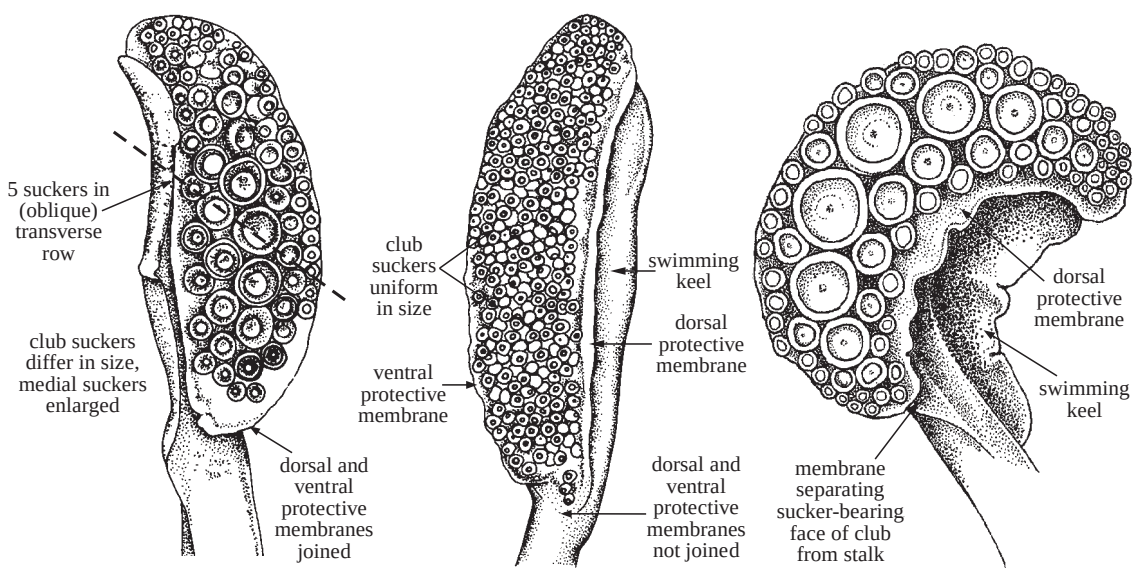


Fig. 1 diagram of basic cuttlefish features



(after Sasaki, 1929) (after Nesis, 1982)

Fig. 2 examples of male hectocotylized arms



a) ***Sepia apama*** (after Lu, in press)

b) ***Sepia esculenta*** (after Okutani et al., 1987)

c) ***Sepia latimanus*** (after Roper et al., 1984)

Fig. 3 tentacular clubs

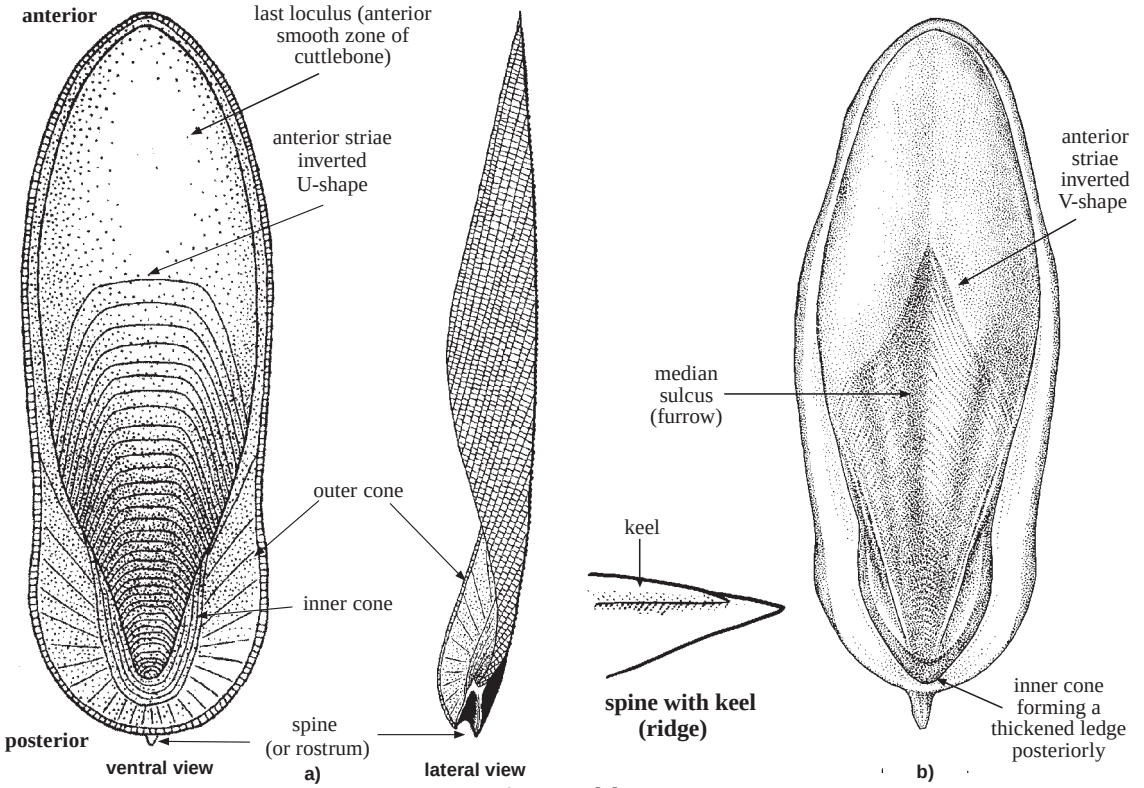


Fig. 4 cuttlebone

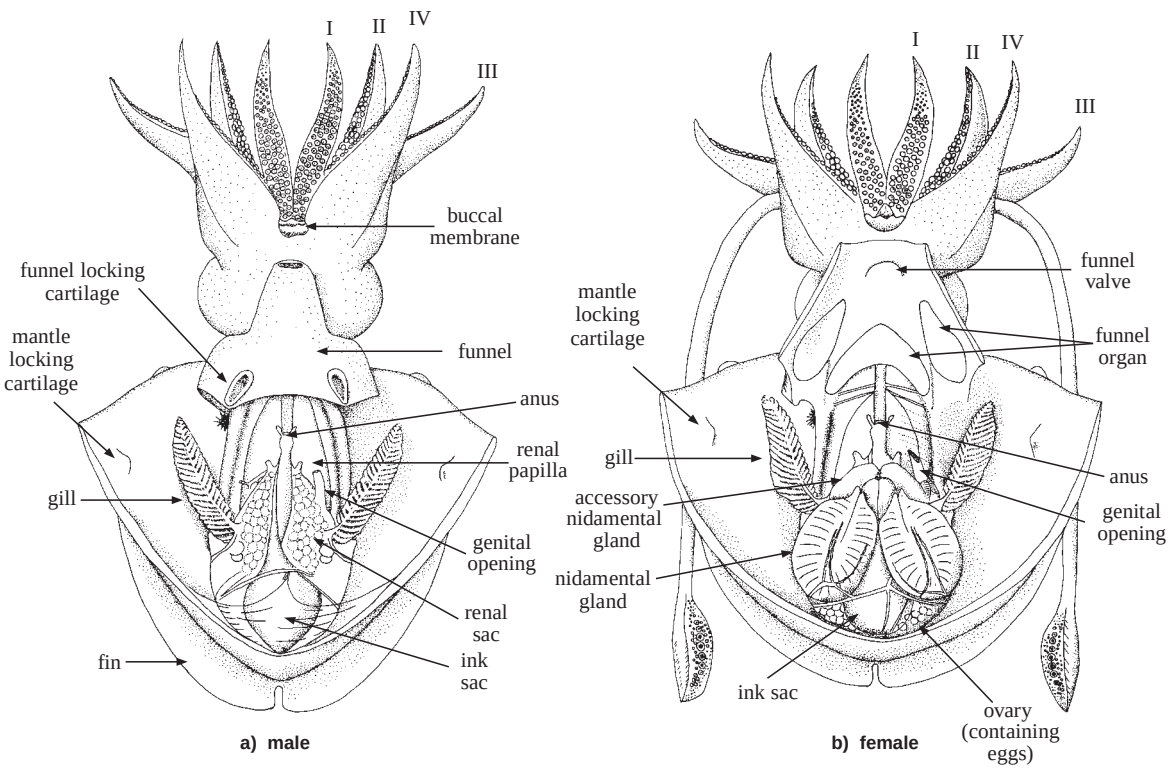
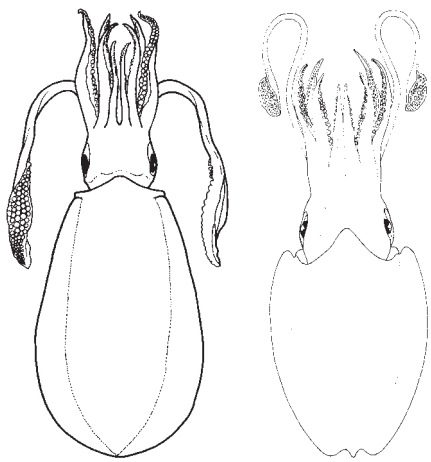


Fig. 5 mantle cavity (*Sepia officinalis*)

Diagnostic characters: Small to medium-sized cephalopods. Mantle robust, slightly flattened dorsoventrally, may be broad or slender; oval, oblong or nearly circular in outline; anterior dorsal mantle margin projected forward, not fused with head. Fins narrow, located dorsolaterally on mantle, approximately equal to mantle length; **posterior fin lobes free**, not connected to each other (Fig. 1). Head robust, slightly narrower than mantle; eyes prominent, covered by a transparent membrane and a conspicuous secondary fold on the eyelid. Mouth surrounded by 10 appendages (8 arms, 2 tentacles). Arms with 2 to 4 suckers in transverse rows (Fig. 1). Males of some species with hectocotylized ventral arm(s) IV for holding spermatophores; when present, usually consists of a modified region of reduced suckers (Fig. 2); hectocotylized region may also be swollen and crenulated by transverse folds (Fig. 2b). Tentacular clubs (Fig. 3) with 4 or more suckers in transverse rows; **tentacles retractile into pockets on the ventrolateral sides of the head** (Fig. 1). Arm and club suckers with chitinous rings. Mantle locking apparatus angular (Fig. 10a) or curved (Fig. 10b) in shape. Internal **calcareous cuttlebone** (Fig. 4) located dorsally underneath the skin, cuttlebone length usually equal to mantle length; cuttlebone shape ranges from lanceolate, oval, to diamond-shaped; dorsal side a calcareous plate (dorsal shield); ventrally, finely laminate, porous and comprised of thin, transverse septa supported by transverse calcareous rods. One pair of gills (Fig. 5); no branchial canal between afferent and efferent branchial blood vessels. Liver divided or bilobed. Buccal membrane present (Figs 1 and 5), with or without suckers; each radula tooth unicuspid (with a single projection). Olfactory organ a ciliated pit.

Habitat, biology, and fisheries: On the continental shelf and upper slope to a maximum depth of approximately 600 m. Primarily bottom dwellers over a range of habitats, including rocky, sandy and muddy bottoms to seagrass, seaweed and coral reefs. Slower swimmers than the more streamlined squids. Able to attain neutral buoyancy by regulating the relative amounts of gas and fluid in the chambers of the cuttlebone; able to hover in midwater, with fins acting as stabilisers. Some species migrate seasonally in response to temperature changes and aggregate, usually in shallow water, at the time of spawning. Within a species, individuals may attain sexual maturity at very different sizes, depending upon the combined effects of temperature and light. Eggs, relatively few in number, are individually attached to various substrates in clusters; length of development varies with temperature. Life span (studied for *Sepia officinalis*) between 18 months and 2 years, though males may live longer; post-spawning mortality is high in females. Prey on a wide range of invertebrates and fish.

Many species of cuttlefish are important to fisheries in the area. Fishing activity ranges from local, or subsistence fisheries, to major export industries. Sepiids are also an important component of finfish and prawn trawl bycatch in the area. They are used primarily for human consumption, but also as bait and are marketed fresh, frozen or dried. In 1995, FAO's Yearbook of Fishery Statistics reports 96 198 t of cuttlefish (and bobtail squids) from the Western Central Pacific (about 44% of the total world catch of cuttlefish for that year). This figure comprises 42 700 t caught off Thailand, 37 000 t from Viet Nam, 2 836 t from the Philippines, and 3 t from Australia.



Loliginidae (*Sepioteuthis*) **Sepiidae**

Similar families occurring in the area

Some species are superficially similar in appearance to the loliginid squid genus *Sepioteuthis*, but can be readily distinguished due to the presence of a calcareous cuttlebone in the sepiids.

Identification note

The taxonomy and biology of the cuttlefish from the area is generally poorly known and in need of review. While some, particularly commercial species, can be easily recognized, others which may occur in catches are not well defined. This presents difficulties in attempting to construct a key to all species occurring in the area, as particular character states for many species have been incompletely documented. For this reason, the key below should only be used in combination with the species accounts to follow to confirm identification.

Many distinguishing features are seen only in males, so animals of this sex are generally required for identification. Where possible, however, features of the cuttlebone and tentacular clubs have been included in the key to enable females to be identified. Males can often be recognized by the presence of a hectocotylus. One (usually the left), or both ventral arms (IV) may be modified. Not all species have a hectocotylus. In addition, in juvenile males this secondary sexual character may not be fully developed, so

it may be necessary to check internal anatomical features to determine sex. To examine the contents of the mantle cavity, a median longitudinal incision needs to be made through the mantle on the ventral side of the animal. The internal features of males and females are shown in Figure 5. Mature females can readily be distinguished from males by the presence of a pair of leaf-shaped creamy yellow nidamental glands (Fig. 5b). Eggs may also be seen in the ovary, below and posterior to the nidamental glands. In immature females, the nidamental glands may be greatly reduced in size or visible only as two short slits. The shape of the male and female genital openings on the left side of the mantle cavity also differs slightly between the sexes (Fig. 5a, b). Any body patterning, such as transverse wavy lines or bands on the dorsal side of the mantle, is usually more pronounced in males and may be faint or absent in females.

The number and size of the **tentacular club suckers** are important traits. If the tentacles are retracted, they can readily be extracted in fresh animals by gently probing inside the pouches between arms III and IV on either side of the buccal mass (Fig. 1). Extraction of the club may be more difficult in preserved specimens and dissection may be necessary. The number of club suckers given for each species, and used in the keys, refers to the number of suckers in **transverse rows**. This is determined by counting the number of suckers that are intersected in an **oblique line** midway along the tentacular club as shown in Fig. 3a. Other important features of the tentacular club include:

1. The relative sizes of the suckers: they may vary in size (Fig. 3a, c), or be of similar size (Fig. 3b);
2. The protective membranes may be joined at the posterior end of the sucker-bearing face of the club (Fig. 3a, c), or not joined (Fig. 3b);
3. The swimming keel may extend beyond the sucker-bearing face of the club (Fig. 3c), or may be equivalent in length to the sucker-bearing face;
4. The sucker-bearing face may be joined to the tentacle stalk (Fig. 3b), or may be separated from it by a membrane (Fig. 3c).

Suckers are described as **normal** or **normal-sized** if they do not differ obviously in size from other suckers.

As for **club suckers**, arm sucker **"rows"** refer to suckers positioned in transverse rows, that is, positioned in oblique lines approximately perpendicular to the longitudinal axis of the arm. **"Series"** refers to suckers positioned approximately parallel to the longitudinal axis of the arm. **Biserial** suckers are those arranged in 2 series, **tetraserial** are those arranged in 4 series.

The **cuttlebone** (Fig. 4) can easily be removed from a fresh animal by making a median longitudinal incision along the length of the mantle, and two shorter incisions at the anterior end of the mantle as shown in Fig. 6. The skin can then be peeled open to reveal the cuttlebone below. Aside from its shape, important features of the cuttlebone include:

1. The width of the outer cone: it may broaden posteriorly (Fig. 4a, b), or be of approximately uniform width along the length of the cuttlebone (Fig. 7);
2. The inner cone may be narrow throughout (Fig. 7), or broaden posteriorly (Fig. 4a, b);
3. The inner cone may be thickened posteriorly, and/or form a raised ledge (Fig. 4b);
4. The median sulcus (or furrow) may be wide, or narrow;
5. The shape of the striae: while the striae may vary in shape within species along the length of the cuttlebone, the shape of the anteriormost striae (where the striated zone joins the last loculus) is rather uniform and used for diagnoses. However, in some cases, the distinction between "anterior striae inverted U-shape", and "anterior striae inverted V-shape" is not clear-cut, so identification should be confirmed following examination of other characters. The anterior extent of the striated zone may vary with the size of the animal, so may differ in some cases from that shown in illustrations.

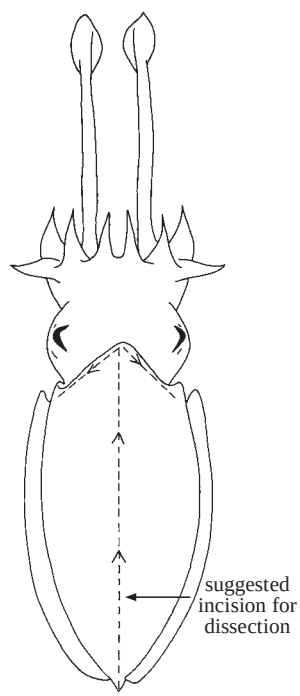


Fig. 6 cuttlefish in dorsal view

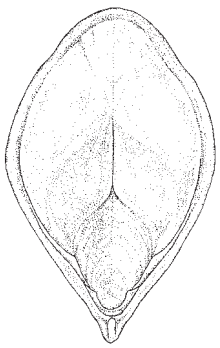
No other internal features, requiring dissection of animals, are included in the following key. Reference should be made to Figures 1 to 4 and the "Glossary of Technical Terms" (pages 692 to 698).

Key to the species of Sepiidae occurring in the area

1a. Cuttlebone diamond-shaped in outline (Fig. 7); cuttlebone much shorter than mantle, located in the anterior 1/2 to 2/3 of mantle; dorsal anterior edge of mantle without tongue-like projection (Fig. 8a) . . . . . ***Metasepia***

(a single species, *M. pfefferi*, occurring in the area; unconfirmed records of *M. tullbergi* from the Philippines and Viet Nam)

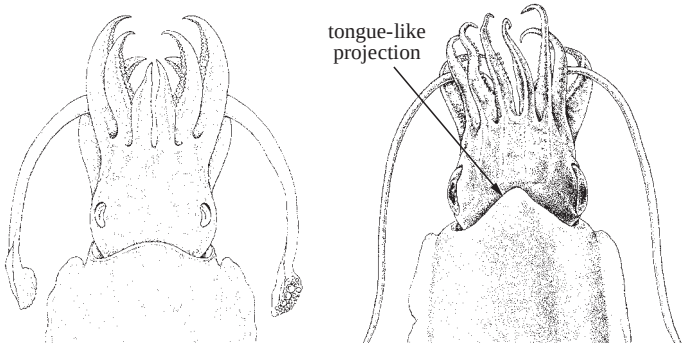
1b. Cuttlebone outline elliptical to lanceolate; cuttlebone length approximately equal to mantle length; dorsal anterior edge of mantle usually with tongue-like projection (Fig. 8b). . . . . → ***2***



cuttlebone (ventral view)

Fig. 7 ***Metasepia pfefferi***

(illustration: K. Hollis/ABRS)



a) ***Metasepia pfefferi*** **b) *Sepia, Sepiella***

Fig. 8 head and anterior mantle (dorsal view)

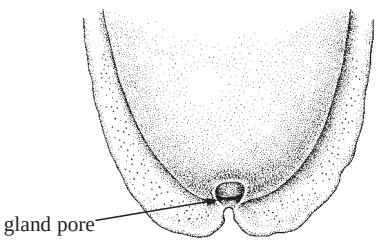
(illustration: K. Hollis/ABRS)

2a. A gland and gland pore located on the ventral side of the posterior end of the mantle (Fig. 9); mantle locking apparatus (position shown in Fig. 5) with triangular projection (Fig. 10a); cuttlebone inner cone with very short limbs; outer cone a wide, flared, chitinized border around posterior end of cuttlebone (Fig. 11a) . . . . **(*Sepiella*)** → ***3***

2b. Gland and gland pore absent; mantle locking apparatus (position shown in Fig. 5) semicircular, without triangular projection (Fig. 10b); cuttlebone inner cone with relatively long limbs; outer cone usually calcareous, not obviously flared posteriorly (Fig. 11b) . . . . . **(*Sepia*)** → ***6***

3a. Tentacular club with 7 to 10 suckers in transverse rows . . . . . → ***4***

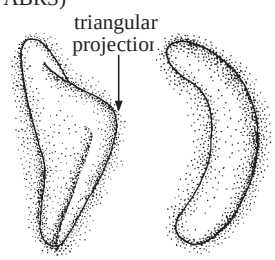
3b. Tentacular club with 12 to 24 suckers in transverse rows . . . . . → ***5***



posterior end of mantle (ventral view)

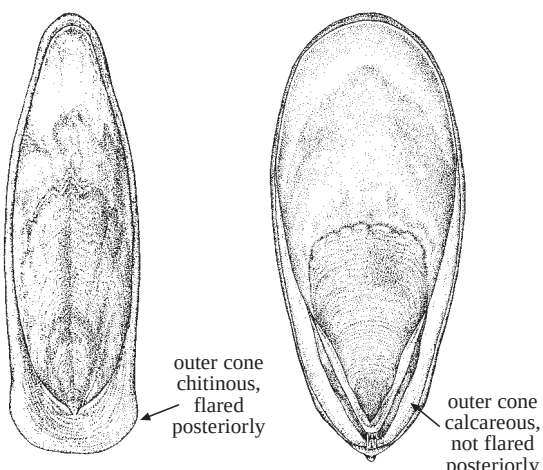
Fig. 9 ***Sepiella***

(illustration: K. Hollis/ABRS)



a) ***Sepiella*** **b) *Sepia***

Fig. 10 mantle locking apparatus



a) ***Sepiella*** **b) *Sepia***

Fig. 11 cuttlebone (ventral view)

(illustration: K. Hollis/ABRS)

4a. Five to 6 wine-coloured spots at base of each fin; spots increasing in size posteriorly (Fig. 12a); cuttlebone width about 30% the length; cuttlebone broadens posteriorly, tapers anteriorly (Fig. 13a) . . . . . ***Sepiella weberi***

4b. Six to 7 wine-coloured spots along fins, close to fin margin; spots all similar in size (Fig. 12b); cuttlebone width narrow, 20 to 25% the length; cuttlebone of approximately uniform width throughout its length, sides parallel (Fig. 13b) . . . . . ***Sepiella ocellata***

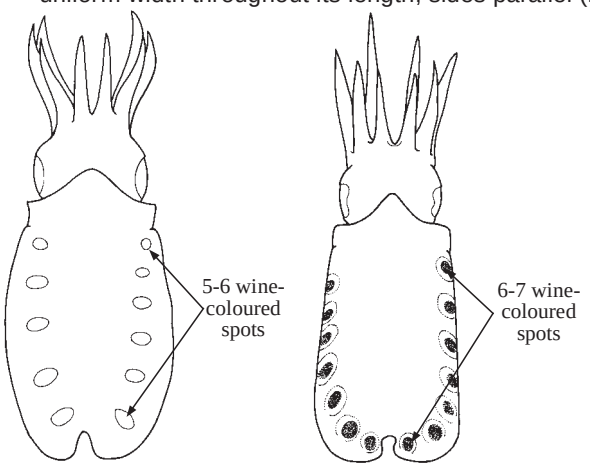


Fig. 12 dorsal view

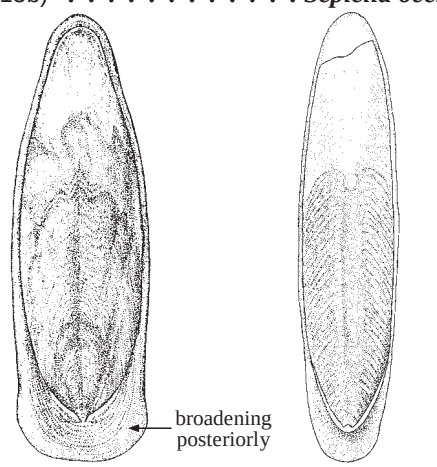
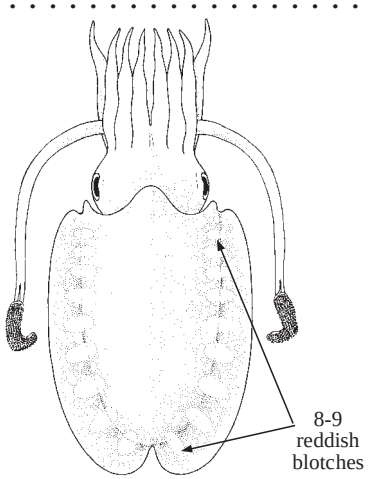


Fig. 13 cuttlebone (ventral view)

5a. Mantle colour greyish brown with 8 or 9 reddish patches along base of each fin (Fig. 14); cuttlebone width approximately 40% the length; outer cone indented towards posterior end of striated zone (Fig. 15a), flared, spoon-shaped posteriorly; anterior striae m-shape, following the deep median sulcus (Fig. 15a) . . . . . ***Sepiella inermis***

5b. Mantle dark greyish brown with white spots and a pale reflective line along base of fins; cuttlebone width approximately 30% the length; outer cone tapers gradually posteriorly, not indented towards posterior end of striated zone (Fig. 15b); anterior striae inverted U-shape, median sulcus indistinct (Fig. 15b) (unconfirmed records from the Philippines) . . . . . ***Sepiella japonica***



Sepiella inermis

Fig. 14 dorsal view

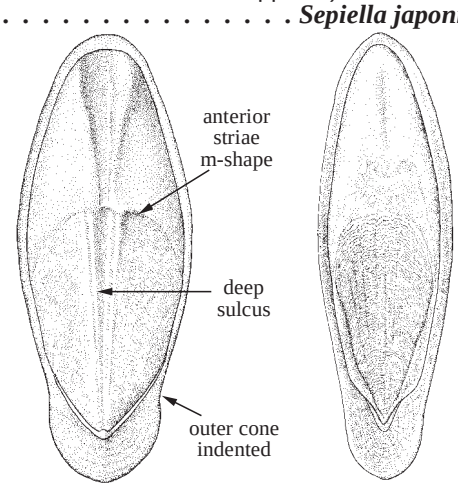


Fig. 15 cuttlebone (ventral view)

(after Sasaki, 1929)

6a. Cuttlebone outline narrow, lanceolate (Fig. 16a) . . . . . → ***7***
[includes *Sepia mira*, until recently known only from cuttlebone; see species account to follow]

6b. Cuttlebone outline moderate to broad, oval (Fig. 16b) . . → ***11***
[includes *Sepia bartletti*, status uncertain, known only from the type and 6 other specimens reported by Iredale (1954) from Misima and the Conflict Group of Islands, Louisiade Archipelago, southeast of Papua New Guinea; see species account to follow]

7a. Tentacular club with 5 or 6 suckers in transverse rows . . → ***8***

7b. Tentacular club with 8 suckers in transverse rows . . . → ***10***

8a. Arms I to IV of females with biserial suckers proximally and at extreme distal tips, remaining suckers tetraserial; male arms I to IV with biserial suckers on the proximal third and at distal tips, remaining suckers enlarged, tetraserial; male arms III protective membranes thickened with alternating transverse ridges . . . . . ***Sepia cottoni***

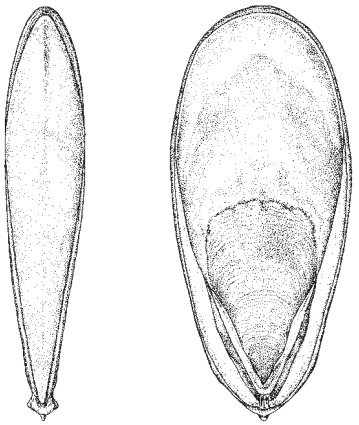
8b. Arms I to III of females with tetraserial suckers proximally and biserial suckers distally, female arms IV with tetraserial suckers; male arms I to III with tetraserial suckers proximally and biserial suckers distally, male arms IV with tetraserial suckers; male arms III protective membranes not thickened . . . . . → ***9***

9a. Arms III of males greatly elongate; hectocotylus absent; club suckers differ markedly in size (Fig. 17a) . . ***Sepia braggi***[1/]

9b. Arms III of males not greatly elongate; hectocotylus present; club suckers differ only slightly in size (Fig. 17b) . . . . . ***Sepia vietnamica***

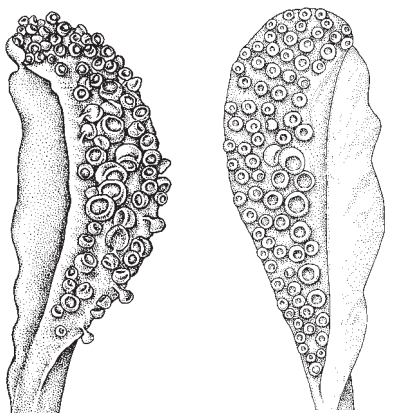
10a. Arms II of males greatly elongate, 3 times longer than other arms (Fig. 18); male arms II with tetraserial suckers proximally, biserial suckers at distal tips; left ventral hectocotylized arm (IV) with approximately 10 rows of normal suckers proximally, then remaining suckers reduced to tip of arm; club suckers differ markedly in size (Fig. 19a) . . . . . ***Sepia andreana***

10b. Male arms all of similar length; male arm suckers all tetraserial; left ventral hectocotylized arm (IV) with approximately 9 to 12 rows of normal suckers proximally, followed by 8 to 10 rows of reduced suckers, then rest normal to tip of arm; club suckers differ only slightly in size (Fig. 19b) . . . . . ***Sepia kobiensis***



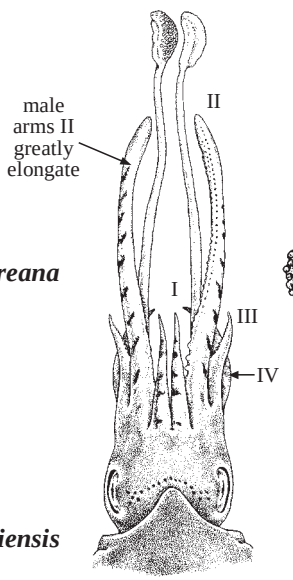
a) lanceolate (*Sepia braggi*) b) oval (*Sepia apama*)

Fig. 16 cuttlebone (ventral view)
(illustration: K. Hollis/ABRS)



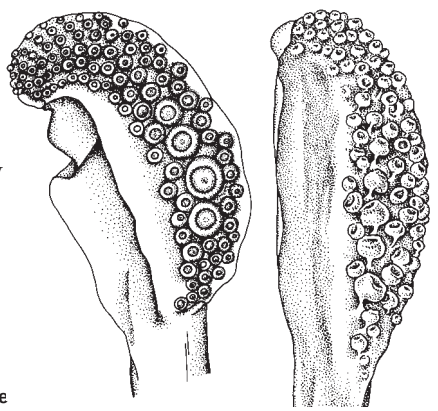
a) *Sepia braggi* b) *Sepia vietnamica*

Fig. 17 tentacular club



head and anterior mantle of male (dorsal view)

Fig. 18 *Sepia andreana*



a) *Sepia andreana* b) *Sepia kobiensis*

Fig. 19 tentacular club

1/ Until recently believed to occur in the Western Central Pacific. See footnote on species account to follow (p. 739).

11a. Tentacular club suckers all similar in size . . . . . → ***12***
11b. Tentacular club suckers differ markedly in size . . . . . → ***24***

12a. Tentacular club with 8 or fewer suckers in transverse rows . . . . . → ***13***
12b. Tentacular club with 10 or more suckers in transverse rows . . . . . → ***18***

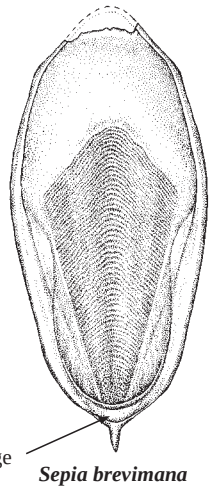
13a. Arms I to IV of both sexes with biserial suckers proximally, tetraserial distally . . . . . ***Sepia sulcata***
13b. Arms I to IV of both sexes with tetraserial suckers throughtout . . . . → ***14***

14a. Cuttlebone inner cone forming a raised ledge posteriorly (Fig. 20) . . . . . ***Sepia brevimana***
14b. Cuttlebone inner cone may be thickened, but does not form a raised ledge posteriorly . . . . . → ***15***

15a. Hectocotylus absent; cuttlebone inner cone limbs not thickened posteriorly (Fig. 21) . . . . . ***Sepia mestus***
15b. Hectocotylus present; cuttlebone inner cone limbs thickened posteriorly . . . . . → ***16***

16a. Tentacular club with 5 or 6 suckers in transverse rows; anterior margin of cuttlebone triangular, posterior margin blunt-pointed; cuttlebone striated zone flat, or slightly convex; cuttlebone outer cone of approximately uniform width along its length (Fig. 22) . . . . . ***Sepia cultrata***
16b. Tentacular club with 8 suckers in transverse rows; anterior margin of cuttlebone blunt-pointed or rounded, posterior margin rounded; cuttlebone striated zone concave; cuttlebone outer cone broadens posteriorly . . . . . → ***17***

17a. Dorsal mantle with wrinkled striped pattern and distinctive ocellate patches, and a pale reflective line along base of fins (Fig. 23); cuttlebone anterior striae inverted V-shape; cuttlebone inner cone limbs thick, broadens posteriorly (Fig. 24a) . ***Sepia lycidas***
17b. Dorsal mantle brownish, sometimes with darker brown blotches and scattered white spots; cuttlebone anterior striae inverted U-shape; cuttlebone inner cone limbs thick, of uniform width (Fig. 24b) . . . ***Sepia madokai***



Sepia brevimana

Fig. 24 cuttlebone

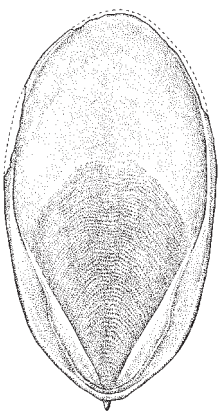
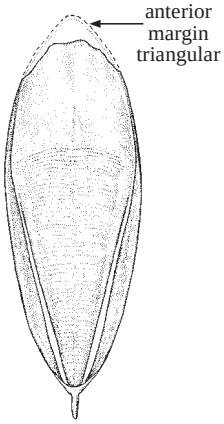
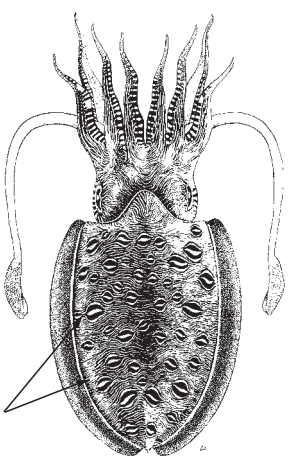

Sepia mestus

Fig. 20 cuttlebone (ventral view)



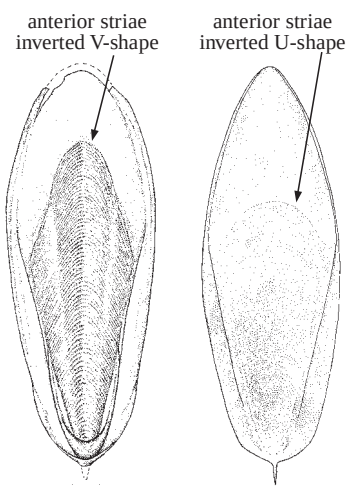
Sepia cultrata

Fig. 21 cuttlebone (ventral view)



dorsal view

Fig. 22 ***Sepia lycidas***



a) ***Sepia lycidas*** **b)** ***Sepia madokai***

Fig. 23 cuttlebone (ventral view)

18a. Tentacular club with approximately 20 suckers in transverse rows . . . . . → ***19***

18b. Tentacular club with 16 or less suckers in transverse rows . . . . . → ***20***

19a. Left ventral arm (IV) hectocotylized: 8 rows of normal arm suckers proximally, followed by 8 rows of reduced suckers; 2 ventral series of reduced suckers smaller than 2 dorsal series; club swimming keel extends beyond sucker-bearing face of club; cuttlebone inner cone forming a raised ledge posteriorly (Fig. 25a) . . . . . ***Sepia smithi***

19b. Both ventral arms (IV) hectocotylized: left ventral arm with 7 or 8 rows of normal suckers proximally, followed by 5 or 6 rows of reduced suckers, and right ventral arm with 4 or 5 rows of reduced suckers distally; reduced suckers equal-sized across series; club swimming keel equal to or shorter than sucker-bearing face of club; cuttlebone inner cone a narrow rim, does not form a raised ledge posteriorly (Fig. 25b) . . . . . ***Sepia whitleyana***

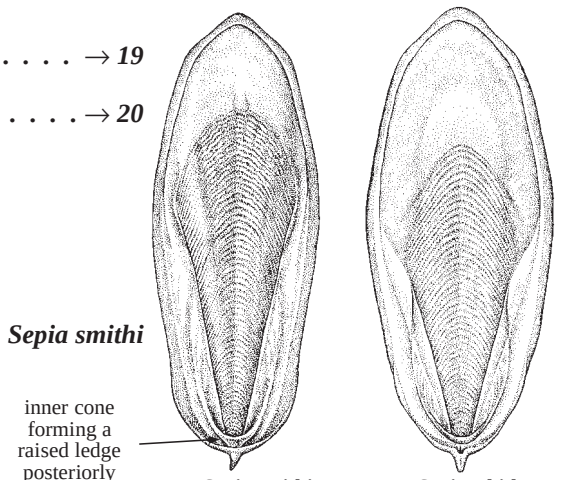


Fig. 25 cuttlebone (ventral view)

20a. Cuttlebone spine with dorsal and ventral keel (Fig. 26) . . . . . ***Sepia stellifera***

20b. Cuttlebone spine without keel(s) . . . . . → ***21***

21a. Hectocotylus with 9 or 10 rows of reduced suckers; cuttlebone inner cone limbs uniform in width, not forming a ledge posteriorly (Fig. 27) . . . . . ***Sepia rex***

21b. Hectocotylus with between 5 and 7 rows of reduced suckers; cuttlebone inner cone limbs broaden and form a ledge posteriorly . . . . . → ***22***

22a. Hectocotylus (left ventral arm IV) with 7 or 8 rows of normal suckers proximally, followed by 7 rows of slightly reduced suckers; dorsal and ventral protective membranes not fused at base of tentacular club in small specimens, fused in large specimens; cuttlebone inner cone with posterior ledge not thickened, flat, thin; dull white, not shiny (Fig. 28) . . . . . ***Sepia elliptica***

22b. Hectocotylus (left ventral arm IV) with 6 or less rows of normal suckers proximally, followed by 5 or 6 rows of markedly reduced suckers; dorsal and ventral protective membranes not fused at base of club; cuttlebone inner cone with posterior ledge thickened, rounded, not flat; ledge shiny, yellowish . . . . . → ***23***

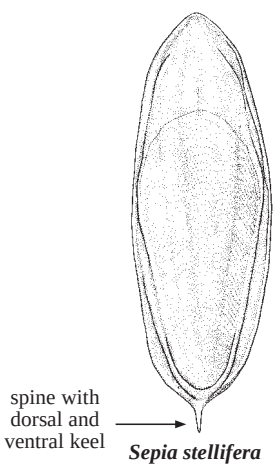


Fig. 26 cuttlebone (ventral view)

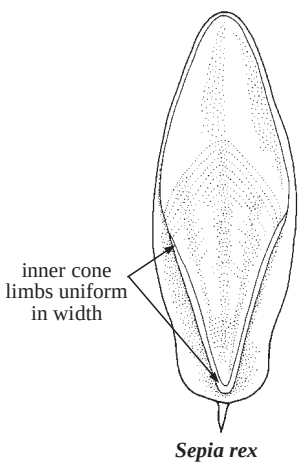


Fig. 27 cuttlebone (ventral view)

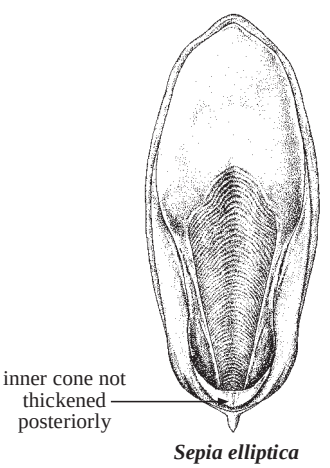


Fig. 28 cuttlebone (ventral view)

23a. Hectocotylus with 3 rows of normal suckers proximally; cuttlebone anterior striae inverted U-shape (Fig. 29a) . . . . . ***Sepia aculeata***

23b. Hectocotylus with 5 to 6 rows of normal suckers proximally; cuttlebone anterior striae inverted V-shape (Fig. 29b) . . . . . ***Sepia esculenta***

24a. Tentacular club with 6 or less suckers in transverse rows. . . . . .→ ***25***

[Ghofar (1989) reports *Sepia bandensis* as having 7 to 9 suckers in transverse rows on the tentacular club. The number of suckers in transverse rows cited in the original description of Adam (1939), and by subsequent workers e.g. Okutani (1995), and followed here is 5]

24b. Tentacular club with 8 suckers in transverse rows . . . . . .→ ***31***

25a. Tentacular club with 3 or 4 suckers in transverse rows . . . . . ***Sepia opipara***

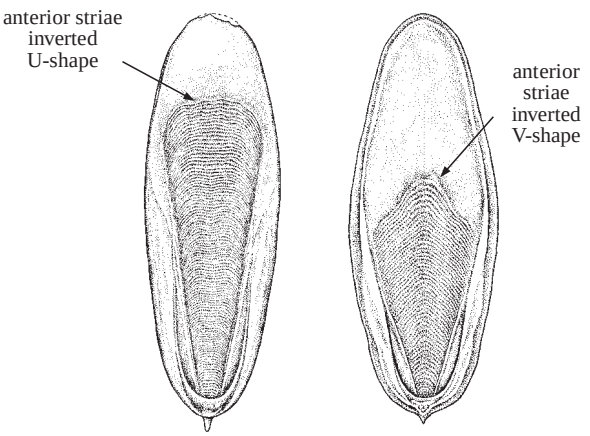
25b. Tentacular club with 5 or 6 suckers in transverse rows . . . . . .→ ***26***

26a. Cuttlebone without spine, or spine reduced to a tiny tubercle . . . . . .→ ***27***

26b. Cuttlebone with spine . . . . . .→ ***28***

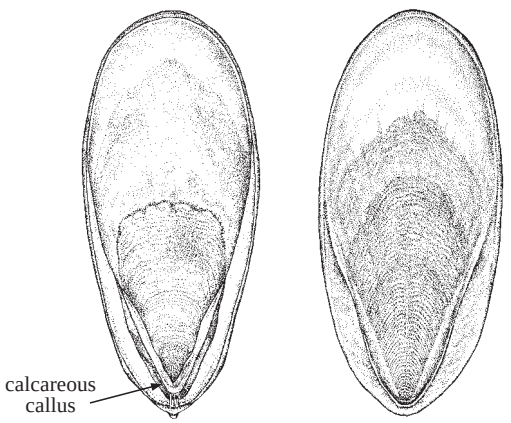
27a. Maximum size 500 mm mantle length; anterior edge of inner cone with a V-shaped calcareous callus, or rough thickening posteriorly (Fig. 30a) . . . . . ***Sepia apama***

27b. Maximum size 50 mm mantle length; cuttlebone inner cone without calcareous callus posteriorly (Fig. 30b) . . . . . ***Sepia bandensis***



a) ***Sepia aculeata*** **b)** ***Sepia esculenta***

Fig. 29 cuttlebone (ventral view)

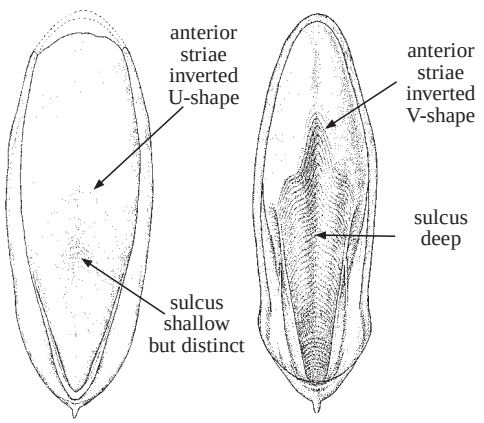


a) ***Sepia apama*** **b)** ***Sepia bandensis***

Fig. 30 cuttlebone (ventral view)
(illustration: K. Hollis/ABRS)

28a. Male arms I to IV with tetraserial suckers cuttlebone inner cone limbs of uniform width; cuttlebone sulcus distinct, flanked by rounded ribs (Fig. 31a, b) . . . . . .→ ***29***

28b. Male arms I to III with tetraserial suckers proximally, biserial suckers distally; cuttlebone inner cone limbs broaden posteriorly; cuttlebone sulcus indistinct, not flanked by rounded ribs (Fig. 32a, b) . . . . . .→ ***30***



a) ***Sepia latimanus*** **b)** ***Sepia plangon***

Fig. 31 cuttlebone (ventral view)

29a. Hectocotylus absent; tentacular club separated from stalk by a membrane; cuttlebone spine without keel; cuttlebone sulcus shallow (Fig. 31a); cuttlebone anterior striae blunt inverted V-shape (Fig. 31a); males dark purple-brown with white spots and white transverse stripes on fins, extending to mantle . . . . . ***Sepia latimanus***

29b. Hectocotylus present; tentacular club joined to stalk, not separated from stalk by a membrane; cuttlebone spine with keel; cuttlebone sulcus deep (Fig. 31b); cuttlebone anterior striae inverted V-shape (Fig. 31b); males with pale, transverse stripes . . . . ***Sepia plangon***

30a. Female arms I to III with tetraserial suckers throughout length; hectocotylus absent; cuttlebone inner cone limbs not thickened posteriorly, do not form a rough chitinous callus (Fig. 32a) . . . . . ***Sepia papuensis***

30b. Female arms I to III with tetraserial suckers proximally, biserial suckers on distal tips; hectocotylus present; cuttlebone inner cone limbs with a thick, rough, chitinous callus posteriorly (Fig. 32b) . . . . . ***Sepia recurvirostra***

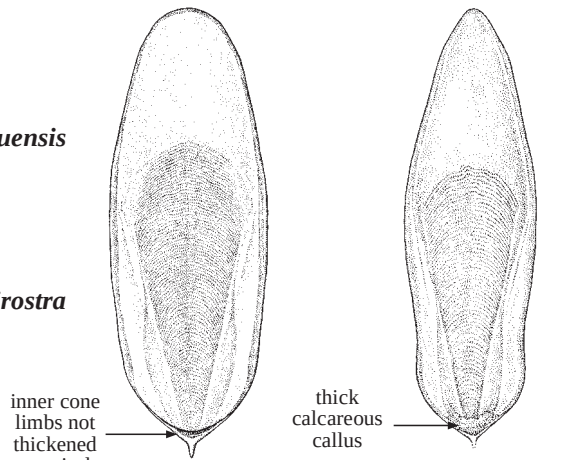


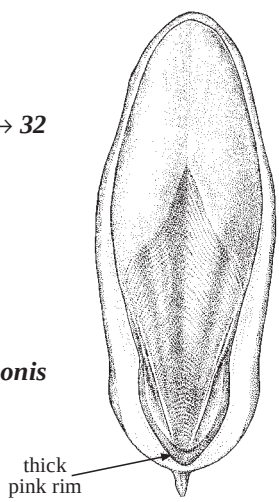
Fig. 32 cuttlebone (ventral view)

31a. Dorsal and ventral protective membranes fused at base of club; club separated from stalk by a membrane; cuttlebone inner cone limbs broaden posteriorly, forming a thick pink rim (Fig. 33) . . . . . ***Sepia rozella***

31b. Dorsal and ventral protective membranes not fused at base of club; club joined to stalk, not separated from stalk by a membrane; cuttlebone inner cone limbs of uniform width, or form a distinctive rounded swelling, not pink . . . . . → ***32***

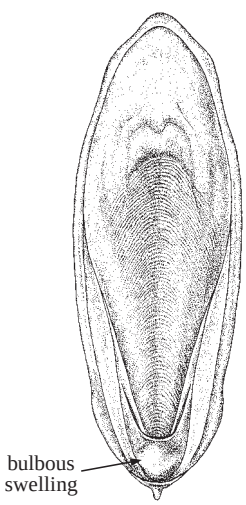
32a. Cuttlebone inner cone limbs broaden, thicken posteriorly to form a distinct bulbous, shiny swelling (Fig. 34); cuttlebone sulcus deep, wide, flanked by rounded ribs; hectocotylus (left ventral arm IV) with 10 rows of normal suckers at base followed by reduced suckers . . . . ***Sepia pharaonis***

32b. Cuttlebone inner cone limbs of uniform width, form a thickened rim, do not form a bulbous swelling; cuttlebone sulcus shallow, narrow, not flanked by rounded ribs; hectocotylus (left ventral arm IV) with 3 rows of normal suckers at base, followed by reduced suckers . . . . . ***Sepia vossi***



Sepia rozella

Fig. 33 cuttlebone (ventral view)



Sepia pharaonis

Fig. 34 cuttlebone (ventral view)

List of species occurring in the area

The symbol is given when species accounts are included.

Metasepia pfefferi (Hoyle, 1885)

Sepia aculeata Férussac and d'Orbigny, 1848
Sepia andreana Steenstrup, 1875
Sepia apama Gray, 1849
Sepia bandensis Adam, 1939
Sepia bartletti (Iredale, 1954)[1/]
[*Sepia braggi* Verco, 1907][2/]
Sepia brevimana Steenstrup, 1875
? *Sepia carinata* Sasaki, 1920[3/]
Sepia cottoni Adam, 1979
Sepia cultrata Hoyle, 1885
Sepia elliptica Hoyle, 1885
Sepia esculenta Hoyle, 1885
Sepia kiensis Hoyle, 1885
Sepia kobiensis Hoyle, 1885
Sepia latimanus Quoy and Gaimard, 1832
? *Sepia lorigera* Wülker, 1910[3/]
Sepia lycidas Gray, 1849
Sepia madokai Adam, 1939
Sepia mestus Gray, 1849
Sepia mira (Cotton, 1932)[1/]
Sepia opipara (Iredale, 1926)
Sepia papuensis Hoyle, 1885
Sepia pharaonis Ehrenberg, 1831
Sepia plangon Gray, 1849
Sepia recurvirostra Steenstrup, 1875
Sepia rex (Iredale, 1926)
Sepia rozella (Iredale, 1926)
Sepia smithi Hoyle, 1885
Sepia stellifera Homenko and Khromov, 1984
Sepia sulcata Hoyle, 1885
Sepia vietnamica Khromov, 1987
Sepia vossi Khromov, 1996
Sepia whitleyana (Iredale, 1926)

Sepiella inermis Van Hasselt, 1835
? *Sepiella japonica* Sasaki, 1929[4/]
Sepiella ocellata Pfeffer, 1884
Sepiella weberi Adam, 1939
Sepiella sp.[5/]

1/ Uncertain status.
2/ Until recently believed to occur in the area. See footnote on species account to follow (p. 739).
3/ Unconfirmed records from Viet Nam.
4/ Species known as *Sepiella maindroni* in China. It is important in the fisheries of Japan, South Korea, and China. Unconfirmed records from the Philippines.
5/ New species from northern Australia (A. Reid and C.C. Lu, submitted manuscript).

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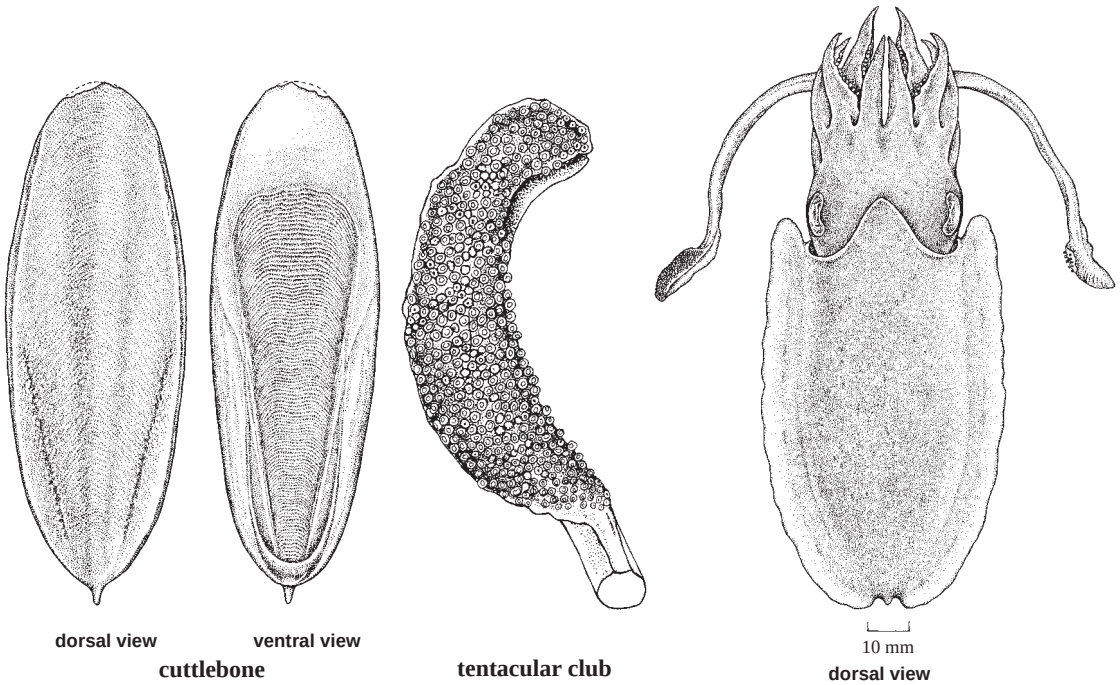
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Sepia aculeata Férussac and d'Orbigny, 1848

Frequent synonyms / misidentifications: *Sepia indica* Férussac and d'Orbigny, 1848 / None.

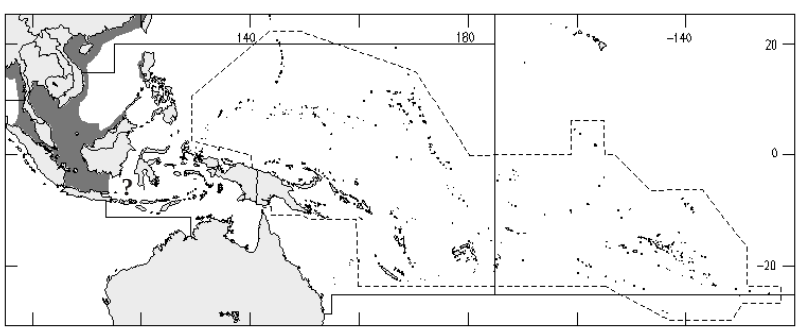
FAO names: En - Needle cuttlefish; **Fr** - Seiche aiguille; **Sp** - Sepia con punta.



Diagnostic characters: Left ventral arm (IV) of males hectocotylized: 3 rows of normal suckers proximally, followed by 5 or 6 rows of reduced suckers, remaining suckers normal to tip of arm; reduction marked, **suckers in 2 dorsal series smaller than rest**; 2 dorsal and 2 ventral series widely spaced. Tentacular club long, with **10 to 12 suckers in transverse rows (males)**, or **13 or 14 suckers in transverse rows (females)**; **suckers all of similar size, minute**; dorsal and ventral protective membranes not fused at base of club, extending beyond sucker-bearing face along stalk. Buccal membrane with few, minute suckers. Cuttlebone outline oval; dorsal and lateral ribs present, distinct; spine present, keel(s) absent; **anterior striae inverted U-shape**; **inner cone limbs broaden posteriorly, raised to form a thickened, rounded, ledge**; outer cone narrow anteriorly, broadens posteriorly. **Colour:** variable; dorsal mantle with fine **transverse reticulated colour pattern** in the spawning season, or may be pale brownish with, or without white blotches or spots, sometimes with transverse saddle mark; **fins with pale reflective line along base**.

Size: Maximum mantle length 230 mm; maximum weight 1.3 kg. Commercially caught animals from the Gulf of Thailand and the Andaman Sea range between 60 and 130 mm mantle length.

Habitat, biology, and fisheries: A demersal neritic species; at depths to 60 m. Spawning occurs all year in the Gulf of Thailand, with peak months from March to April and July to September. Males in this region mature at 70 mm, and females at 810 mm mantle length, with the sex ratio of males to females 1:1.3. An object of fisheries in southern China, Taiwan Province of China, and also commercially important in Thailand; mostly caught using otter trawl, smaller catches are made using pair trawl, and to a lesser extent, squid light-lures, traps, and push nets; bottom otter and pair trawls are used offshore, and push nets and lift nets in inshore and coastal waters.



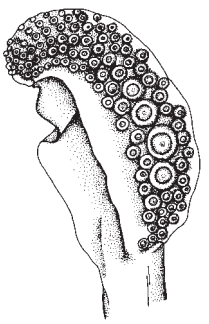
Distribution: Southern India to Andaman Sea, Indonesia, Thailand, Malaysia, the Philippines, China, and north to central Japan.

Sepia andreana Steenstrup, 1875

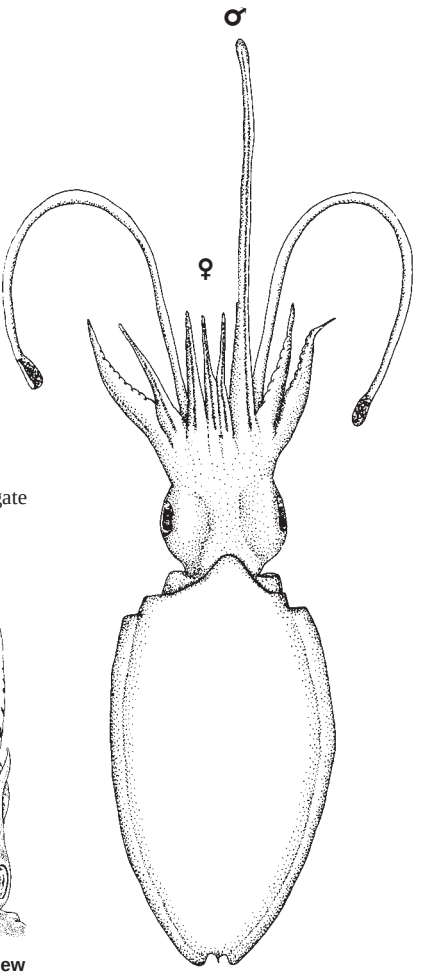
Frequent synonyms / misidentifications: None / *Sepia kobiensis* Hoyle, 1885.

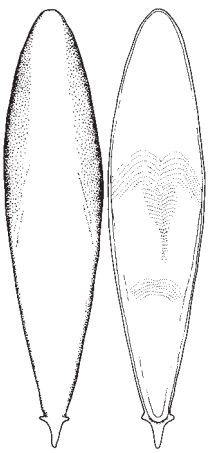
FAO names: En - Andrea cuttlefish; **Fr** - Seiche andreana; **Sp** - Sepia andreana.

Diagnostic characters: Fins end in small auriculate lobes posteriorly, with a small V-shaped interstice between lobes where the cuttlebone spine is located. **Male arms II greatly elongated**, 3 times longer than the other arms (except in very young animals); **rounded distally**, not tapered. Male arms II with 4 suckers in transverse rows proximally and 2 suckers in transverse rows distally, with suckers becoming rudimentary and sparse; male arms I, III and IV with 4 suckers in transverse rows. Female arms all with 4 suckers in transverse rows. Left ventral arm (IV) of males hectocotylized: approximately **10 rows of normal suckers proximally, remaining suckers greatly reduced, rudimentary**, on swollen peduncular bases; reduced sucker rows evenly spaced on arm. Tentacular club with **8 suckers in transverse rows; differing markedly in size, with 4 or 5 large median suckers;** swimming keel extending slightly beyond sucker-bearing face; **dorsal and ventral protective membranes not fused at base of club**, terminating at posterior end of sucker-bearing face, dorsal membrane forming deep cleft at junction with the stalk. **Cuttlebone lanceolate**; without dorsal median rib present; **striated** zone and last loculus convex; sulcus shallow, narrow; **anterior striae M-shape**; inner cone limbs of uniform width. **Colour:** dorsal mantle pale brownish with yellow spots; arms I to III with orange pigmented stripe along aboral surface.

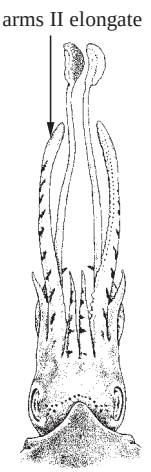


tentacular club
(after Voss, 1963)





dorsal view **ventral view**
cuttlebone
(after Voss, 1963)



dorsal view
head of male

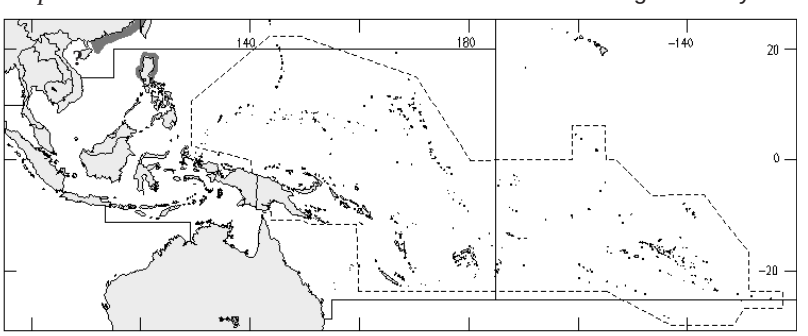
dorsal view
(after Okutani, 1995)

Size: Maximum mantle length 120 mm.

Habitat, biology, and fisheries: A demersal species occurring in coastal waters to a depth of 50 m. Taken as bycatch in trawl and set-net fisheries.

Distribution: Western Pacific from northern Philippines, along south China coast to central Japan.

Remarks: May be confused with *Sepia kobiensis*. Mature males of *S. andreana* can be distinguished by the greatly elongate second arm pair and the hectocotylus sucker arrangement: in *S. kobiensis*, 9 to 12 rows of normal suckers are followed by 8 to 10 rows of reduced suckers, then remaining suckers normal to tip of arm. Also, *S. kobiensis* is smaller, reaching a maximum mantle length of 70 mm.



click for next page

click for previous page

Sepia apama Gray, 1849

Frequent synonyms / misidentifications: *Sepia palmata* Owen, 1881; *Amplisepia verreauxi* Iredale, 1926; *A. parysatis* Iredale, 1954 / None.

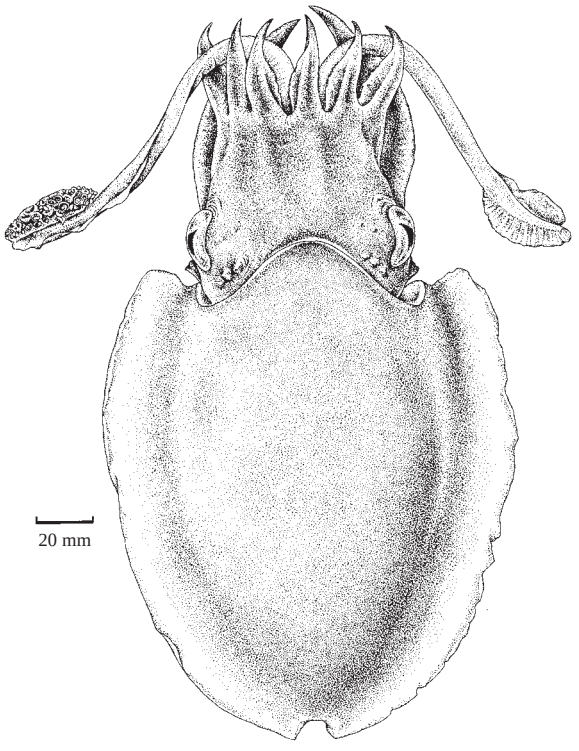
FAO names: En - Giant Australian cuttlefish; **Fr** - Seiche géante; **Sp** - Sepia gigante.

Diagnostic characters: Three large flap-like papillae posterior to each eye; sometimes additional smaller papillae anterior to these large papillae. Left ventral (IV) arm of males hectocotylized, **proximal 6 to 10 sucker rows slightly reduced**; reduced suckers equal in size across rows. Tentacular club crescent-shaped; sucker-bearing face flattened, with **5 or 6 suckers in transverse rows, differing markedly in size** (median suckers enlarged); swimming keel extending slightly beyond sucker-bearing face; dorsal and ventral protective membranes fused at base of club, separated from stalk by a membrane. Cuttlebone outline broadly oval in juveniles, wider in anterior half, becoming elongate in adults; cuttlebone rounded anteriorly and posteriorly in juveniles, acuminate in adults; dorsal surface with faint median and lateral ribs; spine present in juveniles, lost in adults; last loculus flat, striated zone convex, with shallow sulcus, **anterior striae inverted U-shape**; inner cone limbs broadening posteriorly, anterior margin **forms a rough calcareous callus posteriorly**; outer cone narrow anteriorly, broadens posteriorly, extends well beyond inner cone in adults. **Colour:** during breeding season, dorsal mantle with bold, transverse stripes.

Size: Maximum mantle length 500 mm; maximum weight over 5 kg. One of the largest cuttlefishes.

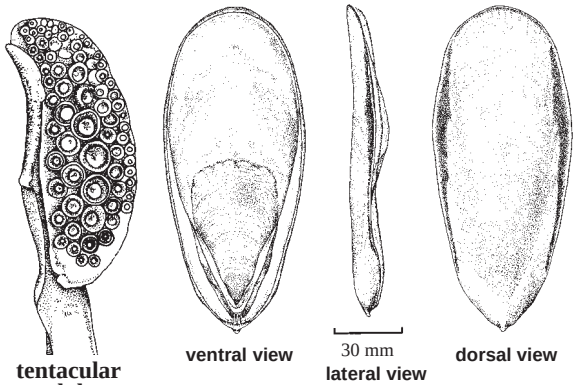
Habitat, biology, and fisheries: A neritic demersal species occurring in rocky areas, seagrass beds and on open trawl grounds to a depth of 100 m. Spawning extends from May to September. Taken as bycatch of prawn and mixed species trawl fisheries and also caught by hook-and-line, or speared by divers. Commonly seen in fish markets along the southern coast of Australia. Sold for human consumption and as bait.

Distribution: Southern Australia.



dorsal view

(illustration: K. Hollis/ABRS)

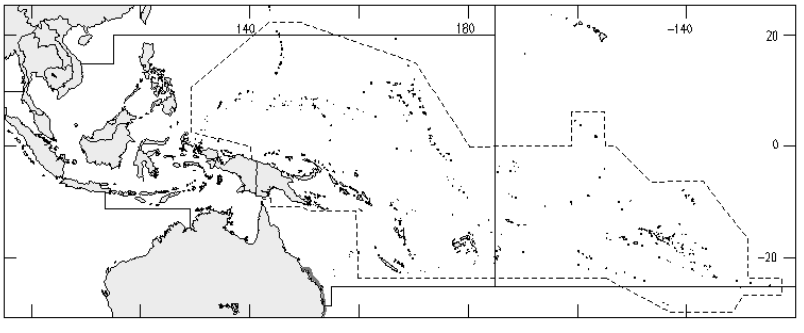


tentacular club

(after Lu, in press)

cuttlebone (subadult)

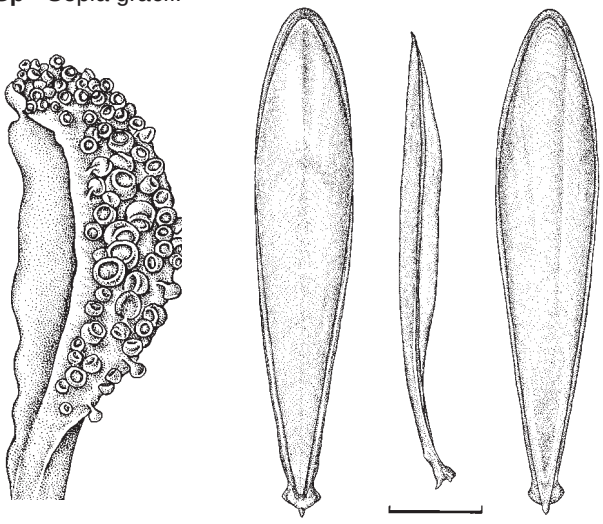
(illustration: K. Hollis/ABRS)

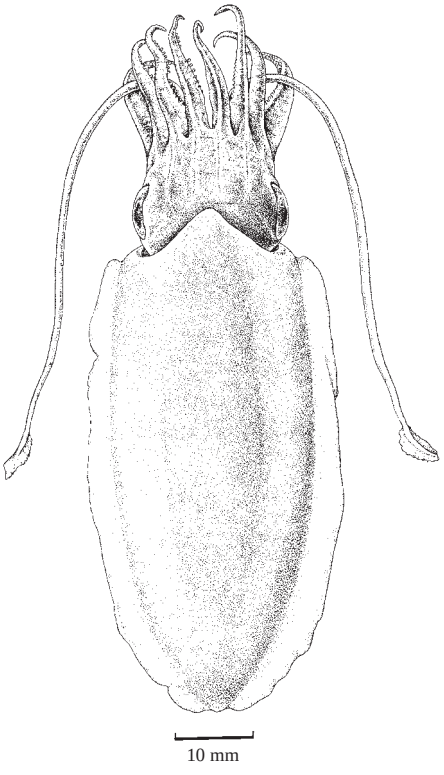


Sepia braggi Verco, 1907

Frequent synonyms[1/] **/ misidentifications:** *Arctosepia limata* Iredale, 1926; *A. versuta* Iredale, 1926; *A. rhoda* Iredale 1954; *A. treba* Iredale 1954; *A. braggi xera* Iredale, 1954 / None.

FAO names: En - Slender cuttlefish; **Fr** - Seiche gracile; **Sp** - Sepia grácil.





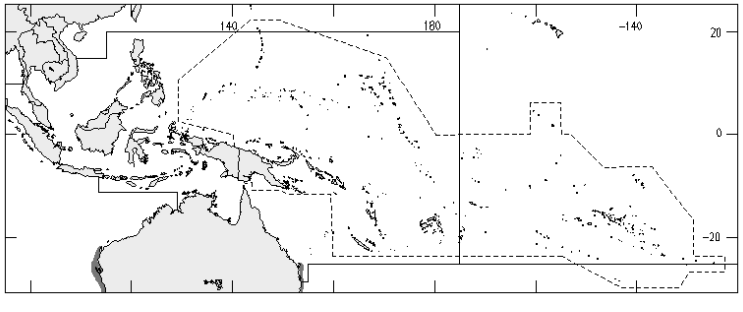
(illustration: K. Hollis/ABRS)

Diagnostic characters: Mantle shape oblong. Both sexes with longitudinal row of 5 or 6 ridges along each side, close to fins. **Male arms III greatly elongated**; female arms all similar in length. Male and female arm suckers: **arms I to III with tetraserial suckers proximally, biserial suckers at distal tips; arms IV with tetraserial suckers throughout. Hectocotylus absent**. Tentacular club short, with **5 or 6 suckers in transverse rows**, differing markedly in size, 5 or 6 median suckers twice the diameter of rest; **dorsal and ventral protective membranes not fused at base of club**, joined to stalk at base of club, extending beyond sucker-bearing face along stalk; dorsal protective membrane much wider than ventral membrane. **Cuttlebone outline lanceolate**; dorsal surface pinkish; evenly convex; faint median rib present; spine present, long, curving upward, keel(s) absent; **ventral surface convex**; sulcus deep, narrow, flanked by rounded ribs; **anterior striae m-shaped**; inner cone limbs of uniform width, thickened posteriorly forming a shiny rounded ridge; **outer cone limbs expanded forming 2 short wings**. **Colour:** pinkish purple dorsally, pale ventrally; arms II to IV with median longitudinal dark pink strips and transverse bars and spots.

Size: Maximum mantle length 65 mm.

Habitat, biology, and fisheries: A demersal species, at depths between 30 and 146 m. Taken as bycatch with other cuttlefish species in southern and southeastern Australia.

Distribution: Southern Australia **(see footnote!)**.



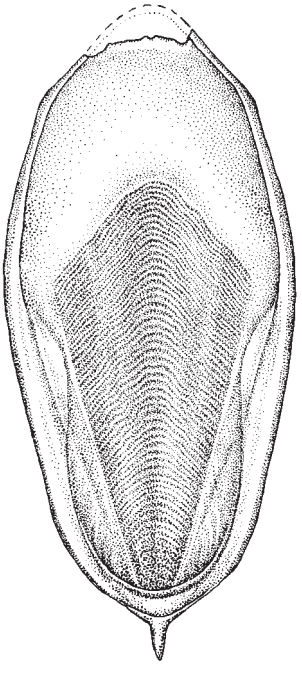
1/ Since the time of writing, some additional information has been become available. Lu (in press) included 5 species in synonymy with *Sepia braggi* (see section on "Frequent synonyms" above). Work in progress by the author [A.L. Reid] and currently being prepared for publication has shown *S. limata* (Iredale, 1926) and *S. rhoda* (Iredale, 1954) to be valid species. In addition, the distribution of *S. braggi* is now known to be restricted to the southeastern corner of Australia (outside the WCP area).

Sepia brevimana Steenstrup, 1875

Frequent synonyms / misidentifications: *Sepia rostrata* Férussac and d'Orbigny, 1848 / *Sepia stellifera* Homenko and Khromov, 1984.

FAO names: En - Shortclub cuttlefish; **Fr** - Seiche petites mains; **Sp** - Sepia mazicorta.

Diagnostic characters: Mantle blunt-pointed posteriorly. **Tentacular club small; with 5 to 8 minute suckers in transverse rows**; swimming keel extending well beyond sucker-bearing face; **dorsal and ventral protective membranes not fused at base of club, dorsal membrane much wider than ventral membrane. Cuttlebone very angular, V-shaped anteriorly**; dorsal surface flat, texture uniformly pustulose; spine present, long, keels present dorsally and ventrally, also with nose-like protuberance in the anterior part of spine; a shallow, narrow sulcus extending along striated zone, flanked by rounded ribs; anterior striae inverted V-shape; **inner cone limbs broaden posteriorly, thickened, rose-coloured or yellowish orange, outer margin of inner cone forming a raised, flattened ledge posteriorly**; outer cone narrow anteriorly, broadens posteriorly. **Colour:** buff-brown.



ventral view

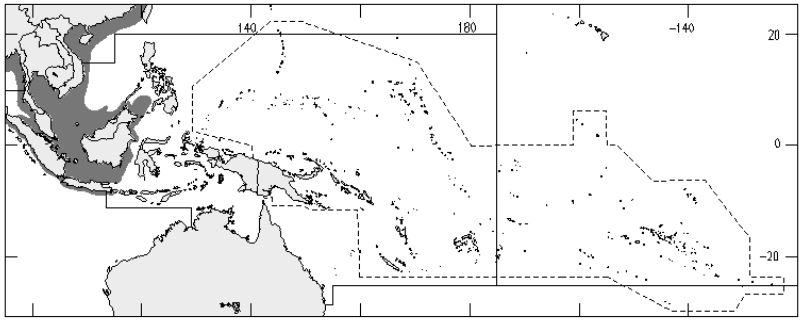
cuttlebone

Size: Maximum mantle length 100 mm. In the Gulf of Thailand, commonly caught at 40 to 60 mm mantle length, with a maximum mantle length of 90 mm.

Habitat, biology, and fisheries: A demersal species, ranging to a depth of 100 m. The vertical range is 10 to 40 m and the peak occurrence 30 to 40 m in the Gulf of Thailand and the Andaman Sea, with the sex ratio of males to females caught 1:2.2. Important to the commercial squid fishery in Thailand. Most are caught using otter trawl, some using pair trawl, and small catches are made using squid light-lures, traps and push nets, with bottom otter and pair trawls used offshore, and push nets and lift nets used in inshore and coastal waters. It is also fished in South China Sea.

Distribution: Southern India to the Andaman Sea, Gulf of Tonkin, including Java, Sulu, and Celebes Seas.

Remarks: The number of tentacular club suckers in transverse rows has been recorded as 5, 5 to 8, and 6 to 8 by various workers. The exact number needs to be confirmed. Can be confused with *Sepia stellifera*, but differs in having up to 8, rather than 10 suckers in transverse rows on the club, and the shallow and narrow sulcus of the cuttlebone, which is deep and wide in *S. stellifera*. Similar to *S. esculenta*, but differs in having fewer club suckers (10 to 16 suckers in transverse rows in *S. esculenta*), in having no fleshy papillae along the base of the fins, and in having a coloured inner cone.

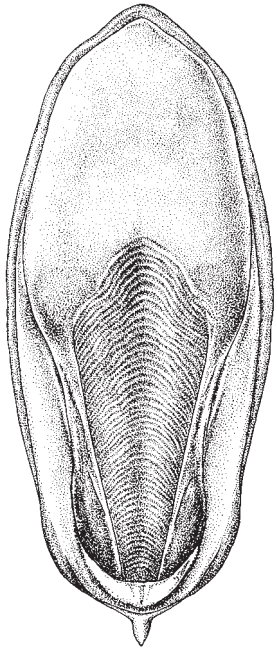


Sepia elliptica Hoyle, 1885

Frequent synonyms / misidentifications: None / *Sepia esculenta* Hoyle, 1885; *S. stellifera* Homenko and Khromov, 1984.

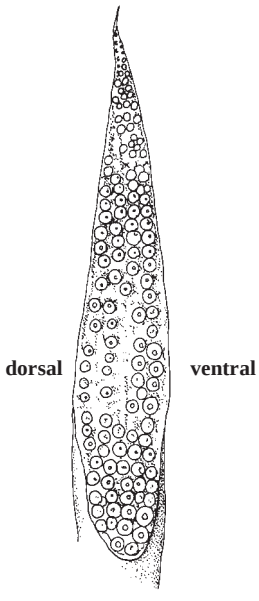
FAO names: En - Ovalbone cuttlefish.

Diagnostic characters: Left ventral arm (IV) of males hectocotylized: **7 or 8 rows of normal suckers proximally, followed by 7 rows of reduced suckers**, then remainder normal to arm tip; reduction slight; **2 dorsal series smaller than remaining suckers**. Tentacular club sucker-bearing face flattened; with **10 to 12 minute suckers in transverse rows**; dorsal and ventral protective membranes not fused in small specimens, fused at base of club in large specimens, separated from stalk by a membrane. **Cuttlebone outline oval;** rounded posteriorly; median ribs indistinct; spine present, keel(s) absent; sulcus deep, wide; anterior striae inverted U-shape; **inner cone limbs broadening posteriorly, not thickened, outer margin of inner cone forms a raised, flattened anteriorly directed ledge**; outer cone narrow anteriorly, broadens posteriorly. **Colour:** pale pinkish purple.



ventral view

cuttlebone



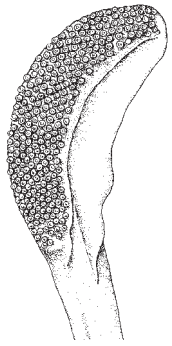
hectocotylus
(after Hoyle, 1886)

Size: Maximum mantle length 173 mm.

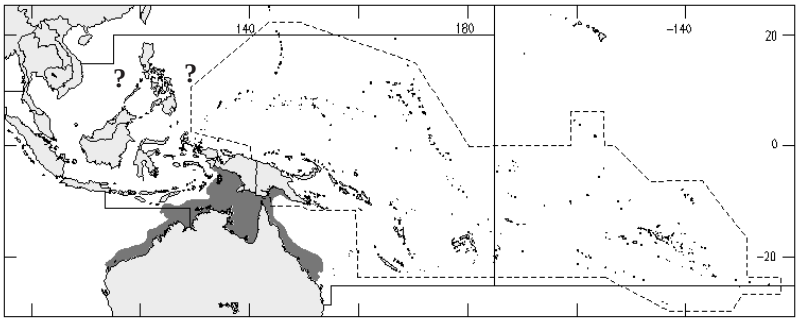
Habitat, biology, and fisheries: Coastal waters at depths from 10 to 142 m. In the Gulf of Carpentaria, both sexes of *Sepia elliptica* reach maturity at 36 mm mantle length, with broad size ranges of both sexes over most of the year indicative of extended spawning season.

Distribution: Northern Australia and New Guinea, South China Sea, possibly Philippines.

Remarks: May be confused with *Sepia esculenta* which can be distinguished by the following characters: hectocotylus with 5 or 6 rows of normal suckers proximally, followed by 6 rows of reduced suckers; dorsal and ventral protective membranes not fused at base of club; cuttlebone anterior striae inverted V-shape, and inner cone limbs thickened posteriorly.



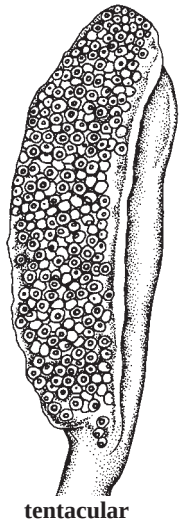
tentacular club (subadult)



Sepia esculenta Hoyle, 1885

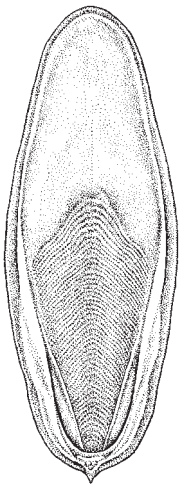
Frequent synonyms / misidentifications: None / *Sepia elliptica* Hoyle, 1885.

FAO names: En - Golden cuttlefish; **Fr** - Seiche dorée; **Sp** - Sepia dorada.



tentacular club

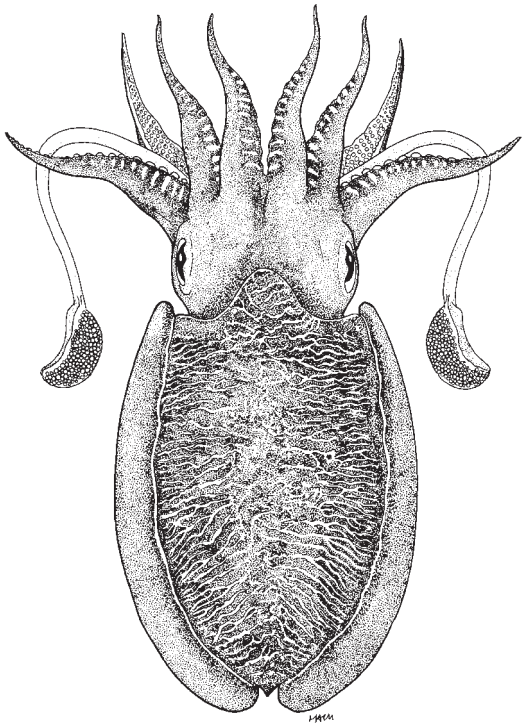
(after Okutani et al., 1987)



10 mm

ventral view

cuttlebone



dorsal view

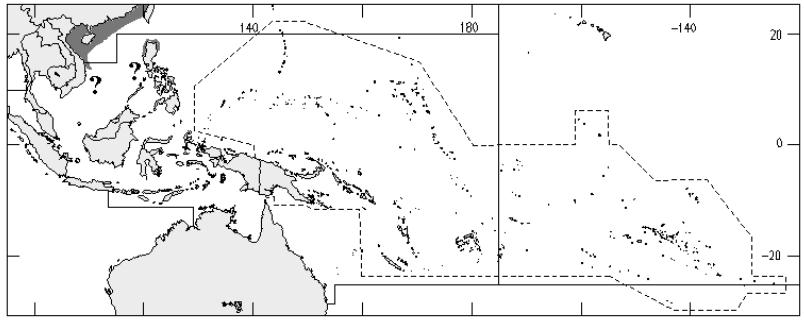
(after Okutani et al., 1987)

Diagnostic characters: Mantle with a row of 6 or 7 yellowish fleshy tubercles along silvery stripe at base of each fin. Left ventral arm (IV) of males hectocotylized: **5 or 6 rows of normal suckers proximally, followed by 6 rows of reduced suckers**, then remaining suckers normal to tip of arm. Tentacular club long; sucker-bearing face flattened, with **10 to 16 similar-sized, minute suckers in transverse rows**; dorsal and ventral protective membranes not fused at base of club. Buccal membrane without suckers. Cuttlebone rounded anteriorly and posteriorly; spine present; **sulcus deep, wide; anterior striae inverted V-shape; inner cone limbs thickened posteriorly, forming a raised, rounded ledge**. **Colour:** dorsal mantle pale with transverse stripes, sometimes studded with yellow tubercles; **fins with pale, golden reflective line along base, visible dorsally, and ventrally**; arms with pinkish bands along the aboral surface.

Size: Maximum mantle length 175 mm; maximum weight 0.6 kg.

Habitat, biology, and fisheries: A demersal inner shelf species found on sandy bottoms between depths of 10 and 100 m, sometimes burrowing into the substrate. After overwintering in deeper water, animals migrate into shallower coastal waters where they spawn when the water temperature increases in spring and summer. Eggs are deposited on macrophytes and other substrates. Supports localized and subsistence fisheries in the Philippines and Hong Kong. Caught using otter trawls, pound nets, hoop nets and on hook-and-line. The flesh is highly thought of as food.

Distribution: South and East China seas. Japan, Hong Kong (China), Viet Nam, northern Philippines, and Indonesia.

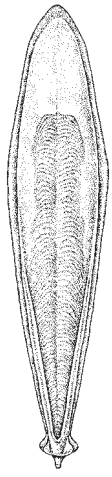


Remarks: This species has been confused with *Sepia elliptica*. In *S. elliptica*, the inner cone ledge of the cuttlebone is thinner, flatter and directed anteriorly, and the anterior striae are inverted U-shaped. The hectocotylus sucker arrangement also differs.

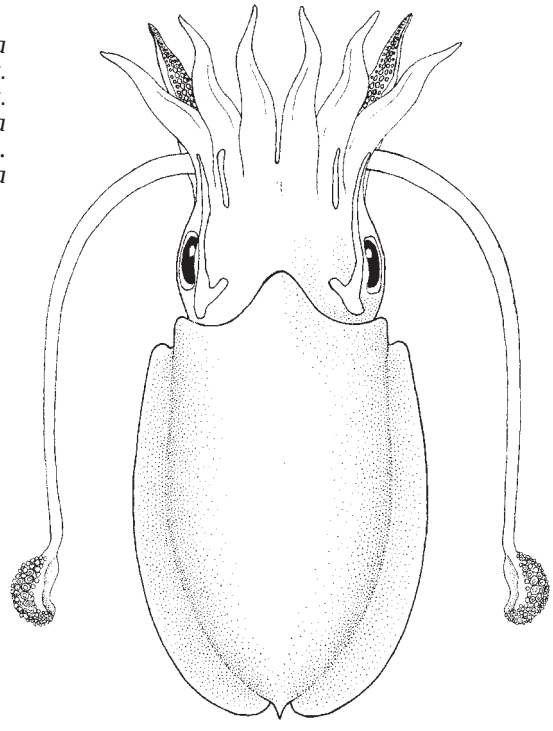
Sepia kobiensis Hoyle, 1885

Frequent synonyms / misidentifications: *Sepia andreanoides* Hoyle, 1885; *S. kobiensis* var. *andreanoides* Sasaki, 1929; *S. kobiensis* var. *toyamensis* Sasaki, 1929; *S. kobiensis* var. *beppauna* Sasaki, 1929; *S. kobiensis* var. *crassa* Sasaki, 1929; *S. kobiensis* var. *albatrossi* Sasaki, 1920 / *Sepia andreana* Steenstrup, 1875.

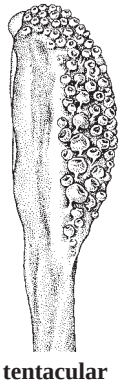
FAO names: En - Kobi cuttlefish; **Fr** - Seiche kobi; **Sp** - Sepia kobí.



ventral view
cuttlebone


dorsal view

Diagnostic characters: Body narrow. All arms similar in length, with tetraserial suckers. Left ventral arm (IV) of males hectocotylized: 9 to 12 rows of normal suckers proximally, followed by **8 to 10 rows of reduced suckers**, then remaining suckers normal to tip of arm; **reduction marked, 2 dorsal and 2 ventral series widely spaced; oral surface wide, fleshy, with transversely grooved ridges and a deep median furrow**. Tentacular club short, with **8 suckers in transverse rows**, differing only slightly in size; swimming keel extends slightly beyond club. **Cuttlebone lanceolate**, slightly broader in females; dorsal surface pinkish, or yellowish; spine present, long; sulcus shallow, narrow; **anterior striae inverted m-shape**; inner cone limbs of uniform width, thickened, U-shaped posteriorly; outer cone limbs narrow throughout most of length, **limbs expanded posteriorly forming 2 short wings**. **Colour:** dark reddish purple; **head with V-shaped reddish stripe on dorsal margin of orbit**; dorsal mantle brownish with darkish central area and reddish orange spots; **reddish stripes on aboral surface arms I** to **III**.

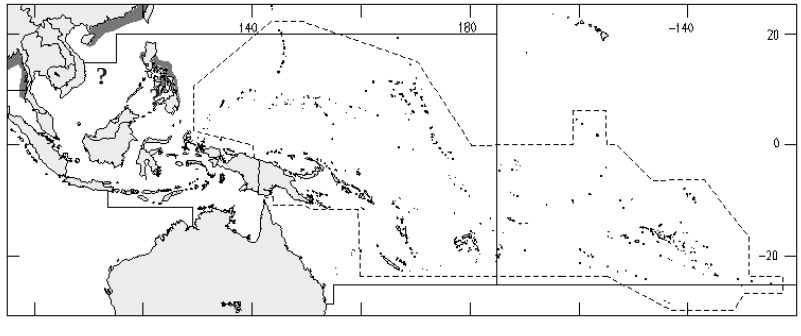

tentacular club

Size: Maximum mantle length 70 mm.

Habitat, biology, and fisheries: Subtidal to a depth of 150 m or more. Taken in small quantities in the Hong Kong, China area, also caught as bycatch in small scale fisheries off southern Japan and China, mainly with fixed nets, trawls, and beach seines.

Distribution: South and East China Seas, Yellow Sea to southern and central Japan. Indo-Malayan waters, Philippines, Gulf of Tonkin and the northern part of the Indian Ocean from the Arabian Sea and the Persian Gulf to Myanmar.

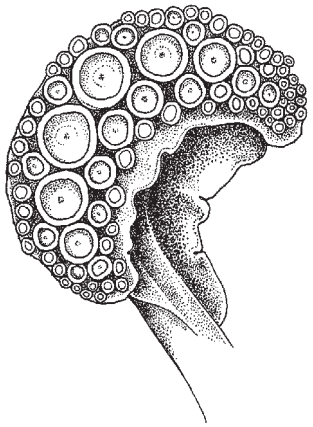
Remarks: Probably a complex of related species. *Sepia kobiensis* has been confused with *S. andreana*. In adult male *S. andreana*, the second pair of arms is greatly elongate and bears biserial suckers, rather than tetraserial suckers; the hectocotylus has about 10 rows of normal suckers at the base, and the remaining suckers are reduced and very rudimentary. Also, the club suckers differ markedly in size in *S. andreana*, while those in *S. kobiensis* differ only slightly in size.



Sepia latimanus Quoy and Gaimard, 1832

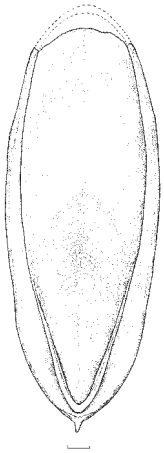
Frequent synonyms / misidentifications: *Ponderisepia eclogaria* Iredale, 1926; *Sepia rappiana* Férussac, 1835; *S. mozambica* Rochebrune, 1884; *S. hercules* Pilsbry, 1894 / None.

FAO names: En - Broadclub cuttlefish; **Fr** - Seiche grandes mains; **Sp** - Sepia mazuda.



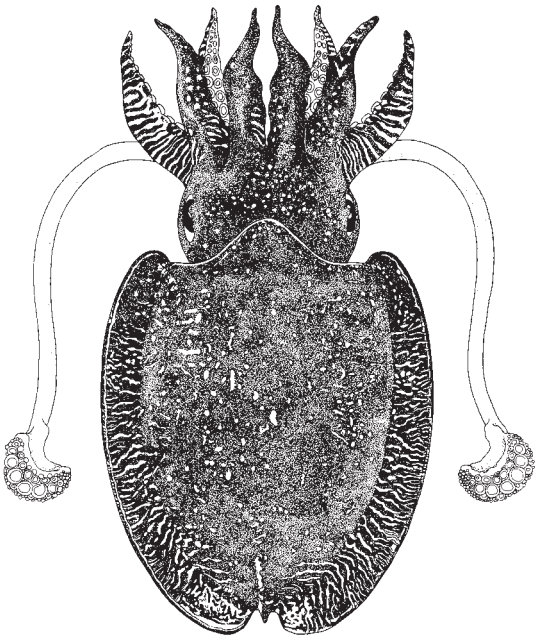
tentacular club

(from Roper et al., 1984)



ventral view

cuttlebone



dorsal view

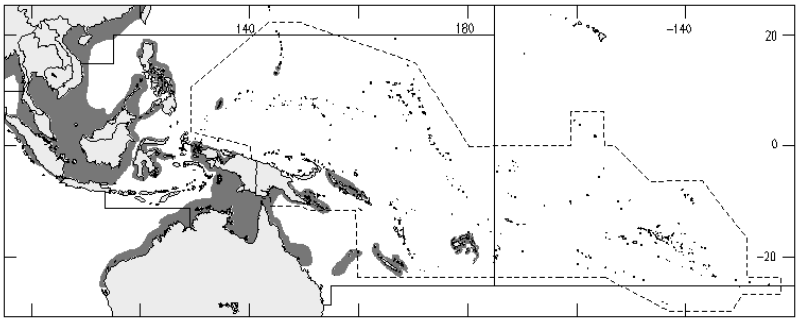
(after Okutani et al., 1987)

Diagnostic characters: Head tubercles present, papilliform. Hectocotylus absent. **Tentacular club crescent-shaped, sucker-bearing face flattened; with 5 or 6 suckers in transverse rows**, differing markedly in size with a few median suckers enlarged; swimming keel extends beyond sucker-bearing face; **dorsal and ventral protective membranes fused at base of club, separated from stalk by membrane**; dorsal protective membrane forms a deep cleft at junction with stalk. Cuttlebone rounded anteriorly and posteriorly; dorsal surface granulose, loosely following growth lines; spine present, short; keel(s) absent; **sulcus shallow, narrow, extending entire length of cuttlebone, flanked by rounded ribs; anterior striae blunt inverted V-shape**; inner cone limbs thickened posteriorly, form a rounded, shiny ridge; outer cone deep, cup-like posteriorly. **Colour: dorsal mantle dark purple/brown with white spots; fins with white transverse stripes extending onto mantle; arms vivid with transverse stripes**.

Size: Maximum mantle length 500 mm. Males up to 170 mm (0.5 kg) and females to 240 mm (1.3 kg) mantle length in Alas Strait, Indonesia.

Habitat, biology, and fisheries: A shallow-water species inhabiting tropical coral reefs to a depth of 30 m. Mating occurs on the west coast of Guam and off Okinawa in shallow waters from January to May and the eggs hatch after 38 to 40 days. This species supports local fisheries in western Japan and the Philippines. Caught with jigs, handlines, set nets, and spears and commonly taken as bycatch in Southeast Asian trawl fisheries. Fished in small quantities in the Ryukyu Islands, China, near Taiwan Province of China, and in the waters of Indochina. In the Philippines, the large cuttlefish, *Sepia pharaonis* and *S. latimanus*, are split open, the cuttlebone and viscera removed and are dried in the sun without salt.

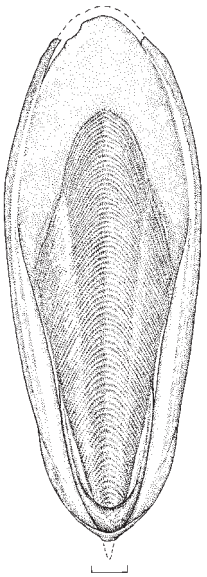
Distribution: Widespread in the tropical Indo-West Pacific from the Andaman Sea, South and East China Seas, Japan, the Philippines, Malaysia, Indonesia to New Guinea, northern Australia and east to Palau, Guam, New Caledonia, and Fiji. Westernmost record Madagascar (doubtful).



Sepia lycidas Gray, 1849

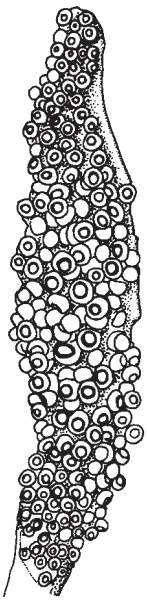
Frequent synonyms / misidentifications: *Sepia subaculeata* Sasaki, 1914 / None.

FAO names: En - Kisslip cuttlefish; **Fr** - Seiche baisers; **Sp** - Sepia labiada.



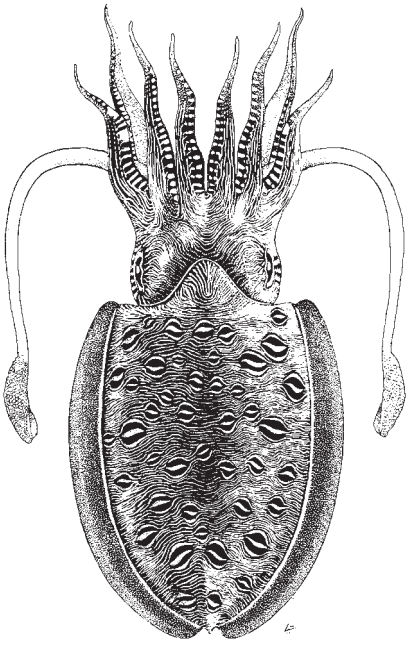
ventral view

cuttlebone



tentacular club

(after Okutani et al., 1987)

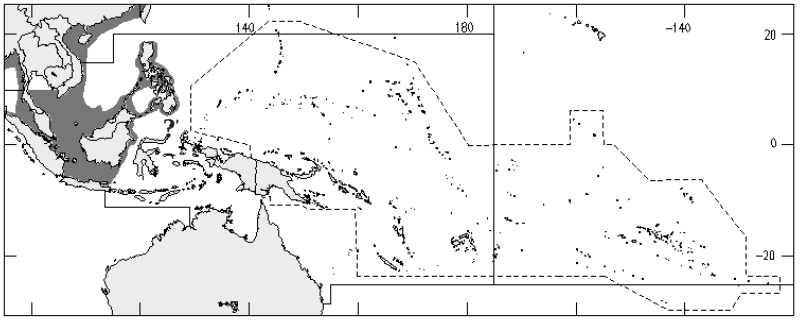


dorsal view

Diagnostic characters: Left ventral arm (IV) of males hectocotylized: 6 rows of normal suckers proximally, then 4 rows of reduced suckers. **Tentacular club with 8 similar-sized suckers in transverse rows**; swimming keel extending nearly to base of club; **dorsal and ventral protective membranes not fused at base of club. Buccal membrane with a few, minute suckers**, single sucker on most lobes. Cuttlebone outline elliptical, rounded anteriorly and posteriorly, dorsal median rib absent; spine present, short; **sulcus deep, wide; anterior striae inverted V-shape; inner cone limbs thickened posteriorly broadens to form a rounded ridge**, outer cone narrow anteriorly, broadens posteriorly. **Colour:** head, mantle and fins with wrinkled zebra-stripe pattern; **dorsal mantle with scattered ocellate patches** (pattern more obvious in males than females). Fins with wide stripe at base.

Size: Maximum mantle length about 200 mm. In the Gulf of Thailand, most animals caught are between 100 and 200 mm mantle length, with maximum mantle length 380 mm and maximum weight 5 kg.

Habitat, biology, and fisheries: A neritic demersal species. The depth range in the Gulf of Thailand and Andaman Sea is 10 to 100 m, with most animals caught between 20 to 40 m. In the South China Sea, it is abundant between depths of 60 and 100 m in the pre-spawning period (November to February), and migrates inshore to spawn in depths of 15 to 30 m from March to May. *Sepia lycidas* is important to the commercial cuttlefish fishery in Thailand and Viet Nam. Most cuttlefish are caught off Thailand using otter trawl, with smaller catches made using pair trawl and to a lesser extent, squid light-lures, traps and push nets, with bottom otter and pair trawls used offshore, and push nets and lift nets used in inshore and coastal waters. The mantle flesh is thick and tasty and therefore highly esteemed.



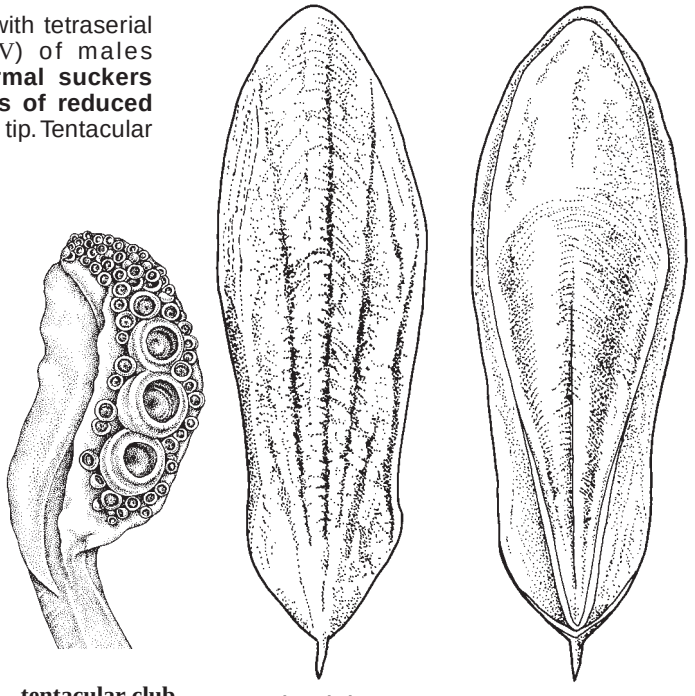
Distribution: East and South China Seas, the Philippines, Viet Nam, and Borneo. Commonly distributed in the Andaman Sea. In the Gulf of Thailand it occurs south of 10°N, and never appears in the inner and eastern coast of the Gulf.

Sepia opipara (Iredale, 1926)

Frequent synonyms / misidentifications: *Glyptosepia opipara* Iredale, 1926 / None.

FAO names: En -Staregaze cuttlefish.

Diagnostic characters: Both sexes with tetraserial arm suckers. Left ventral arm (IV) of males hectocotylized: **5 or 6 rows of normal suckers proximally, followed by 6 or 7 rows of reduced suckers**, then remainder normal to arm tip. Tentacular club sucker-bearing face flattened; with **3 or 4 suckers in transverse rows; suckers differ markedly in size, middle of club with 4 or 5 big suckers**; swimming keel extending well beyond club; **dorsal and ventral protective membranes not fused at base of club**, joined to stalk at base of club, not separated from stalk by a membrane; protective membranes extending beyond sucker-bearing face along stalk, dorsal membrane forming a deep cleft at junction with stalk. Cuttlebone dorsal surface pinkish; **flat medially and laterally; median rib present, distinct, sides approximately parallel**; lateral ribs distinct; spine with ventral keel; sulcus shallow, narrow; **anterior striae inverted U-shape; inner cone limbs of uniform width**, thickened posteriorly forming a rounded ridge; outer cone narrow anteriorly, broadens posteriorly, lateral limbs wide. **Colour:** pale pinkish brown.

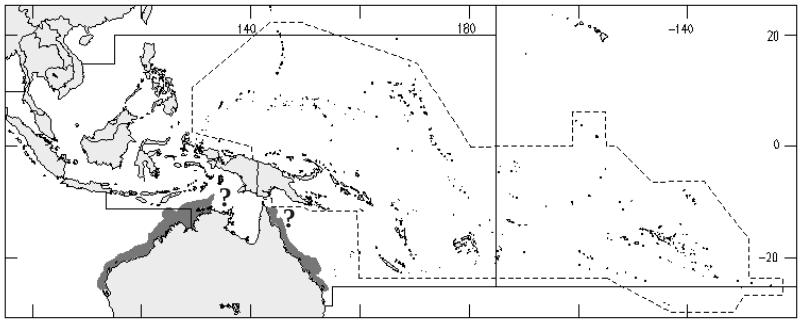


(after Iredale, 1926)

Size: Maximum mantle length about 150 mm.

Habitat, biology, and fisheries: At depths from 83 to 184 m. Species taken as bycatch of prawn and mixed species trawl fisheries.

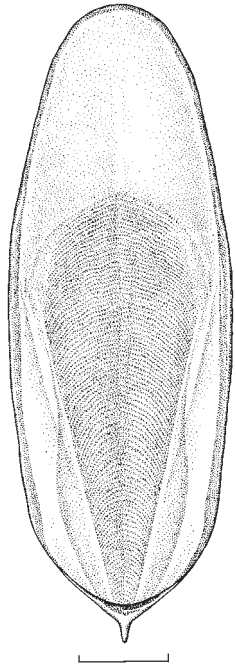
Distribution: Northern Australia.



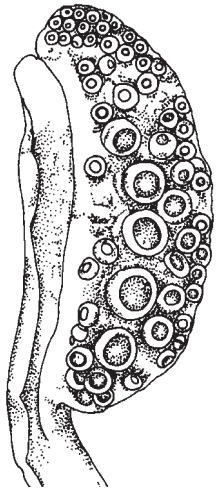
Sepia papuensis Hoyle, 1885

Frequent synonyms / misidentifications: *Sepia galei* Meyer, 1909; *S. prionota* Voss, 1962; *Solitosepia submestus* Iredale, 1926; *S. occidua* Cotton, 1929; *S. genista* Iredale, 1954; *S. lana* Iredale, 1954 / None.

FAO names: En - Papuan cuttlefish.



10 mm
ventral view
cuttlebone



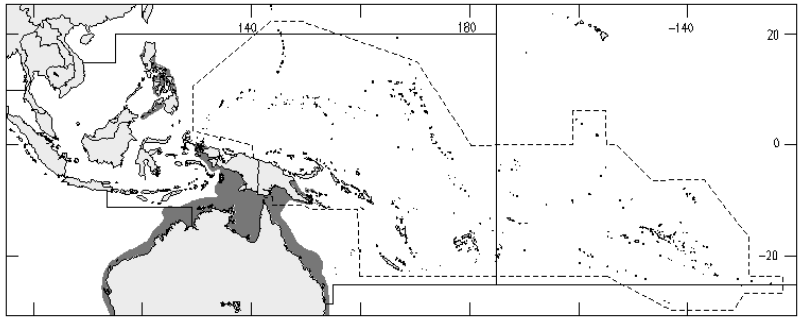
tentacular club (subadult)
(after Lu, in press)

Diagnostic characters: Papillae on head, mantle and arms. Dorsal mantle with a row of elongated tubercles along silvery stripe at base of fins, or dorsal and ventral mantle covered with numerous small papillae. Head with numerous scattered small papillae and 2 pairs of large papillae located over each eye and 1 on each eyelid. Tubercles present on dorsal surface of arms I to III. Arm protective membranes (both sexes) wide, well developed. **Male arms I to III with tetraserial suckers proximally, biserial suckers at distal tips; male arms IV** with tetraserial suckers. Female arms all tetraserial. **Hectocotylus absent**. Tentacular club sucker-bearing face flattened; with **5 or 6 suckers in transverse rows, differing markedly in size**; swimming keel extending well beyond club; dorsal and ventral protective membranes not fused in small specimens, fused at base of club in large specimens, extending beyond sucker-bearing face along stalk; **dorsal protective membrane much longer than ventral membrane**, dorsal membrane forming deep cleft at junction with stalk. Cuttlebone rounded anteriorly and posteriorly; **median rib distinct, broadens anteriorly; spine with ventral keel**; striated zone and last loculus concave; **sulcus shallow, wide; anterior striae inverted U-shape**; inner cone limbs broaden posteriorly, not thickened; outer cone narrow anteriorly, broadens posteriorly. **Colour:** dorsal mantle pale brownish with white blotches or spots; paired dorsal eye spots present.

Size: Maximum mantle length 110 mm.

Habitat, biology, and fisheries: A shelf species found on silt, sand or mud bottoms, at depths from 17 to 155 m. Species taken as bycatch of prawn and mixed species trawl fisheries. In the Gulf of Carpentaria, Australia, probably forms part of bycatch of Taiwanese trawl fisheries in the region.

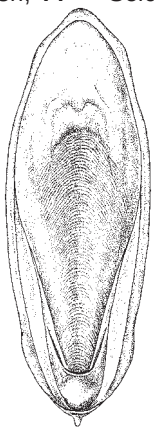
Distribution: Philippines, Indonesia, Arafura and Coral seas, northern Australia.



Sepia pharaonis Ehrenberg, 1831

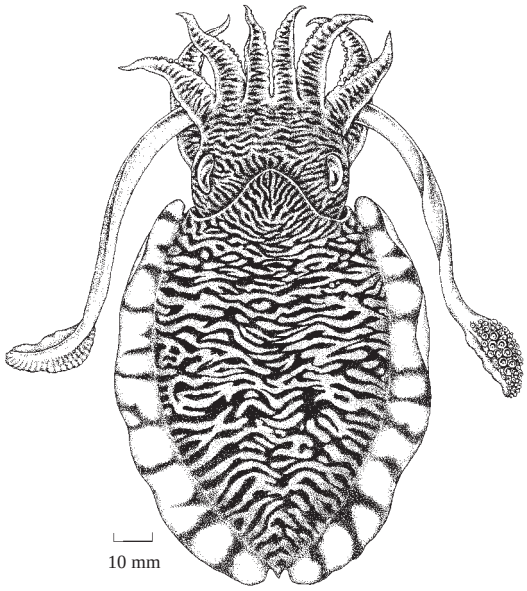
Frequent synonyms / misidentifications: *Crumenasepia hulliana* Iredale, 1926; *C. ursulae* Adam, 1939; *Sepia rouxii* Férussac and d'Orbigny, 1841; *S. formosana* Berry, 1912; *S. tigris* Sasaki, 1929 / None.

FAO names: En - Pharaoh cuttlefish; **Fr** - Seiche pharaon; **Sp** - Sepia faraónica.



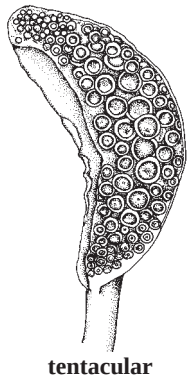
ventral view

cuttlebone



dorsal view

Diagnostic characters: Mantle with a row of elongated tubercles along silvery stripe at base of fins, or covered with numerous small papillae. Head tubercles absent. Left ventral arm (IV) of males hectocotylized: **10 rows of normal suckers proximally, followed by 6 rows of reduced suckers**, then suckers normal to arm tip; reduction marked, **2 dorsal series, smaller than 2 ventral serries,** oral surface wide, fleshy, with transversely grooved ridges. Tentacular club long; sucker-bearing face flattened; with **8 suckers in transverse rows**, differing markedly in size (5 or 6 median suckers enlarged); **dorsal and** ventral protective membranes not fused at base of club, joined to stalk at base of club, not separated from stalk by a membrane. Buccal membrane with few, minute suckers. Cuttlebone median rib present, distinct, wider anteriorly; lateral ribs indistinct; sulcus extending entire length, **flanked by rounded ribs**; anterior striae inverted U-shape; **inner cone limbs thickened posteriorly, form a shiny swelling**; outer cone narrow anteriorly, broadens posteriorly; spine without keel. **Colour:** head with a vivid, transverse striped pattern; dorsal mantle pale brownish with white blotches or spots, or pale brown with transverse saddle mark (in females), or with vivid transverse striped pattern (especially in males); **fins with pale reflective line along base** (sometimes broken), line is blue in females; arms vivid with transverse stripes.

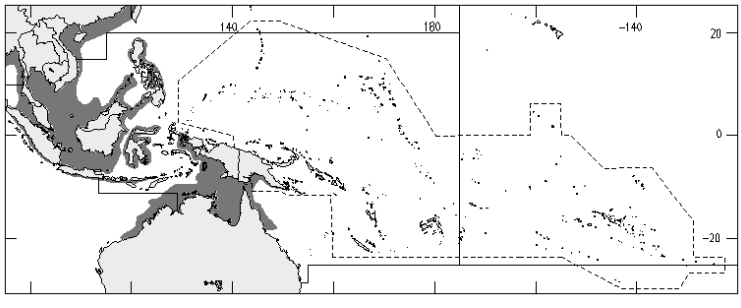


tentacular club

(after Lu, in press)

Size: Maximum mantle length 420 mm; maximum weight 5 kg. In the Gulf of Carpentaria (Australia), the largest male and female collected in 1990 and 1991 surveys were 192 mm and 173 mm mantle length, respectively. In the Gulf of Thailand, the maximum size of animals caught is for males 350 mm mantle length, and females 300 mm mantle length.

Habitat, biology, and fisheries: A neritic demersal species, at depths from 10 to 110 m. In the Gulf of Thailand and the Andaman Seas, found from the coastal shallows to a depth of 100 m, with most caught between 10 and 40 m. In the Gulf of Thailand, spawning occurs all year round, with peak months of January-February and July-September. Males mature at 13.7 mm mantle length, females at 142 mm mantle length. Supports industrial or artisanal fisheries throughout its range. With *Sepia esculenta*, the most abundant cuttlefish species caught in the Philippines. Also important to the commercial squid fishery of Thailand. Contributes about 90% of the cuttlefish catch off Australia by Chinese pair trawlers. This amounted to some 1 000 t in 1979. Taken by domestic fisheries as bycatch of prawn and mixed species trawl fisheries. The flesh is thick, tender and excellent for human consumption.



Distribution: South and East China seas, Indonesia, Malaysia, Philippines, northern Australia, Gulf of Suez, Zanzibar, Madagascar to the Arabian Sea.

Sepia plangon Gray, 1849

Frequent synonyms / misidentifications: *Solitosepia plangon adhaesa* Iredale, 1926 / None.

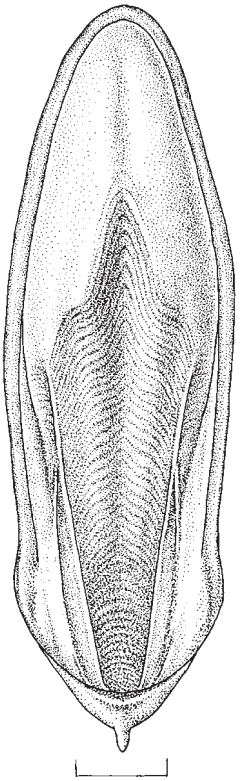
FAO names: En - Striking cuttlefish.

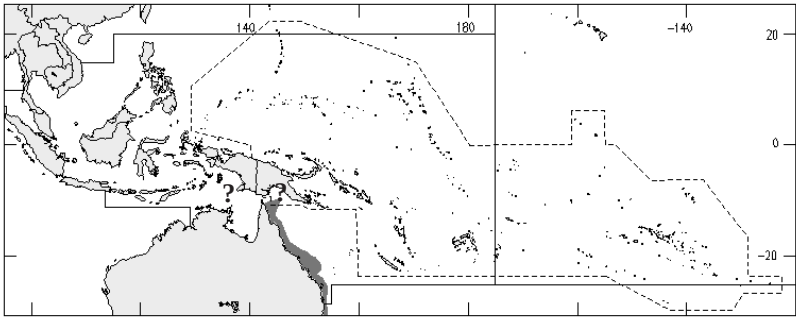
Diagnostic characters: Left ventral arm (IV) of males hectocotylized: **5 rows of normal suckers proximally, followed by 5 rows of reduced suckers** then remainder normal to arm tip; reduction slight, **suckers equal sized across series**; oral surface as for remaining arms, not wide, fleshy. Tentacular club sucker-bearing face flattened; with **5 suckers in transverse rows**, differing markedly in size; swimming keel extends well beyond sucker-bearing face; **dorsal and ventral protective membranes fused at base of club**; joined to stalk at base of club, not separated from stalk by a membrane; protective membranes extend beyond sucker-bearing face along stalk, **dorsal membrane forming deep cleft at junction with stalk**. Cuttlebone blunt-pointed anteriorly; rounded posteriorly; dorsal median rib distinct, sides approximately parallel; lateral ribs indistinct; spine present, with **ventral keel**; striated zone concave, last loculus flat; sulcus extending length of cuttlebone, **deep, narrow, flanked by rounded ribs** (giving striae a wavy appearance); anterior striae inverted V-shape; **inner cone limbs of uniform width**; outer cone narrow anteriorly, broadens posteriorly. **Colour:** deep purplish brown.

Size: Maximum mantle length 135 mm.

Habitat, biology, and fisheries: Intertidal to a depth of 83 m. Taken as bycatch of prawn and mixed species trawl fisheries.

Distribution: Eastern Australia.





click for next page

Sepia recurvirostra Steenstrup, 1875

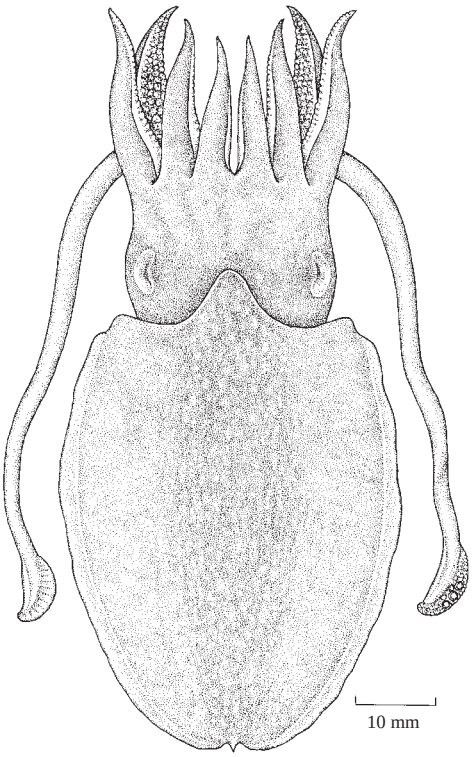
Frequent synonyms / misidentifications: *Sepia singaporensis* Pfeffer, 1884 / *S. pagenstecheri* Pfeffer, 1884.

FAO names: En - Curvespine cuttlefish; **Fr** - Seiche hameçon; **Sp** - Sepia ganchuda.



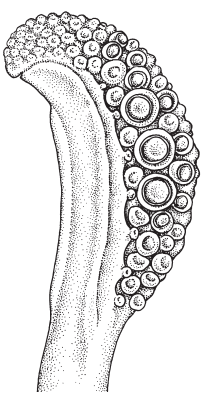
ventral view

cuttlebone



dorsal view

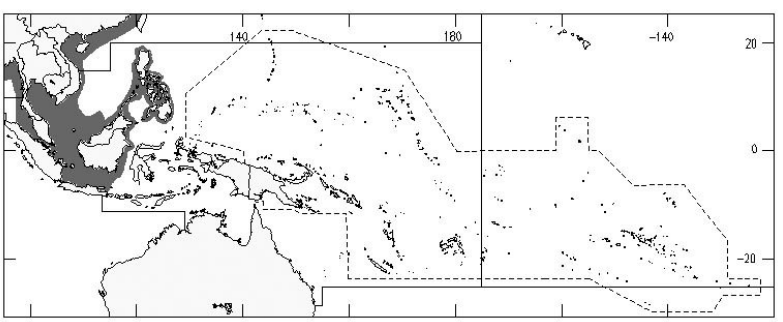
Diagnostic characters: Arm suckers (both sexes): **arms I to III with tetraserial suckers proximally, biserial suckers at distal tips; arms IV with tetraserial suckers**. Hectocotylus present: suckers normal proximally, then reduced, followed by normal suckers to arm tip; reduction marked, rows evenly spaced on arm; **2 dorsal series, smaller than 2 ventral series**. Tentacular club sucker-bearing face flattened; with **5 or 6 suckers in transverse rows, differing markedly in size**, 5 or 6 median suckers enlarged; swimming keel extends slightly beyond sucker-bearing face; **dorsal and ventral protective membranes not fused at base of club**; dorsal protective membrane forming deep cleft at junction with stalk. Cuttlebone outline oblong; **very angular, V-shaped anteriorly**; rounded posteriorly; dorsal median and lateral ribs present; **spine present, curving ventrally** (giving species its name); last loculus concave; sulcus extending along striated zone only; sulcus shallow, narrow; **anterior striae inverted U-shape**; inner cone limbs broadening posteriorly, **thickened posteriorly forming a rough chitinous callus**; outer cone narrow anteriorly, broadens posteriorly. **Colour:** dorsal mantle pale with transverse stripes; **fins with pale** opalescent blue reflective line along base.



tentacular club

Size: Maximum mantle length 170 mm; maximum weight 0.4 kg. In the Gulf of Thailand, most animals caught are between 40 and 130 mm mantle length, with a maximum size of 170 mm mantle length.

Habitat, biology, and fisheries: A demersal species inhabiting the continental shelf to depths of around 160 m. In the Gulf of Thailand and Andaman Seas, it is found from depths of 10 to 100 m, with peak of occurrence at 20 to 40 m. In this region, spawning occurs all year, with peak times in November-February and July-September. A commercial species in Gulf of Thailand, South and East China Seas, Japan; and Hong Kong, China. In Thailand, most are caught using otter trawl, with smaller catches made using pair trawl, squid light-lures, traps and push nets, with bottom otter and pair trawls used offshore, and push nets and lift nets used in inshore and coastal waters. A few are caught using purse seine and hook-and-line.



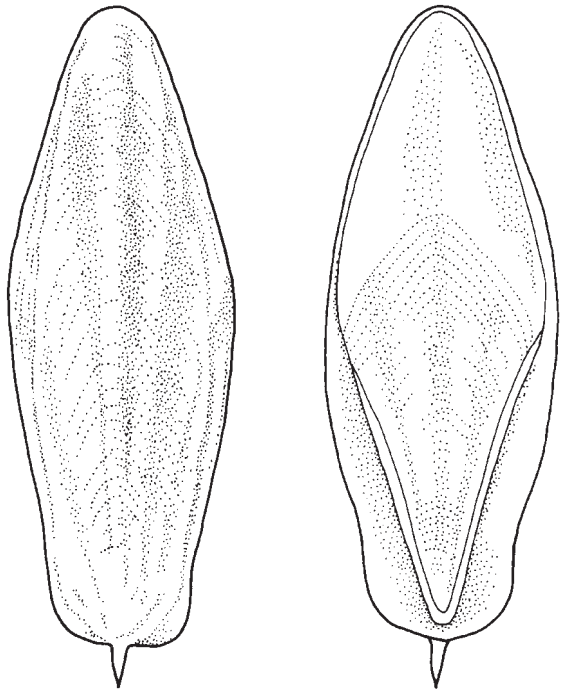
Distribution: Andaman Sea to Celebes Sea and from Java Sea to the Yellow Sea.

Sepia rex (Iredale, 1926)

Frequent synonyms / misidentifications: *Decorisepia rex* Iredale, 1926; *D. cottlesloensis* Cotton, 1929; *D. jaenschi* Cotton, 1931 / *Sepia madokai* Adam, 1939.

FAO names: En - King cuttlefish.

Diagnostic characters: Arms in both sexes with tetraserial suckers. Left ventral arm (IV) of males hectocotylized: **6 to 8 rows of normal suckers proximally, followed by 9 or 10 rows of reduced suckers, then rest normal to arm tip; reduction marked, 2 dorsal and 2 ventral series widely spaced**; suckers equal sized across series; oral surface wide, fleshy, with transversely grooved ridges and shallow median furrow. Tentacular club sucker-bearing face flattened; with **10 to 12 similar-sized, minute suckers in transverse rows**; swimming keel extends well beyond club; **dorsal and ventral protective membranes not fused at base of club**, joined to stalk at base of club and terminating at posterior end of sucker-bearing face; **dorsal protective membrane forming deep cleft at junction with stalk**. Cuttlebone outline oblong, narrowed anteriorly, tending to diamond-shaped, maximum width in middle of cuttlebone; dorsal surface pinkish; median rib present, distinct; spine without keel(s); ventral sulcus extending entire length of cuttlebone, shallow, narrow; anterior striae inverted U-shape; **inner cone limbs of uniform width**, thickened posteriorly forming a rounded ridge; outer cone narrow anteriorly, broadens posteriorly. **Colour:** pale pinkish purple.

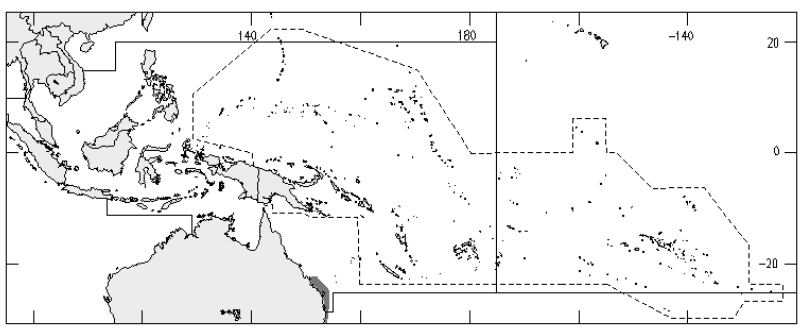


cuttlebone
(after Iredale, 1926)

Size: Maximum mantle length 120 mm.

Habitat, biology, and fisheries: At depths from 55 to 400 m. Taken as bycatch of prawn and mixed species trawl fisheries.

Distribution: Southern Australia.



Remarks: *Sepia rex* has been confused with *S. madokai*. It differs in having all reduced suckers of the hectocotylus similar in size, while in *S. madokai*, the 2 dorsal series are much smaller than the 2 ventral series. The club suckers in *S. madokai* (8 suckers in transverse rows), are fewer than those (10 to 12) seen in *S. rex*. The cuttlebone in this species has distinct median ribs and the inner cone limbs are of uniform width, while in *S. madokai* it has faint median ribs, and the inner cone limbs broaden posteriorly. *S. rex* may be synonymous with *S. hedleyi* Berry, 1918.

Sepia rozella (Iredale, 1926)

Frequent synonyms / misidentifications: *Solitosepia rozella* Iredale, 1926; *Solitosepia rozella peregrina* / None.

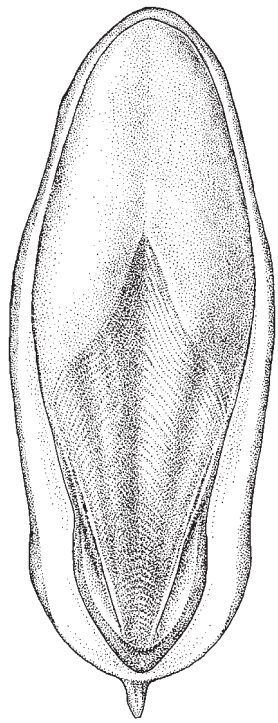
FAO names: En - Rosecone cuttlefish.

Diagnostic characters: Arm suckers tetraserial in both sexes. **Hectocotylus present**, left ventral arms (IV) modified: **suckers reduced proximally for 2/5 of arm length; oral surface wide, fleshy, with transversely grooved ridges and shallow median furrow**, thicker than corresponding portion on right ventral arm. Tentacular club sucker-bearing face flattened, with **8 suckers in transverse rows, differing markedly in size** (third series from dorsal margin larger than other suckers); swimming keel extending well beyond sucker-bearing face; **dorsal and ventral protective membranes fused at base of club**, separated from stalk by membrane; **dorsal protective membrane forms a deep cleft at junction with stalk**. Cuttlebone outline oblong (widest in middle); blunt-pointed anteriorly and posteriorly; dorsal surface pinkish; median rib present, distinct, wider anteriorly; lateral ribs indistinct; **spine with ventral keel; sulcus deep, wide, flanked by 2 strongly convex rounded ribs**; anterior striae inverted V-shape; inner cone limbs broaden posteriorly (**rose-coloured**), thickened forming a slightly raised, rounded ledge from outer margin of inner cone; outer cone narrow anteriorly, broadens posteriorly. **Colour:** pinkish purple.

Size: Maximum mantle length 140 mm.

Habitat, biology, and fisheries: At depths from 27 to 183 m. Species taken as bycatch of prawn and mixed species trawl fisheries.

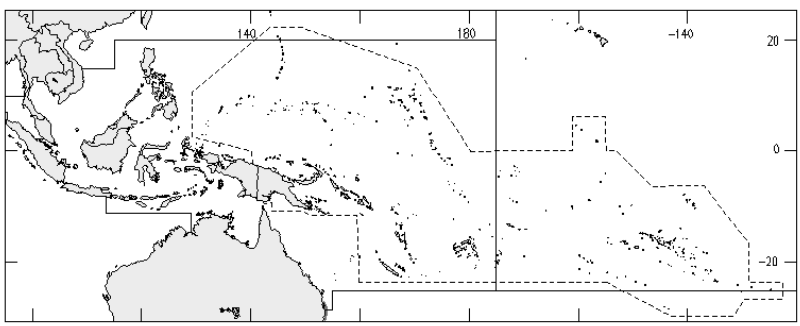
Distribution: Eastern Australia.



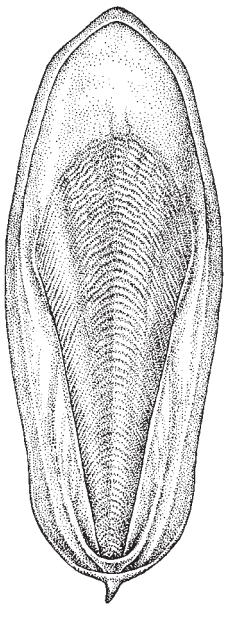
10 mm

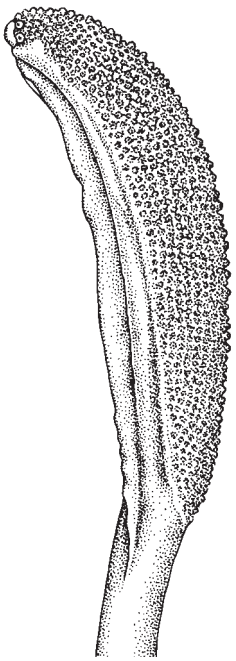
ventral view

cuttlebone



Sepia smithi Hoyle, 1885





cuttlebone **tentacular club**

Frequent synonyms / misidentifications: *Acanthosepion pageorum* Iredale, 1954 / *Sepia whitleyana* (Iredale, 1926).

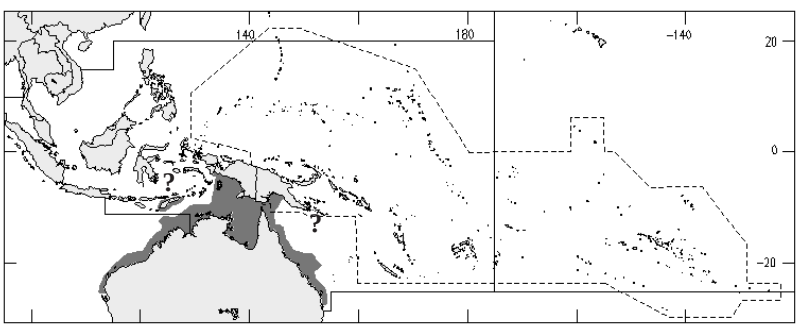
FAO names: En - Smiths cuttlefish.

Diagnostic characters: Arms in both sexes with tetraserial suckers. Left ventral arm (IV) of males hectocotylized: **8 rows of normal suckers proximally, followed by 8 rows of reduced suckers**, then remainder normal to tip of arm; reduction marked, 2 dorsal and 2 ventral series widely spaced; **2 ventral series, smaller than dorsal series**; oral surface wide, fleshy, with transversely grooved ridges and a shallow median furrow. Tentacular club sucker-bearing face convex; with **20 similar-sized, minute suckers in transverse rows**; swimming keel extends beyond sucker-bearing face of club; dorsal and ventral protective membranes not fused at base of club, joined to stalk at base of club, not separated from stalk by a membrane. Cuttlebone outline oblong, V-shaped anteriorly, rounded posteriorly; dorsal surface convex medially, flattened laterally, granulose; median rib faint, broadens anteriorly; lateral ribs indistinct; spine present, curving upward; keel absent; striated zone concave; **sulcus deep, wide; anterior striae inverted U-shape**; inner cone limbs broaden posteriorly, **thickened posteriorly forming a raised, flattened ledge from outer margin of inner cone**; outer cone narrow anteriorly, broadens posteriorly. **Colour:** pale pinkish purple.

Size: Maximum mantle length 170 mm.

Habitat, biology, and fisheries: At depths of 33 to 138 m. Taken as bycatch of prawn and mixed species trawl fisheries.

Distribution: Northern Australia, Timor, Arafura, and Coral Seas.

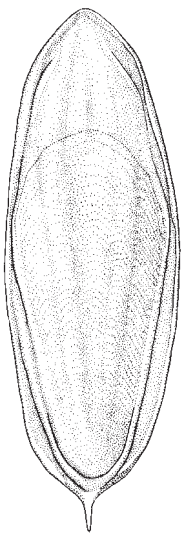


Remarks: Often confused with *Sepia whitleyana*. In *S. whitleyana*, both ventral arms are modified in males, with all reduced suckers equal in size, rather than differing in size as in *S. smithi*. The swimming keel does not extend beyond the sucker-bearing face of the club in *S. whitleyana*. The inner cone limbs form a small ridge but do not form a distinct ledge posteriorly in *S. whitleyana*.

Sepia stellifera Homenko and Khromov, 1984

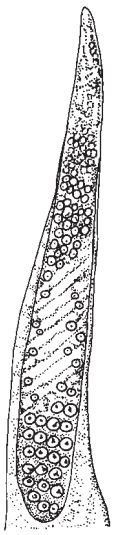
Frequent synonyms / misidentifications: None / *Sepia brevimana* Steenstrup, 1875.

FAO names: En - Starry cuttlefish.

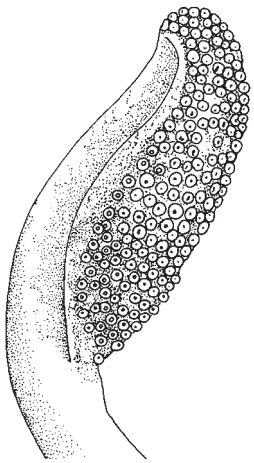


ventral view

cuttlebone

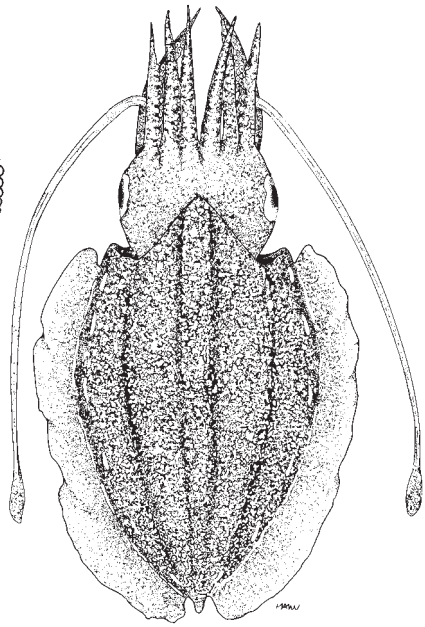


hectocotylus



tentacular club

(after Homenko and Khromov, 1984)



dorsal view

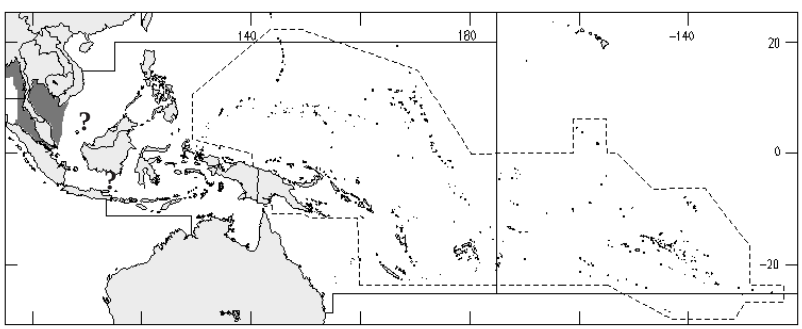
(after Homenko and Khromov, 1984)

Diagnostic characters: Tentacular club with **10 similar-sized suckers in transverse rows**. Cuttlebone outline oval; very angular, V-shaped anteriorly; spine present, long; keels present dorsally and ventrally; inner cone forms a raised ridge posteriorly; sulcus extending along striated zone only; **deep, wide, flanked by rounded ribs.**

Size: Maximum mantle length 120 mm.

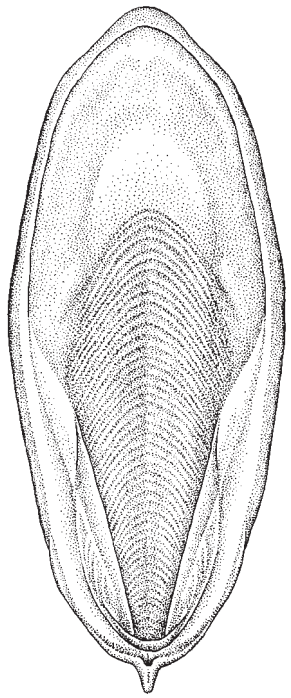
Habitat, biology, and fisheries: At depths to 200 m. Fished commercially in India and the Gulf of Thailand and may figure in statistical data with *S. brevimana*.

Distribution: Arabian Sea, Bay of Bengal, Andaman Sea, Gulf of Thailand.



Remarks: This species is similar to *Sepia brevimana*. It differs in having 10 club suckers in transverse rows, rather than 6 to 8 in *S. brevimana*. Also, the sulcus is deep and wide, rather than narrow and shallow, as seen in *S. brevimana*.

Sepia whitleyana (Iredale, 1926)



ventral view

cuttlebone

Frequent synonyms / misidentifications: *Acanthosepion whitleyanum* Iredale, 1926 / *Sepia smithi* Hoyle, 1885.

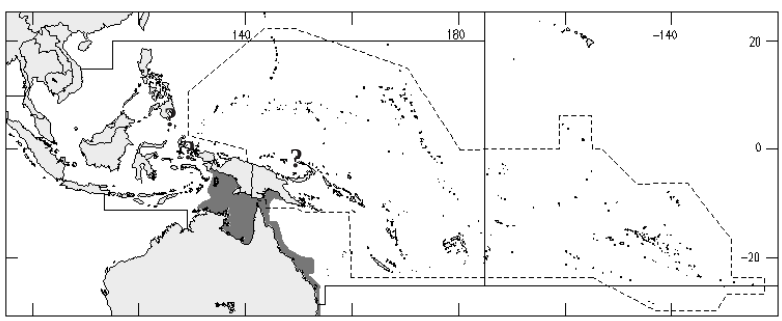
FAO names: En - Whitleys cuttlefish.

Diagnostic characters: Arms in both sexes with tetraserial suckers. Hectocotylus present, **both male ventral arms (**IV**) modified: left ventral arm with 7 or 8 rows of normal suckers proximally; 5 or 6 rows reduced suckers medially**, then remainder normal to arm tip; right ventral arm with 4 or 5 rows of minute suckers distally, remaining suckers normal; reduction marked, left arm IV with **2 dorsal and 2 ventral series widely spaced; suckers equal size across series**; oral surface wide, fleshy, with transversely grooved ridges and shallow median furrow. Tentacular club sucker-bearing face flattened; with **20 similar-sized, minute suckers in transverse rows**; swimming keel does not extend beyond sucker-bearing faced of the club; dorsal and ventral protective membranes not fused at base of club, joined to stalk at base of club, not separated from stalk by a membrane and terminating at posterior end of sucker-bearing face. Cuttlebone outline oblong; texture uniformly pustulose; median rib faint; lateral ribs indistinct; spine without keel; **striated zone deeply concave**; last loculus slightly convex; sulcus deep, wide; anterior striae inverted U-shape; inner cone limbs broadening posteriorly, thickened forming a rounded ridge; outer cone narrow anteriorly, wider posteriorly. **Colour:** pale pinkish purple.

Size: Cuttlebone length of holotype 168 mm (excluding spine).

Habitat, biology, and fisheries: At depths of 23 to 160 m. Taken as bycatch of prawn and mixed-species trawl fisheries.

Distribution: Eastern Australia from the Gulf of Carpentaria to New South Wales.

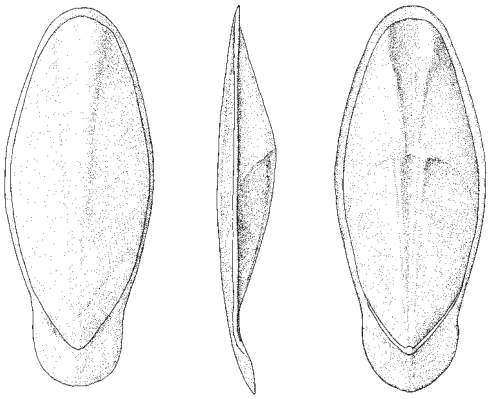


Remarks: Often confused with *Sepia smithi*, but differs in having both ventral arms modified in males (only the left ventral arm hectocotylized in *S. smithi*). The swimming keel extends beyond the sucker-bearing face of the club in *S. smithi*, but is equal to the club length in *S. whitleyana*. The distinct inner cone limbs do not form a ledge posteriorly in *S. whitleyana* but form a narrow rim.

Sepiella inermis Férussac and dOrbigny, 1835

Frequent synonyms / misidentifications: *Sepia (Sepiella) microcheirus* Gray, 1849; *Sepia affinis* Eydoux and Souleyet, 1852; *Sepiella mandroni* Rochebrune, 1884 / None.

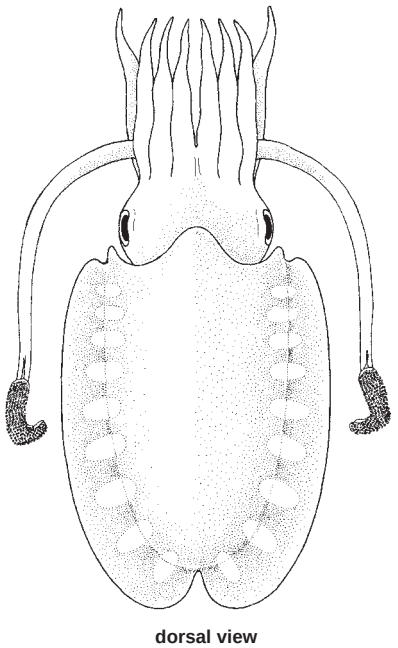
FAO names: En - Spineless cuttlefish; **Fr** - Sepia inerme; **Sp** - Sepia inerme.



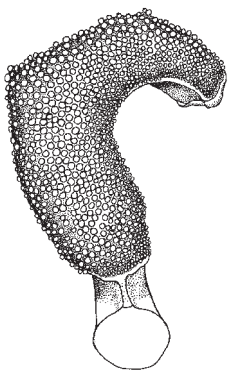
dorsal view lateral view ventral view

cuttlebone

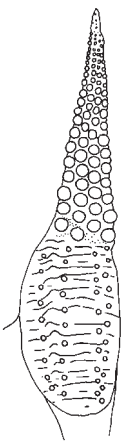
(after Adam, 1939)



dorsal view



tentacular club



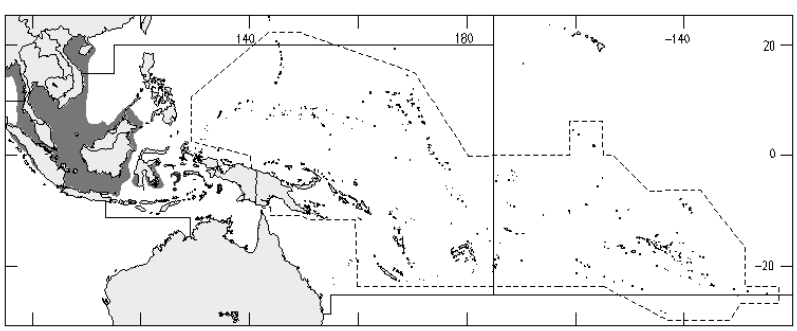
hectocotylus

(after Adam, 1939)

Diagnostic characters: Arms in both sexes with tetraserial suckers. Hectocotylus present, suckers reduced and widely spaced on proximal half of club. **Tentacular club with 12 to 24 equal-sized suckers in transverse rows**; **swimming keel shorter than sucker-bearing face of club**; dorsal and ventral protective membranes not fused at base of club, extending proximally along stalk as low ridges. Cuttlebone width approximately 33 to 43% the length; spine absent; sulcus extending entire length of cuttlebone; anterior striae m-shape; outer cone chitinous, flared, spoon-shaped, **indented at posterior end of striated zone**. **Colour:** dorsal mantle greyish brown with 8 or 9 reddish patches along base of each fin.

Size: Maximum mantle length 125 mm. In the Gulf of Thailand, most animals caught range between 20 and 80 mm mantle length, with the maximum size recorded at 105 mm mantle length.

Habitat, biology, and fisheries: A demersal, shallow-water species, depth range to 40 m. Probably a species complex. Highly abundant in the Gulf of Thailand, and Andaman Sea, it occurs from the shallows to a depth of 40 m, with most caught between 10 and 20 m. *Sepiella inermis* is an object of several small fisheries in the waters of Indochina. It is important to the commercial cuttlefish fishery in Thailand. Cuttlefish in this region are usually caught using squid light lures, traps, push nets, purse seines and hook-and-line. This species has been reared successfully in culture experiments conducted by the Thai Coastal Culture Division, Department of Fisheries and there is hope to convert this work to a commercial basis.

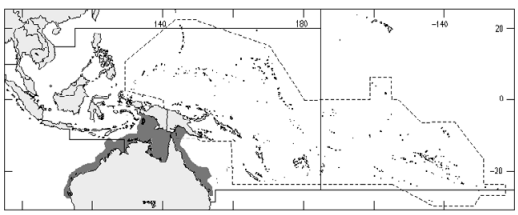


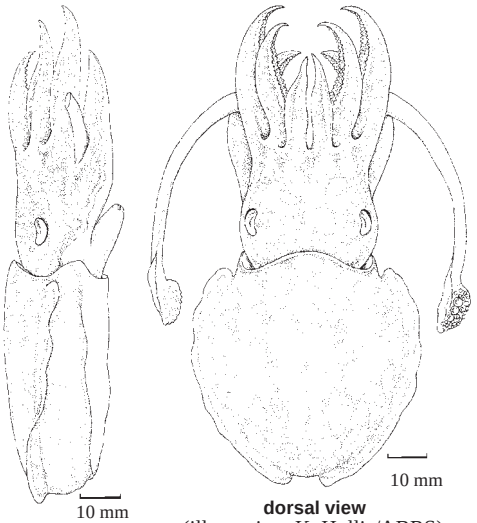
Distribution: Mouth of Zambezi River (Mozambique), Indian Ocean, southern Red Sea, Gulf of Aden to Andaman Sea, eastern Indonesia, the Gulf of Tonkin and the southern South China Sea.

Metasepia pfefferi (Hoyle, 1885)

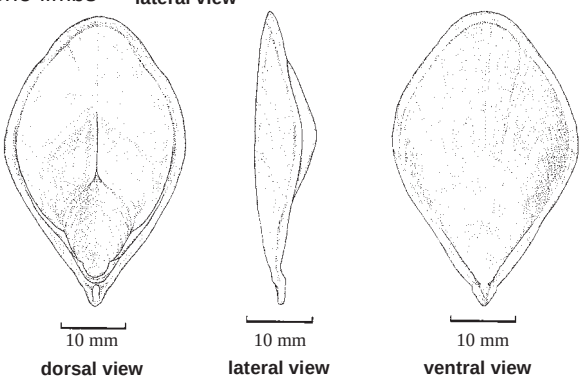
En - Pfeffers flamboyant cuttlefish.

Maximum mantle length 80 mm. Mantle very broad. **Dorsal mantle with 3 pairs of large, flat, flap-like papillae; head with papillae over eyes. Arms broad, blade-like; male and female arms I** reduced. Fins broad, transparent positioned dorsolaterally. Left ventral arm (IV) of males hectocotylized. Tentacular club short, sucker- bearing face flattened; with 5 or 6 suckers in transverse rows, differing markedly in size, 4 median suckers greatly enlarged; **dorsal and ventral protective membranes not fused at base of club; swimming keel twice as long as sucker-bearing face**. Cuttlebone much shorter than mantle; **located in anterior 2/3 to 3/4**; outline **diamond-shaped**; blunt-pointed anteriorly and posteriorly; median rib absent; **spine absent**; **chitin covers entire dorsal surface**; striated zone concave; last loculus convex (thick in anterior third); sulcus deep, wide; anterior striae inverted V-shape; inner cone limbs of uniform width; outer cone narrow throughout. **Colour:** a pair of prominent white bars on mantle; striking flowery body pattern; dorsal surface of cuttlebone yellowish. From depths of 3 to 86 m. Northern Australia.





(illustration: K. Hollis/ABRS)

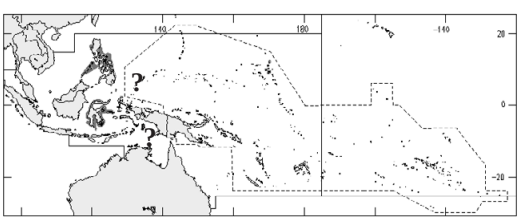


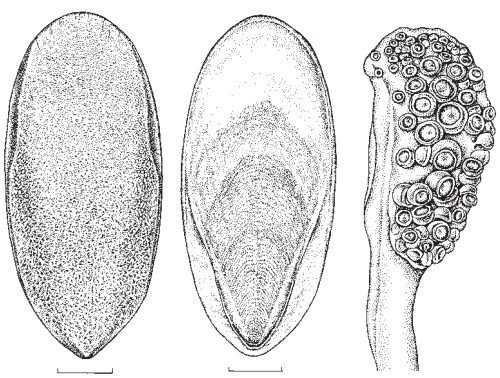
(illustration: K. Hollis/ABRS)

Sepia bandensis Adam, 1939

En - Stumpy spined cuttlefish.

Maximum mantle length 48 mm in males, 50 mm in females. Tentacular club short, with 5 suckers in transverse rows, central 3 suckers enlarged; dorsal and ventral protective membranes fused at base of club. Cuttlebone outline broad, oval; rounded anteriorly and posteriorly. Dorsal surface evenly convex with reticulate sculpture; median and lateral ribs absent; **spine reduced to tiny tubercle**; sulcus shallow, narrow; anterior striae inverted U-shape; **inner cone limbs broadening posteriorly, not thickened**. **Colour:** dark brown with scattered yellowish spots. Coastal shallow waters. Importance to fisheries unknown. Java, eastern Indonesia, Philippines, New Guinea, and Marshall Islands.

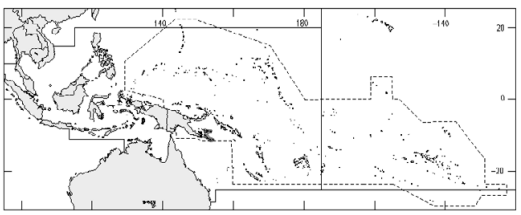


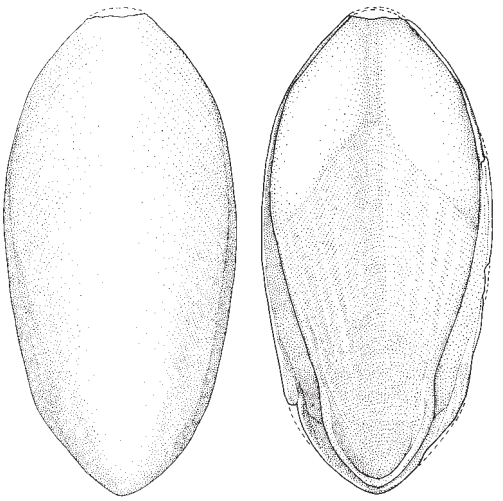


Sepia bartletti (Iredale, 1954)

En - Bartletts cuttlefish.

Known only from the cuttlebone. Status uncertain. Cuttlebone length 73 mm. Dorsal surface of cuttlebone without sculpturing; spine absent; a shallow, wide sulcus present on the last loculus only, absent from striated zone; inner cone limbs extending to last loculus. Fisheries importance unknown. Known only from the Misima and the Conflict Group of islands, Louisiade Archipelago (southeast of Papua New Guinea).





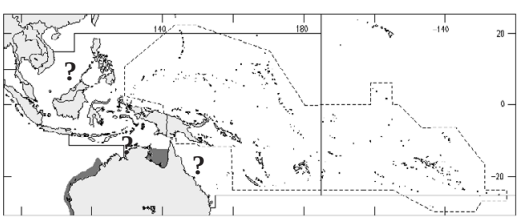
dorsal view ventral view

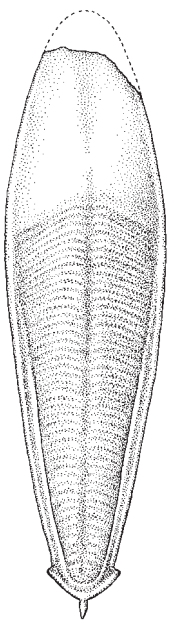
cuttlebone

Sepia cottoni Adam, 1979

En - Cottons cuttlefish.

Maximum mantle length 65 mm. Male arms all elongate, twice as long as in females, tips of arms I, II, and IV thread-like; **arms III with protective membrane in middle part widened and thickened with transverse ridges**; ridges alternate, uniting inner margin of one membrane and outer margin of opposite membrane, each ridge with 2 small suckers. Male arms proximally with a few normal-sized biserial suckers, followed by 7 or 8 tetraserial rows of large suckers; distally, suckers biserial, reduced, disappearing on thread-like tips of arms I, II, and IV. Female arms with biserial suckers at the base, tetraserial suckers medially, biserial suckers at distal tips. **Tentacular club with 5 suckers in transverse rows**; suckers differing markedly in size, about 6 in the middle of club twice as wide as others. Dorsal and ventral protective membranes not fused at base of club. Cuttlebone lanceolate; spine present, keel(s) absent; sulcus, shallow, narrow; striae slightly convex-straight; inner cone limbs thickened posteriorly forming a rounded ridge; **outer cone limbs expanded forming 2 short wings**. At depths from 83 to 164 m. Importance to fisheries unknown. Western Australia and the Gulf of Carpentaria; possibly Viet Nam (unconfirmed records). One cuttlebone collected from North Stradbroke Island Queensland, Australia implying a northern Australian distribution.





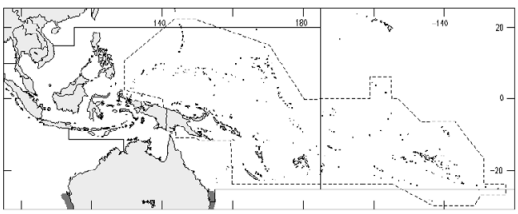
ventral view

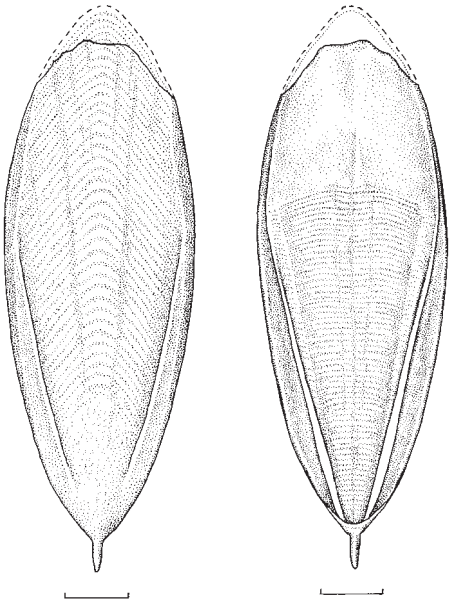
cuttlebone

Sepia cultrata Hoyle, 1885

En - Knifebone cuttlefish.

Left ventral arm of male hectocotylized: suckers normal proximally, followed by reduced suckers, then remaining suckers normal to tip of arm; reduction marked, 2 dorsal and 2 ventral series widely spaced, **2 dorsal series smaller than 2 ventral series**. Tentacular club with 5 or 6 suckers in transverse rows; suckers approximately of similar size, small; swimming keel extending well beyond club sucker-bearing face; dorsal and ventral protective membranes not fused at base of club. Cuttlebone triangular anteriorly; median rib distinct; spine present; sulcus indistinct; striae slightly convex-straight; inner cone limbs of uniform width, very narrow, thickened posteriorly forming a rounded ridge. Outer shelf and upper bathyl species, at depths from 132 to 803 m (majority of catches from 300 to 500 m). Species taken as bycatch of prawn and mixed species trawl fisheries. Southern Australia.



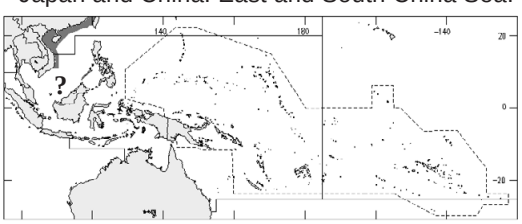


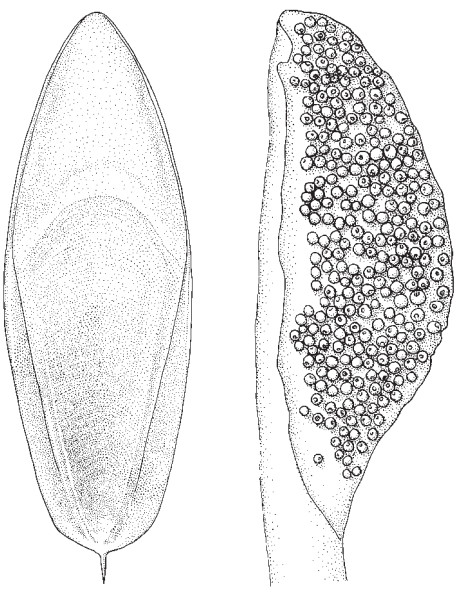
cuttlebone

Sepia madokai Adam, 1939

En - Madokais cuttlefish; **Fr** - Seiche madokai; **Sp** - Sepia madokai.

Maximum mantle length 80 mm. Left ventral arm of males hectocotylized: **suckers normal proximally, followed by 10 rows of reduced suckers, then rest normal to arm tip**; **2 dorsal series of reduced suckers smaller than 2 ventral series**. Tentacular club sucker-bearing face flattened, with **8 equal-sized, small suckers in transverse rows**. Cuttlebone dorsal surface pinkish; spine present without keel(s); **anterior striae inverted U-shape**; **inner cone limbs approximately of uniform width**, very slender, thickened, forming a rounded ridge posteriorly. **Colour:** dorsal mantle without distinct markings, brownish with some whitish blotches, or spots. A demersal species, most common in bays. Commonly confused with *Sepia acuminata* and *S. rex*. A minor object of fisheries in Japan and China. East and South China Sea.





ventral view

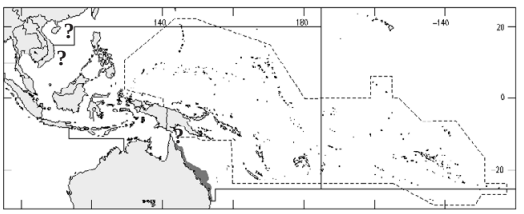
cuttlebone

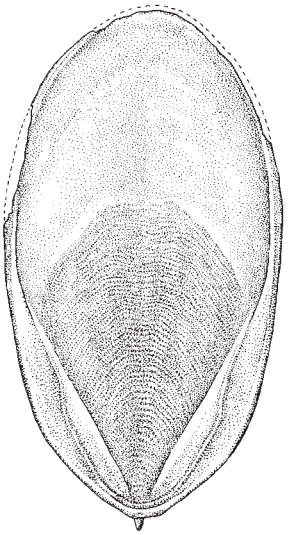
tentacular club
(after Okutani et al., 1987)

Sepia mestus Gray, 1849

En - Reaper cuttlefish; **Fr** - Seiche moisson; **Sp** - Sepia segadora.

Maximum mantle length 140 mm. Arms all of similar length in both sexes, with tetraserial suckers. **Hectocotylus absent**. Tentacular club sucker-bearing face flattened; with **6 small suckers in transverse rows**, those in middle of third dorso-longitudinal row slightly enlarged; swimming keel extending well beyond sucker-bearing face of club; **dorsal and ventral protective membranes fused at base of club**, joined to stalk at base of club, not separated from stalk by a membrane. **Cuttlebone oval, rounded anteriorly and posteriorly**; dorsal median rib indistinct; spine with ventral keel; **sulcus shallow, narrow; anterior striae inverted U-shape**; inner cone limbs broaden posteriorly, **not thickened**. A neritic demersal species, at depths to 146 m. Cuttlebones have been found in eastern Australia. Whole animals have been collected only from the Sydney region. Also reported from northern China and Viet Nam though it is uncertain whether either of these records refer to species conspecific with *S. mestus* from Australia.





10 mm

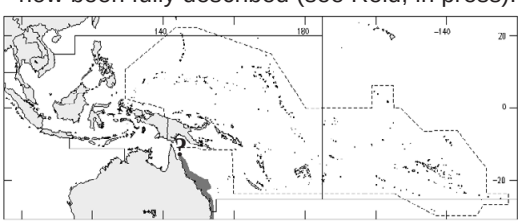
ventral view

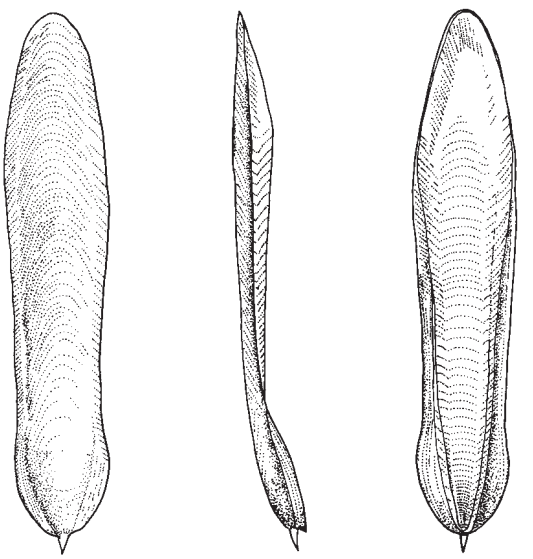
cuttlebone

Sepia mira (Cotton, 1932)

En - Little cuttlefish.

Cuttlebone length 55 mm. Cuttlebone outline lanceolate, **narrowed between middle and posterior third, widened near posterior end**; dorsal surface white, evenly convex; median and lateral ribs absent; spine present, straight, without keels; **striated zone and last loculus convex**; sulcus absent; **striae slightly convex-straight**; inner cone limbs of uniform width; thickened posteriorly forming a rounded, shiny ridge; outer cone narrow anteriorly, wider posteriorly. Until recently, known only from cuttlebones found in Queensland, at Lizard Island and North-West Islet, as well as Trial Bay (New South Wales). On the basis of specimens trawled betwen 20 and 72 m off northern New South Wales, *Sepia mira* has now been fully described (see Reid, in press).





dorsal view **lateral view** **ventral view**

cuttlebone

(after Cotton, 1952)

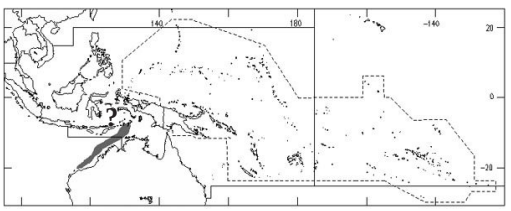
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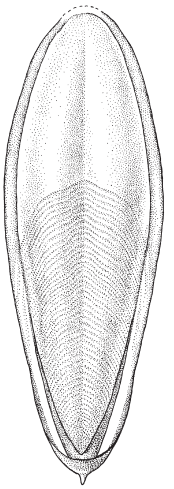
click for previous page

Sepia sulcata Hoyle, 1885

En - Grooved cuttlefish.

Maximum mantle length 68 mm. Mantle broadest at mantle opening, blunt-pointed posteriorly. **Suckers biserial proximally, tetraserial distally on arms I to IV** in both sexes. Left ventral arm of males hectocotylized: **14 rows of reduced suckers proximally**; reduction marked, 2 dorsal and 2 ventral series widely spaced; oral surface wide, fleshy, with transversely grooved ridges and deep median furrow. Tentacular club with **5 to 7 similar-sized, minute suckers in transverse rows**; swimming keel extending well beyond club sucker-bearing face; dorsal and ventral protective membranes not fused at base of club, dorsal membrane much wider than ventral membrane (as in *Sepia brevimana*). Cuttlebone outline broad, oval; rounded anteriorly, blunt-pointed posteriorly; dorsal median rib and lateral ribs present, distinct; sulcus shallow, narrow, flanked by rounded ribs; **inner cone raised to form a thin, flat ledge posteriorly,** outer cone recurved ventral to spine. Ki Island, Arafura Sea to Australia.

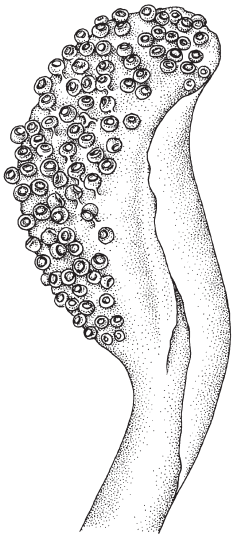




10 mm

ventral view

cuttlebone

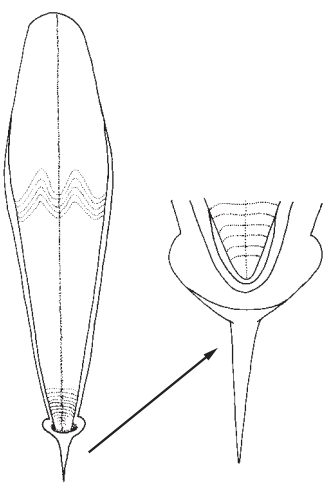


tentacular club

Sepia vietnamica Khromov, 1987

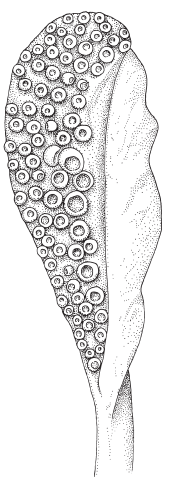
En - Viet Nam cuttlefish.

Maximum mantle length 56 mm. Body papillae present, mantle with row of elongated tubercles along silvery stripe at base of fins. **Male and female arms all of similar length**. In both sexes **arms I to III with tetraserial suckers proximally, biserial suckers at distal tips of arm**. Left ventral arm of males hectocotylized: 8 to 11 rows of normal suckers proximally, suckers reduced medially, then rest normal to distal tip of arm; reduction marked, 2 dorsal and 2 ventral series widely spaced; **2 dorsal series smaller than 2 ventral series**; oral surface with deep median furrow. Tentacular club sucker-bearing face flattened, with **5 or 6 suckers in transverse rows, differing only slightly in size**; dorsal and ventral protective membranes not fused at base of club. **Cuttlebone outline lanceolate**; convex ventrally; sulcus deep, narrow; anterior striae M-shape; inner cone limbs of uniform width; **outer cone limbs expanded forming 2 short wings**. **Colour:** head with 2 small, crescent-shaped orange spots near dorsal projection of mantle margin and above eyes; dorsal mantle dark brown; fins pale, with transverse rows of large wine-coloured spots; arms I to III with spots on aboral surface same as for mantle (sometimes visible, males only); spots may not be visible in preserved animals. At depths to 105 m. Fisheries importance unknown. Northwestern South China Sea, off Viet Nam.



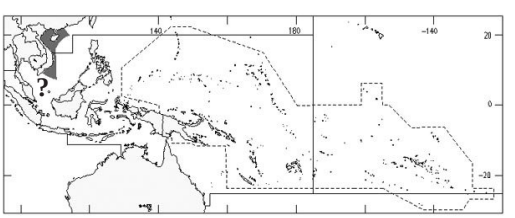
ventral view

cuttlebone



tentacular club

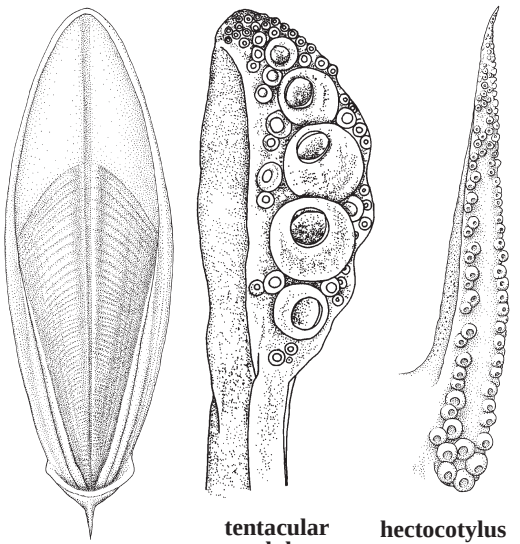
(after Khromov, 1987)



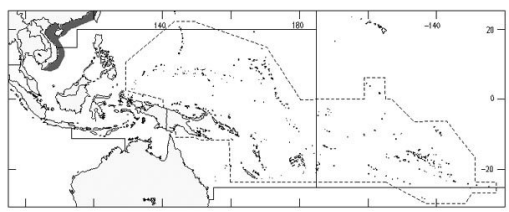
Sepia vossi Khromov, 1996

En - Voss cuttlefish.

Maximum mantle length 100 mm. Arms in both sexes with tetraserial suckers. **Hectocotylus present**: 3 rows of normal suckers proximally, followed by reduced suckers, then rest normal to arm tip; reduction pronounced, **2 dorsal and 2 ventral series widely spaced**, oral surface wide, fleshy, with transversely grooved ridges. Tentacular club with **8 suckers in transverse rows; suckers differing markedly in size**: **3 to 5 suckers in middle of third longitudinal row extremely enlarged**; swimming keel extending slightly beyond club; **dorsal and ventral protective membranes not fused at base of club**. Cuttlebone blunt-pointed anteriorly and posteriorly; spine with keels; sulcus shallow, narrow; inner cone limbs of uniform width, form a ledge posteriorly, outer cone recurved, cup-like. **Colour:** dorsal mantle light brown, with dark brown transverse stripes. A neritic demersal species, at depths to 200 m. Until recently, this Indo-Pacific cuttlefish was considered to be conspecific with *Sepia omani* Adam and Rees, 1966. It differs from *S. omani* in the cup-like formation of the outer cone and inner cone ledge. Known from Pakistan, western India, and Hong Kong, China to southern Viet Nam.



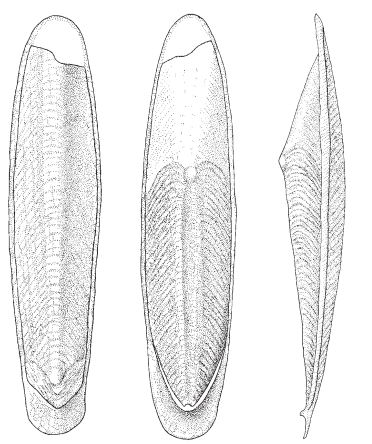
(after Voss and Williamson, 1971)



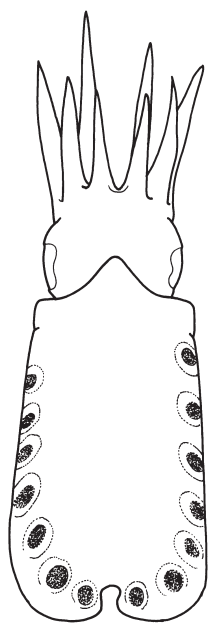
Sepiella ocellata Pfeffer, 1884

En - Spotty cuttlefish.

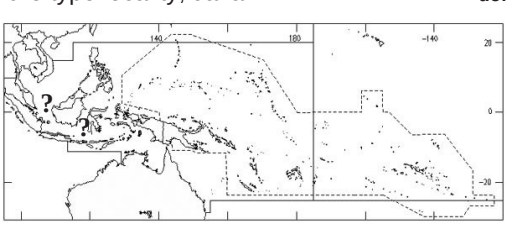
Maximum mantle length 50 mm. Known only from a single male specimen. Tentacular club with **8 to 10 suckers in transverse rows**. Cuttlebone narrow, width 20 to 25% of length, oval, of uniform width along its length, sides approximately parallel. **Colour:** 6 or 7 wine-coloured, similar-sized spots along fins, close to fin margin. Very similar to *Sepiella ornata* from the west coast of Africa, which differs in having a broader cuttlebone and 10 to 14 arm suckers in transverse rows. The status of this species is questionable. Fisheries importance unknown. Known only from the type locality, Java.



cuttlebone
(after Adam, 1939)



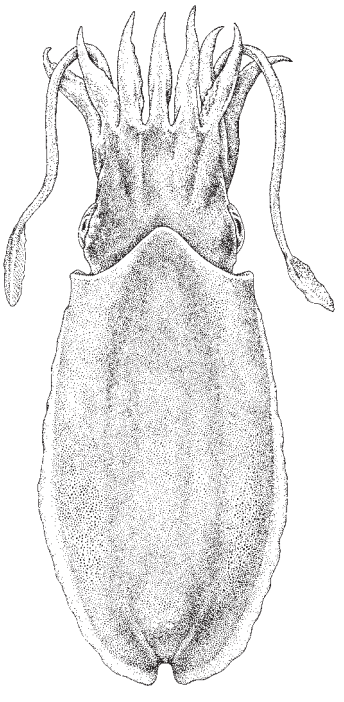
dorsal view
(after Adam, 1939)



Sepiella weberi Adam, 1939

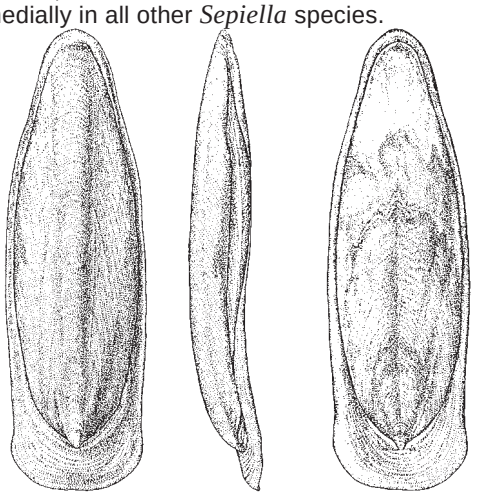
En - Webs cuttlefish.

Left ventral arm of males hectocotylized: **10 to 12 rows of reduced suckers proximally**; reduction marked, 2 dorsal and 2 ventral series widely spaced; oral surface wide, fleshy, with transversely grooved ridges and a deep median furrow. Tentacular club sucker-bearing face convex; with **7 to10 suckers in transverse rows**; dorsal and ventral protective membranes not fused at base of club, joined to stalk at base of club, not separated from stalk by a membrane; **swimming keel equal in length to sucker-bearing face of club**. Cuttlebone median rib present, faint, wider anteriorly; lateral ribs absent; sulcus shallow, narrow; striae wavy; inner cone limbs of uniform width; outer cone chitinous, spoon-shaped, expanded. **Colour:** 5 or 6 large wine-coloured spots at base of each fin. Depth range 1 to 88 m. Eastern Indonesia and northern Australia; unconfirmed records from Viet Nam. In contrast to *Sepiella weberi*, the ventral side of the cuttlebone is strongly convex medially in all other *Sepiella* species.



dorsal view

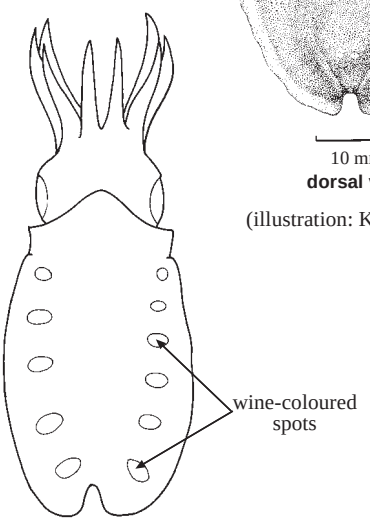
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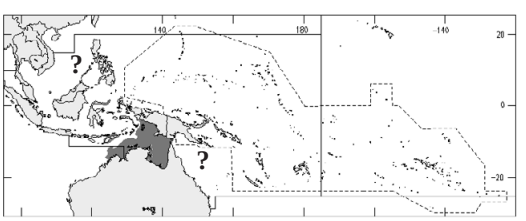
dorsal view **lateral view** **ventral view**

cuttlebone

(illustration: K. Hollis/ABRS)



schematic presentation in dorsal view



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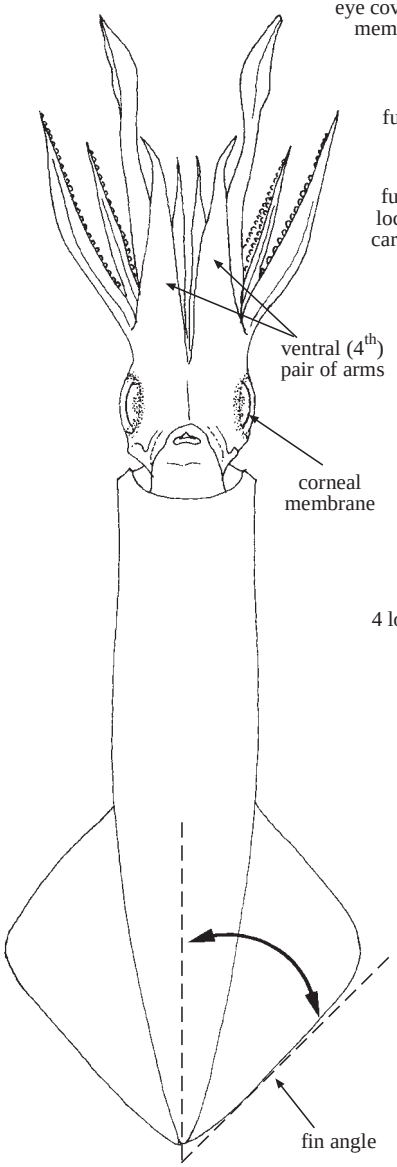
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LOLIGINIDAE

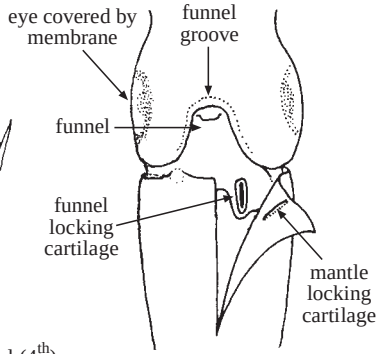
Inshore squids, pencil squids

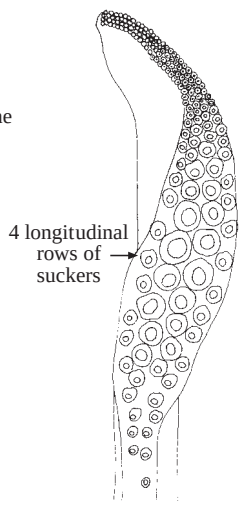
by M.C. Dunning

Diagnostic characters: Shape variable from short and stout to long and slender. Fins terminal or marginal, but always reaching posterior end of body (present in *Uroteuthis* as very thin membranes around the "tail"). **Funnel locking apparatus a simple, straight groove**. **Eyes covered with transparent membrane (cornea)**. **Buccal connectives attached to ventral borders of arms (**IV**)**; 7 buccal lappets supplied with small suckers (can be readily lost after capture). Mouth surrounded by 10 appendages (8 arms, 2 tentacles). **Two longitudinal rows of suckers on arms and 4 rows on tentacular clubs; hooks never present**. Usually, left ventral arm (IV) hectocotylized in males; hectocotylus with suckers reduced in size or number, and/or modified into fleshy papillae or flaps, or lost completely. **Colour:** translucent to dense colour, bright scarlet (in some species with yellow and pink chromatophores) to dark brown (nearly black), darker dorsally, but highly variable depending on the behavioural situation and degree of expansion of chromatophores.

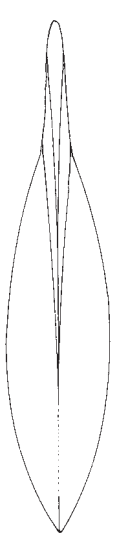


ventral view

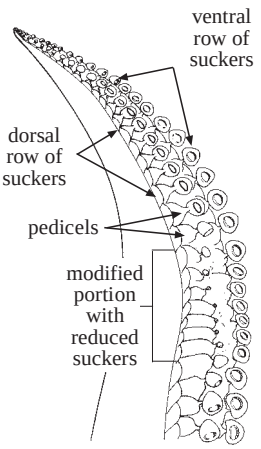




tentacular club



gladius (internal skeletal mantle support) feather-shaped



hectocotylized arm of males

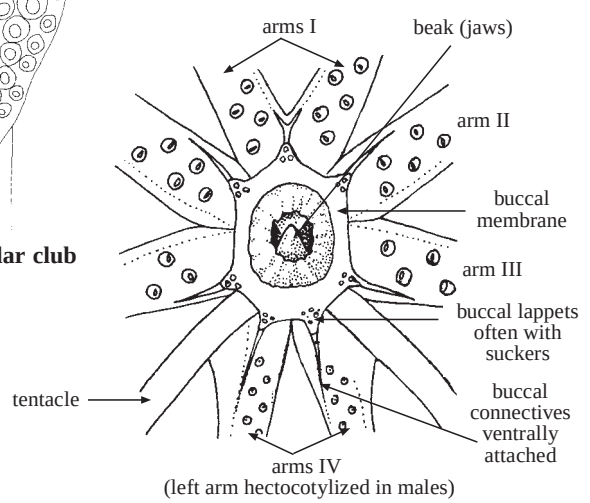
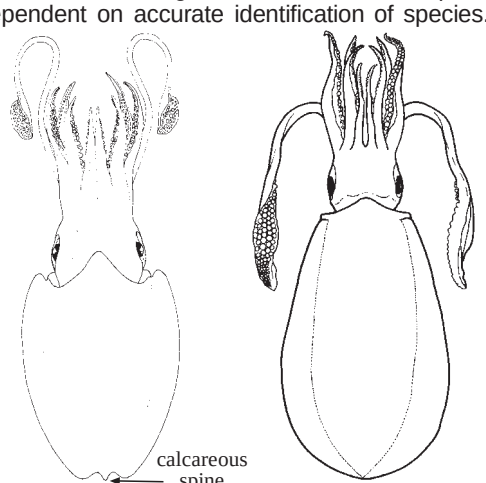


diagram of oral surface of brachial crown and buccal area

Habitat, biology, and fisheries: Demersal or semipelagic inhabitants of coastal and continental shelf areas to a maximum depth of about 400 m. Several species are restricted to extremely shallow waters and some of these penetrate into brackish waters (*Loliolus*). Typically, they undertake diel movements, aggregating near the bottom during the day, but dispersing into the water column at night. Many species are positively phototactic, and hence often are captured with fishing techniques using light attraction. Some species undergo seasonal onshore-offshore migrations in response to temperature changes. The eggs (which range from about 2 mm diameter in *Photololigo* to about 10 mm diameter in *Sepioteuthis*) are encapsulated in gelatinous, finger-like strings and attached in clusters to various substrates. Hatchlings resemble the adults. Recent studies of growth using direct measurements from statoliths reveal that some tropical loliginids may live only for a few months. Inshore squids are predators on crustaceans and small fishes. Loliginids are the dominant component of the Western Central Pacific cephalopod catch, but separate statistics on total catches are not reported for this family. They are a significant component of major trawl fisheries in the Gulf of Thailand and South China Sea areas; they also are taken as bycatch in many nearshore trawl fisheries for crustaceans and demersal finfish. Numerous artisanal and subsistance fisheries take inshore squids either in multispecies catches or as prime target species; gear used includes purse seines, dip nets, lift nets, cast nets, encircling nets including fixed or tunnel nets in intertidal areas, baited and unbaited jigs sometimes trolled rather than used vertically, often used at night in association with light attraction. Loliginids are highly valued for human consumption. They are marketed either fresh, frozen, dried or processed into cleaned mantles (whole hoods, rings). Small squid are also used as bait for both commercial and recreational fisheries.

Remarks: A recent study using modern biochemical genetic techniques has highlighted the incomplete state of knowledge of the taxonomy of the Indo-West Pacific loliginids. This is especially true for members of the genus *Photololigo* which includes the majority of the large commercially important species. The present set of diagnostic morphological characters (fin shape, sucker dentition, hectocotylus structure) does not always ensure a reliable identification of species. They do not take into account variability with growth and sex in some of these characters, particularly when these have been poorly and inadequately defined in the type descriptions (many from the mid 1800s). In many cases, type reference material is poorly preserved and had poor geographic locality information (e.g. Yokohama market for *Loligo edulis*, "Australian Seas (?S.E.)" for *Loligo etheridgei*. Generic level revisions have recently been undertaken for *Sepioteuthis*, *Loliolus*, and "*Loligo*". However, additional studies at the species level over broad geographic areas are required to clarify the "species complexes" represented by what are currently known as "*Photololigo edulis*", "*P. chinensis*" and "*Sepioteuthis lessoniana*". Several poorly known and new unnamed species are referred to in the literature and "seasonal forms" with different life history characteristics and of questionable taxonomic status and distribution are known (e.g. *Sepioteuthis lessoniana* around Okinawa). This poor state of taxonomic knowledge has been highlighted previously in workshops and published papers but little progress has been made. Current and future fisheries assessments of the loliginid resource and subsequent decisions concerning the management of the stocks are dependent on accurate identification of species. Therefore, there is an urgent need for a substantial cooperative region-wide taxonomic study of the genus *Photololigo* using classical morphology supported by modern techniques including allozyme electrophoresis and DNA analysis.



Sepiidae **Loliginidae (*Sepioteuthis*)**

Similar families occurring in the area

Sepiidae (cuttlefishes): the loliginid genus *Sepioteuthis* shows some external similarities to cuttlefish but can be easily distinguished from them by the presence of a gladius in the dorsal mantle rather than a chalky cuttlebone with a posterior calcareous spine; the presence of the midline connection of the fin lobes posteriorly in *Sepioteuthis* and the possession of contractile rather than retractile tentacles only without pockets.

Identification note

The key and descriptions provided below are based on the existing, inadequate adult character sets and users should recognize that in some cases, they may not readily assist with identifying the animals at hand. It should also be noted that in some cases, known or suspected species complexes are referred to rather than single species ("*Photololigo chinensis*", "*Photololigo edulis*" and "*Sepioteuthis lessoniana*"). **Some nominal species** described in the literature and listed below are **not included in the key** because detailed descriptions have yet to be published, they remain poorly characterized from the type descriptions or are described from limited material and their status as valid species remains questionable. These include:

Loligo reesi (Voss, 1962), a form that matures at a small size (less than 80 mm mantle length) known only from the Philippines which has long square-tipped arm sucker teeth, both ventral arms hectocotylized in males (left with papillae along more than 50% arm length and right with much reduced suckers on the distal half) and the the tips of both ventral arms in males devoid of suckers and papillae. The existing descriptions do not mention the presence of light organs;

Loligo vossi Nesis, 1982 [= species A of Voss (1963)], reaching 140 mm mantle length and reported from around the Philippines and northern Indian Ocean perifery, with 15 to 20 triangular teeth on the large tentacular suckers, 2 to 4 on the distal edge much larger, sharp and hook-like in Philippine specimens. Only the left ventral arm is hectocotylized in males by the development of long fleshy papillae along 40 to 50% of the arm. The existing descriptions do not mention the presence of light organs;

***Loligo* n.sp.** of Chotiyaputta (1993), a form that matures at a small size (less than 60 mm mantle length) known only from the Gulf of Thailand which has long square-tipped arm sucker teeth and sharp conical widely spaced subequal teeth on the large tentacular sucker rings. The existing incomplete description does not mention the presence of light organs;

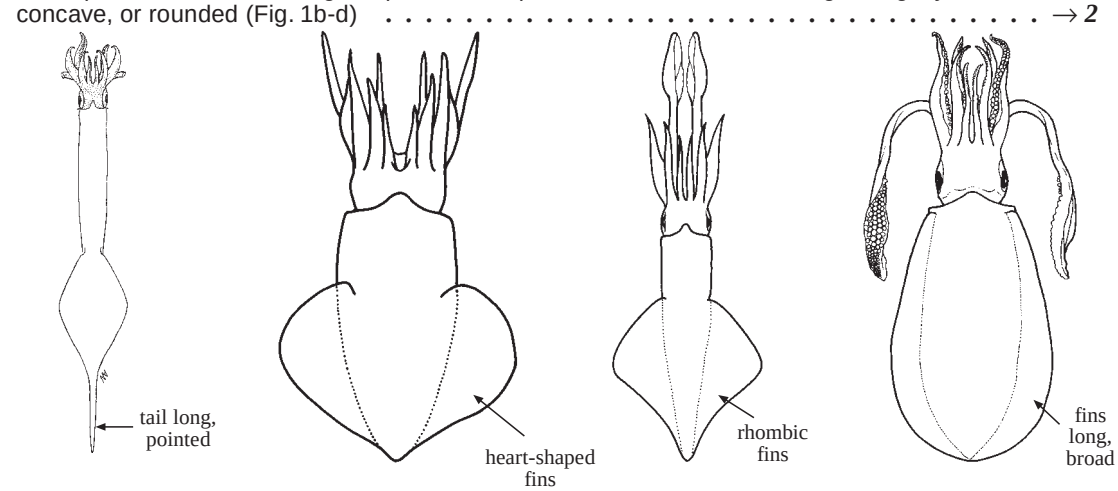
***Photololigo* spp. 1, 2, 3** of Yeatman and Benzie, 1994, are "species" which have been distinguished using allozyme electrophoresis. Morphological characteristics of species 1 and 2 from northern Australia (which mature at less than 120 mm mantle length) fall within the range of the "*Photololigo edulis"* complex with square tipped teeth on the arm sucker rings, sharp conical teeth on the large tentacular sucker rings and hectocotylization by development of long fleshy papillae along more than 50% of the left ventral arm in males. Species 3 is a larger maturing form (more than 150 mm mantle length) which falls within the "*Photololigo chinensis*" complex with a broad, robust mantle and large head and arms; sharp conical toothed sucker rings on the arms and large sharp conical teeth interspersed with smaller ones on the large tentacular sucker rings. All species have paired light organs adjacent to the rectum on the ink sac.

It is recommended that samples of animals (including mature males and females where available) which cannot be identified readily from the key should be preserved in formalin or alcohol, labelled with location, date of capture, depth and means of capture, and name of collector, sealed in a plastic bag and sent to an expert for identification. Major regional cephalopod collections and cephalopod specialists are at the Museum of Victoria (Invertebrate Zoology), Swanston Street, Melbourne, Victoria 3000 Australia and at the National Science Museum, 3-23-1 Hyakunincho, Shinjuku-ku, Tokyo 169, Japan. Material marked "squid for scientific study" may also be sent for identification to Dr Malcolm Dunning, Fisheries Group, Queensland, Department of Primary Industries, GPO Box 3129, Brisbane, Queensland 4001, Australia.

Key to the species of Loliginidae occurring in the area

1a. Mantle very long, narrow, its posterior end drawn out into a long, pointed tail, especially in males; posterior border of fins strongly concave, extend part way or entirely along tail as narrow membranes (Fig. 1a) . . . . . ***Uroteuthis bartschi***

1b. Mantle elongate or short, relatively robust, its posterior end pointed or rounded, but never produced into an elongate, pointed tail; posterior border of fins straight, slightly concave, or rounded (Fig. 1b-d) . . . . . → ***2***



a) ***Uroteuthis bartschi*** **b)** ***Loliolus*** **c)** ***Photololigo*** **d)** ***Sepioteuthis***

Fig. 1 characteristic fin shapes of loliginid genera (dorsal view)

(after Adam, 1984; Voss, 1963; Okutani, 1995)

2a. Fins very long, more than 90% of mantle length, broad; *Sepia*-like but much wider and more muscular; mantle very robust (Fig. 2) . . . . . ***"Sepioteuthis lessoniana"***

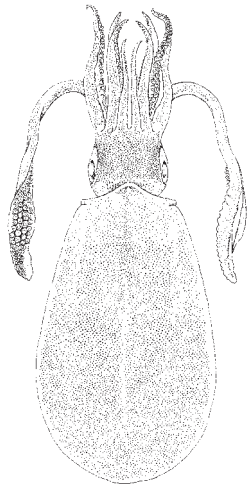
2b. Fins short to moderately long, less than 75% of mantle length; mantle elongate and narrow to short and stout . . . . . → ***3***

3a. Fins heart-shaped, rounded (Fig. 1b); mantle stout; mature at small sizes (less than 50 mm mantle length) . . . . . → ***4***

3b. Fins rhomboidal, with posterior borders straight or slightly concave (Fig. 1c); mantle elongate, bluntly to sharply pointed; generally mature at more than 50 mm mantle length . . . . . → ***6***

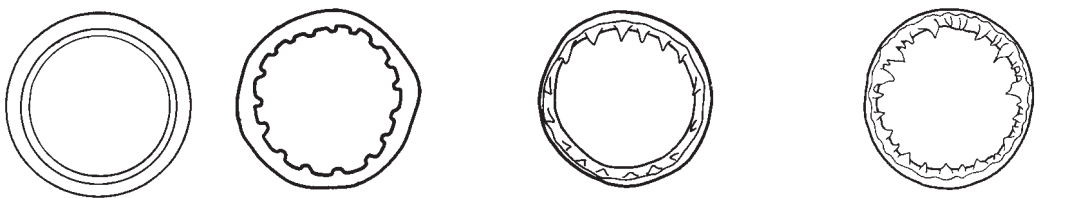
4a. Pair of light organs present on either side of the rectum on ink sac; large tentacular sucker rings smooth (Fig. 3a); sucker stalks on hectocotylus (left ventral arm IV) of males modified as papillae along entire length (Fig. 4) . . . . . ***Loliolus noctiluca***

4b. No light organs on ink sac; large tentacular suckers with small blunt truncate teeth around entire margin (Fig. 3b); no conspicuous papillae on hectocotylus of males . . . . . → ***5***



dorsal view

Fig. 2 ***"Sepioteuthis lessoniana"***
(illustration: K.Hollis/ABRS)



a) smooth

b) small blunt truncate teeth

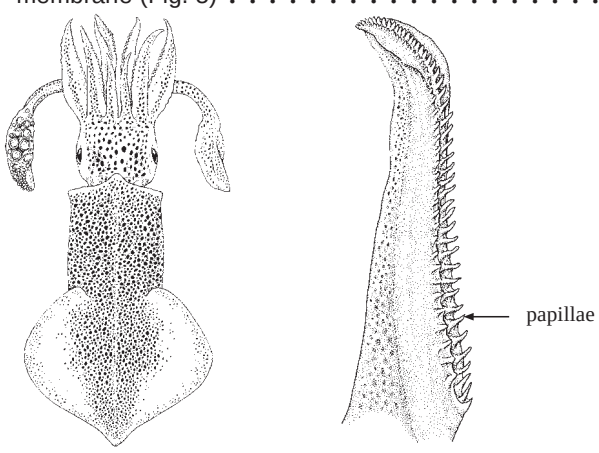
c) subequal-sized regularly spaced sharp conical teeth

d) unequal-sized irregularly spaced sharp conical teeth

Fig. 3 large tentacular sucker

5a. Large tentacular suckers with 20 to 29 small truncate teeth on the entire margin; suckers and sucker stalks on ventral column of hectocotylus (left ventral arm IV) absent in mature males, ventral protective membrane broad, thickened, forming a large crest present proximally and becoming narrower towards the arm tip . . . . . ***Loliolus hardwickei***

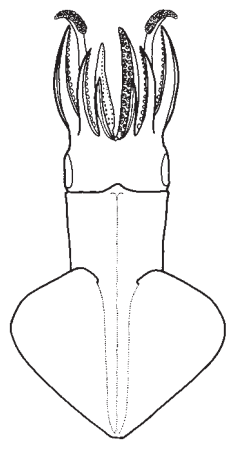
5b. Large tentacular suckers with 15 to 20 small truncate teeth on the entire margin; hectocotylized arm in males without a proximal crest on the modified ventral protective membrane (Fig. 5) . . . . . ***Loliolus affinis***



a) dorsal view

b) hectocotylus

Fig. 4 ***Loliolus noctiluca***
(illustration: K.Hollis/ABRS)



dorsal view

Fig. 5 ***Loliolus affinis***
(after Lu, Roper, and Tait, 1985)

6a. Gladius relatively broad without thickened lateral asymptotes, cone flags developed (Fig. 6a) . . . . . → ***7***

6b. Gladius narrow with thickened lateral asymptotes and much reduced cone flags (Fig. 6b) . . . . . → ***8***

7a. Large suckers of arms III with low, broad plate-like square teeth in the distal margin, proximal margin smooth (Fig. 7a) . . . . . → ***9***

7b. Large suckers of arms III with slender teeth on the distal margin, either square-tipped (Fig. 7b) or sharp conical (Fig. 7c), proximal margin smooth or with low serrations . . . . . → ***10***

8a. Suckers of lateral arms (II and III) with 7 to 11 wide teeth distally (Fig. 8) . . . . ***Photololigo singhalensis***

8b. Suckers of lateral arms (II and III) with wide rough teeth around entire ring; in males arms II and III suckers greatly enlarged to be more than twice the diameter of the median club suckers . . . . . ***Photololigo pickfordae***

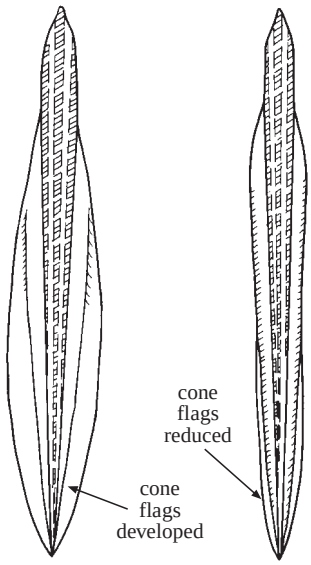


Fig. 6 gladius
(after Alexyev, 1989)

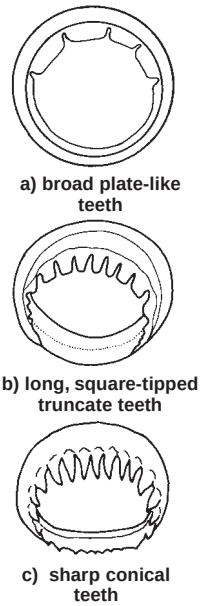


Fig. 7 arm III sucker rings

9a. Medial tentacular sucker rings smooth (Fig. 3a) or with only low serrations distally . . . . . → ***11***

9b. Medial tentacular sucker rings with subequal-sized, regularly spaced sharp conical or triangular teeth around their entire diameter (Fig. 3c) . . . . . → ***12***

10a. Large suckers of arms III with 6 to 12 long, square-tipped teeth on the distal margin (Fig. 7b); posterior fin margins distinctly concave; in males, dorsal and ventral sucker stalks of the left ventral arm modified into papillae for more than 50% of its length (Fig. 9) . . . . . ***"Photololigo edulis"*** **complex**

10b. Large suckers of arms III with 10 to 18 sharp, conical teeth on the distal margin (Fig. 7c); posterior fin margins almost straight; in males, papillate hectocotylus involving less than 40% of the left ventral arm (Fig. 10) . . . . . ***"Photololigo chinensis"*** **complex**

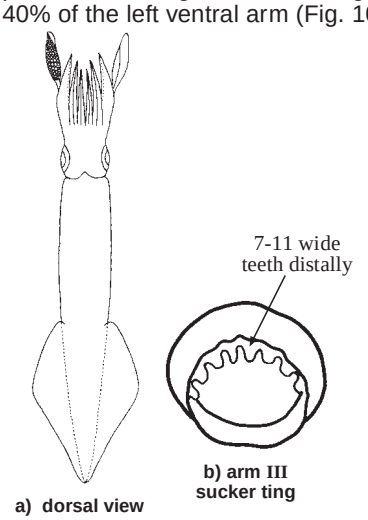


Fig. 8 ***Photololigo singhalensis***

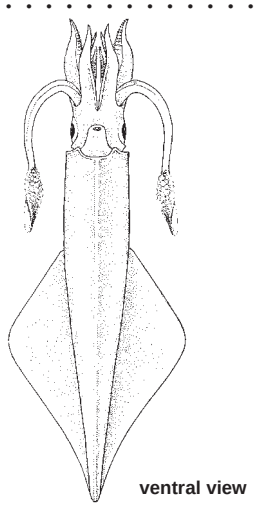


Fig. 9 ***"Photololigo edulis"***

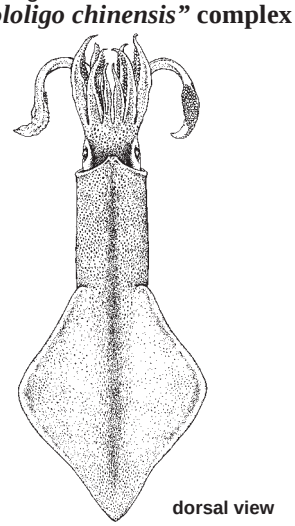


Fig. 10 ***"Photololigo chinensis"***
(illustration: K.Hollis/ABRS)

11a. Arm III sucker rings with 5 to 10 low plate-like teeth; diameters less than those of the largest tentacular sucker rings (Fig. 11a) which are smooth or have low serrations around only part of their diameter (Fig. 12) . . . . . ***Nipponololigo sumatrensis***

11b. Arm III sucker rings with 3 to 6 low plate-like teeth; diameters approximately equal to those of the largest tentacular sucker rings (Fig. 11b) which are smooth . . . . . ***Nipponololigo uyii***

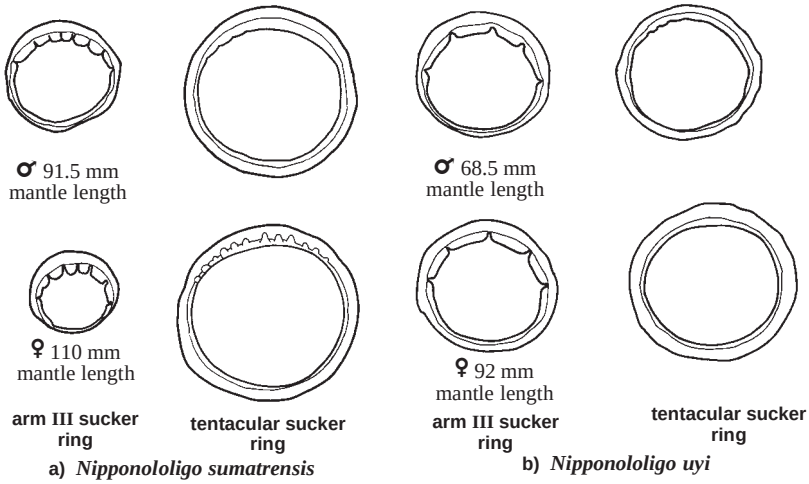


Fig. 11 relative sizes of sucker rings of arms III and tentacles

(after Natsukari, 1984)

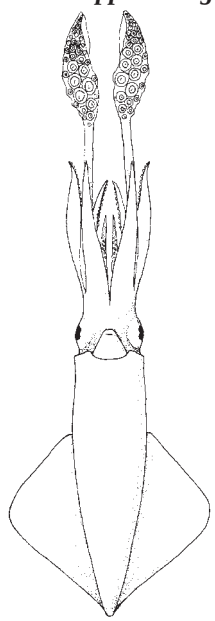


Fig. 12 ***Nipponololigo sumatrensis***

12a. Suckers on arms II and III equal to or greater than diameter of largest tentacular sucker rings (Fig. 13a); suckers of arm II in males greatly enlarged (more than 2 times larger than large tentacular sucker diameter, Fig. 13a); arm suckers with 3 to 7 large low plate-like teeth; no paired light organs either side of the rectum on ink sac (Fig. 14) . . . . . ***Nipponololigo beka***

12b. Suckers on arms II and III generally less than or equal to diameter of largest tentacular sucker rings (Fig. 13b); suckers of arm III in males somewhat enlarged (about 1.5 times larger than large tentacular sucker diameter, Fig. 13b); arm suckers with 5 to 13 low plate-like teeth; paired light organs either side of the rectum on ink sac (Fig. 15) . . . . . ***Photololigo duvaucelii***

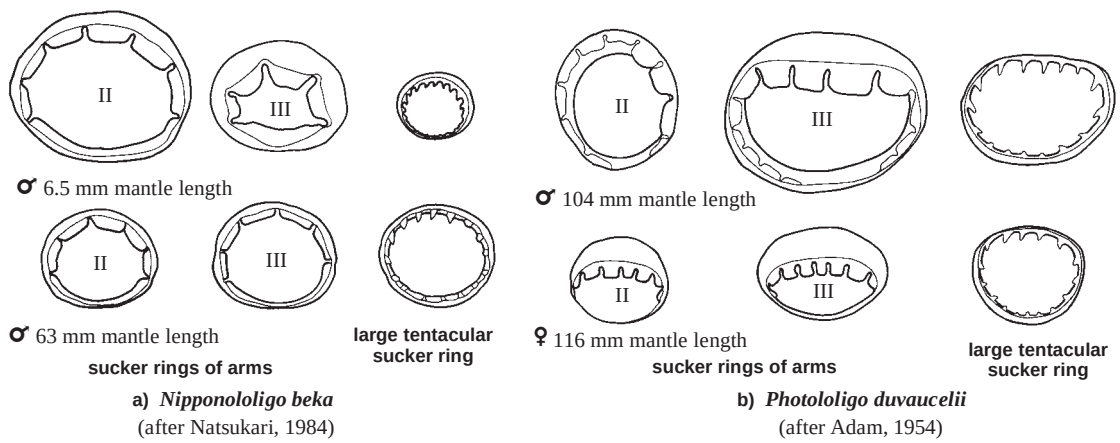
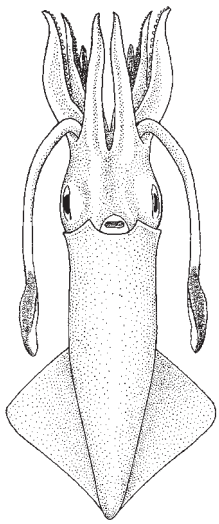
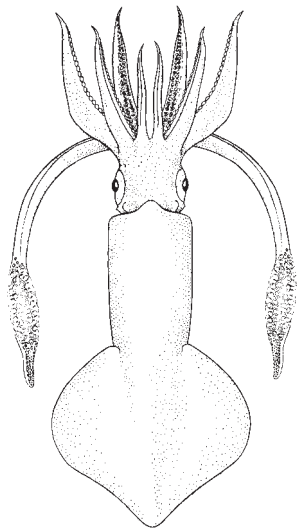


Fig. 13 relative sizes of sucker rings of arms II and III and the large tentacular sucker rings



ventral view

Fig. 14 ***Nippololigo beka***



dorsal view

Fig. 15 ***Photololigo duvaucelii***

List of species occurring in the area

The symbol ♜ is given when species accounts are included.

? *Loligo reesi* (Voss, 1962)
? *Loligo vossi* Nesis, 1982
Loligo sp. nov. [Chotiyaputta, 1993]

♜ *Loliolus affinis* Steenstrup, 1856
Loliolus hardwickei Gray, 1849
♜ *Loliolus noctiluca* Lu, Roper, and Tait, 1985

♜ *Nipponololigo beka* (Sasaki, 1929)
♜ *Nipponololigo sumatrensis* (d'Orbigny, 1835)
Nipponololigo uyii Wakiya and Ishikawa, 1921

♜ "*Photololigo chinensis*" (Gray, 1849)[1/]
♜ *Photololigo duvaucelii* (Orbigny, 1848)
♜ "*Photololigo edulis*" (Hoyle, 1885) [2/]
Photololigo pickfordae Adam, 1954
? *Photololigo robsoni* Alexeyev, 1992
♜ *Photololigo singhalensis* (Ortmann, 1891)
Photololigo sp. 1 [Yeatman and Benzie, 1994]
Photololigo sp. 2 [Yeatman and Benzie, 1994]
Photololigo sp. 3 [Yeatman and Benzie, 1994]

♜ "*Sepioteuthis lessoniana*" Lesson, 1830[3/]

♜ *Uroteuthis bartschi* Rehder, 1945

1/ Probably a species complex including *Loligo etheridgei* Berry, 1918, *L. formosana* Sasaki, 1929, and *Photololigo* sp. 3 of Yeatman and Benzie, 1994.
2/ Probably a species complex including *Loligo edulis*, *L. budo*, and *Photololigo* spp. 1 and 2 of Yeatman and Benzie, 1994.
3/ Probably a species complex.

References

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Nipponololigo beka (Sasaki, 1929)

Frequent synonyms / misidentifications: None / *Nipponololigo uyii* Wakiya and Ishikawa, 1921.

FAO names: En - Beka squid; **Fr** - Calmar cracheur; **Sp** - Calamar beka.

Diagnostic characters: Mantle short, slender; fins rhomboidal with round lateral angles, length more than 50% of mantle length. Tentacular clubs expanded, lanceolate; **medial manus suckers twice the diameter of lateral suckers and with 18 to 30 sharp teeth on the sucker rings**. **Arm sucker rings with 3 to 7 very low broad squared teeth; left ventral arm modified in males with palisade-like fleshy papillae on the distal 60%**.

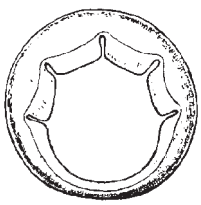
Size: Maximum dorsal mantle length 70 mm.

Habitat, biology, and fisheries: Found in coastal waters, particularly bays. Occurs in trawl and light-luring net catches in the Gulf of Thailand.

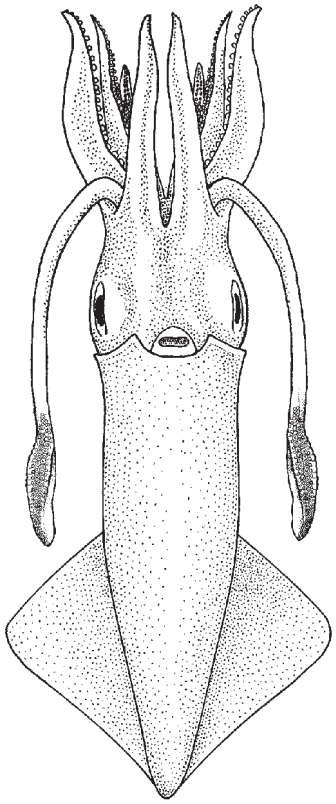
Distribution: Southeast Asian coastal waters to southern Japan.



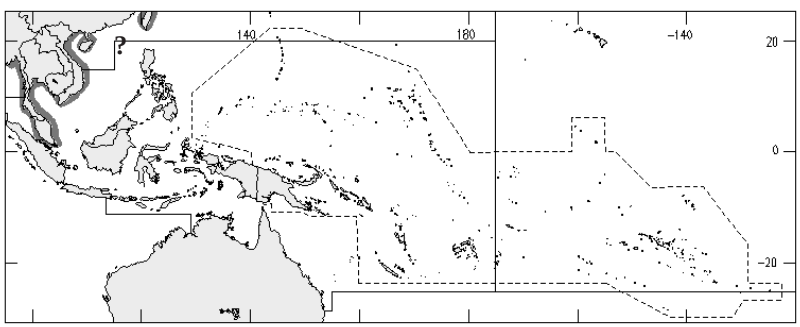
tentacular club sucker ring



arm III sucker ring



ventral view



Nipponololigo sumatrensis (Orbigny, 1835)

Frequent synonyms / misidentifications: *Loligo kobiensis* Hoyle, 1885; *L. rhomboidalis* Burgess, 1967; *L. yokoyae* Ishikawa, 1926 / *Nipponololigo uyii* Wakiya and Ishikawa, 1921.

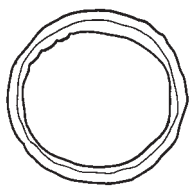
FAO names: En - Kobi squid; **Fr** - Calmar kobi; **Sp** - Calamar kobí.

Diagnostic characters: Mantle short, slender; fins rhomboidal with round lateral angles, length approximately 65% of mantle length. Tentacular clubs expanded, lanceolate; club suckers in 4 rows, **6 to 8 medial manus suckers up to 4 to 5 times the diameter of lateral suckers and with smooth sucker rings (occasionally with low serrations distally)**; other larger tentacular suckers with 6 to 15 sharp teeth. Arm sucker rings with **5 to 10 low broad squared teeth, left and right ventral arms (IV) modified in males; beyond the first 3 rows of normal suckers, sucker stalks of the left arm modified as low stump-like papillae in the dorsal column and broad thick palisade-like papillae in the ventral column, reducing in size distally; right arm IV with 3 or 4 rows of much enlarged suckers proximally**.

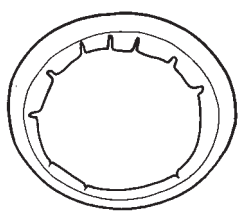
Size: Maximum dorsal mantle length 100 mm, commonly to 50 mm mantle length.

Habitat, biology, and fisheries: Found in coastal waters, common in upper 10 m of the water column. Abundant in Gulf of Thailand trawl and light-luring net catches.

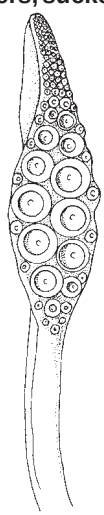
Distribution: Southeast Asian coastal waters to central Japan.



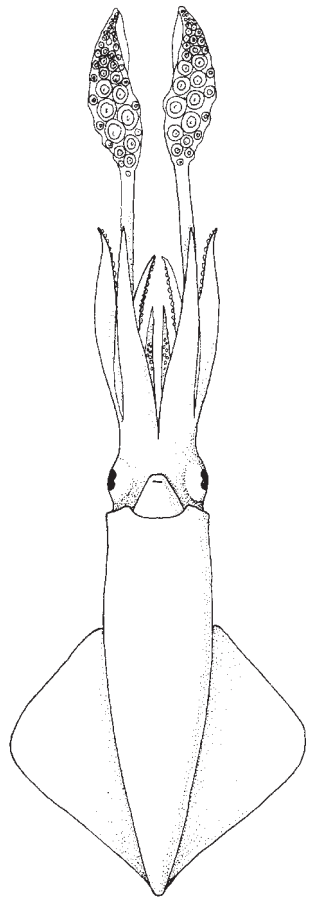
tentacular club sucker ring



arm III sucker ring

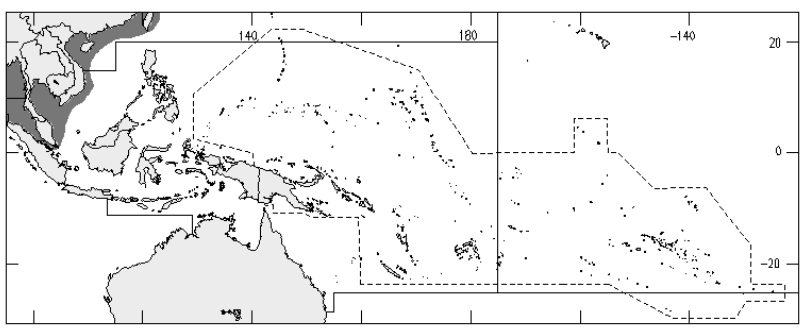


tentacular club



ventral view

(after Natsukari, 1984)

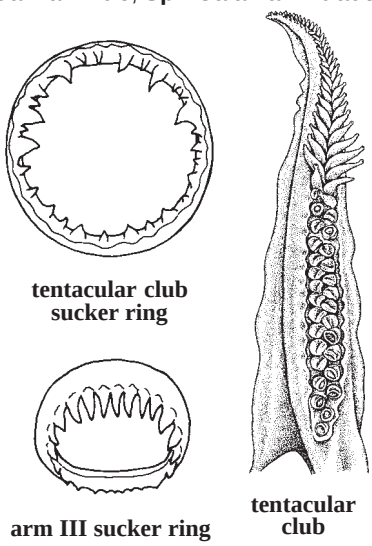


"*Photololigo chinensis*" Gray, 1849 species complex

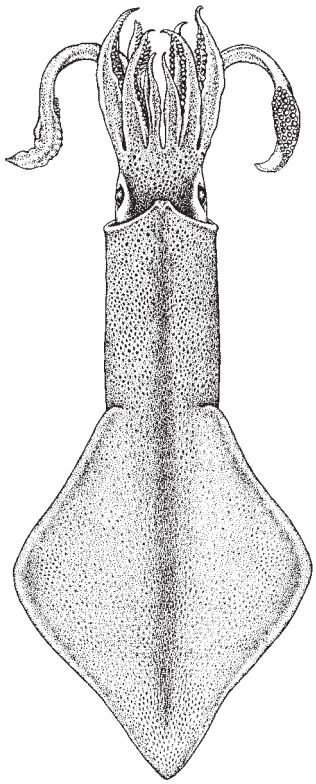
Frequent synonyms (named species of uncertain status included in the complex) / misidentifications: *Loligo chinensis* Gray, 1849; *L. australis* Gray, 1849; *L. formosana* Sasaki, 1929; *L. etheridgei* Berry, 1918; *L. indica* Hoyle, 1886; ?*L. vossi* Nesis, 1982; *Photololigo* sp. 3 of Yeatman and Benzie, 1994 / ?*Doryteuthis singhalensis* of Voss, 1963.

FAO names: En - Mitre squid; **Fr** - Calmar mitre; **Sp** - Calamar mitrado.

Diagnostic characters: Mantle elongate, slender, bluntly pointed posteriorly; **fins rhombic, long, over 60% of mantle length in adults**. About 12 medial manal suckers of tentacular clubs enlarged to 1.5 times the diameter of lateral suckers and twice the diameter of largest arm sucker; **large rings with 20 to 30 sharp, conical separate teeth**, the 6 to 12 larger ones interspersed with 1 to 4 smaller ones. **Larger sucker rings of arms II and III with 10 to 18 sharp conical teeth distally**, with degenerate teeth or smooth proximally; left arm **IV hectocotylized at distal 33 to 40%** by modification of more than 30 suckers and stalks in each row into slender, conical papillae that remain larger in the ventral row.



(illustration: K. Hollis/ABRS)



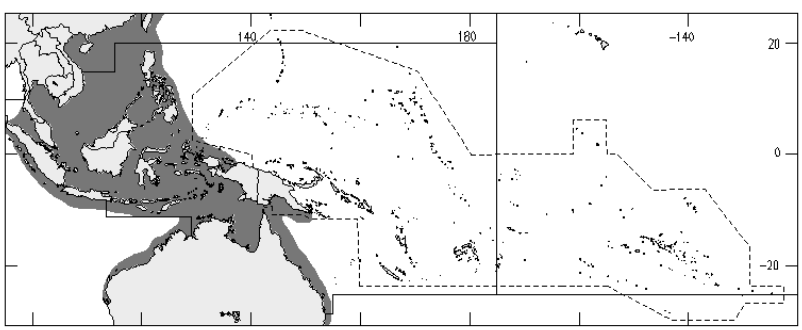
dorsal view

(illustration: K. Hollis/ABRS)

Size: Maximum 400 mm mantle length, commonly to 200 mm mantle length.

Habitat, biology, and fisheries: Neritic species ranging from intertidal areas to a depth of 170 m; positively phototactic and periodically forming large aggregations. Spawning occurs throughout the year, with peaks in Spring and Autumn. This species complex is targetted or a welcome bycatch of numerous commercial and small-scale fisheries throughout its range; major squid species together with *Photololigo duvaucelii* in the Gulf of Thailand, where it is taken in waters from depths between 15 and 30 m and amounts to up to 71% of the catch (more than 40 000 t in 1984) from light-luring vessels. Bycatch (together with "*Photololigo edulis*") in prawn trawling off northern Australia and occurs in minor quantities in Indonesian, Malaysian, and Philippine catches. Taken with a variety of gears, including demersal trawls, purse seines, cast, lift, dip and box nets, hook-and-lines including jigs, scoop nets, and stake nets, often involving light attraction. Marketed fresh, frozen, or dried and is also processed into cleaned "hoods" and rings.

Distribution: Western Pacific: South and East China Seas to Japan, Gulf of Thailand, Arafura and Timor seas, northern Australia.

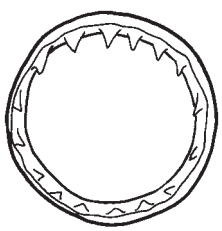


Photololigo duvaucelii (d'Orbigny, 1835)

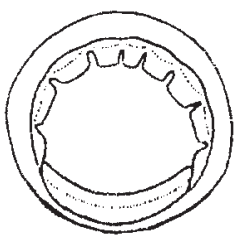
Frequent synonyms / misidentifications: *Loligo duvauceli* Orbigny, 1848, *L. oshimai* Sasaki, 1929; *L. indica* Pfeffer, 1884 / None.

FAO names: En - Indian squid; **Fr** - Calmar indien; **Sp** - Calamar índico.

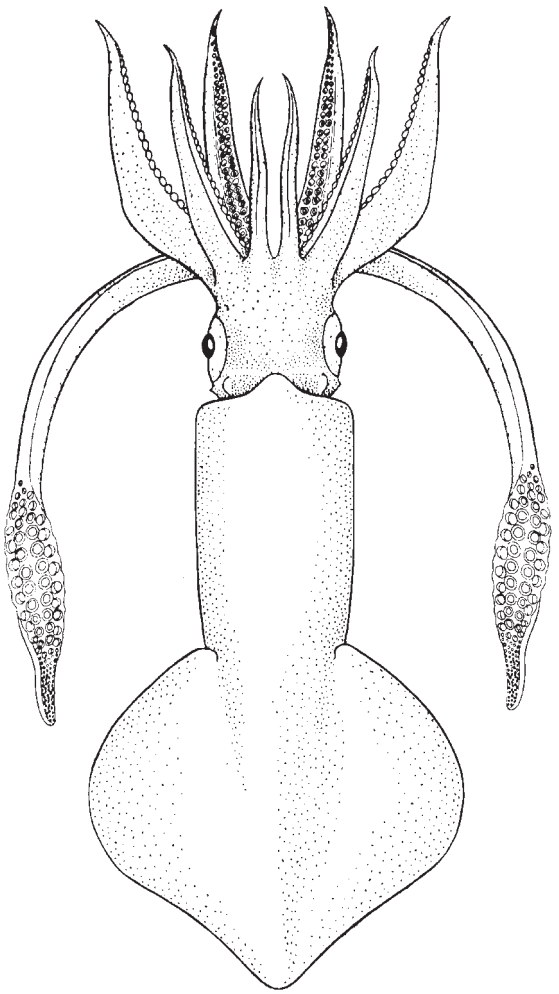
Diagnostic characters: Mantle relatively short, stout. Fins rhombic, broad, short, just over 50% of mantle length. Tentacular clubs expanded; large median manal suckers 1.5 times larger than marginals, with **14 to 17 short, sharp teeth around ring**. **Arm suckers of female of about equal size on arms II and III**, **rings smooth proximally, toothed with about 7 broad, blunt teeth distally; in males, suckers of arm II** and especially III greatly enlarged, with 5 to 13 low, **squared to rounded, truncate teeth in the distal 2/3 of ring, proximal 1/3 smooth**; left arm IV of male hectocotylized for more than 1/2 its length, with 2 rows of large papillae, some with minute suckers on tip, ventral rows larger, turned outward, comb-like; an oval photophore on each side of rectum on the ink sac.



tentacular club sucker ring



arm III sucker ring

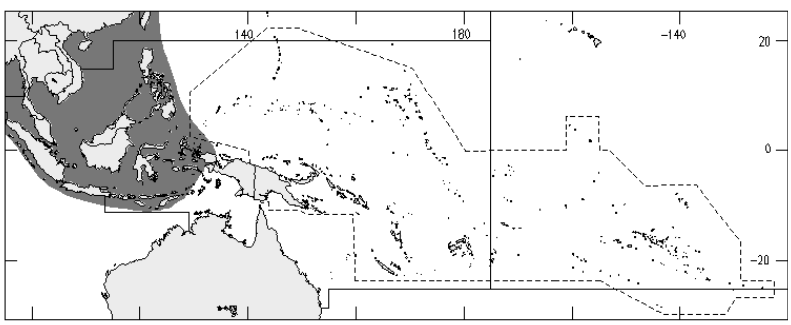


dorsal view

Size: Maximum mantle length 300 mm, commonly to 150 mm mantle length.

Habitat, biology, and fisheries: A neritic, inshore species occurring in depths between 30 and 170 m, forming large aggregations during the spawning season. Spawning occurs throughout the year. Feeds on crustaceans (such as mysids, euphausids and ostracods), fishes and squids; cannibalism is common. Exploited throughout its range, mainly by artisanal subsistance fisheries; in the Gulf of Thailand it is one of the target species of the demersal trawl and light-luring fisheries (with "*Photololigo chinensis*") with over 15 000 t taken in 1984.

Distribution: Indo-Pacific: Indian Ocean periphery, including the Red Sea and the Arabian Sea, extending eastwards from Mozambique to the South China Sea and the Philippines Sea, northward to Taiwan Province of China.

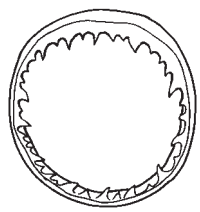


"***Photololigo edulis***" (Hoyle, 1885) species complex

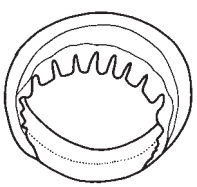
Frequent synonyms / misidentifications: *Doryteuthis kensak* (Wakiya and Ishikawa, 1921); *Loligo budo* Wakiya and Ishikawa, 1921; *Photololigo* sp. 1 and 2 of Yeatman and Benzie, 1994 / ?*Doryteuthis sibogae* Adam, 1954.

FAO names: En - Swordtip squid; **Fr** - Calmar épée; **Sp** - Calamar espada.

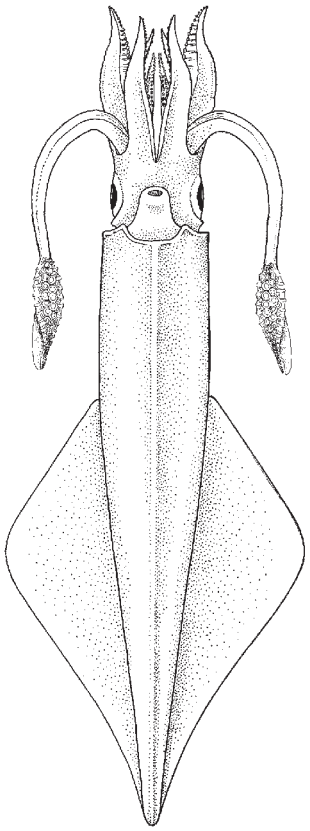
Diagnostic characters: Mantle moderately stout to elongate, slender in mature males. **Fins rhombic, attaining 70% of mantle length in adults**, their posterior margin slightly concave. Tentacular clubs expanded, lanceolate; about 16 medial manal suckers 1.2 times larger than the marginals, approximately equal to largest arm suckers, with 30 to 40 sharp conical teeth, 20 to 30 small ones interspersed between 10 larger ones. **Arm sucker rings with 6 to 12 distinct, squared, truncate teeth in distal 2/3**, smooth or with rudimentary denticles proximally; **slightly more than 50% of left arm IV hectocotylized** by enlargement of about 50 pairs of sucker stalks into swollen papillae, each with a minute rudimentary sucker on the tip; papillae slightly larger in ventral row; a fusiform photophore on each side of rectum. Seasonal forms present around Japan ("budo" and "kensaki") varying in the robustness of the mantle and number of normal sucker rows at the base of the hectocotylized arm; small maturing (less than 120 mm mantle length) unnamed species morphologically similar but genetically distinct occurring off northern Australia.



tentacular club sucker ring



arm III sucker ring

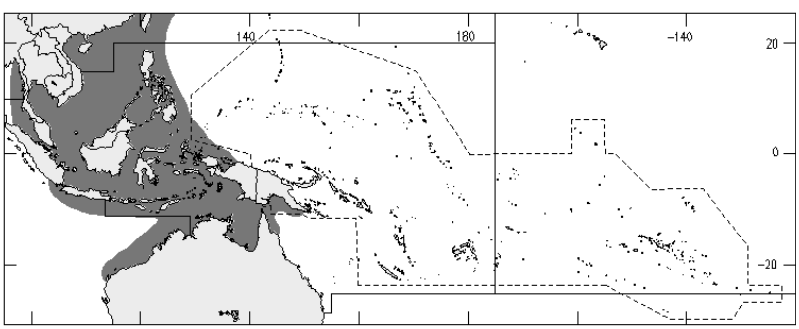


ventral view

Size: Maximum mantle length 400 mm; common size in commercial catches in South China Sea between 150 and 250 mm.

Habitat, biology, and fisheries: A neritic species occurring in depths from 30 to 170 m. May undergo seasonal inshore-offshore migrations, forming large aggregations. Spawning of the kensaki form has been reported on sandy bottoms in depths from 30 to 40 m off southern Japan. Supports local fisheries throughout its range, in western Japan, the Philippines, and in Indonesia. At least 2 species in this complex are taken as bycatch in prawn trawling in northern Australian waters. Other gears include hand jigs and set nets. The flesh is of good quality and sold at high prices both fresh and frozen, processed into a dried product and also used for sashimi in Japan.

Distribution: Western Pacific from northern Australia, Philippine Islands, South China Sea to central Japan.



Photololigo singhalensis (Ortmann, 1891)

Frequent synonyms / misidentifications: *Doryteuthis sibogae* Adam, 1954; *Loligo sibogae* (Adam, 1954) / *Photololigo chinensis* (Gray, 1849).

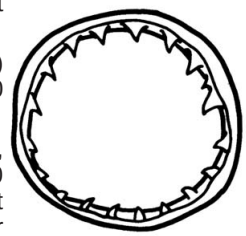
FAO names: En - Long barrel squid; **Fr** - Calmar baril; **Sp** - Calamar buril.

Diagnostic characters: Mantle long and slender. Fins long, reaching approximately 50% of mantle length. Tentacular clubs short, slightly expanded; **suckers in medial rows of manus only about 25% larger than those on lateral rows with 20 to 22 sharply pointed**, curved teeth, some of which are quite reduced in size. **Arms relatively short; sucker rings with 7 to 11 long, plate-like squared teeth distally, smooth proximally**. Left arm IV hectocotylized in distal half with slender papillae. Paired, bean-shaped light organs present adjacent to the rectum on the ink sac.

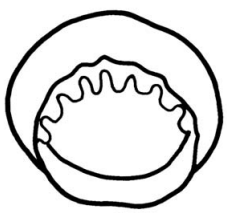
Size: Maximum mantle length 500 mm (males) and 310 mm (females), commonly caught at 150 to 200 mm mantle length.

Habitat, biology, and fisheries: A neritic, semipelagic species occurring at depths from 30 to 120 m. It is positively phototactic, a feature that is utilized in the fishery by attracting it by light prior to capture. It aggregates in large schools in summer, probably for mating and spawning. Males grow larger than females. In the Philippines, Indonesia and Taiwan Province of China (Penghu), it supports localized and subsistence fisheries and is taken by jigs, purse seines, and dip-nets using light attraction together with *Photololigo chinensis* and other large loliginids. Seasonally abundant, indicating some migration.

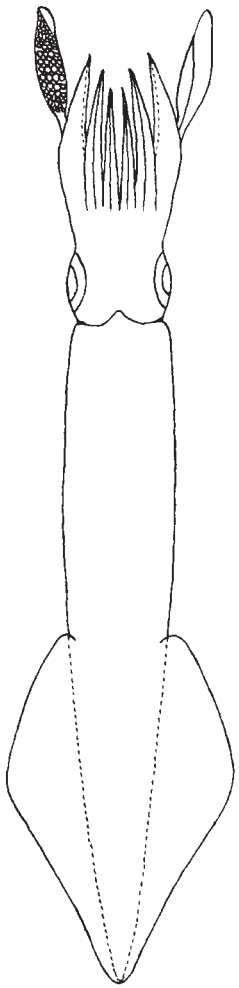
Distribution: Indo-Pacific from Eastern Arabian Sea, Bay of Bengal to South China Sea and Philippines Sea, Indonesian waters, Solomon Sea, and Taiwan Province of China (Penghu).



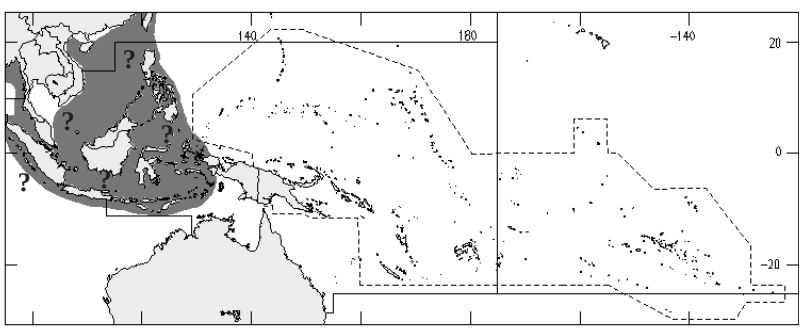
largest tentacular club sucker ring



largest arm III sucker ring



dorsal view

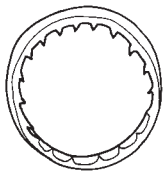


"***Sepioteuthis lessoniana***" Lesson, 1830 ? species complex

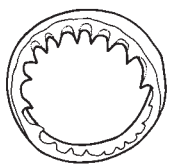
Frequent synonyms / misidentifications: *Sepioteuthis arctipinnis* Gould, 1852 / None.

FAO names: En - Bigfin reef squid; **Fr** - Calmar tonnelet; **Sp** - Calamar manopla.

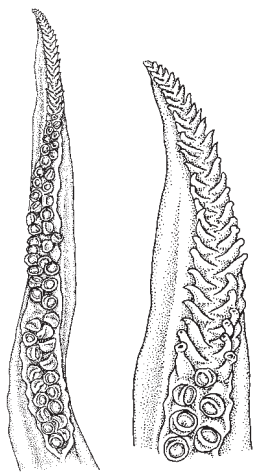
Diagnostic characters: Mantle long, robust, its width about 40% of length. Fins very large, length over 90% mantle length, width up to 75% mantle length; greatest width occurs posterior to the midpoint of the fins. Tentacular clubs long, expanded; median manus suckers enlarged; rings with 14 to 23 sharp conical teeth. Arm sucker rings with 18 to 29 long sharp, regularly spaced, conical teeth around entire margin; tentacles long, robust; left arm IV hectocotylized along distal 25 to 30%. **Colour:** dark to light brown to pale translucent; iridescent pale transverse bars or spots are present dorsally in all colour phases and are distinctive of this species.



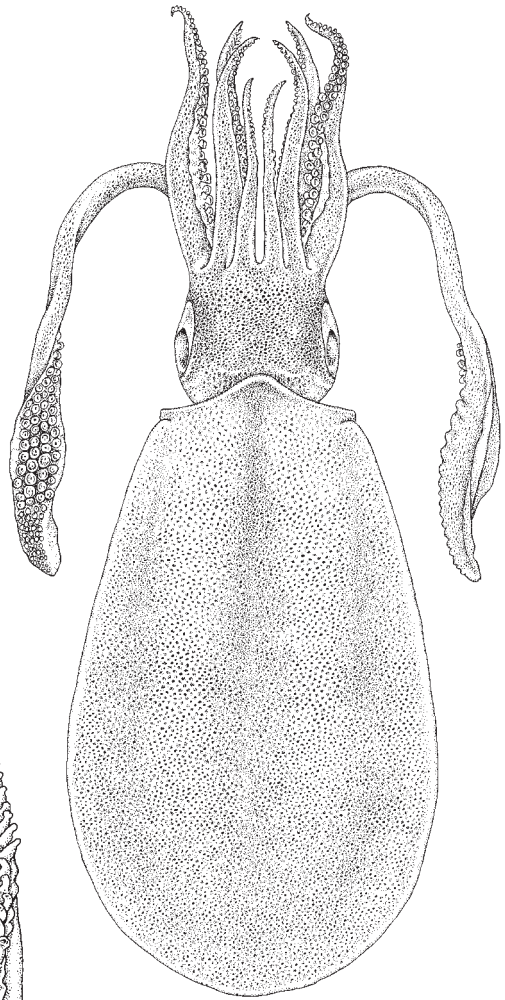
tentacular club sucker ring



arm III sucker ring



hectocotylus **distal end of hectocotylus**



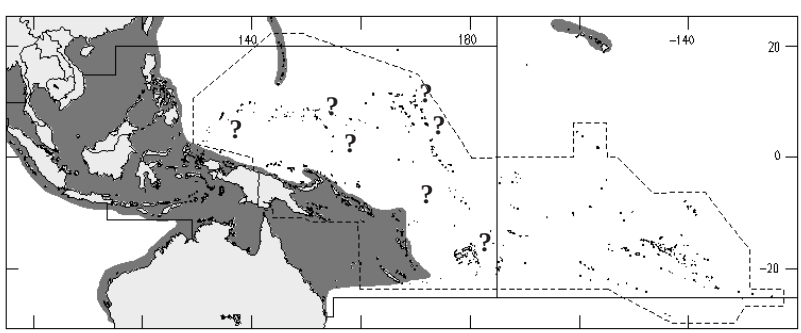
dorsal view

(illustration: K. Hollis/ABRS)

Size: Maximum dorsal mantle length 422 mm in males, smaller in females; commonly 200 to 300 mm mantle length.

Habitat, biology, and fisheries: *Sepioteuthis lessoniana* is a neritic species occurring from the surface down to a depth of at least 100 m. The spawning season may be quite extended. Egg capsules containing 3 to 7 eggs are finger-shaped and attached in clusters to seaweeds, submerged mangrove roots, twigs, stones and corals in coastal waters. Around Okinawa and Palau, a form laying 2 eggs per capsule attached underneath coral boulders has recently been reported. Preys primarily on prawns and fishes, occasionally on stomatopods and crabs. Grows to 200 mm in about 150 days in northern Australia. Males reach larger sizes than females. Of major commercial and artisanal value throughout Southeast Asia, captured using a variety of gear from demersal trawls to jigs and hooks, spears, set nets, and traps.

Distribution: Widespread in the Indo-Pacific: Red Sea eastward to the Hawaiian Islands, northern Australia to central Japan.



Uroteuthis bartschi Rehder, 1945

Frequent synonyms / misidentifications: None / None.

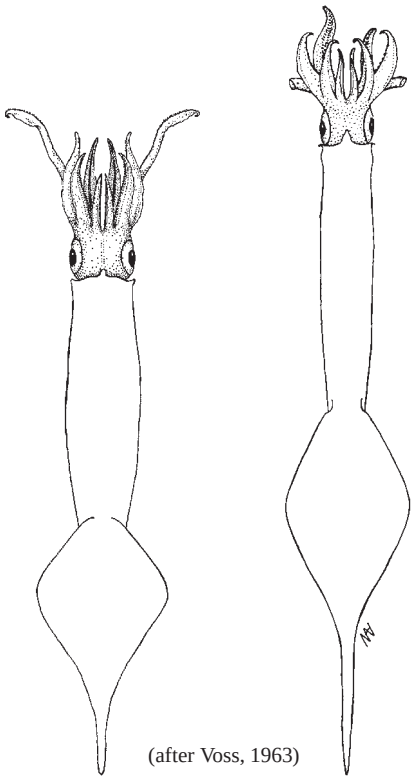
FAO names: En - Bartsch's squid; **Fr** - Calmar tépo; **Sp** - Calamarete.

Diagnostic characters: Mantle very narrow, elongate, with very long, pointed tail, more pronounced in males. Fins rhomboidal, their lateral angles rounded, posterior borders concave, generally extending the entire length of tail but sometimes as only a minute membrane. Head relatively small, narrow. Arm suckers with broad, plate-like teeth in the distal margin, smooth proximally; large medial tentacular suckers with long square-tipped teeth. Left arm IV hectocotylized in distal half by abrupt transformation of suckers into long, stout papillae.

Size: Maximum mantle length 200 mm.

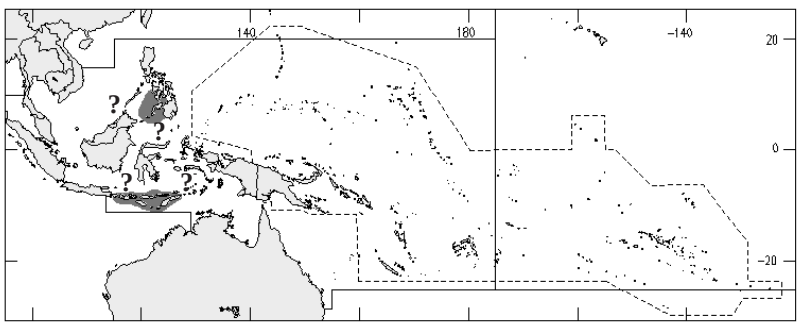
Habitat, biology, and fisheries: A neritic species; upper and lower limit of depth range undetermined. Taken as bycatch in local trawl and net fisheries in Indonesia and the Philippines. Utilized mostly fresh.

Distribution: Western Pacific Ocean: in Philippine and Indonesian waters.



(after Voss, 1963)

dorsal view of female **dorsal view of male**

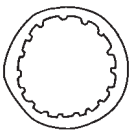


Loliolus affinis Steenstrup, 1856

Frequent synonyms / misidentifications: None / ?*Photololigo* spp.; *Nipponololigo* spp.

En - Steenstrup's bay squid.

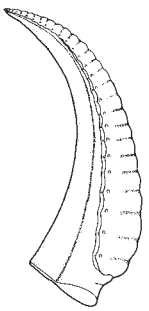
Maximum mantle length to 39 mm (females larger than males), occur in shallow coastal habitats to depths of at least 13 m. Probably a schooling species. Caught occasionally in demersal trawl catches in the Gulf of Thailand among larger loliginids, may be confused with juveniles of other larger more commercially important species, mature males readily identified by the absence of any normal suckers from the hectocotylized arm.



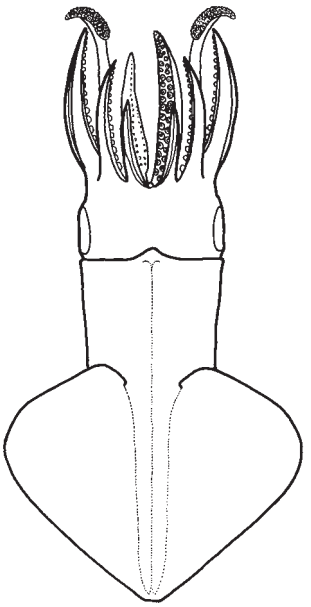
tentacular club sucker ring



arm III sucker ring

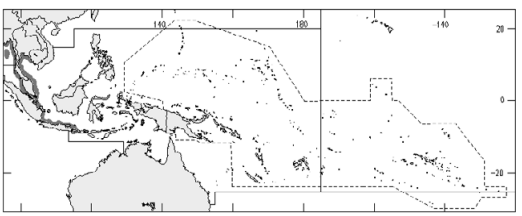


hectocotylus



dorsal view

(after Lu, Roper, and Tait, 1985)



Loliolus noctiluca Lu, Roper, and Tait, 1985

Frequent synonyms / misidentifications: None / *Photololigo* spp.; *Nipponololigo* spp.

En - Luminous bay squid.

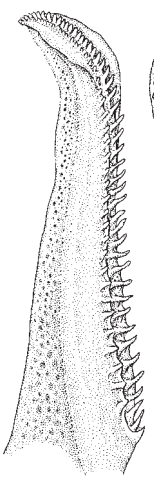
Maximum mantle length to 90 mm (females larger than males). Occur in shallow coastal habitats including seagrass beds to depths of about 50 m. Caught incidentally in inshore prawn trawls along the northeastern Australian coast, may be confused with juveniles of other larger more commercially important species from which they can be separated by fin shape and, in freshly caught specimens, by the presence of yellow and pink chromatophores on the fin margins and mantle. Short lived, reaching 60 mm mantle length in tropical Australian waters in approximately 70 days.



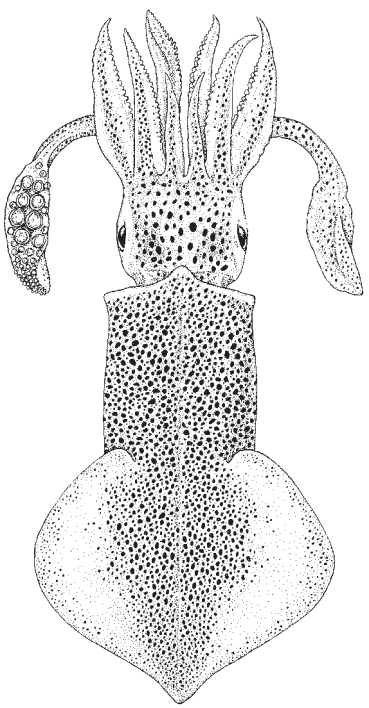
tentacular club sucker ring



arm III sucker ring

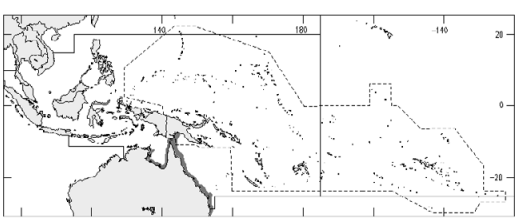


hectocotylus



dorsal view

(illustration: K. Hollis/ABRS)

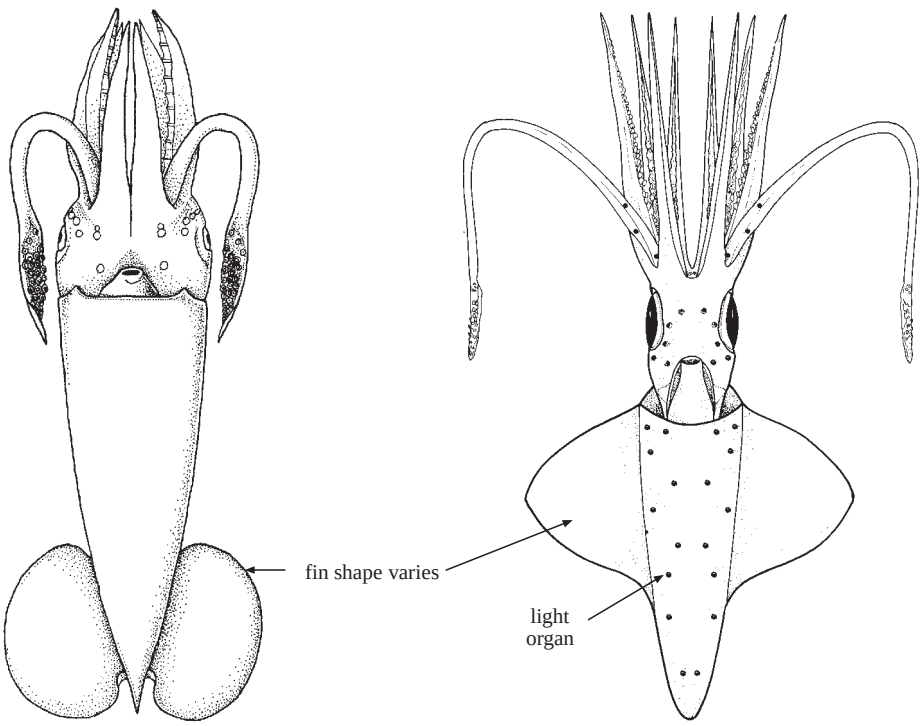


ENOPLOTEUTHIDAE

Firefly squids, enope squids

by M.C. Dunning

Diagnostic characters: Small to medium-sized squids (generally less than 150 mm mantle length) with only moderately muscular or gelatinous mantles. Fin shape varies. **Light organs present in adults of all genera**; arrangement, size and number of light organs is a generic and species specific characteristic. Characterized by a **simple, straight funnel locking apparatus**. **Sharp toothed suckers (*Pterygioteuthis*) or suckers and hooks (remaining genera)** arranged **in biserial rows on arms and in 4 columns on tentacular clubs**. **Buccal connectives attached to dorsal border of ventral arms (IV)**. One or both ventral arms hectocotylized in males, with considerable variation between species. Hectocotylized arm of *Pyroteuthis* with hooks modified by the development of a secondary cusp. All hooks replaced in *Pterygioteuthis* by a single chitinous plate housed in a fleshy pocket midway along the oral surface of the ventral arm.



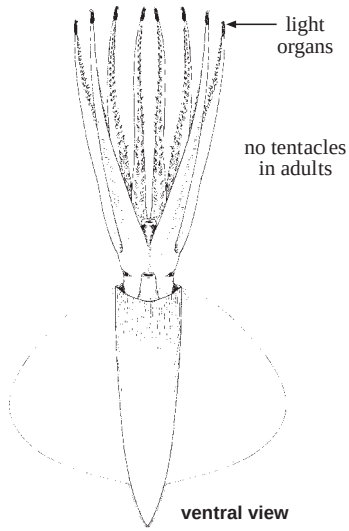
ventral view
Pterygioteuthis

ventral view
Ancistocheirus

Habitat, biology, and fisheries: Epi- to mesopelagic, tropical and subtropical oceanic squids, some species spawning in continental slope and deeper continental shelf waters. Female reproductive organs are modified from the typical oegopsid squid form by the loss of the nidamental glands and strong development of the oviducal glands in the genera *Abralia*, *Abraliopsis*, and *Ancistrocheirus*. In *Pyroteuthis* and *Pterygioteuthis*, only the right or left oviducal glands are present. Though some oegopsid squid spawn eggs in masses surrounded by jelly, some female enoploteuthids spawn individual eggs into the plankton. Females of enoploteuthid squid such as *Abralia* and *Abraliopsis* which mature at about 50 mm mantle length are capable of producing between 10 000 and 20 000 eggs, typically with a maximum diameter of 1.2 mm. Ripe eggs of mature *Ancistrocheirus* are large for oegopsids, reaching 3 mm over the long axis. Enoploteuthids are among the most commonly caught squids in midwater trawls and migrate to deeper waters during the daytime. Several genera are caught in demersal trawls in deeper slope waters. Their abundance in the epipelagic and mesopelagic zones is reflected by their prevalence in the diets of tunas and lancetfish, sharks, and marine mammals. Enoploteuthids are not the subject of target fisheries in tropical waters of the Western Central Pacific, although they do appear in some markets as bycatch from trawling activities. In the Sea of Japan, up to several thousand tonnes of a temperate species closely related to *Abralia* and *Abraliopsis*, *Watasenia scintillans* (Berry, 1911), are taken annually using set nets to capture spawning aggregations. *Watasenia* are processed by boiling whole.

Similar families occurring in the area

Octopoteuthidae: larger species may appear superficially similar to *Ancistrocheirus* (long rhomboid fins, hooks on arms) but are distinguished by the following characters: buccal connectives attached to ventral border (rather than to dorsal border) of ventral arms (IV); loss of tentacles in adult stage; no light organs on ventral mantle (although present on tips on some of the arms, internally on the viscera, and in the tail). Species of *Ancistrocheirus* have several light organs on the ventral mantle and the ventral surface of the head.



Octopoteuthidae

Key to the genera of Enoploteuthidae occurring in the area
(after Nesis, 1987)

1a. Light organs present on the surface of mantle, head, and arms; none or only a single light organ present inside the mantle cavity; no light organs or a single row only on ventral side of eyeball; posterior end of mantle conical, not produced into an acute tail, terminal cone of gladius slightly developed; posterior end of fins concave or straight; both oviducts developed . . . . . → ***2***

1b. No light organs on the surface of mantle, head, or arms; 8 to 10 light organs present inside the mantle cavity, embedded in the tentacular stalk; 12 to 15 light organs on ventral side of eyeball; posterior end of mantle extending into an acute tail with a needle-like terminal cone of the gladius; fins rounded, their posterior edges convex, not reaching end of body; only 1 oviduct developed . . . . . → ***5***

2a. Twenty-two large semicircular light organs present on ventral surface of mantle; large light organs also present on head and tentacular stalk; many minute light organs scattered over mantle, head, and ventral arms; no light organs inside mantle or on ventral side of eyeball; anterior end of mantle elongated in adults to form a tail extending beyond posterior edge of fins; hooks in 2 rows on tentacular clubs; in adults, no marginal suckers on central part of clubs; nidamental glands developed; adults reaching 400 mm mantle length (Fig. 1) . . . . . ***Ancistrocheirus***

2b. Hundreds of small, approximately equal-sized light organs present on ventral surface of mantle, head, and arms; light organs also present on ventral side of eyeball; no light organs present in the tentacular stalk; nidamental glands absent and replaced by oviducal glands that are greatly enlarged and divided into 2 halves; adults rarely exceeding 200 mm mantle length . . . . . → ***3***

3a. Eight to 12 light organs on ventral side of eyeball, the 2 marginal ones large, the others small and abutting one another; posterior end of mantle in adults usually developed into a soft conical tail extending beyond edge of fins (Fig. 2) . . ***Enoploteuthis***

3b. Five to 8 unequal-sized, separate light organs on ventral side of eyeball; fins reaching posterior end of mantle; central part of tentacular clubs with 1 row of hooks and 2 rows of suckers, or with 2 rows of hooks and several small suckers between them (suckers only present in larvae and juveniles) . . . . . → ***4***

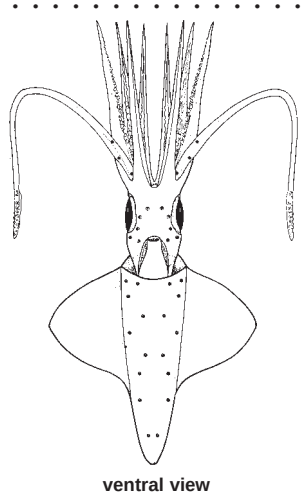


Fig. 1 ***Ancistrocheirus***

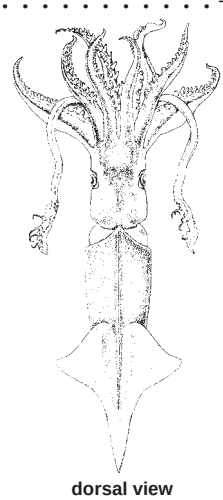


Fig. 2 ***Enoploteuthis***

(illustration: K. Hollis/ABRS)

4a. No large black globular light organs on tips of ventral arms; only silvery light organs may be present, smaller than diameter of arms; hooks in a single row on clubs; 5 to 8 light organs of different size and structure (posterior one usually differing from the others) on ventral side of eyeball; buccal membrane pink; left (sometimes right) ventral arm (IV) hectocotylized (Fig. 3) . . . . . ***Abralia***

4b. Three large light organs on tip of each ventral arm (appear like small black balls in preserved specimens, but are green in life); hooks in 2 rows on clubs; 5 round light organs of similar structure on ventral side of eyeball, both marginal light organs larger than middle ones, which are equal-sized; buccal membrane dark violet; right ventral arm (IV) hectocotylized . . . . . ***Abraliopsis***

5a. Hooks present on tentacular clubs and on ventral arms (IV); hooks on club in a single row and in 2 rows along entire length of ventral arms; 12 light organs on ventral side of eyeball; 10 light organs present inside the mantle cavity; 6 to 8 light organs present in the tentacular stalks; the right ventral arm hectocotylized in males; only the left oviduct developed in females . . . . . ***Pyroteuthis***

5b. No hooks on tentacular clubs and not more than 2 hooks on ventral arms (IV); a few hooks in 1 or 2 rows present in the middle of arms I to III; 14 to 15 light organs on ventral side of eyeball; 8 light organs present inside the mantle cavity; 4 light organs present in the tentacular stalks; left ventral arm hectocotylized in males; only the right oviduct developed in females (Fig. 4) . . . . . ***Pterygioteuthis***

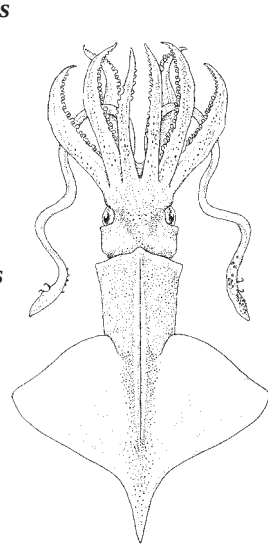


Fig. 3 ***Abralia***

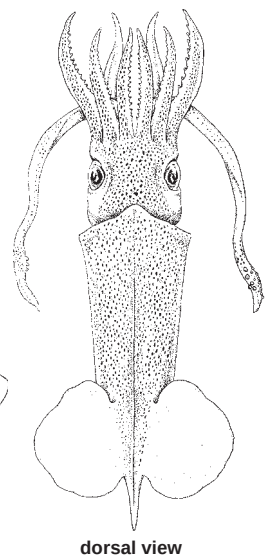


Fig. 4 ***Pterygioteuthis***

(illustration: K. Hollis/ABRS)

List of species occurring in the area

Abralia andamanica Goodrich, 1896
Abralia armata (Quoy and Gaimard, 1832)
Abralia astrolineata Berry, 1914
Abralia astrostricta Berry, 1909
Abralia lucens Voss, 1963
Abralia renschi Grimpe, 1931
Abralia similis Okutani and Tsuchiya, 1982
Abralia spaercki Grimpe, 1931

Abraliopsis chuni Nesis, 1982
Abraliopsis lineata (Goodrich, 1896)
Abraliopsis pfefferi Joubin, 1896

Ancistrocheirus lesueuri Férussac and d'Orbigny, 1839

Enoploteuthis galaxias Berry, 1912
Enoploteuthis jonesi Burgess, 1982
Enoploteuthis leptura magnoceani Nesis, 1982
Enoploteuthis reticulata Rancurel, 1970

Pterygioteuthis giardi Fischer, 1896

Pyroteuthis margaritifera (Rüppell, 1844)

References

Kubota, T., K. Iizuka, and T. Okutani. 1982. Some biological aspects of *Abralia andamanica* from Suruga Bay, Japan (Cephalopoda: Enoploteuthidae). *J. Fac. Mar. Sci. Tech., Tokai Univ.*, 15:333-343.

Okutani, T. 1976. Rare and interesting squid from Japan V. A gravid female of *Ancistrocheirus lesueuri* (d'Orbigny, 1839) collected in the Kuroshio Area (Oegopsida, Enoploteuthidae). *Venus*, 35:73-81.

Okutani, T. and S. Tsukada. 1988. Squids eaten by lancetfish and tunas in the tropical Indo-Pacific oceans. *J. Tokyo Univ. Fish.*, 75:1-44.

Rancurel, P. 1976. Note sur les Cephalopodes des contenus stomacaux de *Thunnus albacares* (Bonnaterre) dans le Sud-ouest Pacifique. *Cah. ORSTOM (Ser. Océanog)*, 14:71-80.

ONYCHOTEUTHIDAE

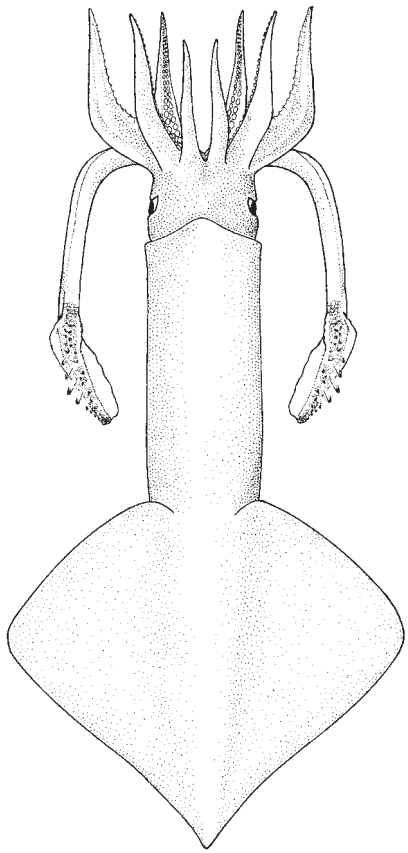
Hooked squids

by M.C. Dunning

Diagnostic characters: Medium-sized to large oceanic squids, with a strong, muscular torpedo-shaped mantle and **large muscular rhomboidal fins** attenuated posteriorly in some species. **Funnel locking cartilage simple, straight. Buccal connectives attached to ventral border of ventral arms**. **Arms with biserial and sometimes smooth suckers; tentacular clubs with biserial medial hooks** and 2 rows of marginal suckers in the immature stages. Club-fixing apparatus consisting of smooth-ringed suckers and corresponding knobs present at the base of the tentacular clubs. Hectocotylisation not evident in males. Numerous distinctive pleats or folds are present in the neck region in *Onychoteuthis* and *Ancistoteuthis* (see Fig. 2a), and the skin of *Moroteuthis* often contains subcutaneous papillae and ridges. Lateral arms have swimming keels in some of the larger species. Visceral light organs are present in the genus *Onychoteuthis*.

Habitat, biology, and fisheries: Onychoteuthids occur in tropical to polar waters in all oceans. They are oceanic squid, occasionally encountered in continental slope waters where they may be caught in demersal trawls. They feed on a broad range of fish, crustaceans including krill, squid, and other pelagic molluscs, and are at least partially cannibalistic. Known predators include lancetfish, tunas, whales, dolphins, seals, and albatrosses. Onychoteuthids form schools. Juvenile *Onychoteuthis* are able to leap above the surface to escape predators, as do ommastrephids, and sometimes are found on the decks of vessels. Immature *Moroteuthis* species share with other epipelagic cephalopods the deep blue dorsal day coloration characteristic of the neuston generally. Onychoteuthids are not fished commercially in the Western Central Pacific, although sometimes *Moroteuthis* are caught incidentally in demersal trawls in continental slope waters (300 to 600 m) off northern Australia and in the South China Sea.

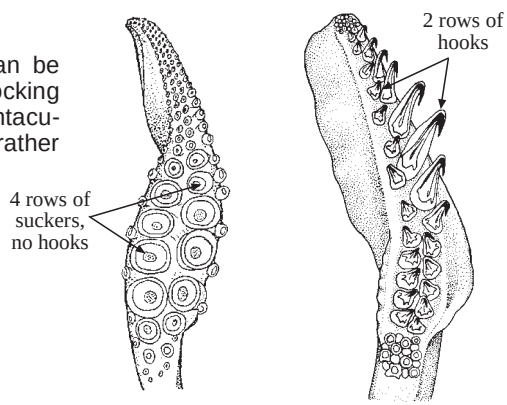
Remarks: Recent taxonomic studies have indicated that at least some tropical oceanic onychoteuthids previously assigned to the genus *Onykia* may be juveniles of various species of *Moroteuthis*.



dorsal view

Similar families occurring in the area

Ommastrephidae: also with an arrow-shaped fin, but can be distinguished by the following characters: funnel-mantle locking apparatus ⊥-shaped; sucker rings toothed; no hooks on tentacular clubs; buccal connectives attached to dorsal border (rather than to ventral border) of ventral arms.

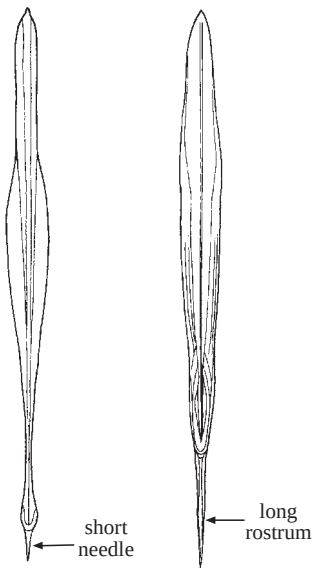


tentacular club Ommastrephidae **tentacular club Onychoteuthidae**

Key to the genera of Onychoteuthidae occurring in the area

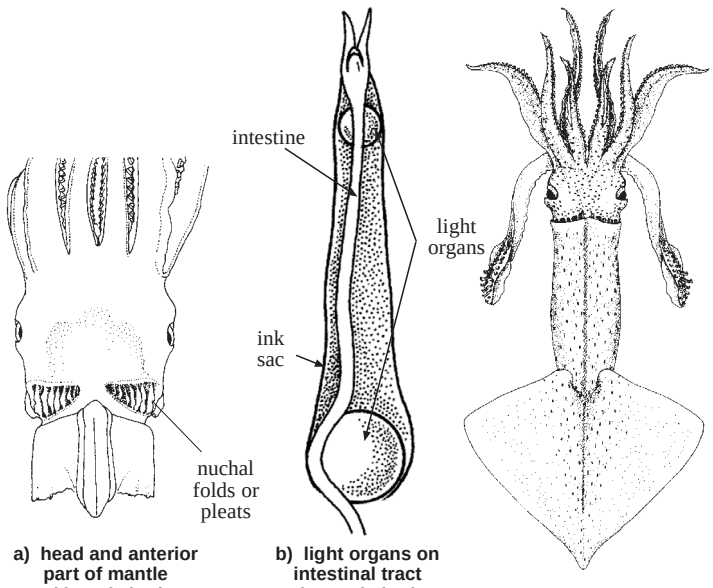
1a. Skin smooth; posterior end of gladius a short chitinous needle (Fig. 1a); light organs present: 1 elongated light organ on ventral side of eyeball, 2 light organs on intestine and ink sac (anterior one small, posterior one large) (Fig. 2a) . . . . . ***Onychoteuthis***

1b. Skin smooth or rough; posterior end of gladius a long opaque cartilaginous rostrum (Fig. 1b); no light organs present (Fig. 2b) . . . . . → ***2***



a) *Onychoteuthis* **b) *Ancistroteuthis, Moroteuthis***

Fig. 1 gladius

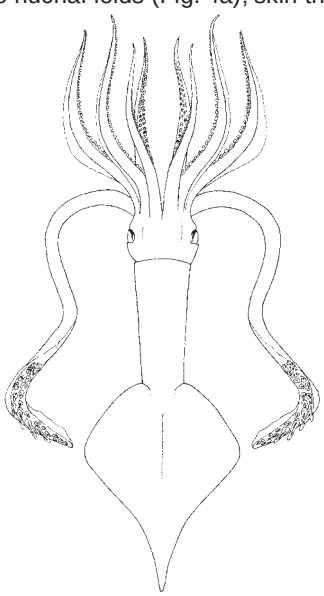


a) head and anterior part of mantle (dorsal view) **b) light organs on intestinal tract (ventral view)** **c) dorsal view**

Fig. 2 *Onychoteuthis*

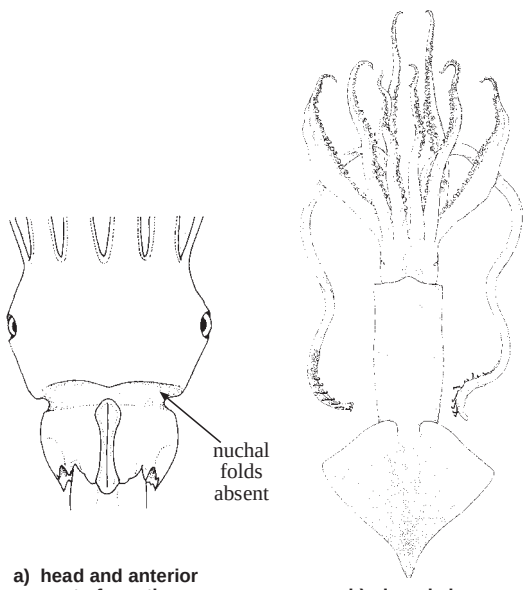
2a. Six to 10 well-developed nuchal folds; skin smooth (Fig. 3) . . . . . ***Ancistroteuthis***

2b. No nuchal folds (Fig. 4a); skin thick, rough, or tuberculate (Fig. 4b) . . . . . ***Moroteuthis***



dorsal view

Fig. 3 *Ancistroteuthis*



a) head and anterior part of mantle (dorsal view) **b) dorsal view**

(illustration: K. Hollis/ABRS)

Fig. 4 *Moroteuthis*

List of species occurring in the area

Ancistroteuthis lichtensteini (Orbigny, 1839)

Moroteuthis lönnbergi Ishikawa and Wakiya, 1914

Onychoteuthis "banksii" Leach, 1817 - species complex
Onychoteuthis compacta (Berry, 1913)
Onychoteuthis meridiopacifica Rancurel and Okutani, 1990

References

Kubodera, T., U. Piatkowski, T. Okutani, and M.R. Clareke. 1996. Taxonomy and Zoogeography of the Family Onychoteuthidae (Cephalopoda: Oegopsida). *Smithson. Contrib. Zool.*

Rancurel, P. 1976. Note sur les Cephalopodes des contenus stomacaux de *Thunnus albacares* (Bonnaterre) dans le Sud-ouest Pacifique. *Cah. ORSTOM (Ser. Océanog.)*, 14:71-80.

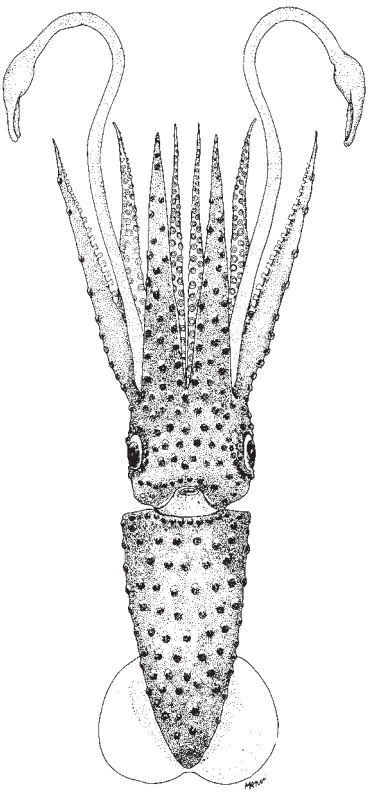
Tsuchiya, K and T. Okutani. 1991. Growth stages of *Moroteuthis robusta* (Verrill, 1881) with a re-evaluation of the genus. *Bull. Mar. Sci.*, 49:137-147.

HISTIOTEUTHIDAE

Jewel squids, umbrella squids

by M.C. Dunning

Diagnostic characters: Medium-sized to large squids. **Characterized by a simple, straight funnel-mantle locking apparatus. Many large, anteriorly-directed light organs over the surface of mantle, head, and arms**, more concentrated on the ventral surface. Unmodified toothed suckers arranged biserially on arms, and in 4 and 8 rows on tentacular clubs. **Buccal connectives attached to dorsal border of ventral arms**. Both dorsal arms (I) usually hectocotylized in males. Head large in adults, with **left eye considerably larger than right eye.** Most species with mantle relatively short, broad, conical, and typically somewhat gelatinous (like the rest of the body). Terminal fins consist of separate oval lobes, free anteriorly but united posteriorly with a distinct median notch on the posterior border; the convex posterior margin of the fins may extend posteriorly beyond the mantle. Internal light organs absent. The light organ pattern on the mantle, head, and arms and the presence of enlarged terminal light organs on the arms are specific characters and may be used in ventral countershading. The species show considerable variation in the development of a web connecting the inner margins of the arms, extending up to 50% of the arm length in some species.



Histioteuthis celetaria pacifica
ventral view

(after Voss, 1969)

Habitat, biology, and fisheries: The only genus of the family, *Histioteuthis*, comprises oceanic species, also occurring on the continental slope. No comprehensive life history studies of any histioteuthid in tropical waters have been conducted. Mature eggs of *H. miranda* have a maximum diameter of 0.8 mm. The number and size of beaks in sperm whale stomachs indicate that histioteuthids are schooling species. Although the family is considered to be primarily mesopelagic, *H. celetaria pacifica* and *H. miranda* have been caught frequently in deep-water lobster trawls at depths of 300 to 600 m off northern Australia, and the latter species in demersal trawls in slope waters of the South China Sea, suggesting that they are associated with the bottom during part of their life cycle. They are important in the diets of sperm whales and also form part of the diets of yellowfin and albacore tuna, scabbard fish, lancetfish, spotted dolphin, and perhaps albatrosses elsewhere. Fish predominates in the diet of adult histioteuthids. Off Hawaii, *H. dofleini* shows both diel vertical migration and ontogenetic descent. Small jewel squids occur at depths from 200 to 300 m during the night and descend to 400 to 700 m during the day. Larger adults have been caught at depths of up to 800 m and only occasionally deeper. Other species are more common in waters of 2 000 m and are captured only rarely in the upper 200 m. Histioteuthids are not presently of commercial interest. Although some histioteuthid species reach in excess of 200 mm mantle length and are frequently, if not abundantly, encountered in continental slope waters, the gelatinous nature of their bodies and high ammonium content would detract from their market acceptance.

Similar families occurring in the area

None. Jewel squids are readily distinguished from other cephalopods by the anteriorly-directed light organs which cover the surface of the mantle, head, and arms.

List of species occurring in the area

Histioteuthis celetaria pacifica (Voss, 1962)
Histioteuthis dofleini (Pfeffer, 1912)
Histioteuthis miranda (Berry, 1918)
Histioteuthis meleagroteuthis (Chun, 1910)

Reference

Voss, N.A. 1969. A monograph of the Cephalopoda of the North Atlantic. The family Histioteuthidae. *Bull. Mar. Sci.*, 19:713-867.

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OMMASTREPHIDAE

Arrow squids, flying squids

by M.C. Dunning

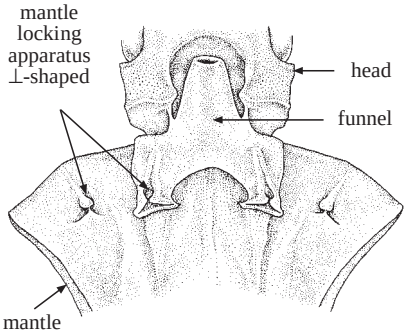
Diagnostic characters: Medium to large oegopsid squid (to 400 mm mantle length) with a strong, muscular torpedo-shaped mantle. Large muscular fins generally rhomboidal but may be attenuated posteriorly to varying degrees. Lateral arms (II, III) strongly keeled in many species. **Funnel-mantle locking apparatus ⊥-shaped**, sometimes fused with mantle and funnel elements. **Suckers arranged biserially on arms and tetra-serially on tentacular clubs;** chitinous sucker rings with sharp conical teeth. **Buccal connectives attached to dorsal border of ventral arms (IV). Light organs present in some species on dorsal and ventral mantle, viscera, and ventrally on eyes and head**. Mouth surrounded by 10 appendages (8 arms, 2 tentacles). One or both ventral arms hectocotylized in males, modifications vary from elaborate development and sculpturing of sucker bases and trabeculae to simple loss of suckers and stalks and development of protective membranes. Unlike most teuthoids which hatch as miniatures of the adults, ommastrephids have a distinct larval form, the rhynchoteuthion, in which the precursors to the tentacles remain fused along their length into a proboscis with a terminal disc of suckers until the larva reaches about 5 mm mantle length.



mantle locking cartilage

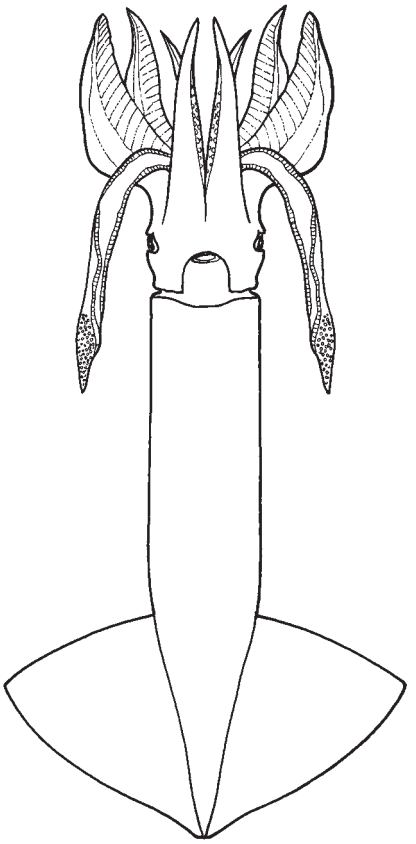


funnel locking cartilage



internal view of anterior mantle

(illustration: K. Hollis/ABRS)

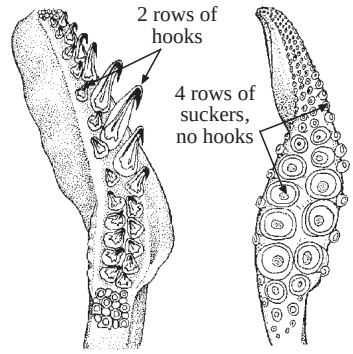


ventral view

Habitat, biology, and fisheries: In the Western Central Pacific, adult members of this family occur in deeper continental shelf, slope and throughout oceanic waters. Larvae and juveniles may also be found in shallow coastal waters. Ommastrephids are nektonic squid, associated with all depth strata from the surface to near the bottom. They are capable of extensive vertical and horizontal migrations. Ommastrephids feed on a broad range of crustaceans, fish, squid and other pelagic molluscs, and are at least partially cannibalistic. Known predators include seabirds, teleosts and sharks, whales, and dolphins. Ommastrephids form schools, which decrease in size as the animal grows. Evidence from commercial fishing operations suggests that neritic species congregate close to the bottom during the day, and move up through the water column at night. Oceanic species are often seen feeding at the surface at night. Juveniles of several species are able to glide like exocoetid flying fish to escape predators for distances in excess of 10 m. There is evidence for long-distance migration associated with spawning in some species. Ommastrephid squid are caught incidentally in demersal trawls in shelf and slope waters in the area. Also caught using baited or artificial lures or jigs, generally operated by hand. Exploratory use of jigging machines has been attempted for several species in the area with limited success. No target fisheries for these species currently exist in the area and regional catch statistics do not separate ommastrephids from other squids in most cases. The shelf and slope species in the area (*Todarodes pacificus, Nototodarus hawaiiensis*) are unlikely to represent large resources with the exception of the broader slope areas off northwestern and northeastern Australia and in the South China Sea. The resource of the oceanic ommastrephids (especially *Sthenoteuthis oualaniensis*) may be large and is probably underexploited.

Similar families occurring in the area

Onychoteuthidae: also relatively large muscular squids with an arrow-shaped terminal fin, but can be distinguished by the following characters: funnel-mantle locking cartilage simple, straight; tentacular clubs with biserially arranged hooks and marginal suckers; buccal connectives attached to ventral border (rather than to dorsal border) of ventral arms.



Key to the species of Ommastrephidae occurring in the area

Note: most ommastrephid species are easily identified in the field as adults. However, ontogenetic development or loss of light organs and variability in sucker dentition with growth may make identification of specimens smaller than 80 mm mantle length more difficult and specimens should be preserved and referred to regional teuthologists for confirmation.

1a. Light organs apparent externally on head and/or mantle (skin may need to be removed to observe dorsal mantle light organs) . . . . . → ***2***

1b. No light organs visible externally . . . . . → ***4***

2a. A large oval light-organ patch present on dorsal mantle just posterior to head (Fig. 1a); funnel and mantle cartilages of locking apparatus fused (Fig. 1b) . . . ***Sthenoteuthis oualaniensis***[1/]
(form with a dorsal light-organ patch)

2b. Light organs clearly visible on ventral mantle and head, no light organs evident on dorsal mantle; funnel and mantle cartilages of locking apparatus not generally fused . . . . . → ***3***

3a. Nineteen spherical light organs arranged in a distinctive pattern on ventral mantle (Fig. 2) . . . . . ***Hyaloteuthis pelagica***

3b. Light organs form 2 longitudinal stripes along the length of ventral mantle (Fig. 3) . . . . . ***Eucleoteuthis luminosa***

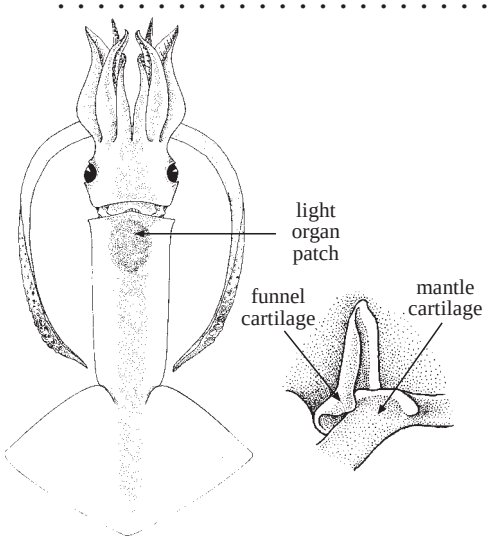


Fig. 1 ***Stenoteuthis oualaniensis***

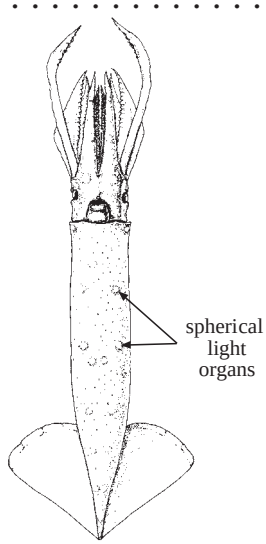


Fig. 2 ***Hyaloteuthis pelagica***
(after Wormuth, 1976)

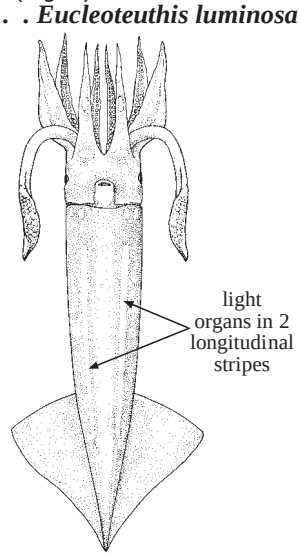


Fig. 3 ***Eucleoteuthis luminosa***

1/ Two forms of *Sthenoteuthis oualaniensis*, the larger more abundant form with, and the smaller without, a dorsal light-organ patch, are known from the area. The former reaches in excess of 300 mm mantle length while females of the latter form reach maturity at less than 200 mm mantle length. It remains unresolved as to whether these represent separate species or whether onset of reproductive maturation at a small size triggered by unknown factors inhibits the formation of the light organ patch in the smaller form.

4a. Mantle very slender, with elongated posterior tail (Fig. 4) . . . . . ***.Ornithoteuthis volatilis***

4b. Mantle moderately stout, without an elongated tail (Fig. 5) . . . . . → ***5***

5a. Large medial tentacular sucker rings with a large tooth in each quadrant, separated by smaller subequal teeth (Fig. 5a) . . . . . → ***6***

5b. Large medial tentacular sucker rings with equal-sized or subequal teeth or with a single larger tooth present distally (Fig. 5b, c) . . . . . → ***7***

6a. Two small round light organs on the intestine, one anteriorly near the anus and the other posteriorly (Fig. 6); ventral mantle uniformly coloured . . . . . ***Sthenoteuthis oualaniensis***[2/]
(form without a dorsal light-organ patch)

6b. No light organs on the intestine, but small spherical sub-cutaneous light organs distributed broadly in the ventral mantle in larger specimens (visible in the mantle wall when cut midventrally); mantle with a midventral bronze stripe (Fig. 7) . . . . . ***Ommastrephes bartramii***

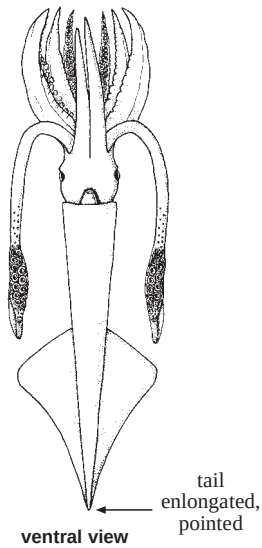


Fig. 4 ***Ornithoteuthis volatilis***

7a. Medial tentacular sucker rings with approximately 30 subequal teeth (Figs 8a and 9) . . ***Todaropsis eblanae***

7b. Medial tentacular sucker rings with less than 25 teeth (Fig. 8a, c) . . . . . → ***8***

8a. Medial tentacular sucker rings with a single larger tooth distally (Fig. 8c) . . . . . → ***9***

8b. Medial tentacular sucker rings with 16 to 20 subequal teeth (Figs 8b and 10) . . . . . ***.Todarodes pacificus*** subspecies

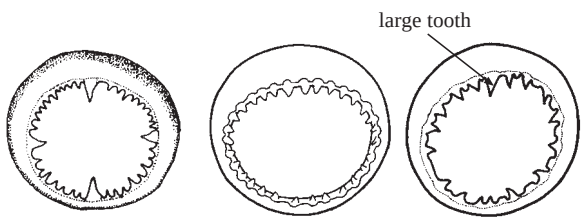


Fig. 5 tentacular sucker rings

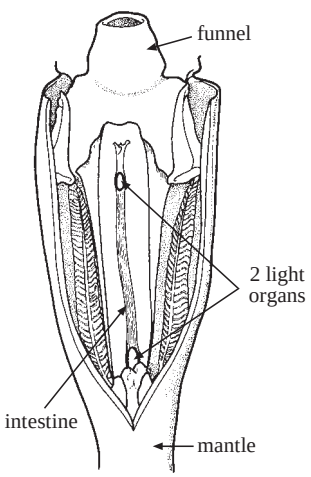


Fig. 6 ***Sthenoteuthis oualaniensis***

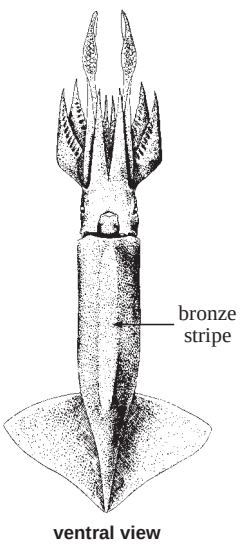


Fig. 7 ***Ommastrephes bartramii***

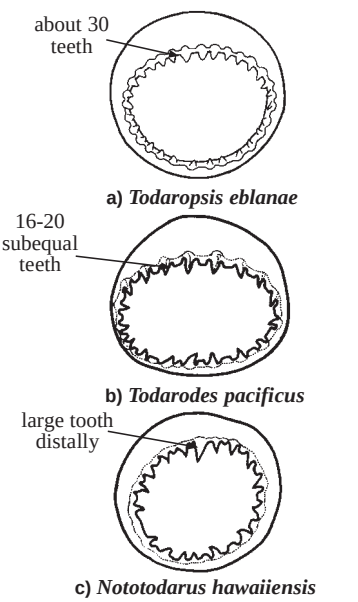
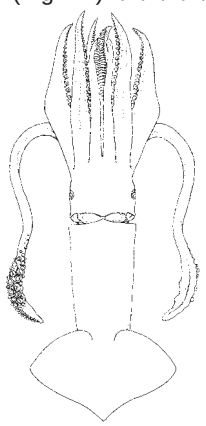


Fig. 8 medial tentacular sucker rings

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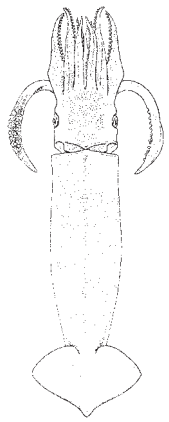
9a. Arms with less than 30 transverse rows of biserial suckers; skin appears rough (Fig. 11) . . . . . ***Nototodarus hawaiiensis***

9b. Arms with more than 35 transverse rows of biserial suckers; skin appears smooth (Fig. 12) . . . . . ***Nototodarus gouldi***



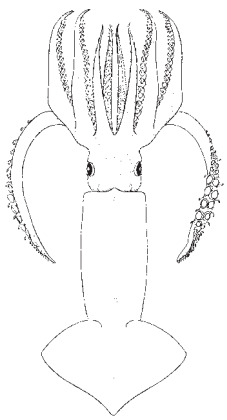
dorsal view

Fig. 9 ***Todaropsis eblanae***



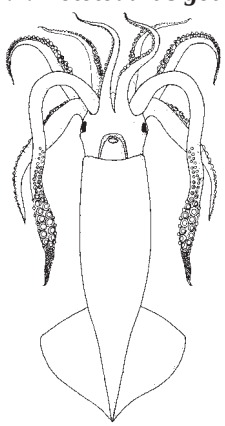
dorsal view

Fig. 10 ***Todarodes pacificus***



dorsal view

Fig. 11 ***Nototodarus hawaiiensis***



ventral view

Fig. 12 ***Nototodarus gouldi***

(illustration: K.Hollis/ABRS)

List of species occurring in the area

The symbol ♜ is given when species accounts are included.

Eucleoteuthis luminosa (Sasaki, 1915)

Hyaloteuthis pelagica (Bosc, 1802)

Nototodarus gouldi (McCoy, 1888)

♜ *Nototodarus hawaiiensis* (Berry, 1912)

♜ *Ommastrephes bartramii* (Lesueur, 1821)

Ornithoteuthis volatilis (Sasaki, 1915)

♜ *Sthenoteuthis oualaniensis* (Lesson, 1830)

♜ *Todarodes pacificus* Steenstrup, 1880

♜ *Todaropsis eblanae* (Ball, 1841)

References

Dunning, M.C. 1988a. *Todarodes pacificus pusillus* new subspecies (Cephalopoda, Ommastrephidae) from northern Australian waters. *Mem. Natl. Mus. Vict.*, 49:149-157.

Dunning, M.C. 1988b. First record of *Nototodarus hawaiiensis* (Berry, 1912) from northern Australian waters with a reconsideration of the identity of *N. sloani philippinensis* Voss, 1962. *Mem. Natl. Mus. Vict.*, 49:159-168.

Dunning, M.C. (in press). A review of the systematics, distribution and biology of the arrow squid genera *Ommastrephes* Orbigny, 1835, *Sthenoteuthis* Verrill, 1880, and *Ornithoteuthis* Okada, 1927 (Cephalopoda, Ommastrephidae). *Smithson. Contrib. Zool.*

Dunning, M.C. and S.B. Brandt. 1985. Distribution and life history of deep-water squid of commercial interest from Australia. *Aust. J. Mar. Freshwat. Res.*, 36:343-359.

Dunning, M.C. and J.H. Wormuth. (in press). The ommastrephid squid genus *Todarodes*: a review of systematics, distribution and biology. *Smithson. Contrib. Zool*.

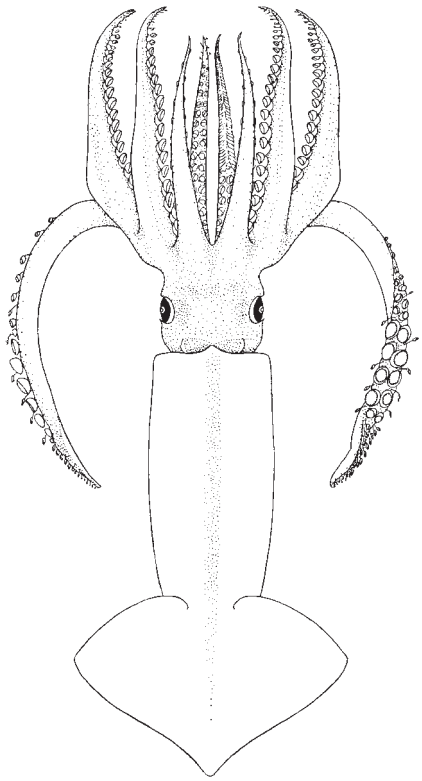
Lu, C.C. 1982. First record of *Todaropsis eblanae* (Ball, 1841) (Cephalopoda: Oegopsida) in the Pacific Ocean. *Venus*, 41:67-70.

Lu, C.C. and M.C. Dunning. 1982. Identification guide to Australian arrow squid (Family Ommastrephidae). *Tech. Rep. Vict. Inst. Mar. Sci*., 2:1-30.

Nesis, K.N. 1979. Squid of the family Ommastrephidae in the Australian - New Zealand Region. *Tr. Inst. Okeanol.*, 109:140-146 (in Russian).

Wormuth, J.H. 1976. The biogeography and numerical taxonomy of the oegopsid squid family Ommastrephidae in the Pacific Ocean. *Bull. Scripps Inst. Oceanogr.*, 23:1-90.

Nototodarus hawaiiensis (Berry, 1912)

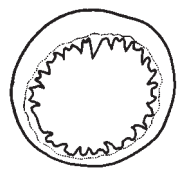


(after Voss, 1963)

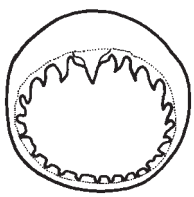
Frequent synonyms / misidentifications: *Nototodarus philippinensis* Voss, 1962; *N. nipponicus* Okutani and Uemura, 1973 / *N. gouldi* (McCoy, 1888).

FAO names: En - Hawaiian flying squid; **Fr** - Encornet bouquet; **Sp** - Pota hawaiana.

Diagnostic characters: Mantle cylindrical, moderately muscular, with abrupt caudal taper; fins short, rhombic. Head large, slightly wider than mantle. Mantle element of T-shaped locking apparatus with straight ridge, **no muscular fusion to funnel element; funnel groove with foveola but no side pockets**. Arms subequal and large, the longest slightly less than half the mantle length; swimming keels show greatest development on arms III; largest arm suckers with 9 to 16 conical teeth interspersed with low flat truncated teeth, **distal tooth significantly larger**; **arms with 19 to 28 transverse rows of suckers**. Protective membranes and their supports of uniform height, not higher than suckers. **Hectocotylization in males involving both ventral arms (IV)**; left ventral arm modified proximally by the enlargement of the first 4 or 5 pairs of sucker bases as sculptured cushions; right ventral arm mirrors its partner proximally and shows modification of the distal ventral protective membrane supports and the sucker bases to form the equivalent of three columns of papillae; right ventral arm slightly shorter than its partner. **Suckers of tentacular manus** in 9 to 11 tetraserial rows; **largest medial manus sucker rings with 14 to 18 moderately large conical teeth interspersed with low horny plates, one distal conical tooth significantly larger**. Fixing apparatus absent. **Light organs absent in larvae, juveniles and adults. Colour:** mantle and arms chestnut brown with a distinctly darker brown dorsal stripe along the mantle midline broadening over head and extending anteriorly as thin stripes along the arms.



tentacular club sucker ring



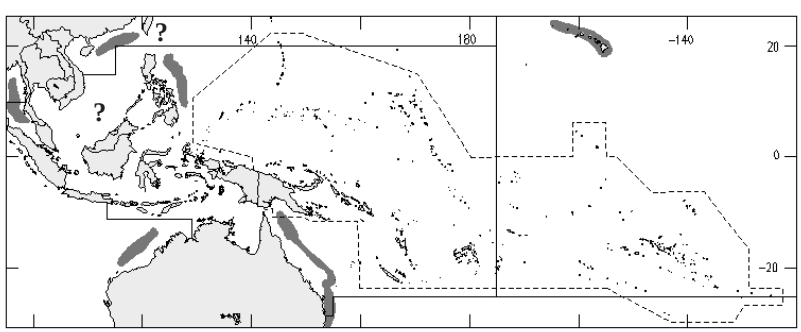
arm III sucker ring

(from Voss and Williamson, 1971)

Size: Maximum mantle length 250 mm, commonly to 150 mm.

Habitat, biology, and fisheries: Occurs predominantly in continental slope waters from depths of more than 200 m to at least 500 m although small juveniles and larvae have also been caught in adjacent shelf waters. Only occasionally taken on jigs in the area near the surface suggesting it is predominantly demersal rather than pelagic; alternatively, may not be as positively phototactic as most ommastrephids. Size at reproductive maturity seasonally variable in northern Australian populations; males generally mature from 130 mm and females from 150 mm mantle length; occurrence of mature females and larvae indicates that spawning occurs throughout the year. Caught incidentally in demersal trawling in deep water and occasionally abundant in catches. No targeted fisheries. Suitable for human consumption and used as bait.

Distribution: Widespread in deeper shelf and slope waters throughout the Indo-Pacific region from east Africa to Sri Lanka, northern Australia, Philippines, around Hong Kong (China), southern Japan, Hawaii, seamounts of the southeastern Pacific off Peru.

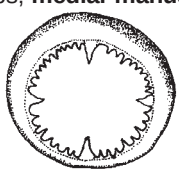


Ommastrephes bartramii (Lesueur, 1821)

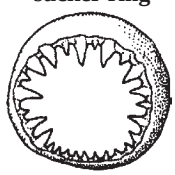
Frequent synonyms / misidentifications: *Ommastrephes caroli stenodactyla* Rancurel, 1976 / *Dosidicus gigas* of Brazier, 1892.

FAO names: En - Neon flying squid; **Fr** - Encornet volant; **Sp** - Pota saltadora.

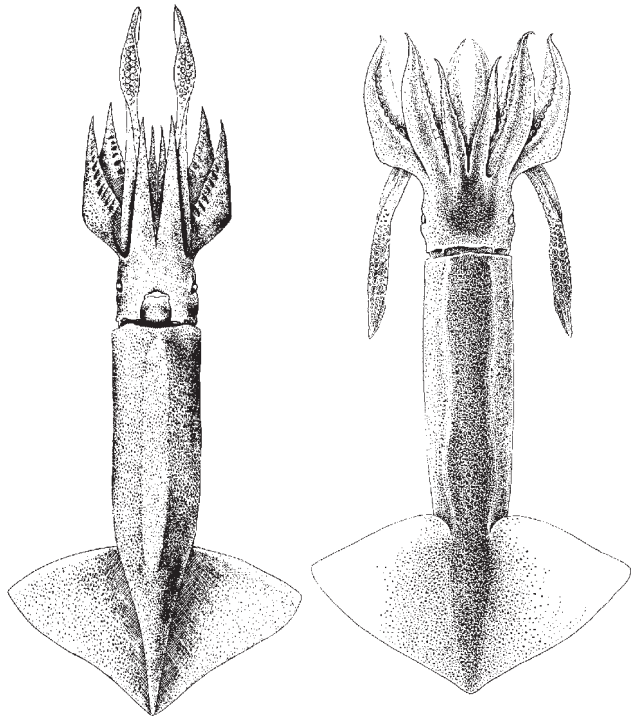
Diagnostic characters: Funnel groove with foveola and side pockets. Tetraserial suckers on dactylus of tentacular clubs; **medial manus sucker rings with 1 tooth in each quadrant greatly enlarged**; carpal fixing apparatus consisting of smooth-ringed suckers and knobs on the tentacular stalk. **Small, irregularly-shaped, subcutaneous light organs present in adults, embedded in the ventral mantle and ventrally in the head**; no light organs in larvae. Either left or right ventral arm (IV) hectocotylized by complete loss of suckers and sucker bases distally in mature males. **Mantle-funnel locking apparatus not fused**.



tentacular club sucker ring



arm III sucker ring

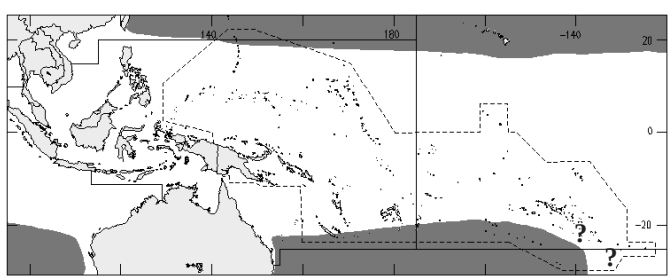


ventral view **dorsal view**

Size: Maximum mantle length 700 mm (females) and 400 mm (males), commonly between 300 and 450 mm mantle length.

Habitat, biology, and fisheries: *Ommastrephes bartramii* occurs as mature adults and larvae around the northern Hawaiian Islands but is very rare between 25°N and the equator in the western North Pacific. In the southwest Pacific, adult *O. bartramii* have been caught between 23°42' S and 45°45' S where surface water temperatures varied from 14.2° to 25.7°C and larvae as far north as 24°S in East Australian Current waters. Adult *O. bartramii* are known to occupy a broad depth range both day and night from the surface to at least 1 500 m. An adult female in the northwest Pacific carrying an ultrasonic tag remained in the upper 100 m (mostly 40 to 70 m) during the night but stayed below 400 m depth during the day. The vertical distribution of larvae and juveniles remains poorly known. Male *O. bartramii* first reach maturity from 320 mm mantle length in the southwest Pacific. Considerable variation was evident in size of maturity of females in summer catches in this region. The smallest female observed with oviducal eggs measured 420 mm mantle length while the largest female with no eggs in the oviducts was 550 mm mantle length. An examination of the degree of development of the web on the ventrolateral arms in *O. bartramii* of both sexes suggests that growth of this structure is correlated with development of reproductive organs. Mature males and a female (520 mm mantle length) washed ashore near New Caledonia in October 1973, indicating that, in addition to off the central eastern Australian coast, spawning may be occurring in this region in spring. Its rarity in the area makes it of little importance as a target fisheries species. However, the northern and southern border regions of the Western Central Pacific may be important as a spawning ground and larval habitat for this species.

Distribution: *Ommastrephes bartramii* is the dominant surface-dwelling oceanic ommastrephid circumglobally in subtropical and temperate oceanic waters and is only rarely encountered in continental slope waters and tropical latitudes. This bisubtropical species is the most widespread of all the ommastrephids. It is replaced as the dominant ommastrephid in tropical Indo-Pacific waters by *Sthenoteuthis oualaniensis*.

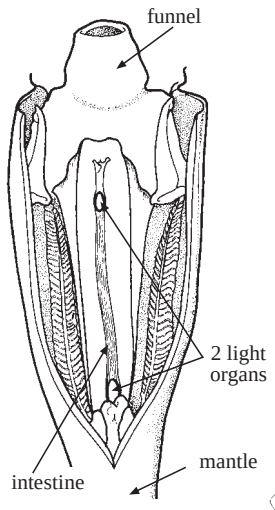


Sthenoteuthis oualaniensis (Lesson, 1830)

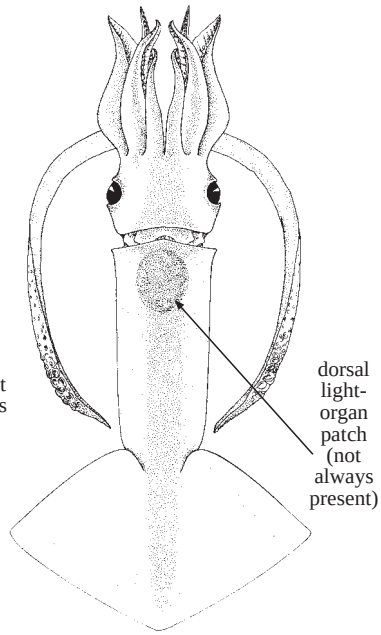
Frequent synonyms / misidentifications: *Symplectoteuthis oualaniensis* (Lesson, 1830) / None.

FAO names: En - Purpleback flying squid; **Fr** - Encornet bande violette; **Sp** - Pota cárdena.

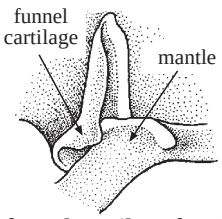
Diagnostic characters: Mantle cylindrical, very muscular, with abrupt caudal taper; fins large rhombic, with fin angle 60 to 70°. Head large, only slightly narrower than mantle. **Mantle element of T-shaped locking apparatus curved with an anterior bifurcation, fused to funnel element** along the posterior third of the longitudinal groove. **Funnel groove with foveola and side pockets**; tetraserial suckers on the dactylus of the tentacular club; **medial manus sucker rings with 1 tooth in each quadrant greatly enlarged, 5 to 7 subequal teeth in between**; carpal fixing apparatus consisting of smooth-ringed suckers and knobs on the tentacular stalk; 2 approximately equal-sized light organs present between the intestine and ink sac in larvae and juveniles, one anteriorly near the anus and the other posteriorly; single, oval light organ also present ventrally on each eye in larvae and juveniles; **large dorsal light organ may be present in larger individuals anteriorly on the mantle**. Either left or right ventral arm (IV) hectocotylized in mature males, 6 to 8 pairs of normal suckers proximally, sucker stalks and bases lost distally and pores developed in the thickened dorsal and ventral protective membranes basally and medially.



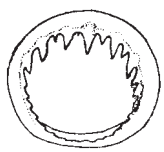
internal view of anterior ventral mantle
(after Wormuth, 1976)



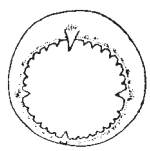
dorsal view



funnel cartilage fused with mantle cartilage



arm III sucker ring

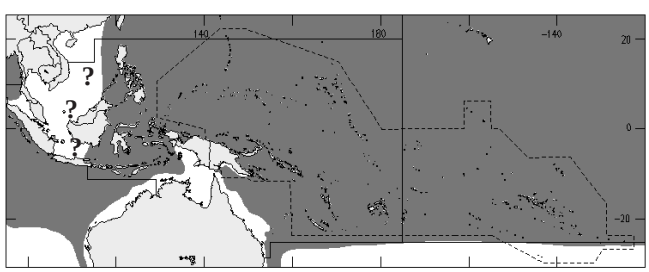


tentacular club sucker ring

Size: Maximum mantle length for the large form to about 300 mm in the area, commonly to about 200 mm mantle length (another larger form from the northwestern Indian Ocean reaches 650 mm mantle length).

Habitat, biology, and fisheries: Adults generally occur only where bottom depth is greater than 200 m, larvae and juveniles occur also in clear, shallower water including around coral reefs. The more abundant large form with the dorsal light organ patch occurs in oceanic waters throughout the area, capable of extensive vertical migrations but also found in surface waters day and night, occurs in small schools (about 30 individuals) of like size. Males of the large form reach maturity at 110 mm mantle length, females at 180 mm mantle length but with seasonal and geographic variability; spawning appears to be geographically widespread in continental slope waters and occurring year-round; spawning migrations have been reported from around Taiwan Province of China. Males of the small maturing form reach maturity at 90 mm mantle length and females at 130 mm mantle length, spawning times and locations for this form unknown. Preys primarily upon small pelagic fishes and crustaceans, cooperatively hunting with other school members. Supports local fisheries around Nansei Islands (Okinawa) and Taiwan Province of China from Spring to Autumn, caught by hand jigging, mechanized jigging has been tried around Okinawa and Fiji without success, used for human consumption and for bait for tuna.

Distribution: Tropical waters throughout the Indo-Pacific region, from Okinawa in the north to northern Australia and from East Africa to the eastern central Pacific.



Remarks: *S. oualaniensis* as it is currently recognized includes 2 forms in the Western Central Pacific, one with and the other without a large dorsal light organ patch on the anterior mantle in adults. The former reaches in excess of 300 mm mantle length while females of the latter form reach maturity at less than 200 mm mantle length. The dorsal light organ patch develops in specimens from 65 mm mantle length and is readily visible at 100 mm mantle length.

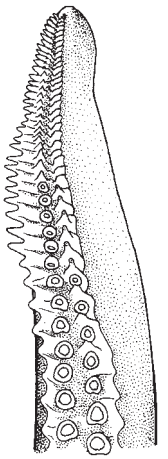
Todarodes pacificus Steenstrup, 1880

SQJ

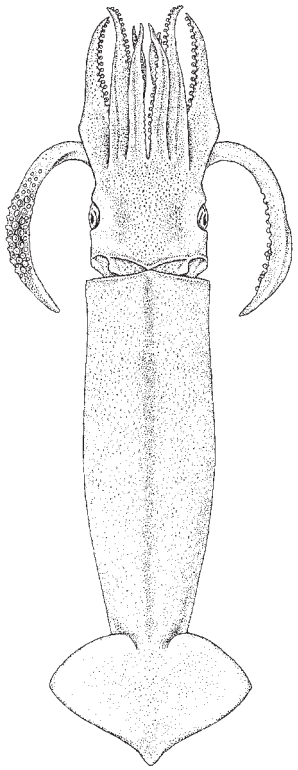
Frequent synonyms / misidentifications: *Ommastrephes sloani pacificus* Sasaki, 1929 / *Nototodarus philippinensis* Voss, 1962 (= *N. hawaiiensis* (Berry, 1912)).

FAO names: En - Japanese flying squid; **Fr** - Toutenon japonais; **Sp** - Pota japonesa.

Diagnostic characters: Mantle cylindrical, slender, only moderately muscular, with abrupt caudal taper; fins short, rhombic. Head large, only slightly narrower than mantle. Mantle element of T-shaped locking apparatus with straight ridge, **no muscular fusion to funnel element; funnel groove with foveola but no side pockets**. Arms subequal and large, the longest slightly less than half the mantle length; swimming keels well developed; **largest arm sucker rings with 9 to 11 sharp subequal somewhat flattened teeth**; protective membranes and their supports of uniform height, not higher than suckers. **Only right ventral arm (IV) hectocotylize in males;** arm slightly thicker and shorter than its partner; 44 to 48 normal arm suckers present proximally in *T. pacificus pacificus*, 11 to 13 in *T. pacificus pusillus* Dunning, 1988; approximately 20 pairs of trabeculae present in modified distal section forming an undulating spatula on the dorsal edge in both subspecies; in *T. p. pacificus* the hectocotylus represents about 30% of the arm length, in *T. p. pusillus,* it reaches 45 to 57%. Suckers of tentacular manus in 6 to 8 tetraserial rows; **largest medial manus sucker rings with 16 to 18 moderately large subequal conical teeth interspersed with low horny plates**. **Light organs absent**. **Colour:** dorsal mantle brown with a distinct deep blue-black dorsal stripe along the mantle midline broadening over head and extending anteriorly as thin stripes along aboral edges of dorsal and dorsolateral arms.

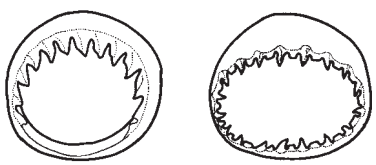


right arm IV of male hectocotylized



dorsal view

Todarodes pacificus pusillus
(illustration: K. Hollis/ABRS)

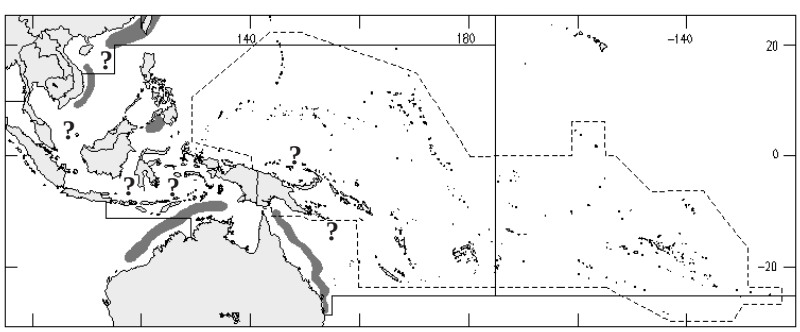


arm III sucker ring **tentacular club sucker ring**

(after Voss and Williamson, 1971)

Size: Maximum mantle length *T. p. pacificus* 500 mm, commonly 300 mm in temped Japan, less than 200 mm off Hong Kong and in the South China Sea; *T. p. pusillus* from northern Australia reaches a maximum mantle length of less than 100 mm.

Habitat, biology, and fisheries: Two subspecies are presently recognized: *Todarodes pacificus pacificus* Steenstrup, 1880, and *Todarodes pacificus pusillus* Dunning, 1988. Occurs in mid-shelf to slope waters in tropical latitudes, in shallow coastal to near oceanic waters in temperate latitudes. Populations around Japan are highly migratory and occur in large aggregations around oceanic fronts, seamounts and gyres where food is abundant. Feed primarily on small pelagic fishes (including anchovies, myctophids) and crustaceans; cannibalism is common. Predators include tunas, dolphins, and whales. Major mechanized jig fishery in the northwest Pacific, catches there have exceeded 600 000 t; also caught in coastal set nets and demersal trawls. Incidental trawl catches only in the Western Central Pacific. Large established markets in Japan, Korea, and Taiwan Province of China as fresh, frozen, processed, dried, and canned product.



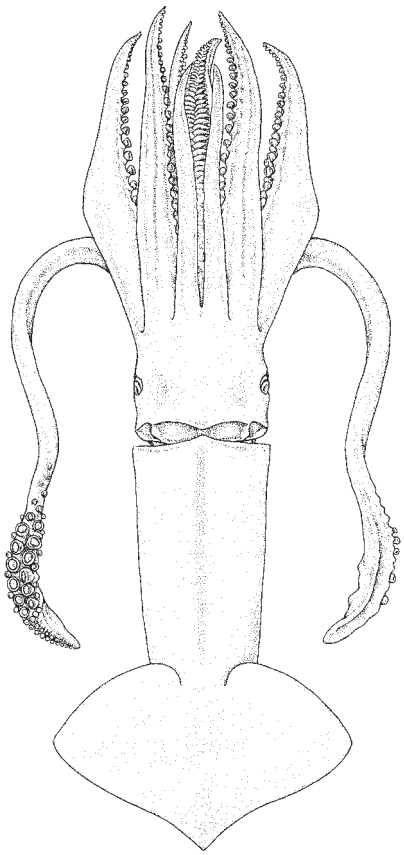
Distribution: Widespread in continental shelf and upper slope waters of the northwestern Pacific, from north of Japan to northern Australia.

Todaropsis eblanae (Ball, 1841)

Frequent synonyms / misidentifications: None / None.

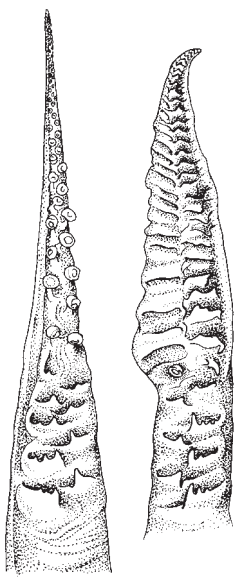
FAO names: En - Lesser flying squid; **Fr** - Toutenon souffleur; **Sp** - Pota costera.

Diagnostic characters: Mantle cylindrical, moderately muscular, relatively short with abrupt caudal taper; fins less than 50% mantle length but broad (about 90% mantle length), rhombic. Head large, slightly wider than mantle. Mantle element of T-shaped locking apparatus with straight ridge, **no muscular fusion to funnel element; funnel groove without foveola or side pockets**. Arms subequal and large, the longest more than half the mantle length; swimming keels show greatest development on arms III; largest arm suckers with about 10 conical teeth on the distal margin, **distal tooth only marginally larger**. Protective membranes and their supports of uniform height, not higher than suckers. **Hectocotylization in males involving both ventral arms (IV)**; suckers on proximal 20 to 30% of both arms lost and trabeculae modified into hard bracket-like structures; right ventral arm mirrors its partner proximally and shows modification of the protective membrane supports and the sucker bases to broad fan-like brackets as on the proximal portion; right ventral arm slightly shorter than its partner. **Suckers of tentacular manus in 6 tetraserial rows**; **largest medial manus sucker rings with 30 or more subequal, regularly spaced small conical teeth**. Fixing apparatus absent. **Light organs absent. Colour:** mantle and arms golden-brown with a darker brown dorsal stripe along the mantle midline.



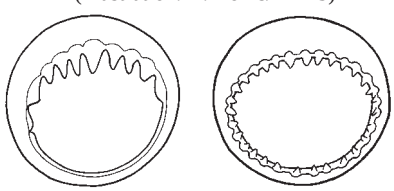
dorsal view

(illustration: K. Hollis/ABRS)



left arm **right arm**

arms IV of male hectocotylized

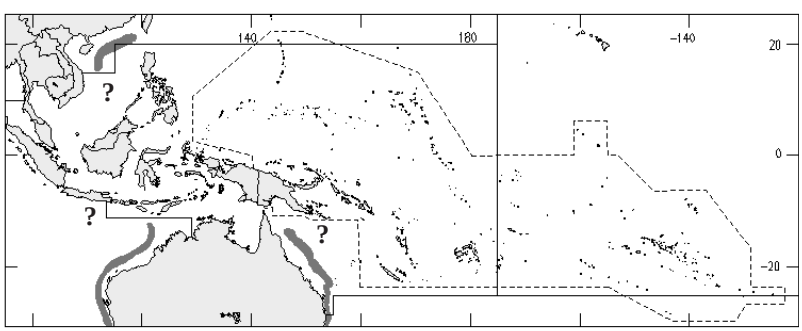


arm III sucker ring **tentacular club sucker ring**

Size: Maximum mantle length to about 160 mm.

Habitat, biology, and fisheries: Occurs predominantly in continental slope waters from depths of more than 200 m to at least 800 m (temperatures 9 to 17.5°C) although small juveniles have also been caught in adjacent deeper shelf waters. Demersal rather than pelagic as adults. Males generally mature from 90 mm and females from 150 mm mantle length in northern Australian waters; spawning season is apparently protracted from midsummer to winter. Caught incidentally in demersal trawling in deep water; sometimes caught together with *Nototodarus hawaiiensis* and *Todarodes pacificus* spp. No targeted fisheries. Suitable for human consumption.

Distribution: Occurs in the eastern Atlantic and Mediterranean, western Indian Ocean and Timor Sea, South China Sea, and off northeastern Australia in slope waters.



THYSANOTEUTHIDAE

Rhomboid squids, diamondback squids

by M.C. Dunning

A single species occurring in the area.

Thysanoteuthis rhombus Troschel, 1857

Frequent synonyms / misidentifications: *Thysanoteuthis nuchalis* Pfeffer, 1912 / None.

FAO name: En - Diamondback squid; **Fr** - Chipliloua commun; **Sp** - Chipirón volantín.

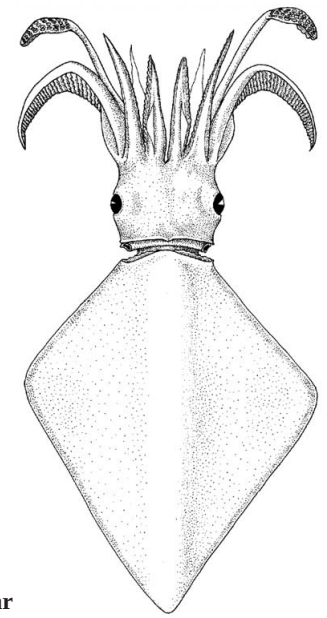
Diagnostic characters: A large squid. Mantle thick, muscular, tapering to a blunt tip posteriorly. **Fins rhombic, extending the entire length of mantle in adults**. **Funnel locking cartilage ⊣-shaped**, with a long narrow longitudinal groove and a short broad transverse groove. Sharp toothed suckers arranged in 2 rows on arms, and in 4 rows on tentacular clubs. Lateral arms (II, III) strongly keeled in large specimens. **Long, cirrate trabeculae on arms support a well-developed web**; buccal connectives attached to ventral border of ventral arms (IV). Left ventral arm hectocotylized in males. Light organs absent.



funnel locking cartilage



tentacular club

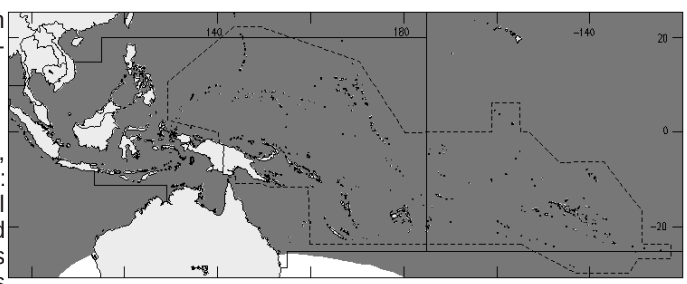


dorsal view

Size: Maximum mantle length 850 mm, commonly to 600 mm mantle length; maximum weight 24 kg.

Habitat, biology, and fisheries: The monotypic *Thysanoteuthis rhombus* is an oceanic species generally caught in the upper 50 m of the water column. Juveniles are apparently capable of leaping out of the water but do not "fly" (glide) in the same manner as ommastrephids and onychoteuthids. Adults are slow swimmers and are often observed in monogomous, pairs (male and female) although groups of up to 20 have been observed elsewhere. It is preyed upon by yellowfin tuna, lancetfish, spotted dolphin, and blue marlin. Females spawn gelatinous, sausage-shaped egg masses, 150 to 200 mm in diameter and up to 1 m long, which have been found near the surface. A spiral, double row of eggs of up to 2 mm diameter is contained in the external layers. Females are thought to be multiple spawners, the spawning season lasting perhaps a few months. In warm waters around Japan, spawning occurs during summer although in warmer tropical waters, it is thought to occur year-round. The smallest larvae hatch at 1.1 mm mantle length as near replicas of the adults. Recent studies of age and growth of this species in the tropical Atlantic have shown them to be fast growers, reaching maturity (450 mm mantle length for males, 600 mm mantle length for females) at less than 8 months of age; the oldest specimen examined (a 770 mm mantle length male) was 309 days old. *T. rhombus* is caught using drifting, sometimes baited jigs and set nets and is renowned for its tender flesh which is sometimes eaten as sashimi.

Distribution: Occurs circumglobally in tropical and warm subtropical oceanic waters but nowhere abundant.



Similar families occurring in the area

Octopoteuthidae (*Octopoteuthis*, *Taningia*), Enoploteuthidae (*Ancistrocheirus lesueuri*): also have long rhomboid fins, but biserial hooks instead of suckers on the arms and tentacular clubs; in addition, all have obvious light organs on the ventral mantle, arm tips or internally. Unlike *Thysanoteuthis*, these other oceanic squid are rarely encountered near the surface.

Loliginidae (*Sepioteuthis lessoniana*): has long fins extending the full length of the mantle but these are oval-shaped; also, the funnel-mantle locking apparatus is simple and straight, not ⊣-shaped. *Sepioteuthis* occurs only in continental shelf waters.

Reference

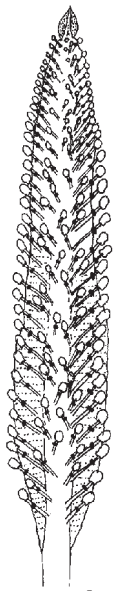
Nigmatullin, Ch.M., A.I. Arkhipkin, and R.M. Sabirov. 1995. Age, growth and reproductive biology of diamond-shaped squid *Thysanoteuthis rhombus* (Oegopsida: Thysanoteuthidae). *Mar. Ecol. Prog. Ser.*, 124:73-87.

CHIROTEUTHIDAE

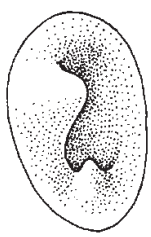
Chiroteuthid squids

by M.C. Dunning

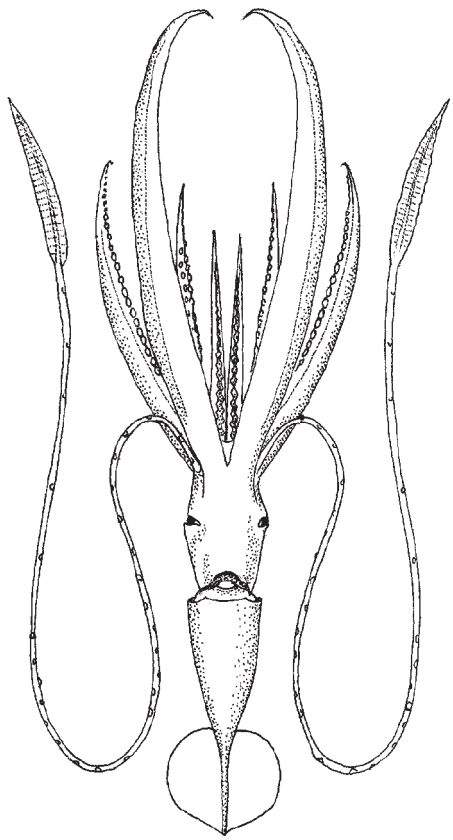
Diagnostic characters: Small to medium-sized squids (less than 400 mm mantle length) with somewhat **gelatinous bodies**. Characterized by an **oval mantle-funnel locking apparatus, the funnel cartilage with 1 or 2 knobs projecting towards the centre of the cavity. Arms with biserial, toothed suckers; ventral pair (IV) greatly enlarged**. Some species possess very elongate tentacles (up to 5 times the mantle length) and distinctive **clubs with tetraserial suckers on long stalks. Buccal connectives attached to ventral border of ventral arms**. Abundant light organs present along tentacle stalks and ventral arms; large light organs also present ventrally on the eyes, at the tips of the tentacular clubs, and embedded in the ink sac on both sides of the intestine.



tentacular club



funnel locking cartilage



ventral view

Habitat, biology, and fisheries: Although considered to be predominantly oceanic, *Chiroteuthis imperator* was taken recently in demersal trawls in continental slope waters at depths from 300 to 600 m off northern Australia and is also caught in “jala-oras”, light-lured surround nets, in Indonesian waters. In deeper oceanic waters, adult *Chiroteuthis* apparently occur below 500 m during the day but are distributed throughout the water column during the night. Diel vertical migration is also evident in some species. Nothing is known of the life history biology of these species. Chiroteuthids form part of the diet of lancetfish and yellowfin tuna in the tropical Indo-West Pacific waters. Off Japan, *C. imperator* feeds on micronektonic crustaceans, molluscs, and fish. Chiroteuthids have no commercial fisheries potential, due to their soft gelatinous bodies.

Similar families occurring in the area

Mastigoteuthidae: also with enlarged ventral arms, but distinguished by the following characters: funnel locking cartilage with posterior knob and (occasionally) medial knob poorly developed; tentacles with many hundreds of small suckers, not tetraserially arranged.

List of species occurring in the area

Asperoteuthis acanthoderma (Lu, 1977)

Chiroteuthis imperator Chun, 1913

Reference

Kubota, T., M. Koshiga, and T. Okutani. 1981. Rare and interesting squid from Japan VII. Some biological data on *Chiroteuthis imperator* from Suruga Bay, Japan. *Venus*, 40:150-159.

MASTIGOTEUTHIDAE

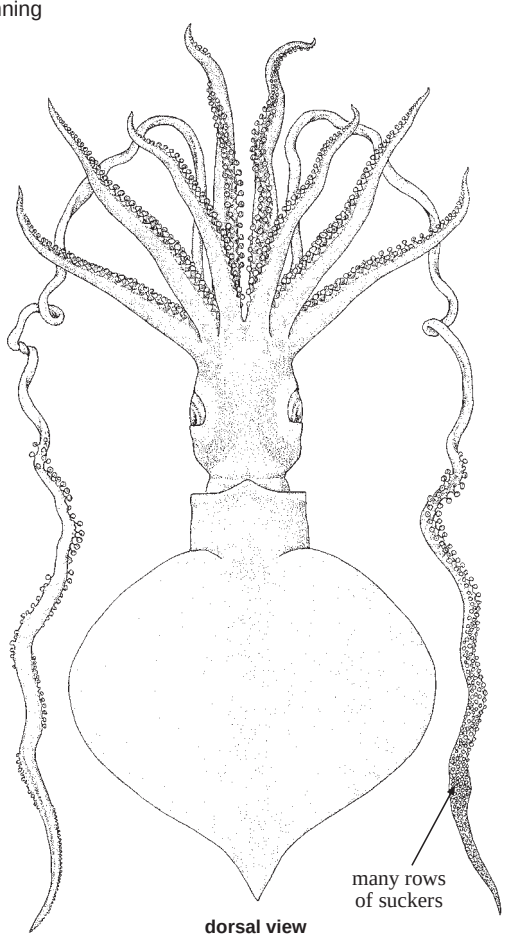
Mastigoteuthid squids

by M.C. Dunning

Diagnostic characters: Medium-sized to large squids (500 to 1 000 mm mantle length), with gelatinous bodies. **Funnel locking cartilage oval, with inward projecting knobs**. **Generally, posterior knob and (occasionally) medial knob poorly developed**. **Arms with biserial, toothed suckers; ventral arms (IV) enlarged**. Males without hectocotylized arm. Characterized by **long, whip-like tentacles, bearing many hundreds of minute suckers**. **Buccal connectives attached to ventral border of ventral arms**. Fins large. Many species with light organs on surface of mantle, ventral surfaces of head, ventral arms, and eyeball. Some species possess minute dermal tubercles covering the body surface. **Colour:** body often pink or brick red coloured.

Habitat, biology, and fisheries: Mastigoteuthids are deep living, oceanic squids occurring from tropical waters to the polar regions. Closing net data indicate that all species live at depths of 500 to 1 000 m during the day and may ascend to shallower water at night, even to as shallow as 50 to 100 m. The known predators of various species of *Mastigoteuthis* include *Alepisaurus ferox*, pilot whales, and sperm whales. Increased fishing effort using bottom trawls on the continental slopes of northern Australia in recent years has captured many mastigoteuthids including large specimens of *Mastigoteuthis cordiformis* up to 700 mm mantle length. Of no commercial fisheries potential because of their gelatinous body consistency and the ammonia content in the mantle and arms.

Remarks: The taxonomy of this family is in need of major revision. It is likely that several species occur in the area, but only adults of *M. cordiformis* have been reported.



dorsal view

(***Mastigoteuthis cordiformis***)

(illustration: K.Hollis/ABRS)

Similar families occurring in the area

Chiroteuthidae: also with enlarged ventral arms, but distinguished by the following characters: funnel locking cartilage with posterior knob and medial knob well developed; tentacular suckers with long stalks, tetraserially arranged.

List of species occurring in the area

Mastigoteuthis cordiformis Chun, 1908

References

Lu, C.C. and J.U. Phillips. 1985. An annotated checklist of the Cephalopoda from Australian waters. *Occas. Pap. Mus. Vict.*, 2:21-36.

Salcedo-Vargas, M.A. and T. Okutani. 1994. New classification of the squid family Mastigoteuthidae. *Venus (Jap. J. Malacology)*, 53(2):119-127.

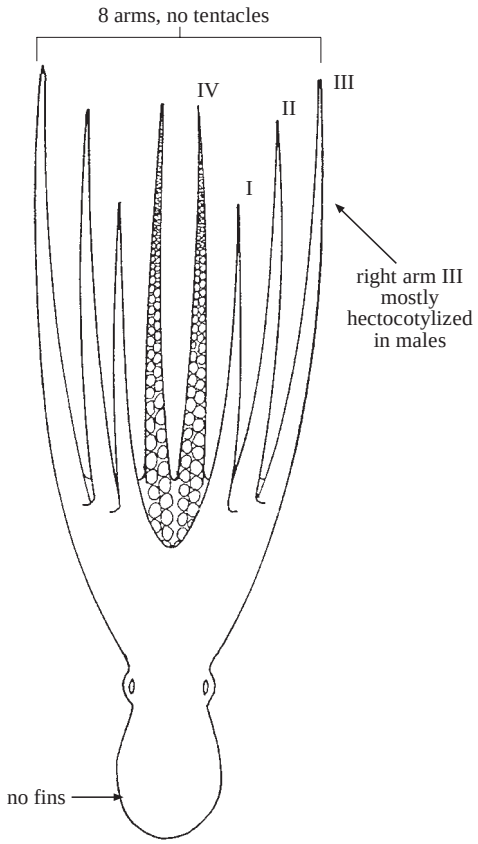
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OCTOPODIDAE

Benthic octopuses

by M.D. Norman



dorsal view

Diagnostic characters: Bottom-living muscular octopuses with **8 arms, lacking tentacles**. Each arm possesses 1 or 2 rows of suckers. **Fins absent. Rows of cirri adjacent to suckers absent.** Internal shell absent or reduced to small rod-like stylets. **One of third pair of arms** (typically right-hand side) **modified in mature males (the hectocotylized arm)**, consisting of a gutter along the margin of this arm (spermatophore groove) and a modified tip (ligula) used to grip and pass spermatophores into the oviducts of the female. Funnel locking apparatus absent.

Habitat, biology, and fisheries: Octopuses of the family Octopodidae are all bottom-dwelling and are found from intertidal waters down to abyssal depths (more than 5 000 m). They occur on a wide range of substrates from coral and rocky reefs, to seagrass beds, sand, and mud. All brood their young, the female tending the eggs until hatching. The egg size in different species dictates the behaviour of the hatchlings. Species with small eggs (approximately 1 to 2 mm long) produce many tiny planktonic young which spend at least some time transported in the water column. Species with large eggs (10 to 30 mm long) produce few, large "crawl-away" young. Many octopus species have high fisheries profiles in the area, important in local and subsistence fisheries, as well as forming major export industries. They are collected in subtidal habitats by trawl, lure, and spear, and on intertidal reefs by hand or spear. The majority are harvested for human consumption with certain species collected primarily as bait for finfish fisheries. They are marketed fresh, frozen, or dried. The reported yearly production of all octopods in the Western Central Pacific from 1990 to 1995 ranged from 20 023 t to 25 567 t (FAO Yearbook of Fishery Statistics). The actual annual total harvest in the area is likely to exceed 50 000 t.

Notes on the taxonomy of Octopodidae

The taxonomy of this family is in a very poor state. There are a large number of undescribed or poorly-defined species (more than 80) occurring in the area, many of which form the basis of local and commercial fisheries. The majority of named species are placed in the catch-all genus *Octopus*, which currently contains over 200 nominal species. The limited existing literature frequently uses inappropriate species names, including several European names for species restricted to the Atlantic Ocean (e.g. *Octopus macropus, O. vulgaris*).

There is negligible information available on biology, distribution or importance to fisheries for all but a handful of species. The list for the Western Central Pacific region, presented below is preliminary, including better known species and only undescribed species of high profile. It excludes species names coined from the area for which there is inadequate original descriptions or insufficient reference material to enable identification (i.e. dubious taxa).

A further complicating factor in the taxonomy of benthic octopuses is the number of species groups within the broad genus *Octopus* (as it currently stands). Each of these groups contains similar species, often difficult to distinguish in the field. The knowledge of members of 3 groups in particular is very poor. The least resolved species group is the "drop-arm" octopuses, the *Octopus horridus* group. Members are found throughout the tropical Indo-West Pacific region and are characterized by small size, long arms (4 to 10 times mantle length), the capacity to sever ("autotomize") arms at the base (used as a wriggling decoy to predators) and complex skin sculpture producing accurate camouflage against coral, rubble, or algae. They typically occur on intertidal reefs where they are active during daytime low tides. Named species in the area include *Octopus abaculus* and *O. aculeatus* (treated below in species accounts). More than 12 species occur throughout the area and the limits to their distributions are unknown. Western Central Pacific species

are frequently misidentified under the names *Octopus horridus* (a large-egg species restricted to the Red Sea and western Indian Ocean) and *O. defillipi* (a species of a different group restricted to the Mediterranean Sea and Atlantic Ocean). See Norman and Sweeney (1997) for discussion of this species group.

The second group of octopuses is the *Octopus macropus* group. These animals are all moderate to large octopuses (up to 3 kg and more than 1 m in total length) characterized by longer and more robust dorsal arms, high gill counts (10 or more lamellae per demibranch), simple colour patterns of red and white, and nocturnal foraging behaviour. Members occur throughout tropical and temperate waters of the world. Named species include *Octopus alpheus, O. aspilosomatis, O. dierythraeus, O. graptus, O. luteus, O. nocturnus,* and *O. ornatus* (all treated below). More than 5 undescribed species also occur in the area covered here and the limits to their distributions are unknown. Members of this group are frequently treated incorrectly under the name *Octopus macropus*, an European member of this group restricted to the Mediterranean Sea and Atlantic Ocean. See Norman (1993a) and Norman and Sweeney (1997) for discussion of this species group.

A suite of pygmy species also occur in the area (more than 10 species), mature at under 1 g and with a mantle length less than 30 mm. These tiny species have low gill counts (5 to 7 lamellae per demibranch), short arms (1.5 to 3 times mantle length) and relatively few suckers (less than 150 suckers on each normal arm). Named species include *Octopus bocki* and *O. wolfi* (not treated here). Many pygmy species throughout the Indo-West Pacific region are undescribed. See Norman and Sweeney (1997) for treatment of pygmy octopuses from the Philippines.

Major revisions of octopus taxonomy have been carried out by Robson (1929), Sasaki (1929) and Nesis (1987).

Octopuses of deeper waters

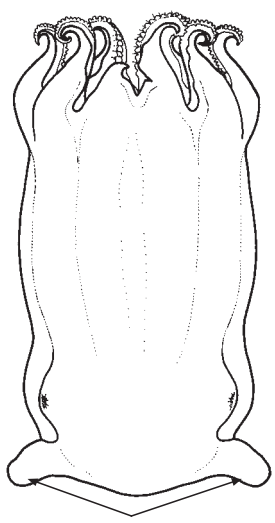
When trawling in deeper waters (more than 200 m), some genera of octopuses may be collected which are not normally encountered in shallower waters. These include species of the poorly-known genera *Scaeurgus* (characterized by a left hand hectocotylized arm in males and a lateral skin ridge around the mantle), *Benthoctopus* (smooth-skinned pale octopuses with large eyes and no ink sac) and *Berrya* (muscular octopuses with loose soft skin, a narrow opening to the mantle cavity and 2 long digit-like papillae over each eye). *Eledone palari* may also be encountered, and is easily distinguished in that it possesses a lateral skin ridge on the mantle and a single row of suckers on each arm (compared with 2 rows in all other members of the family Octopodidae in the area).

Similar families occurring in the area

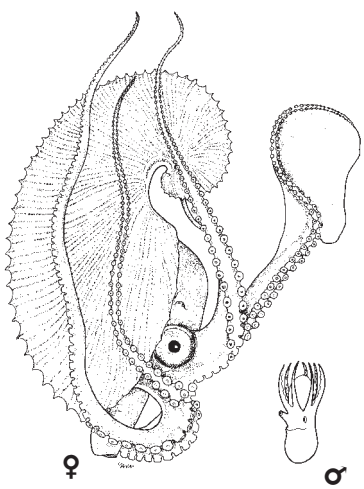
Note: the order Octopoda, as it currently stands, contains 2 distinct groups of octopuses: finned "cirrate" octopuses (suborder Cirrata) and the more familiar "incirrate" octopuses (suborder Incirrata). The latter includes the family Octopodidae.

Opisthoteuthidae and Cirroteuthidae (suborder Cirrata): cirrate octopuses are soft, semi-gelatinous animals of deeper waters easily distinguished from incirrate octopuses (including the family Octopodidae) by paired fins on the mantle, deep webs and rows of sensory papillae ("cirri") adjacent to the suckers. Cirrate octopuses are rarely captured and, due to their soft flesh, are of no economic value.

Argonautidae (suborder Incirrata): the "argonauts" are muscular pelagic octopuses (genus *Argonauta*) easily distinguished from members of the Octopodidae. Female argonauts have expanded webs on the ends of the dorsal arms which secrete a brittle white shell, the "paper nautilus" shell. This shell is used as an egg case in which the eggs are brooded. The tiny male argonaut lacks a shell and has a detachable third left arm in a pouch. A funnel locking apparatus is present as a lug-and-socket type.



Ophisthoteuthidae

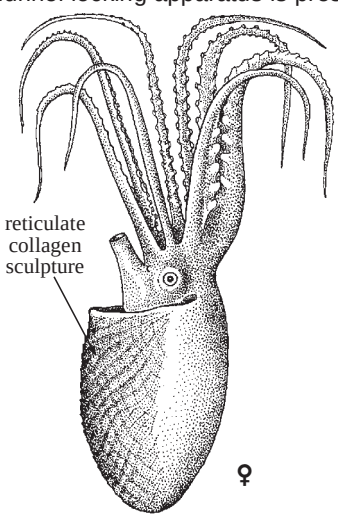


Argonautidae

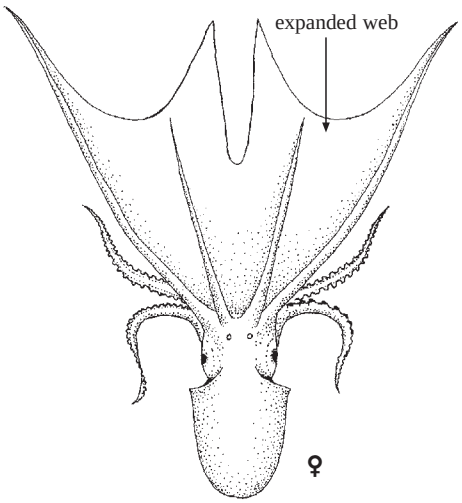
Ocythoidae (suborder Incirrata): contains a single species, the muscular pelagic octopus, *Ocythoe tuberculata*, in which the large female possesses a network of collagen-like ridges in the ventral mantle. The tiny male lacks the collagen sculpture and has a detachable third right arm in a pouch. A funnel locking apparatus is present as a lug-and-socket type.

Tremoctopodidae (suborder Incirrata): contains a single genus and at least 2 species of muscular pelagic "blanket octopuses", the best known being *Tremoctopus violaceus*. Females possess greatly expanded webs along length of dorsal arms, capable of being shed in segments from the tips. The tiny male lacks the dorsal webs and has a detachable third right arm in a pouch. A funnel locking apparatus is present as a transverse flap and shelf.

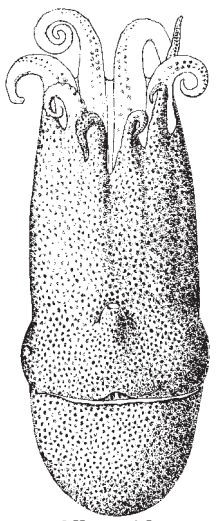
Alloposidae (suborder Incirrata): contains a single species, the deep-water semi-gelatinous octopus, *Haliphron atlanticus* (frequently treated in the literature under the junior synonym, *Alloposus pacificus*). Little is known of this octopus other than the male possesses a detachable third right arm in a pouch. A funnel locking apparatus is present as a transverse flap and shelf.



Ocythoidae

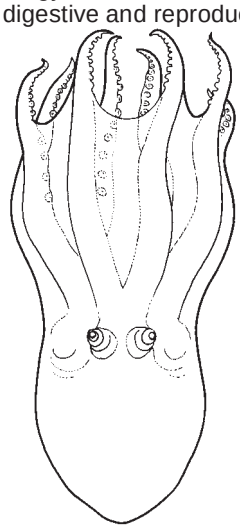


Tremoctopodidae

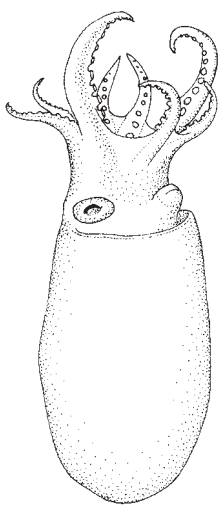


Alloposidae

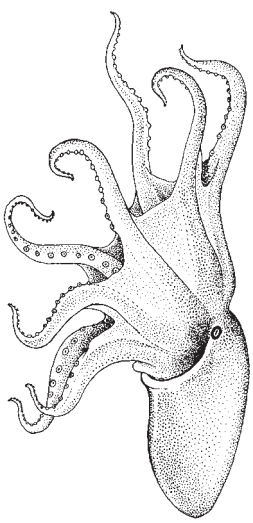
Families Amphitretidae, Bolitaenidae and Vitreledonellidae (suborder Incirrata): These 3 related families of rarely encountered open-water pelagic octopuses are distinguished from members of the family Octopodidae by their gelatinous consistency and a range of internal characters including distinctive radula morphology, the nature of the mantle aperture (double opening in Amphitretidae) and distinctive floorplans to the digestive and reproductive tracts.



Amphitretidae



Bolitaenidae



Vitreledonellidae

Key to the species of Octopodidae occurring in the area

Remarks on key characters: measurements and sucker counts used below refer to submature and mature animals, not juvenile material. In interpreting order of arm lengths, partial arm regeneration can produce confusing combinations. A distinct decrease in sucker diameter along the arms is an indication of partial regeneration from that point.

1a. Dorsal arms distinctly longer and frequently more robust than lateral and ventral arms (Fig. 1a); dorsal webs deeper than ventral webs . . . . . → ***2***

1b. Arms subequal (Fig. 1b) or lateral arms longer and more robust than dorsal arms (Fig. 1c); webs subequal in depth or dorsal webs shallower than other webs . . . . . → ***9***

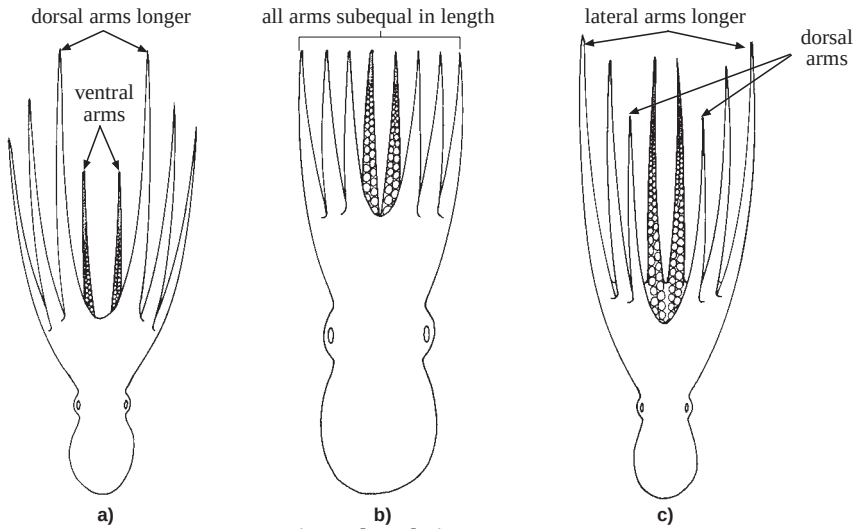


Fig. 1 dorsal view

2a. Water pouches present between bases of arms on oral surface of webs (Fig. 2), visible as pores open to exterior at level of 3rd to 4th proximal sucker (pores difficult to find in contracted or smaller preserved specimens); ligula tiny (less than 1% of arm length), calamus absent . . . . . ***Cistopus indicus***

2b. Water pouches and pores absent; ligula in submature and mature males well developed, cylindrical with deep groove and a distinct calamus . . . . . **(*Octopus macropus* group)** → ***3***
(only 7 common members treated here of more than 12 species in the area)

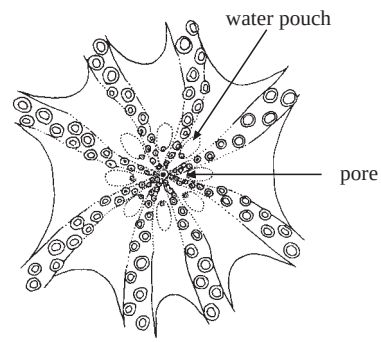


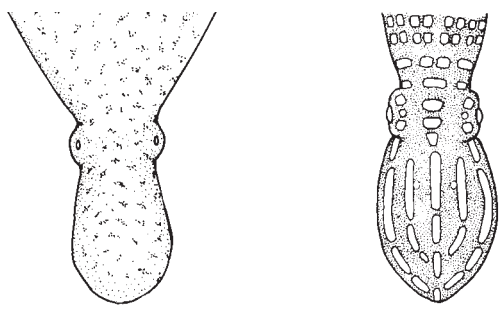
Fig. 2 *Cistopus indicus* (oral view)

3a. Colour pattern of pale cream to pink base with irregular short scribbles on dorsal mantle and arm crown (Fig. 3a) . . . . . ***Octopus graptus***

3b. Colour pattern of numerous white or red spots; dark scribbles absent . . . . . → ***4***

4a. Colour pattern on dorsal mantle of distinctive arrangement of cream to white longitudinal stripes over pink to red base colour (Fig. 3b) . . . . . ***Octopus ornatus***

4b. Dorsal mantle plain or with spots, longitudinal stripes absent . . . . . → ***5***



a) *Octopus graptus* b) *Octopus ornatus*

Fig. 3 dorsal mantle and arm crown

5a. Distinctly elongate species with almost tubular arms and short webs (Fig. 4a); mantle greatly elongated in many specimens (Fig. 4b); deepest web always less than 15% of length of longest arm, typically 10% . . . . . → ***6***

5b. Moderately elongate species with robust arms and deep webs (Fig. 5); mantle never greatly elongated; deepest web always more than 15% of length of longest arm, typically 20% . . . . . → ***7***

6a. Colour pattern on dorsal mantle plain red or white, lacking distinctive spots (Fig. 6a) . . . . . ***Octopus aspilosomatis***

6b. Colour pattern on dorsal mantle of white spots over orange to deep red base colour (Fig. 6b) . . . . . ***Octopus nocturnus***

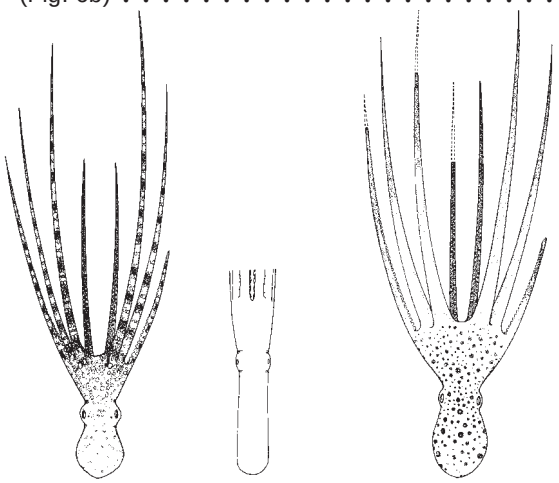


Fig. 4 ***Octopus aspilosomatis*** **Fig. 5** ***Octopus dierythraeus***

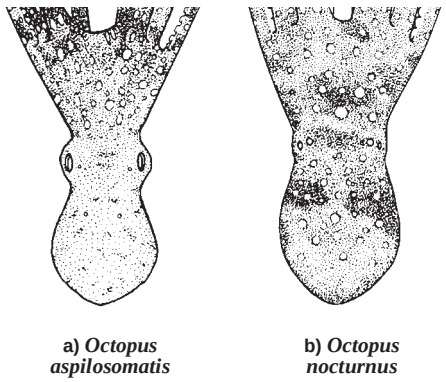


Fig. 6 dorsal mantle and arm crown

7a. More than 230 suckers on normal arms of submature and mature animals; more than 100 suckers on hectocotylized arm of males; alarm display in live animals of large red spots over white base colour on dorsal mantle, arm crown, and arms (Fig. 5) . . . . . ***Octopus dierythraeus***

7b. Typically less than 230 suckers on normal arms of submature and mature animals; less than 100 suckers on hectocotylized arm of males; alarm display in live animals of white spots over red base colour on dorsal mantle, arm crown, and arms (as in *O. nocturnus*, Fig. 6b) . . . . . → ***8***

8a. Eggs large (more than 8 mm) and produced in low numbers (less than 500) (known only from intertidal reef flats of the Capricorn Bunker Islands of the southern Great Barrier Reef, Australia) . . . . . ***Octopus alpheus***

8b. Eggs small (less than 4 mm) and produced in high numbers (more than 10 000) (known at this stage only from the Philippine Islands) . . . . . ***Octopus* cf. *luteus***

9a. Arms greatly elongated (typically 7 to 9 times mantle length), subequal in length when intact; regular alternating white and pink-brown wide bands present on arms (Fig. 7); mantle walls very thin, almost transparent, branchial hearts visible through mantle walls (Fig. 7); arm autotomy present; ink sac absent . . . . . ***Ameloctopus litoralis***

9b. Arms short to long, dorsal arms always slightly shorter than other arms; regular alternating white and pink-brown bands absent; mantle walls muscular, never thin and transparent; arm autotomy present or absent; ink sac present. . . . . → ***10***

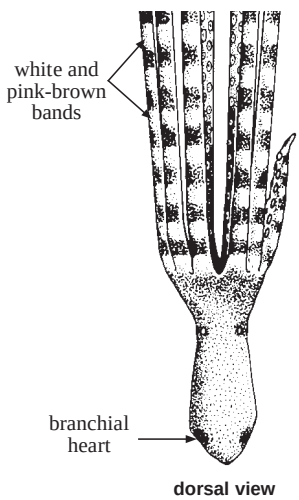


Fig. 7 ***Ameloctopus litoralis***

10a. Small animals with mantle and arm crown covered in rings or lines (Fig. 7), iridescent blue in live animals; arms short, 1.5 to 3 times mantle length . . . . . **(*Hapalochlaena*)** → ***11***

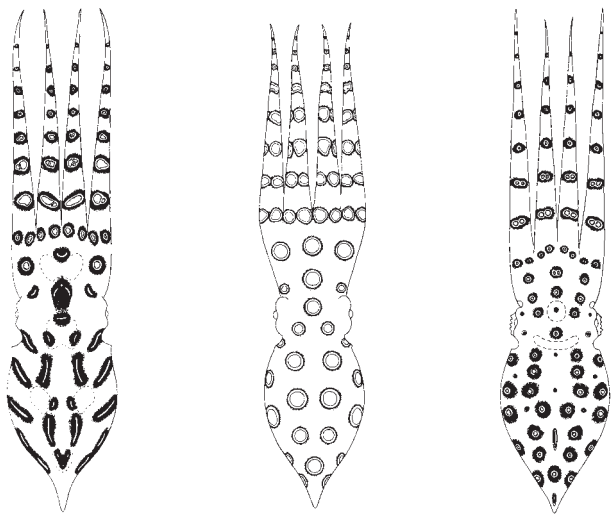
10b. Iridescent tissue absent or, if present, restricted to a pair of false eye-spots ("ocelli") on the arm crown over bases of arms II and III, one below each eye (as in Fig. 13a); arms short to long (more than 2 times mantle length) . . . . . → ***13***

11a. Iridescent blue lines on dorsal and lateral mantle; rings on arm crown and arms (Fig. 8a) . . . . . ***Hapalochlaena fasciata***

11b. Iridescent blue lines never present; small or large iridescent blue rings on all dorsal surfaces . . . . . → ***12***

12a. Large rings (up to 12 mm in diameter, up to 40% of mantle length) over dorsal and lateral surfaces of mantle, head, arm crown, and arms (Fig. 8b) . . . . . ***Hapalochlaena lunulata***

12b. Small rings (up to 2 mm in diameter, approximately 5% of mantle length) over dorsal and lateral surfaces of mantle, head, arm crown, and arms (Fig. 8c) . . . . . ***Hapalochlaena* cf. *maculosa***



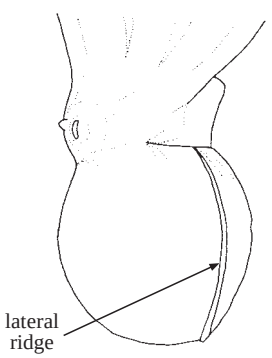
a) *Hapalochlaena fasciata* **b) *Hapalochlaena lunulata*** **c) *Hapalochlaena* cf. *maculosa***

Fig. 8 dorsal view

(after Roper and Hochberg, 1988)

13a. Raised keel (lateral ridge) around lateral mantle (Fig. 9); swollen club-like ligula in mature males (Fig. 10a) . . . . . ***.Octopus australis***
(species of the deep-water genus *Scaeurgus* appear similar to this species but are distinguished by a left-hand hectocotylized arm in males)

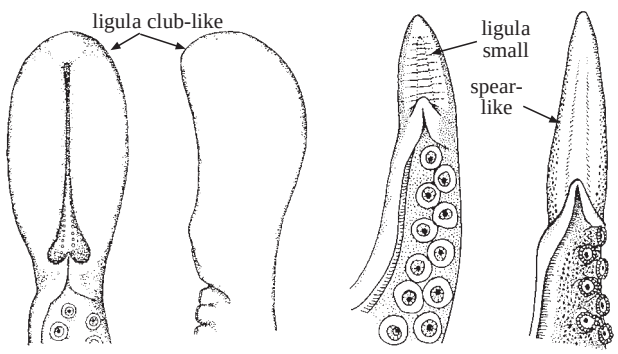
13b. Lateral ridge absent; ligula small to spear-like (Fig. 10b), never as a swollen club . . . . . → ***14***



lateral mantle

Fig. 9 *Octopus australis*

(from Stranks and Norman, 1993)



a) *Octopus australis* **b) other *Octopus* species**

Fig. 10 tip of hectocotylized arm of male

(from Stranks and Norman, 1993)

14a. Small, elongate octopuses (mantle length to 70 mm, weight to 150 g); arms long, more than 4 times mantle length; arms sever at set level near arm base (arm autotomy), as a decoy to predators; skin typically highly sculptured including raised branched papillae (Fig. 11) . . . . . (***Octopus horridus* group)** → ***15***
(only 2 distinct members treated here of more than 10 species in the area)

14a. Small to large robust octopuses; arms typically less than 4 times mantle length; arms not capable of autotomy at set level near arm base; skin smooth to sculptured . . . . . → ***16***

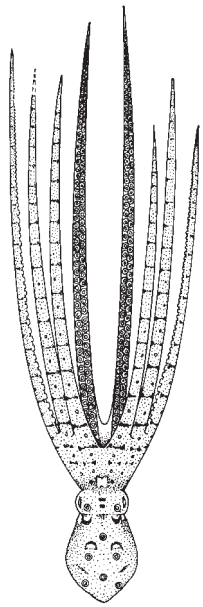


Fig. 11 typical representative of the *Octopus horridus* group

15a. Colour pattern of dark brown to black circular reticulations which define a mosaic of distinct round cream spots (Fig. 12a); sucker counts approximately 90 to 120 on hectocotylized arm; ligula of moderate size (approximately 5% of arm length) . . . . . ***Octopus abaculus***

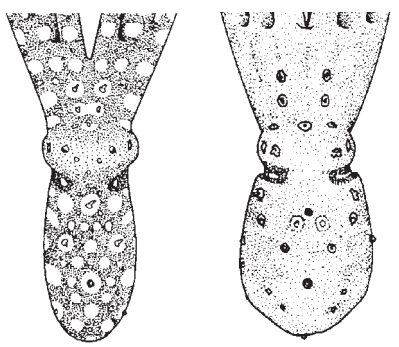
15b. Colour mottled grey-brown to dark grey on dorsal and lateral surfaces (Fig. 12b); sucker counts approximately 140 to 175 on hectocotylized arm; ligula small (less than 2% of arm length) . . . . . ***Octopus aculeatus***

16a. Large robust species (mantle length more than 140 mm, weight more than 1 kg), moderate to long arms (more than 3 times mantle length), more than 200 suckers on normal arms, more than 140 on hectocotylized arm of males . . . . . → ***17***

16b. Small to moderate-sized species (mantle length less than 120 mm, weight less than 500 g), short to moderate length arms (2 to 3 times mantle length), less than 200 suckers on normal arms, less than 110 on hectocotylized arm of males . . . . . → ***18***

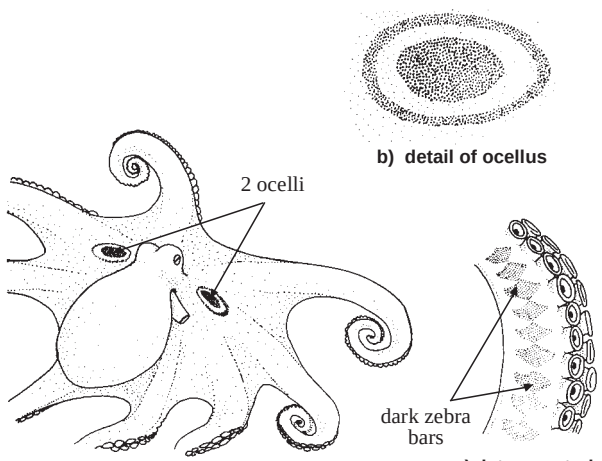
17a. False eye-spot (ocellus) present (Fig. 13a), as a dark oval spot surrounded by pale band of skin (not iridescent) and narrow dark outer band (Fig. 13b); dark zebra bars on lateroventral surfaces of all arms in submature and mature animals (Fig. 13c); sucker counts around 400 to 500 on normal arms, 180 to 230 on hectocotylized arm . . . ***Octopus cyanea***

17b. Ocellus and zebra bars on ventral faces of arms absent; sucker counts 200 to 300 on normal arms, 140 to 160 on hectocotylized arm . . . . . ***Octopus tetricus***



a) *Octopus abaculus* **b) *Octopus aculeatus***

Fig. 12 dorsal mantle and arm crown



b) detail of ocellus

a) whole animal

c) lateroventral surface of arm

Fig. 13 *Octopus cyanea*

18a. Ocelli ("false eye-spots") present, 1 on each lateral face of arm crown between bases of arms II and III (position shown in Fig. 13a) . . . . . → ***19***

18b. Ocelli absent . . . . . → ***23***

19a. Ocellus plain, without iridescent ring, as plain black spot (Fig. 14a) . . . . . ***Octopus exannulatus***

19b. Ocellus with iridescent ring within black spot (Fig. 14b) . . . . . → ***20***

20a. Widely-spaced dark transverse bars on all arms separated by approximately 3 to 5 suckers (Fig. 15a); mature males with 1 to 3 enlarged suckers (12th to 14th) on all arms at level of edge of web . . . . . ***Octopus polyzenia***

20b. Dark longitudinal lines down leading edge of arms I to III (Fig. 15b), never transverse bars; enlarged suckers of mature males (if present) on arms II and III (never I) . . . . . → ***21***

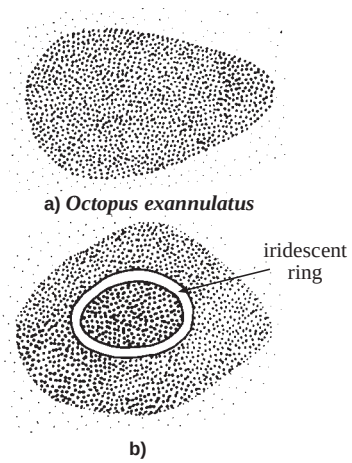


Fig. 14 detail of ocellus

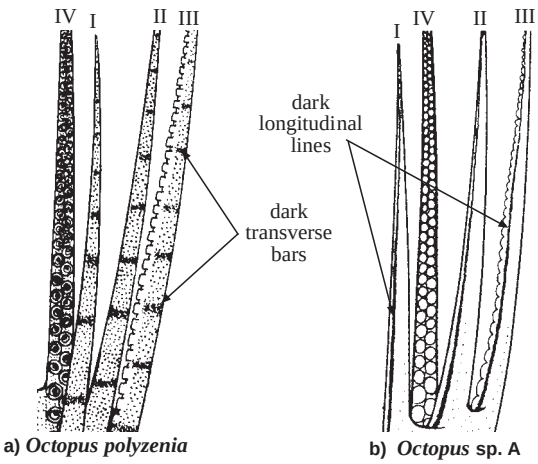


Fig. 15 right arms I to IV

21a. Circular cluster of dark spots above each eye forming petals of "flower" pattern (Fig. 16a); 4 longitudinal rows of dark spots (as solid stripes in some colour patterns) on dorsal body; large digit of skin in white spot on dorsal arm crown anterior to eyes; approximately 100 suckers on hectocotylized arm of males . . . . . ***Octopus mototi***

21b. Base colour of whole animal cream-brown with short black longitudinal bar through each eye (Fig. 16b); pedal of black spots on head and longitudinal stripes on dorsal mantle absent; large digit of skin anterior to eyes absent; 65 to 80 suckers on hectocotylized arm of males . . . . . ***Octopus* sp. A**

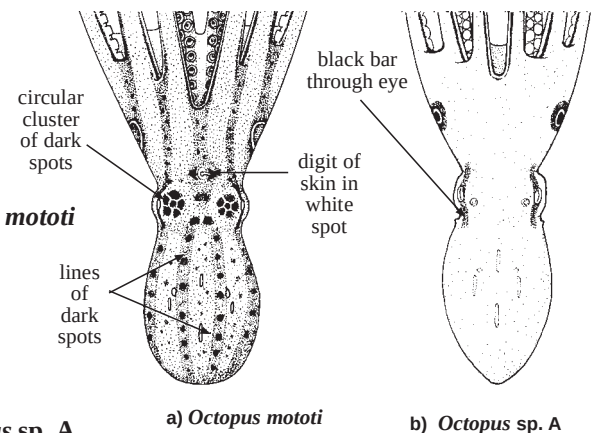


Fig. 16 dorsal view

22a. Pale longitudinal stripe present along midline of dorsal mantle (Fig. 17); pattern of circular cream to green spots bound by dark boundaries over all dorsal and lateral mantle and arm crown (Fig. 17), distinct on lateral faces of arms I to III **. .*Octopus aegina***

22b. Longitudinal stripe along dorsal midline of mantle absent; dark purple/black longitudinal stripe along lateral faces of arms I to III, in marked contrast with white or pink suckers (Fig. 18a); body colour variable from pale purple-brown to deep purple-black; purple black grooves between patches on lateral arm crown form distinctive branching reticulations (Fig. 18a); distinct white triangle under eye (Fig. 18b) **. . . . *Octopus marginatus***

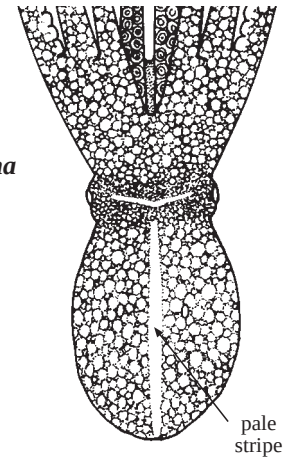


Fig. 17 *Octopus aegina*

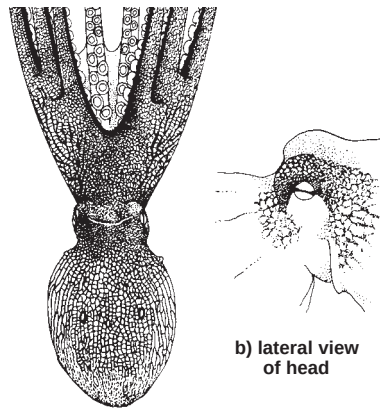


Fig. 18 *Octopus marginatus*

List of species occurring in the area

The symbol ♜ is given when species accounts are included.

	Distribution	Harvest
♜ *Ameloctopus litoralis* Norman, 1992b	Northern Australia	none
♜ *Cistopus indicus* (Rapp, 1835)	SE Asia to India	high
♜ *Hapalochlaena fasciata* (Hoyle, 1886)	Australia, southern Qld and NSW	none
♜ *Hapalochlaena lunulata* (Quoy and Gaimard, 1832)	Indo-Malayan Arch. to Vanuatu	none
♜ *Hapalochlaena* cf. *maculosa* (from Roper and Hochberg, 1988)	Great Barrier Reef	none
♜ *Octopus abaculus* Norman and Sweeney, 1997	Philippines	none known
♜ *Octopus aculeatus* d'Orbigny, 1835	Philippines	low
♜ *Octopus aegina* Gray, 1849[1/]	Indian Ocean and SE Asia	high
♜ *Octopus alpheus* Norman, 1993a	Southern Great Barrier Reef	none
♜ *Octopus aspilosomatis* Norman, 1993a	Northern Great Barrier Reef	none
♜ *Octopus australis* Hoyle, 1885	Australia, southern Qld and NSW	low
Octopus bocki Adam, 1945	Tropical Pacific	none
♜ *Octopus cyanea* Gray, 1849	Tropical Indo-West Pacific	moderate
♜ *Octopus dierythraeus* Norman, 1993a	Northern Australia	none
♜ *Octopus exannulatus* Norman, 1993b	Indo-Malayan Archipelago	low
♜ *Octopus graptus* Norman, 1993a	Northern Australia	low
♜ *Octopus* cf. *luteus* (from Norman and Sweeney, 1997)	Philippines	moderate
♜ *Octopus marginatus* Taki, 1964 [2/]	Indian Ocean and SE Asia	low
♜ *Octopus mototi* Norman, 1993b	Tropical Pacific	none
♜ *Octopus nocturnus* Norman and Sweeney, 1997	Philippines	low
♜ *Octopus ornatus* Gould, 1852	Tropical Indo-West Pacific	low
♜ *Octopus polyzenia* Gray, 1849	Northern Australia	none
Octopus pumilus Norman and Sweeney, 1997	Philippines	none known
♜ *Octopus tetricus* Gould, 1852 [3/]	Australia, southern Qld and NSW	low
Octopus tonganus Hoyle, 1885	Tonga	none known
Octopus vitiensis Hoyle, 1885	Tropical Pacific	none known
Octopus wolfi Wülker, 1913	Tropical Indo-West Pacific	none known
♜ *Octopus* sp. A	Indo-Malayan Archipelago	very high

1/ The genuine *O. aegina* is treated in Roper et al. (1984) under the name of a junior synonym, *O. dollfusi*.
2/ *O. marginatus* is treated in Roper et al. (1984) incorrectly under the name of the related *O. aegina*.
3/ The species treated under the name *O. tetricus* in Roper et al. (1984) is not identical with *O. tetricus* described originally from eastern Australia.

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Cistopus indicus (Rapp, 1835 in Férussac and d'Orbigny, 1834-48)

Frequent synonyms / misidentifications: None / *Octopus macropus* Risso, 1826.

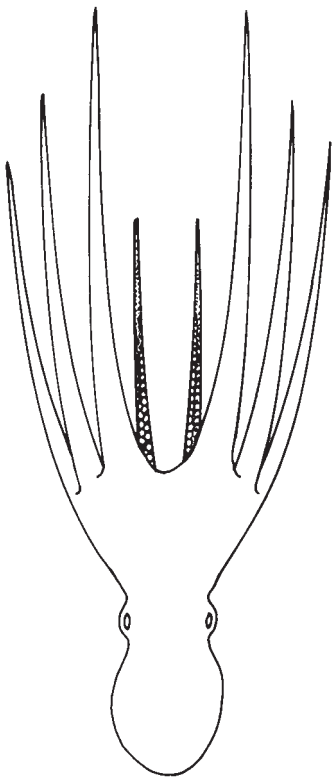
FAO names: En - Old woman octopus (from Chinese "Laai Por"); **Fr** - Poulpe vieille femme; **Sp** - Pulpo perforado.

Diagnostic characters: Large species. **Water pouches present, embedded in the web around the mouth, one in each sector between arms**. Pouch opens through a "water pore" situated at the level of third or fourth sucker from the mouth. Arms long, 6 to 7 times mantle length. Dorsal arms longer than ventral arms (arm formula I.II.III.IV). **Right third arm of males hectocotylized with tiny blunt ligula** (less than 1% of arm length) **and no apparent calamus**. Gills with 9 to 11 lamellae per demibranch. In larger animals, around 120 to 190 suckers on each normal arm, 60 to 130 on hectocotylized arm of male (see comments below). One or 2 enlarged suckers (11th to 13th) sometimes visible in mature males on arms I, II, and IV, but never on arm III. **Colour:** pink or cream, to slate grey with iridescent purple sheen on lateral mantle in fresh specimens; skin sculpture consisting of a few scattered low papillae on the dorsal mantle; no large primary papillae.

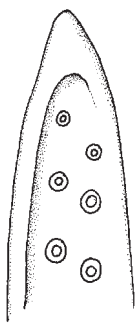
Size: Maximum mantle length 180 mm, total length to over 1 m; weight to 2 kg.

Habitat, biology, and fisheries: Known from muddy coastal waters, living subtidally on soft substrates to depths of at least 80 m. Nothing known of diet or foraging behaviour. No mature females found. The function of the unique water pores is not known. There may be more than 1 species treated under this species name. Specimens from Thailand and Singapore, and west to India appear to show lower sucker counts (around 110 to 140 on normal arms, less than 80 on hectocotylized arm of males) and distinctly enlarged suckers in males, compared with animals from further north and east (180 to 200 suckers on normal arms, 110 to 130 suckers on hectocotylized arm of males, and enlargement of suckers in males slight or absent). These octopuses form major fisheries, important in subsistence, local small-scale and larger commercial fisheries in many coastal Asian countries, harvested primarily by trawlers.

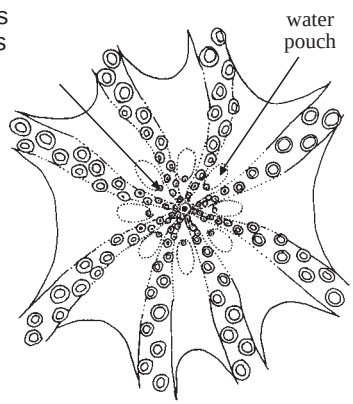
Distribution: *Cistopus indicus*, as it currently stands, occurs in tropical and subtropical coastal waters of the Asian mainland from China, the Philippines, and northern Indonesia, south to Malaysia and west to Pakistan.



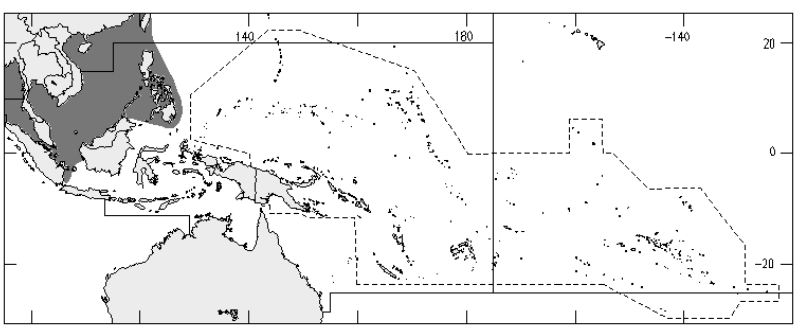
dorsal view



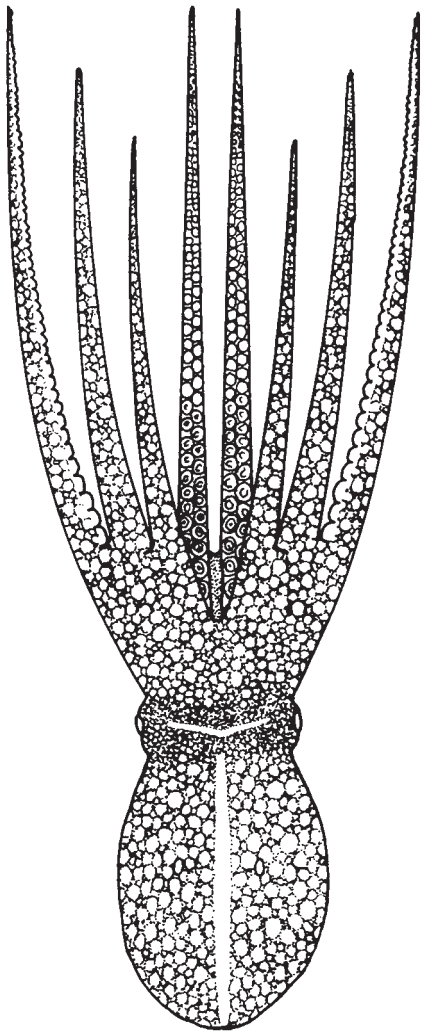
tip of hectocotylized arm of male



oral view



Octopus aegina Gray, 1849



dorsal view

Frequent synonyms / misidentifications: *Octopus dollfusi* Robson, 1828; *O. hardwickei* Gray, 1849 / None.

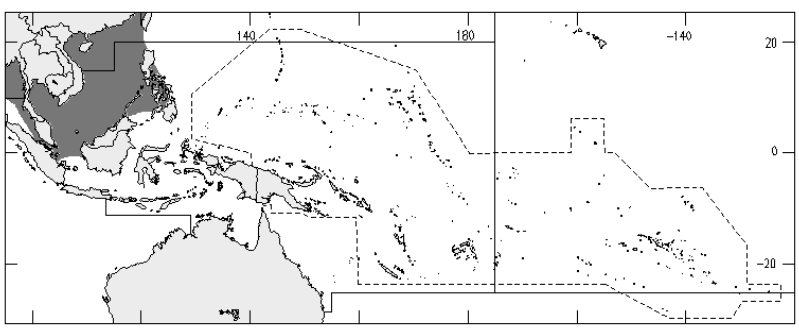
FAO names: En - Marbled octopus; **Fr** - Poulpe nain; **Sp** - Pulpo marmóreo.

Diagnostic characters: Moderate-sized robust species. Arms relatively short, 2 to 3 times mantle length. Lateral and ventral arms longest (arm formula IV=III.II.I). Web deep on lateral arms, very shallow between dorsal arms. Right third arm of males hectocotylized with moderate length sharp ligula (4 to 6% of arm length) with distinct calamus. Gills with 8 or 9 lamellae per demibranch. In larger animals, around 110 to 130 suckers on each normal arm, around 60 to 70 on hectocotylized arm of male. Mature males with 2 or 3 enlarged suckers (6^{th} to 8^{th}) on arms II and III (slightly enlarged on arms IV). **Colour: pattern of reticulations formed by dark grooves defining large, and smaller intermediate, circular patches; reticulated pattern most distinctive on dorsal arm faces; cream coloured longitudinal stripe along dorsal midline of mantle; cream transverse head bar visible in many specimens**; skin sculpture of regular round patches and grooves matching colour pattern; diamond of longitudinal skin ridges on dorsal mantle.

Size: Maximum mantle length 90 mm, total length to around 300 mm; weight to around 100 g.

Habitat, biology, and fisheries: Known from muddy coastal waters found subtidally on soft substrates to depths of at least 40 m. Nothing known of diet or foraging behaviour. This octopus is a major fisheries species throughout coastal mainland Asia, important in commercial trawl fisheries, particularly from the Gulf of Thailand and South China Sea. Exported throughout the world on a large scale along with *Octopus* sp. A (tens of thousands of tonnes annually). Both species are sold and prepared under the name “baby octopus” (at least in Australia and the United States). *Octopus aegina* has frequently been treated under the name of a junior synonym, *Octopus dollfusi*. Large catches of this species reported from Gulf of Thailand under the name *Octopus* “*dollfusi*”.

Distribution: Found in coastal waters of continental Asia, from China south to Malaysia and west to at least Madras, India. Also reported from the Philippines.

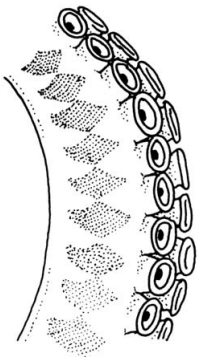


Octopus cyanea Gray, 1849

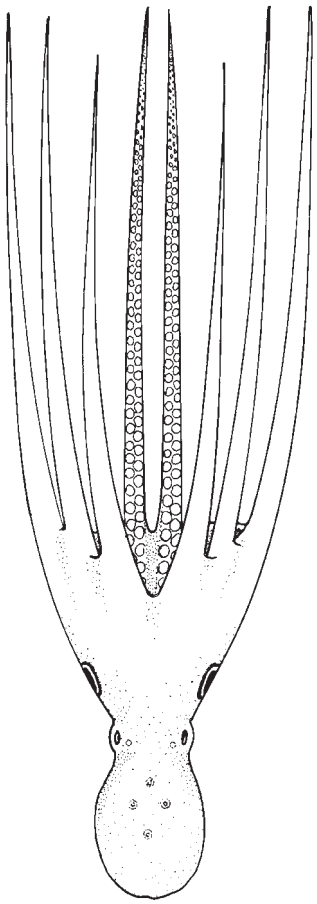
Frequent synonyms / misidentifications: *Octopus magnocellatus* (Taki, 1964); *O. marmoratus* Hoyle, 1885 / *O. bimaculatus* Verrill, 1883.

FAO names: En - Day octopus (formerly reported as big blue octopus).

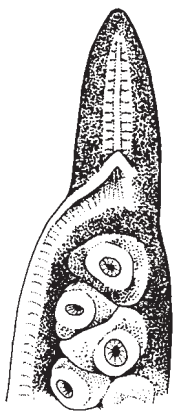
Diagnostic characters: Large and robust ocellate octopus. Arms robust and long, 4 to 6 times mantle length. Dorsal arms slightly shorter than other arms (arm formula IV=III=II.I). Right third arm of males hectocotylized with **tiny ligula (1 to 2% of arm length).** Gills with 9 to 11 lamellae per demibranch. In larger animals, 400 to 500 suckers on each normal arm, 180 to 230 on hectocotylized arm of male. Mature males with 2 to 4 enlarged suckers (12th to 14th) on arms II and III (slightly enlarged on arm IV). **Colour:** variable from dark chocolate brown through mottled patterns to pale grey; **ocellus present as plain black spot surrounded by pale and dark rings; dark zebra bars on ventrolateral faces of all arms in submature and mature animals**; skin sculpture of irregular patches separated by distinct grooves interspersed by large primary papillae, including diamond of 4 papillae on dorsal mantle and large papilla over each eye.



lateroventral surface of arm



dorsal view



tip of hectocotylized arm

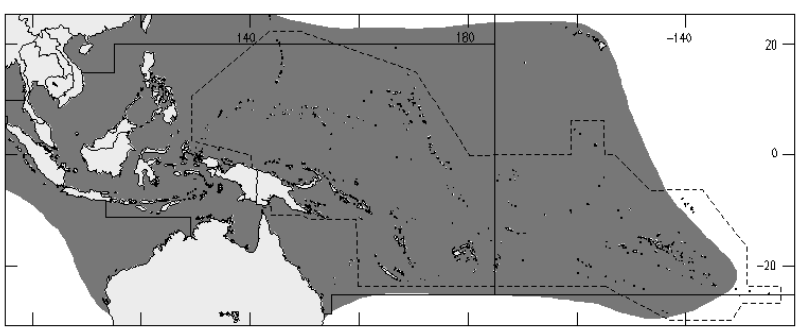


ocellus

Size: Maximum mantle length 160 mm, total length to over 1 m; weight to 6 kg.

Habitat, biology, and fisheries: Known from clear tropical waters, from intertidal reefs to depths of at least 25 m, on coral reefs amongst both live corals and dead coral rubble. Preys primarily on crabs and other crustaceans, foraging throughout the day with peak activity at dusk and dawn. Occupies lairs in coral or rock, often visible by midden of large crab carapaces. Females lay up to 600 000 eggs in festoons, each egg around 1 mm long. Important fisheries species collected in large numbers throughout its range in local subsistence and small-scale fisheries. Frequently sold in fish markets, particularly through the central and southern tropical Pacific, in countries such as Fiji, Tonga, Solomons, New Caledonia, Papua New Guinea, and Philippines. Harvested using spear, lures, traps, and chemical irritants to flush animals from lairs.

Distribution: Found widely throughout shallow waters of the tropical Indo-West Pacific region, from Hawaii in the east to the east African coast in the west. Reported as far north as southern Japan and as far south as New South Wales, Australia.

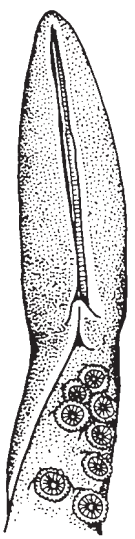


Octopus graptus Norman, 1993a

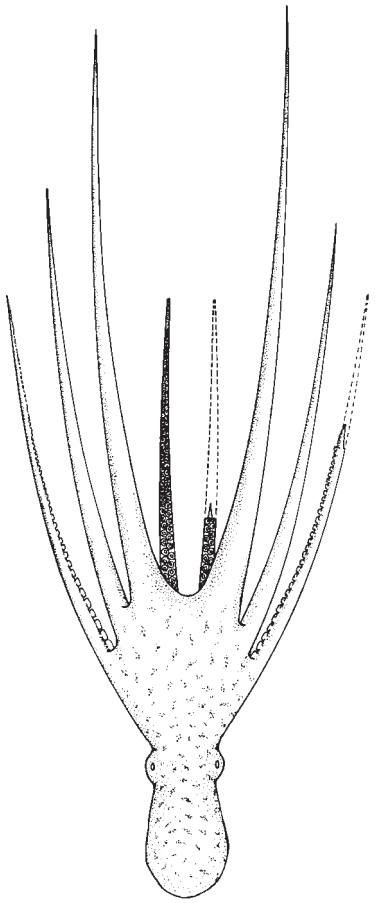
Frequent synonyms / misidentifications: None / None.

FAO names: En - Scribbled night octopus.

Diagnostic characters: Large robust and muscular species. Arms long, 4.5 to 7 times mantle length. Dorsal arms longer than ventral arms (arm formula I.II.III.IV). Webs moderately deep, deepest 16 to 22% of longest arm. Right third arm of males hectocotylized with large cylindrical ligula (around 6% of arm length), with deep groove. Gills with 13 or 14 lamellae per demibranch. In larger animals, around 200 to 280 suckers on each normal arm, around 80 to 90 on hectocotylized arm of male. Suckers on longer dorsal arms proportionally larger than other arms, but none markedly enlarged. **Eggs large (to 40 mm) and produced in low numbers (to 700). Colour:** white to pink base colour with **dark irregular spots and short lines ("scribbles") over dorsal surfaces**; distal tips of all arms grading to crimson purple; skin sculpture simple, consisting of scattered low papillae evenly distributed over dorsal surfaces.



tip of hectocotylized arm

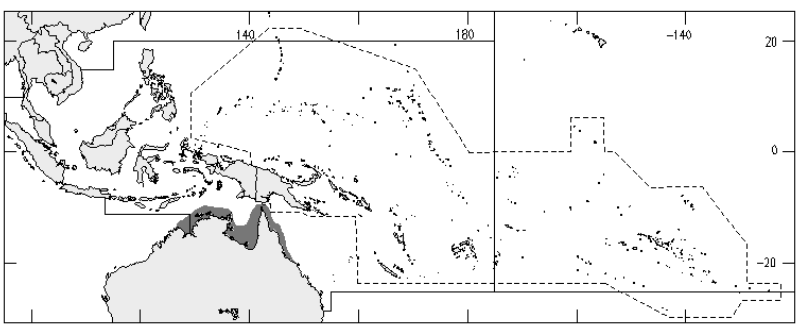


dorsal view

Size: Maximum mantle length 200 mm, total length to over 1.3 m; weight to 5 kg.

Habitat, biology, and fisheries: Known from muddy coastal waters, living subtidally on soft substrates to depths of at least 40 m. Trawl capture data shows this species is caught at night, presumably when it is emerged from lairs and foraging. Captive animals emerge at night to forage, taking a range of prey including crustaceans, bivalves and fish. Females lay large eggs, attached singly to the roof of a lair, not in festoons. This large octopus is commercially harvested as bycatch in prawn trawl fisheries, sold for both human consumption and as bait.

Distribution: Restricted to tropical muddy coastal waters of northern Australia from the Great Barrier Reef to northern Western Australia.



Octopus* cf. *luteus (from Norman and Sweeney, 1997)

Frequent synonyms / misidentifications: None / *Octopus macropus* Risso, 1826.

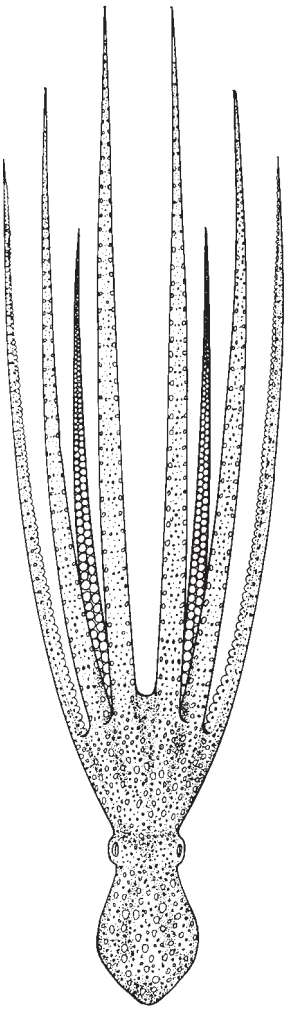
FAO names: En - Small-spot night octopus.

Diagnostic characters: Large elongate species. Arms long, 4.5 to 5.5 times mantle length. Dorsal arms longer than ventral arms (arm formula I.II.III.IV). Webs moderately deep, deepest around 15 to 20% of longest arm. Right third arm of males hectocotylized with large cylindrical ligula with deep groove. Gills with 12 or 13 lamellae per demibranch. In larger animals, greater than 200 suckers on each normal arm, approximately 80 to 90 on hectocotylized arm of male. Suckers on longer dorsal arms proportionally larger than other arms, but none markedly enlarged. **Eggs small type in submature females examined. Colour:** pink to bright red base colour with **many small white spots over dorsal mantle**, arm crown, webs, and arms; **skin sculpture of raised papillae in centres of white spots, interspersed by smaller low papillae over all dorsal and lateral surfaces.**

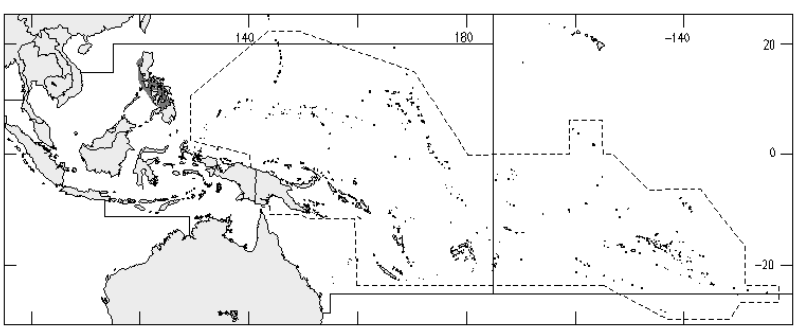
Size: Maximum mantle length at least 90 mm, total length to over 0.5 m; weight to at least 500 g.

Habitat, biology, and fisheries: Little known of the biology and distribution of this species. Material examined was collected from coral rubble and rocky reefs at depths between 1 and 82 m. Females lay small type eggs, no mature females examined. This octopus is taken in local subsistence harvests and in line and trawl fisheries as bycatch. This species shows similarities with *Octopus luteus* Sasaki, 1929, from Taiwan Province of China and coastal waters of mainland China. Resolution of the identity of this species is not possible until more mature material is available.

Distribution: At this stage, the species treated here is only known from the Philippines.



dorsal view



click for next page

click for previous page

Octopus marginatus Taki, 1964

Frequent synonyms / misidentifications: *Octopus striolatus* Dong, 1976 / *Octopus aegina* Gray, 1849.

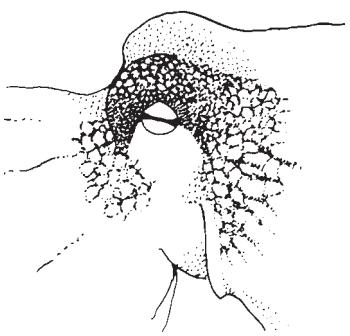
FAO names: En - Sand bird octopus (from Chinese “Saa liu”); **Fr** - Poulpe des sables; **Sp** - Pulpo reticulado.

Diagnostic characters: Moderate-sized octopus. Arms short, 2 to 3 times mantle length. Dorsal arms slightly shorter than other arms (arm formula IV=III=II.I or III.IV=II.I). Right third arm of males hectocotylized with small ligula (1.5 to 3.5% of arm length). Gills with 9 to 11 lamellae per demibranch. Up to 150 suckers on each normal arm, 60 to 85 on hectocotylized arm of male. Mature males possess 4 to 5 slightly enlarged suckers (7th to 11th) on arms II and III. **Colour:** pattern typically orange-brown to purple with dark reticulations defining distinct patches in irregular longitudinal rows; **suckers white to pink contrasting against dark brown to black along leading edge of arms I to III**; narrow transverse “head bar” visible in live animals; **white triangle below each eye; dark reticulations distinctive on lateral arm crown** in same position as false eye-spots in ocellate species; skin sculpture of regular patches separated by distinct grooves; diamond of 4 longitudinal skin ridges on dorsal mantle and large papilla over each eye.

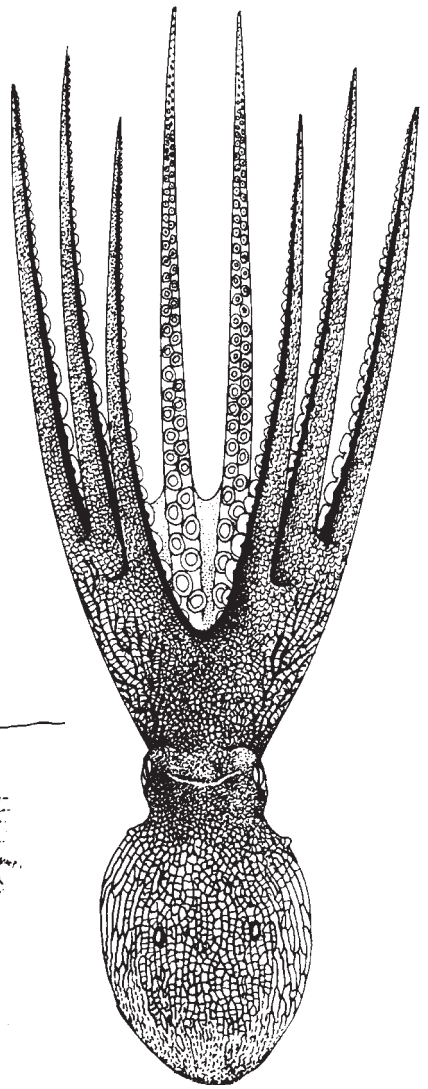
Size: Maximum mantle length around 100 mm, total length to around 300 mm; weight to 400 g.

Habitat, biology, and fisheries: Known from coastal muddy waters on mud and sand substrates, subtidal to depths of at least 190 m. Little known of biology or behaviour. Females lay up to 100 000 small eggs, up to 3 mm long. Important fisheries species collected by trawlers, pots and lines. Taxonomy confused with *Octopus aegina* (treated above) and *O. kagoshimensis* from Japan.

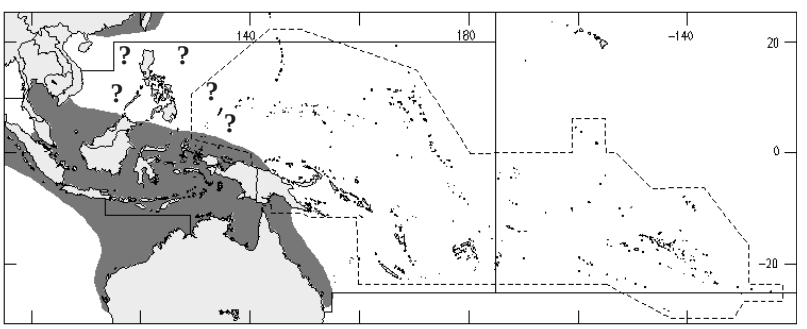
Distribution: Found in tropical continental waters of the Indian Ocean, from the Red Sea and East Africa to Southeast Asia and eastern Australia.



lateral view of head



dorsal view



Octopus nocturnus Norman and Sweeney, 1997

Frequent synonyms / misidentifications: None / *Octopus macropus* Risso, 1826.

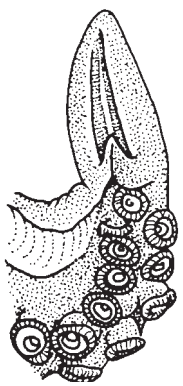
FAO names: En - Philippine night octopus.

Diagnostic characters: Moderate-sized octopus. Arms long, 5 to 6.5 times mantle length. Dorsal arms distinctly longer than other arms (arm formula I.II.III.IV). **Webs shallow, deepest 10 to 15% of longest arm.** Right third arm of males hectocotylized with moderate length ligula (3 to 5% of arm length). Gills with 10 or 11 lamellae per demibranch. In larger specimens, 180 to 220 suckers on each normal arm, 80 to 90 on hectocotylized arm of male. No enlarged suckers in either sex. **Eggs small type and numerous (more than 1 000) in submature females examined. Colour:** pattern of red-brown base with irregular darker blotches and **white spots over dorsal surfaces including mantle**; white spots paired along length of arms; skin sculpture of small low round papillae; no primary papillae visible.

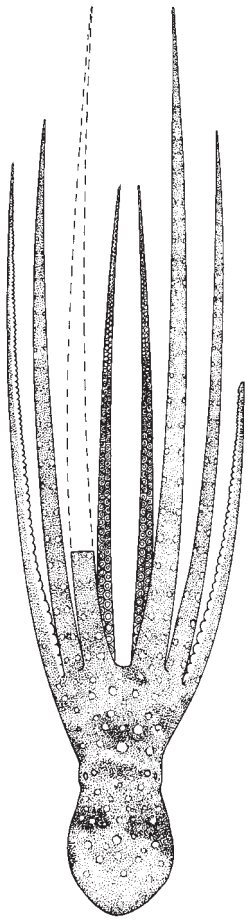
Size: Maximum mantle length around 60 mm, total length to around 350 mm; weight to at least 100 g.

Habitat, biology, and fisheries: Known primarily from intertidal coral and rocky reefs. Deepest record a poison station affecting between a depth of 1.5 and 4.5 m. Members of this species emerge at night to forage during low tides on intertidal reefs. Females produce small eggs in large numbers. Collected in local subsistence harvest, speared on night low tides, historically using burning bamboo torches to find active octopuses.

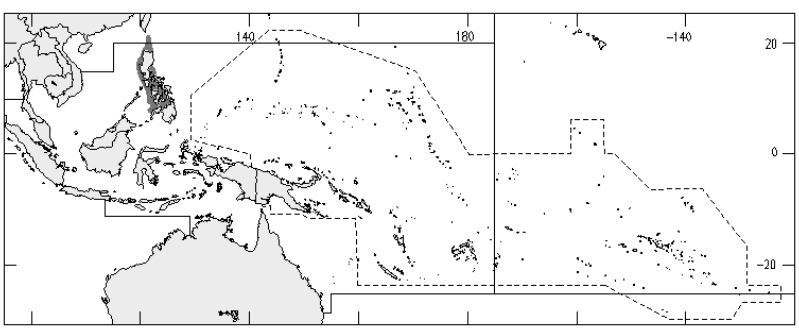
Distribution: At this stage, known only from throughout the Philippines.



tip of hectocotylized arm of male



dorsal view



Octopus ornatus Gould, 1852

Frequent synonyms / misidentifications: *Octopus* (or *Callistoctopus*) *arakawai* (Taki, 1964) / None.

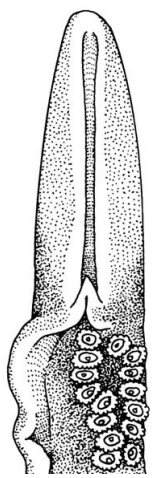
FAO names: En - White-striped octopus.

Diagnostic characters: Large and elongate octopus. **Arms long, 6 to 8 times mantle length.** Dorsal arms much longer than ventral arms (arm formula I.II.III.IV). **Webs shallow, deepest 5 to 11% of longest arm.** Right third arm of males hectocotylized with large cylindrical ligula (4 to 6% of arm length), with deep groove. Gills with 13 or 14 lamellae per demibranch. In larger animals, 300 to 400 suckers on each normal arm, 150 to 170 on hectocotylized arm of male. Suckers on longer dorsal arms proportionally larger than other arms, but none markedly enlarged. **Colour:** pattern of brown to deep red base colour with white markings; **distinctive pattern of longitudinal white bars on dorsal mantle**, visible in live, fresh dead and preserved material; large paired white spots along arms; skin sculpture of low irregular patches separated by distinct grooves; **elongate skin flaps can be raised within longitudinal white bars on mantle.**

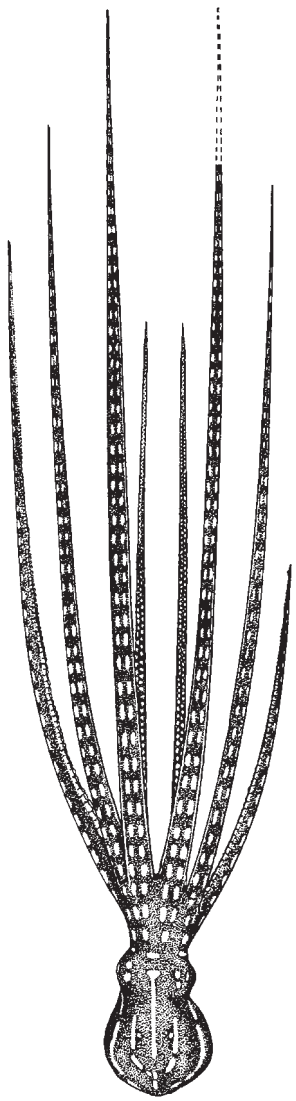
Size: Maximum mantle length 130 mm, total length to over 1 m; weight to at least 1 kg.

Habitat, biology, and fisheries: Known from clear tropical waters, from intertidal shallows to a depth of at least 10 m, on coral reefs amongst both live corals and dead coral rubble. Forages exclusively at night, preying primarily on crustaceans and other octopus species. Typically encountered foraging along the edges of intertidal reefs adjacent to deeper water. Sometimes encountered swimming at the surface in or near lagoons. Occupies deep lairs during the day, the entrance of which is blocked at several levels. Females lay up to 35 000 eggs in festoons, each egg around 3 to 4 mm long. Harvested on a small scale throughout its range, primarily in local subsistence fisheries. It is sold in fish markets in the central and southern tropical Pacific, but less frequently than *Octopus cyanea*. Harvested at night using torches and spears in at least Hawaii.

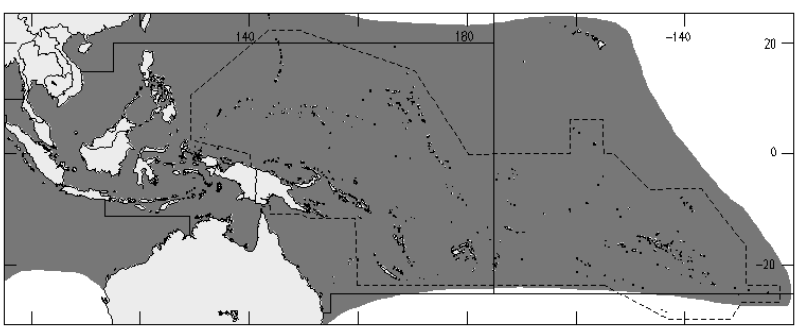
Distribution: Found widely throughout shallow waters of the tropical Indo-West Pacific region, from Hawaii in the east to the east African coast in the west. Reported as far north as southern Japan (as *Callistoctopus arakawai*) and as far south as New South Wales, Australia.



tip of hectocotylized arm III



dorsal view



Octopus tetricus Gould, 1852

Frequent synonyms / misidentifications: None / *Octopus cyanea* Gray, 1849; *O. cyaneus* Gray, 1849.

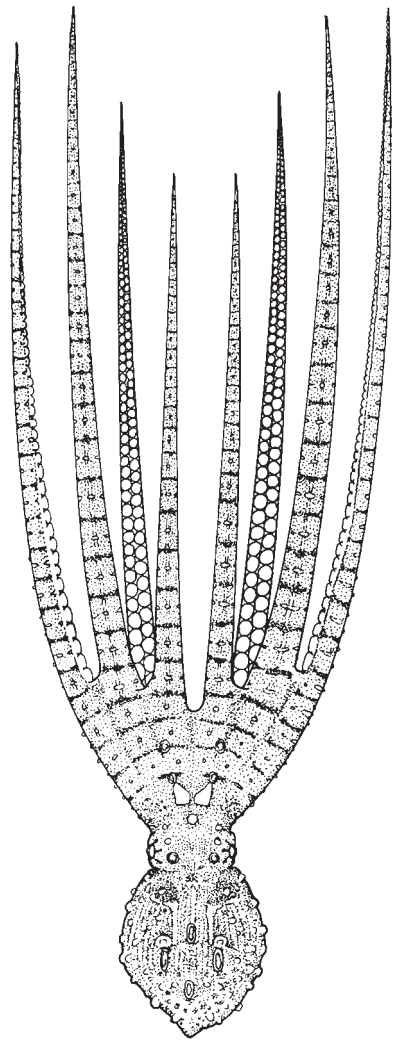
FAO names: En - Common Sydney octopus.

Diagnostic characters: Large and robust species. Arms moderate to long, 3 to 4.5 times mantle length. Dorsal arms slightly shorter and less robust than other arms (arm formula IV=III=II.I). Right third arm of males hectocotylized with **tiny ligula (1 to 2% of arm length).** Gills with 8 or 9 lamellae per demibranch. In larger animals, around 220 to 260 suckers on each normal arm, around 140 to 160 on hectocotylized arm of male. Mature males with around 3 to 5 enlarged suckers (13^{th} to 17^{th}) on arms II and III. **Colour:** active animals cream to mottled orange and dark brown; transverse narrow dark bands along arms in some colour patterns; resting **animals within lairs show grey dorsal surfaces, orange arm faces and eyes with a white iris; skin sculptured in rounded patches separated by distinct grooves**; capable of raising large papillae over dorsal surfaces, including 4 in diamond pattern on dorsal mantle and 1 above each eye.

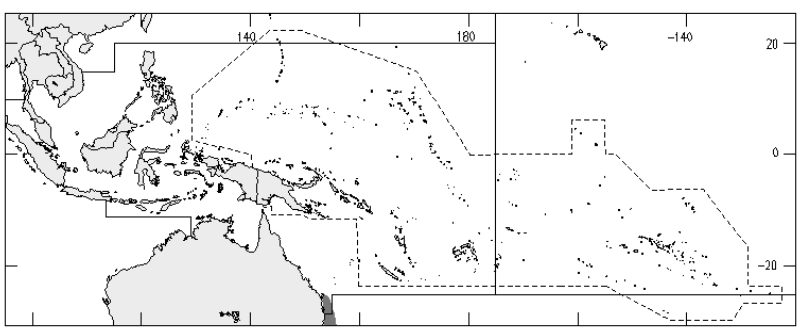
Size: Maximum mantle length at least 140 mm, total length to over 0.6 m; weight to 1 kg.

Habitat, biology, and fisheries: Known from shallow coastal waters, living subtidally on and adjacent to rocky reefs, to a depth of at least 60 m. Active primarily at night, although alert in the mouth of lairs throughout the day. Preys primarily on crabs, but will also take shellfish and finfish (at least in captivity). Occupies lairs in rock crevices or excavated under rocks on sand or mud. Females lay over 150 000 eggs in festoons, each egg around 2 to 3 mm long. Moderate scale harvest as bycatch in prawn and finfish trawl fisheries. Frequently sold in fish markets in New South Wales and southern Queensland. A distinct undescribed species from Western Australia has been incorrectly treated under this name.

Distribution: Found in warm temperate waters of coastal New South Wales and southern Queensland, Australia.



dorsal view



***Octopus* sp. A**

Frequent synonyms / misidentifications: None / *Octopus membranaceus* Quoy and Gaimard, 1832.

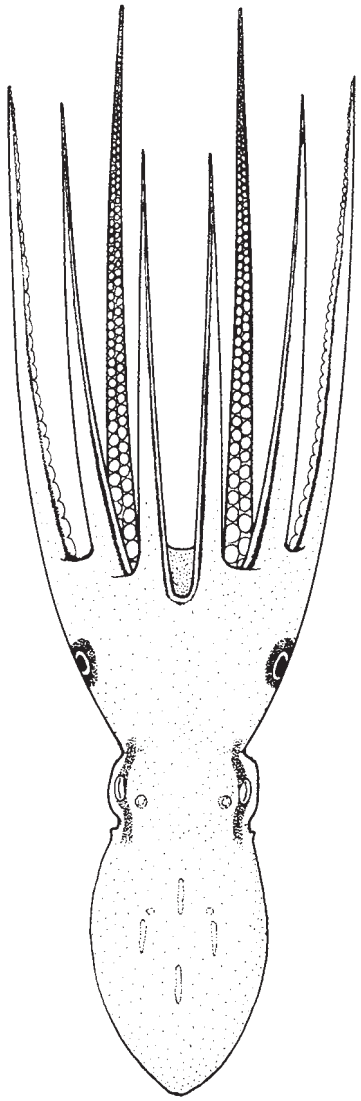
FAO names: En - Eye-bar ocellate octopus.

Diagnostic characters: Small to moderate-sized ocellate octopus. Arms short to moderately long, 2.5 to 3 times mantle length. Dorsal arms slightly shorter than other arms (arm formula IV=III.II.I). Right third arm of males hectocotylized with moderate length, elongate ligula (4 to 10% of arm length) with a shallow groove. Gills with 8 to 10 lamellae per demibranch. Up to 150 suckers on each normal arm, 65 to 80 on hectocotylized arm of male. Mature males possess 2 to 4 moderately enlarged suckers (4^{th} to 8^{th}) on arms II and III. **Colour:** pattern typically cream to light green colour on all surfaces; **short longitudinal bar through each eye; dark brown or black lines along edges of arms; ocellus present as black spot containing a fine iridescent blue to purple ring (4 to 6 mm in diameter in adults)**; head bar and longitudinal stripes on mantle absent; skin sculpture of small low rounded papillae, interspersed by slightly larger pink papillae; diamond of four longitudinal skin ridges on dorsal mantle and large papilla over each eye.

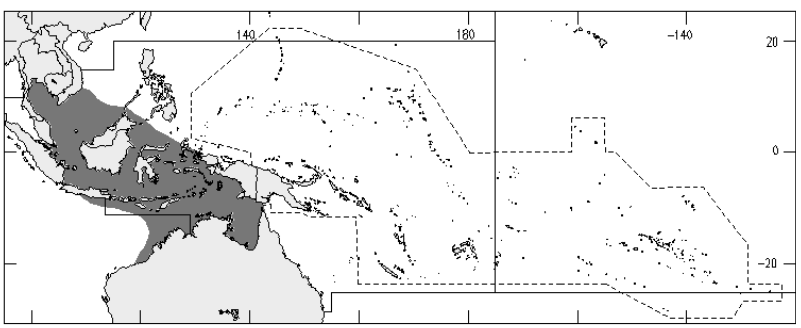
Size: Maximum mantle length around 60 mm, total length to around 250 mm.

Habitat, biology, and fisheries: Known from coastal waters on mud and sand substrates, from intertidal shallows to a depth of at least 60 m. Females lay small eggs, up to 3 mm long, often in shells or bottles. Very important fisheries species collected primarily from the Gulf of Thailand by trawlers. Exported throughout the world on a large scale along with *Octopus aegina* (tens of thousands of tonnes annually). Both species are sold and prepared under the name “baby octopus” (at least in Australia and the United States). The ocellate octopuses of Southeast Asia require extensive revision. A number of undescribed taxa occur throughout the area, several of which are treated under the name *O. membranaceus*. Fisheries statistics for *Octopus* sp. A were reported from Gulf of Thailand, under the name *Octopus* “*membranaceus*”.

Distribution: Found in tropical continental waters of Southeast Asia, from at least Gulf of Thailand, through Indonesia to northern Australia.



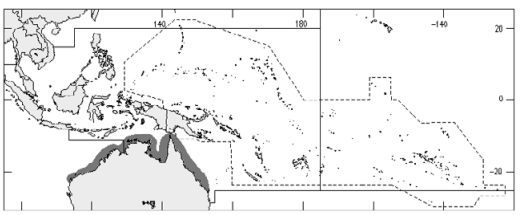
dorsal view

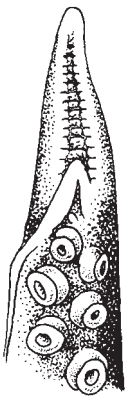


Ameloctopus litoralis Norman, 1992b

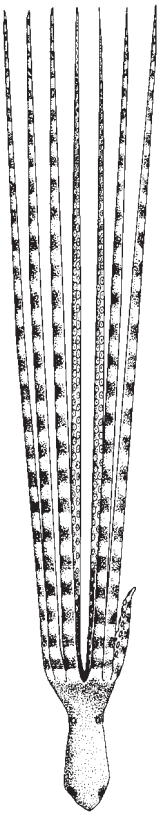
En - Banded long-arm octopus.

Small octopus (maximum mantle length 30 mm) with **greatly elongated arms** (5 to 10 times mantle length). **Arms frequently sever at base as decoy to predators, around 10th sucker.** more than 180 suckers on intact normal arms of larger animals, 20 to 40 on hectocotylized arm of male. **No ink sac.** Right third arm long in submature males, lacking ligula. Mature males sever arm around 40th sucker and develop ligula from stump. Eggs large, to 10 mm. Skin smooth, no papillae. **Colour:** pink to brown, **hearts visible through thin-walled mantle**, **arms with regular purple-brown bands**. Intertidal mud, sand, and rubble reefs. No fisheries value but may be poisonous. Restricted to tropical coastal waters of northern Australia.





tip of hectocotylized arm

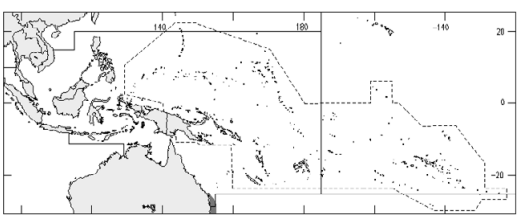


dorsal view

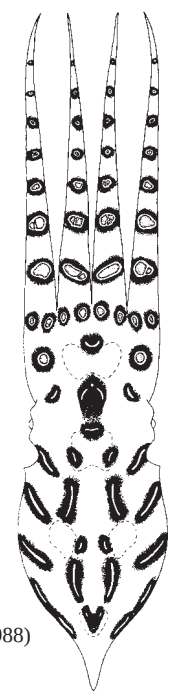
Hapalochlaena fasciata (Hoyle, 1886)

En - Blue-lined octopus.

Small octopus (maximum mantle length 40 mm) with short arms (2 to 3 times mantle length). **Colour:** cream to orange base colour with **iridescent blue lines (not rings) on dorsal mantle** and single or linked blue rings on arm crown and arms. Intertidal and shallow rocky reefs to depths of at least 20 m. No fisheries value but extremely venomous, tetrodotoxin venom produced in the salivary glands and responsible for a number of human deaths. Subtropical waters of eastern Australia from southern Queensland to southern New South Wales.



(after Roper and Hochberg, 1988)

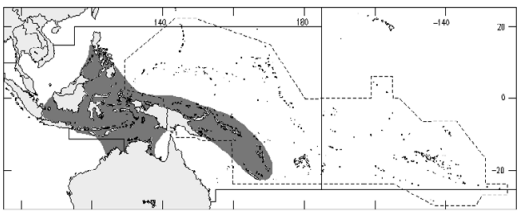


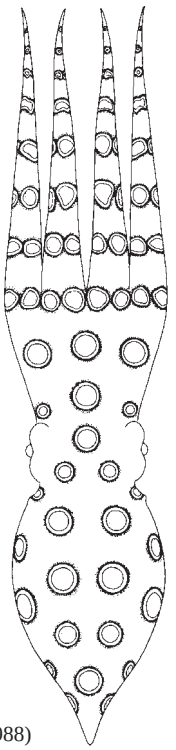
dorsal view

Hapalochlaena lunulata (Quoy and Gaimard, 1832)

En - Greater blue-ringed octopus.

Small octopus (maximum mantle length 50 mm) with short arms (1.5 to 2 times mantle length). **Colour:** cream to orange base colour with **large iridescent blue rings (to 12 mm in diameter) on dorsal mantle**, arm crown and arms. Intertidal and shallow coral reefs. No fisheries value but extremely venomous, tetrodotoxin venom produced in the salivary glands and responsible for a number of human deaths. Tropical waters of Indo-Malayan Archipelago from at least the Philippines to northern Australia and east to Vanuatu.





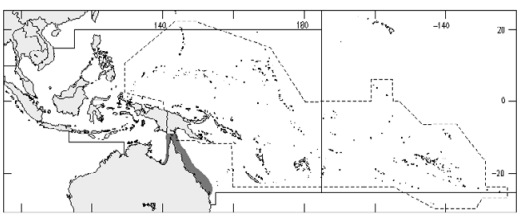
(after Roper and Hochberg, 1988)

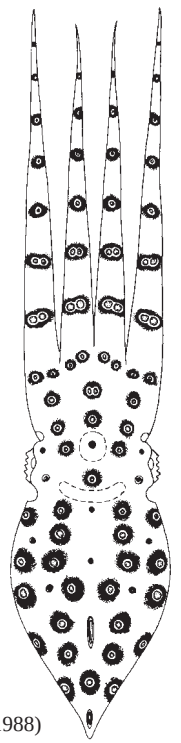
dorsal view

Hapalochlaena* cf. *maculosa (from Roper and Hochberg, 1988)

En - Lesser blue-ringed octopus.

Small octopus (maximum mantle length 40 mm) with short arms (1.5 to 2.5 times mantle length). **Colour:** cream to orange base colour with **small iridescent blue rings (approximately 2 mm in diameter) on dorsal mantle** and single or linked blue rings on arm crown and arms. Intertidal and shallow coral reefs to depths of at least 55 m. No fisheries value but potentially venomous, as in other members of the genus. Tropical waters of northeastern Australia from southern Great Barrier Reef to southern Gulf of Carpentaria.





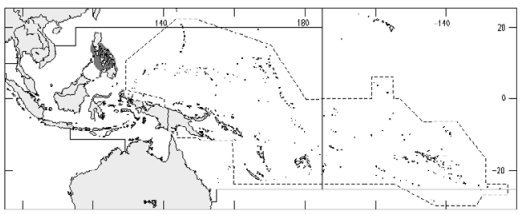
(after Roper and Hochberg, 1988)

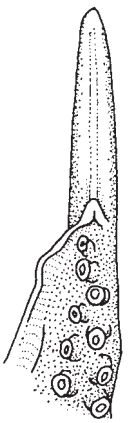
dorsal view

Octopus abaculus Norman and Sweeney, 1997

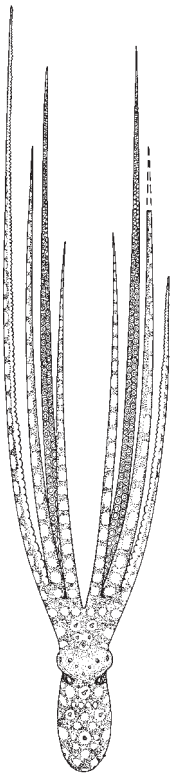
En - Mosaic drop-arm octopus.

Small octopus (maximum mantle length 33 mm) with long arms (5 to 6 times mantle length). **Arms frequently sever at base as decoy to predators, between 5th and 8th sucker.** In adults, 170 to 210 suckers on normal arms, **90 to 120 on hectocotylized arm of male**. Mature males with 8 to 12 enlarged suckers on arms III to IV. Gills with 6 lamellae per demibranch. **Colour: dark grey to purple-black reticulations define large circular cream spots on dorsal surfaces, producing a mosaic pattern**. Intertidal and shallow coral, rubble, or rocky reefs to depths of at least 6 m. No known fisheries value, but may be taken in local subsistence harvest. Only known from the Philippines.





tip of hectocotylized arm

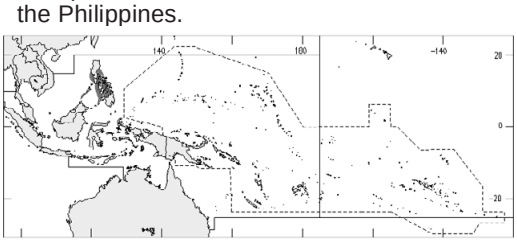


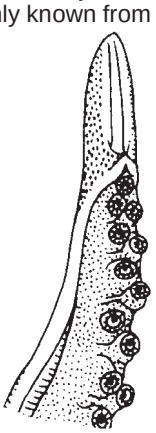
dorsal view

Octopus aculeatus d'Orbigny, 1835

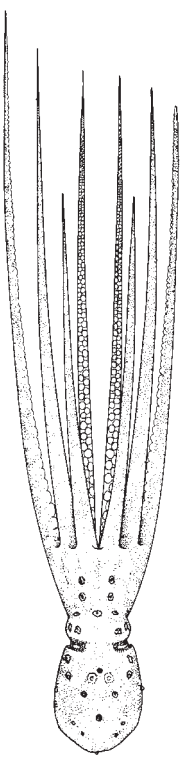
En - Greater drop-arm octopus.

Small to moderate octopus (maximum mantle length 65 mm) with long arms (5 to 6 times mantle length). **Arms frequently sever at base as decoy to predators, between 5th and 8th sucker**. In adults, 190 to 250 suckers on normal arms, **140 to 175 on hectocotylized arm of male**. Mature males with 5 to 12 enlarged suckers on arms II to IV. Gills with 6 or 7 lamellae per demibranch. **Colour: mottled grey-brown to dark grey with small cream spots forming fine mosaic pattern towards arm tips**. Intertidal and shallow mangroves, coral rubble, and rocky reefs to depths of at least 10 m. Small-scale local subsistence harvest. Only known from the Philippines.





tip of hectocotylized arm

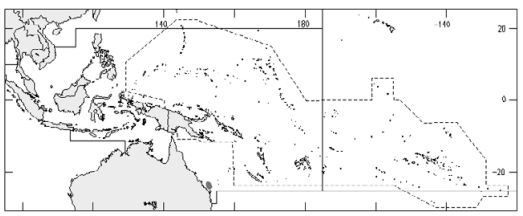


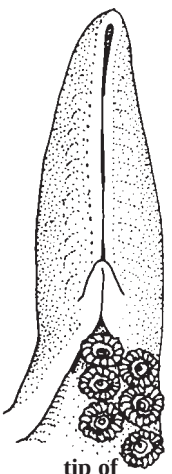
dorsal view

Octopus alpheus Norman, 1993a

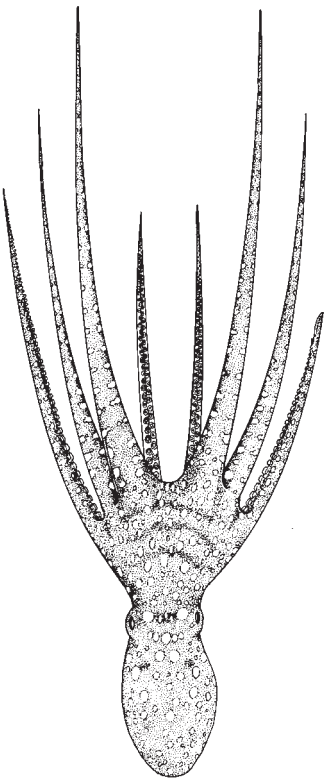
En - Capricorn night octopus.

Moderate to large robust octopus (maximum mantle length 90 mm) with moderately long arms (3 to 5 times mantle length). Dorsal arms longer than lateral and ventral arms. **Webs moderately deep, deepest 16 to 25% of longest arm.** In adults, 190 to 230 suckers on normal arms, 80 to 100 on hectocotylized arm of male. No enlarged suckers. **Large eggs (more than 8 mm) produced in low numbers (less than 500)**. **Colour: orange-brown to red base colour with large white spots over dorsal mantle, arm crown, webs and arms**. Intertidal coral reef flats, emerging to forage during night low tides. No commercial harvest. Tropical species restricted to the Capricorn Bunker Islands, southern Great Barrier Reef, Australia.





tip of hectocotylized arm

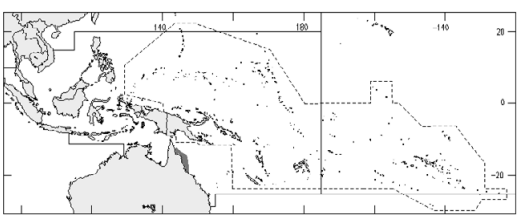


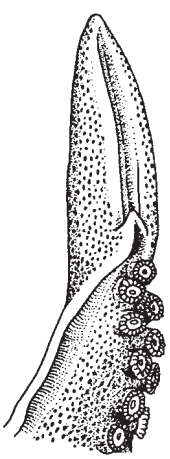
dorsal view

Octopus aspilosomatis Norman, 1993a

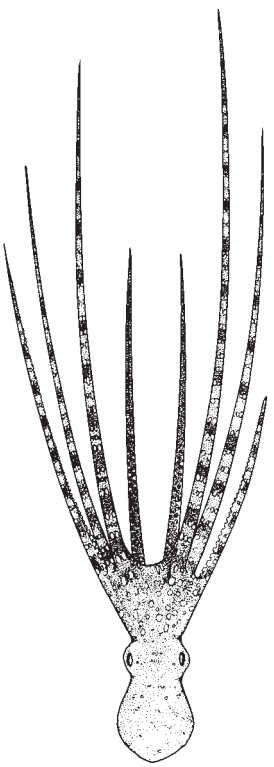
En - Plain-body night octopus.

Moderate-sized, elongate octopus (maximum mantle length 80 mm) with long arms (4.5 to 6 times mantle length). Dorsal arms longer than lateral and ventral arms. **Webs shallow, deepest 9 to 15% of longest arm.** In adults, 200 to 270 suckers on normal arms, 75 to 100 on hectocotylized arm of male. No enlarged suckers. **Small eggs (less than 3 mm) produced in large numbers (more than 10 000). Colour:** orange-brown to deep maroon base colour with white spots on arm crown, webs, and paired down arms; **no white spots ever expressed on mantle.** Intertidal coral reef flats, emerging to forage during night low tides. No commercial harvest. Tropical species known only from coastal reefs and offshore islands of northern Great Barrier Reef, Australia.





tip of hectocotylized arm

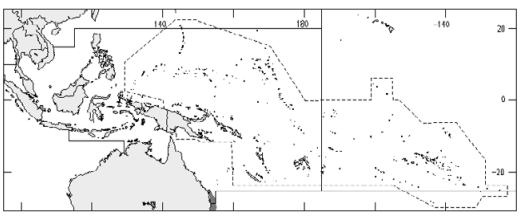


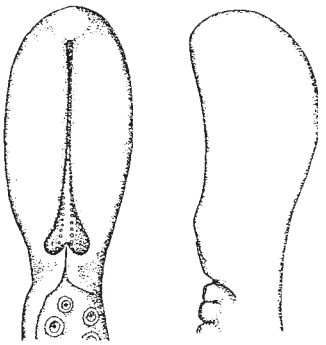
dorsal view

Octopus australis Hoyle, 1885

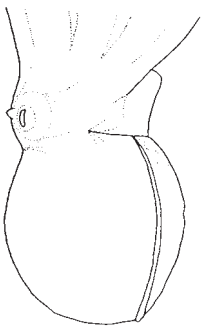
En - Hammer octopus.

Moderate-sized octopus (maximum mantle length 70 mm) with moderately long arms (2.5 to 4 times mantle length). Up to 220 suckers on normal arms, 60 to 80 on hectocotylized arm of male. **Ligula of large swollen club ("hammer").** Eggs large, to 12 mm. **Raised ridge ("keel") of skin around lateral mantle**. Skin covered in regular rounded papillae. **Colour:** cream to purple-brown dorsally, cream on ventral surfaces. Sand and mud substrates to a depth of 134 m. Small-scale trawl harvest for human consumption and as bait. Restricted to subtropical waters of southern Queensland and New South Wales, Australia.

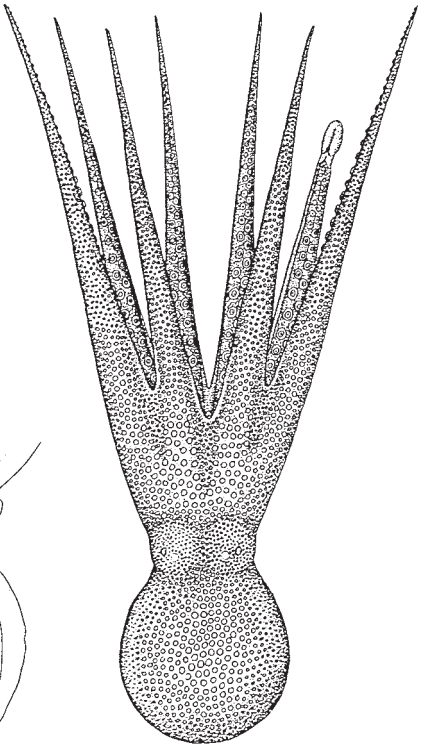




tip of hectocotylized arm



lateral view



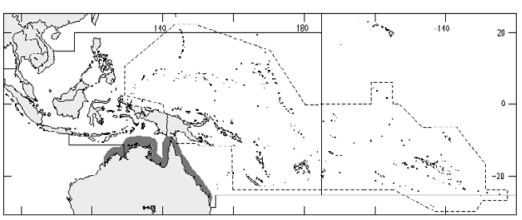
dorsal view

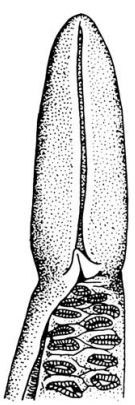
(after Stranks and Norman, 1993)

Octopus dierythraeus Norman, 1993a

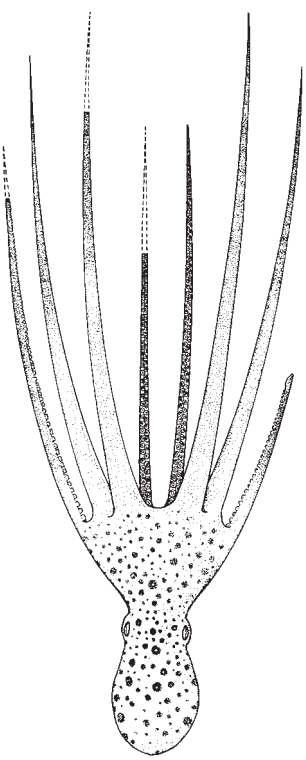
En - Red-spot night octopus.

Large robust octopus (maximum mantle length 140 mm) with moderately long arms (4 to 5 times mantle length). Dorsal arms longer than lateral and ventral arms. **Webs moderately deep, deepest 18 to 28% of longest arm.** In adults, 230 to 280 suckers on normal arms, 100 to 130 on hectocotylized arm of male. No enlarged suckers. **Large eggs (more than 14 mm) produced in low numbers (less than 500). Colour:** foraging animals orange brown to red with white spots over dorsal surfaces, **alarm display of white base colour with red spots over mantle, arm crown, webs and arms.** Shallow coastal waters on rubble, sand or mud from intertidal reefs to depths of at least 80 m. Potential bycatch harvest. Tropical species restricted to coastal waters of northern Australia.





tip of hectocotylized arm

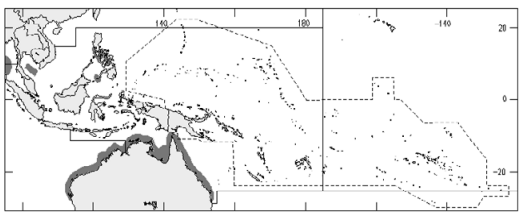


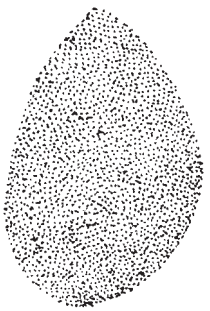
dorsal view

Octopus exannulatus Norman, 1993b

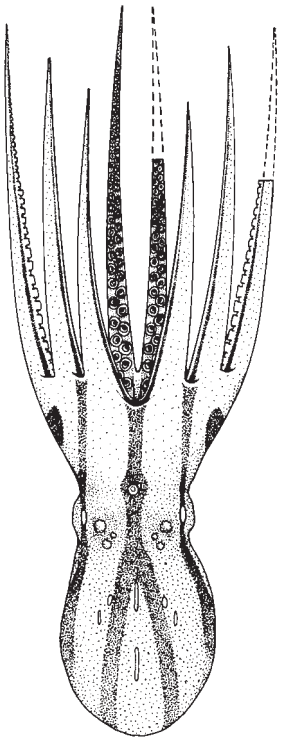
En - Plain-spot ocellate octopus.

Small octopus (maximum mantle length 50 mm) with short arms (2 to 3 times mantle length). 120 to 190 suckers on normal arms of adults, 60 to 80 on hectocotylized arm of male. Gills with 7 or 8 lamellae per demibranch. In mature males, 2 or 3 very large suckers on arms II and III (10th to 12th). Eggs small, to 4 mm. Skin covered in regular oval to round papillae. **Colour:** cream with **4 black stripes along dorsal mantle and arm crown; plain ocellus without iridescent ring; black lines along leading edge of arms**. Shallow sand and mud substrates to depths of at least 84 m. Small harvest in Australia, primarily as bait. Indo-Malayan area from Philippines, to Thailand, and northern Australia.





ocellus

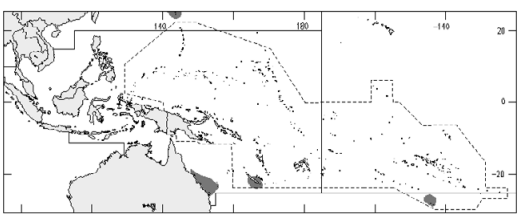


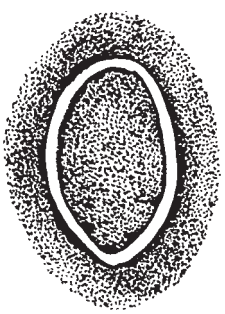
dorsal view

Octopus mototi Norman, 1993b

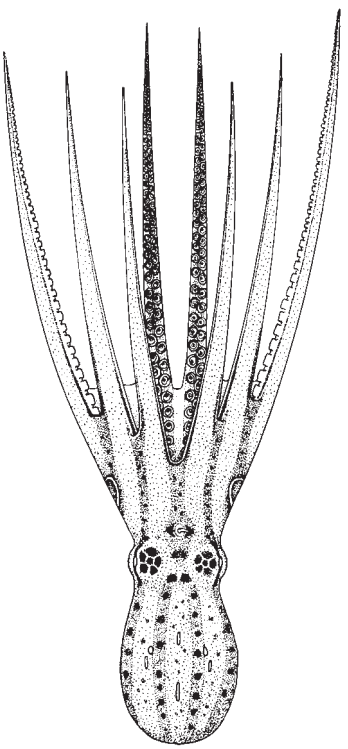
En - Poison ocellate octopus (from Rapa, Rapa Is., “Fe’e motot”).

Moderate-sized octopus (maximum mantle length 70 mm) with short to moderate arms (2.5 to 3 times mantle length). In adults, 140 to 170 suckers on normal arms, 90 to 110 on hectocotylized arm of male. Gills with 9 to 11 lamellae per demibranch. No distinct enlargement of suckers in mature males. Eggs small, to 6 mm. Skin covered in regular polygonal patches. **Colour:** resting colour of orange with **ring of 5 large black spots above each eye**; **6 longitudinal rows of spots on dorsal mantle which become solid maroon stripes in live alarm displays; ocellus with large iridescent blue ring.** Sand and coral rubble substrates to depths of 54 m. No fisheries value, potentially venomous as for blue-ringed octopuses. Reported as poisonous on Rapa Island. Occurs in at least the western and southern tropical Pacific Ocean.





ocellus

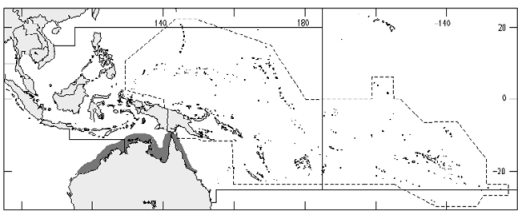


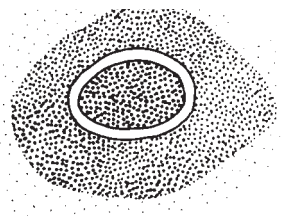
dorsal view

Octopus polyzenia Gray, 1849

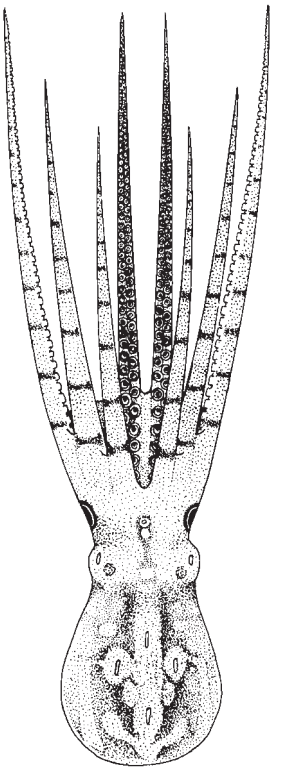
En - Arm-band ocellate octopus.

Small octopus (maximum mantle length 40 mm) with short to moderate arms (2 to 3 times mantle length). 80 to 140 suckers on normal arms of adults, 45 to 55 on hectocotylized arm of male. Gills with 6 or 7 lamellae per demibranch. In mature males, 1 to 3 enlarged suckers (12th to 14th) on all arms. Eggs large relative to mantle length, to 7.5 mm. Skin covered in low small papillae. **Colour:** mottled cream to dark brown; **ocellus with small iridescent blue ring; transverse dark bars widely spaced on arms, one every 3 to 5 sucker pairs**. Shallow coastal waters on rubble, sand or mud to depths of at least 20 m. No fisheries value but may be harvested with other northern Australian ocellate octopuses. Coastal waters of northern Australia.





ocellus



dorsal view

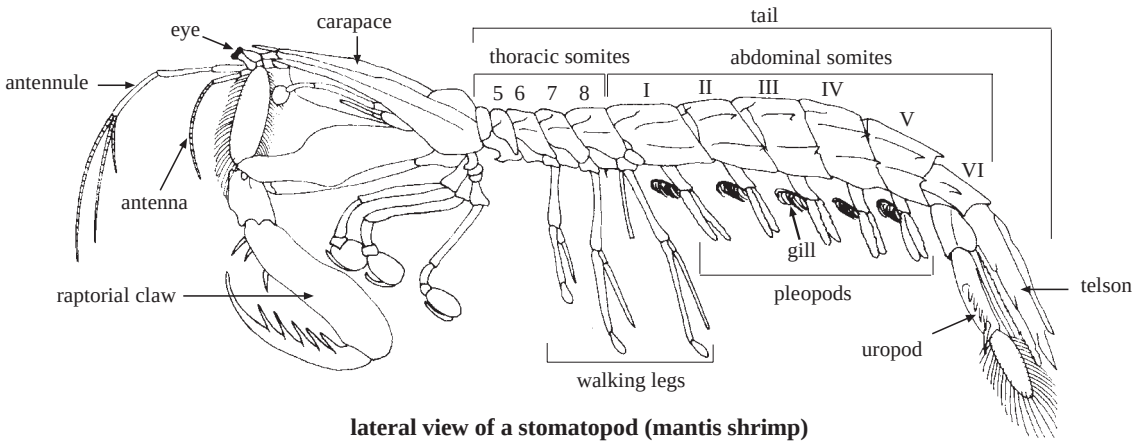
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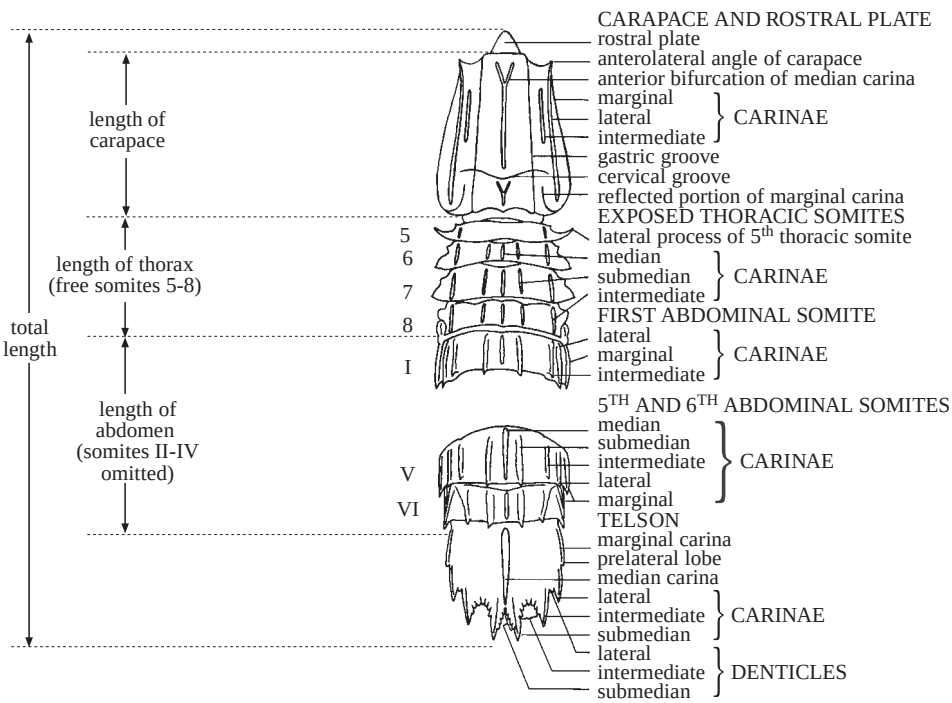
STOMATOPODS

by R.B. Manning

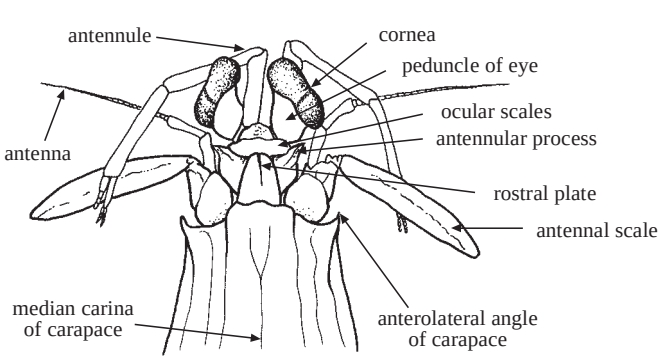
TECHNICAL TERMS AND MEASUREMENTS



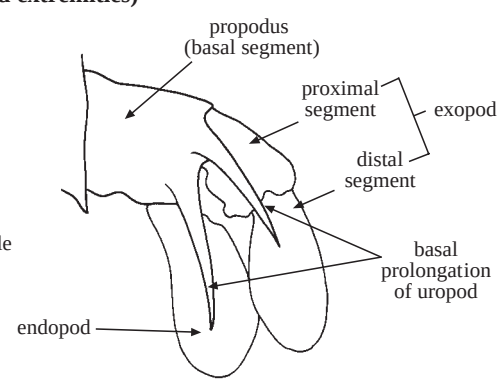
lateral view of a stomatopod (mantis shrimp)



dorsal view (without head and extremities)



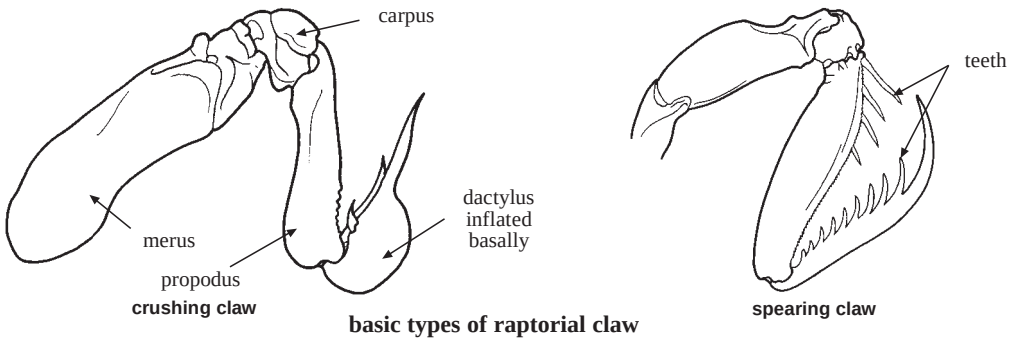
anterior part of body (dorsal view)



left uropod (ventral view)

GENERAL REMARKS

Stomatopods, also called mantis shrimps, are elongate, flattened, shrimp-like or lobster-like crustaceans, which are characterized by the following features: large, often T-shaped, movable eyes, often with a bilobed cornea; **a very short carapace, not more than about 1/3 the total length and not covering the eyes; only 3 pairs of walking legs**; 5 pairs of pleopods under the anterior 5 abdominal somites (I to V); **a long, flattened tail (which includes part of the thorax, the abdomen, and the terminal telson)**; 1 pair of lateral uropods on the abdominal somite VI which includes a strongly spined ventral process; a telson that is often spined posteriorly. The most conspicuous characteristic of mantis shrimps is a pair of **massive, conspicuous, praying mantis-like "raptorial" claws** which are folded under the sides of the carapace. In many of the larger stomatopods, the terminal 2 segments of the claws usually are lined with sharp, serrated teeth. The claws are adapted for crushing or spearing. Those species with crushing claws have the terminal segment of the claw broadened and heavily buttressed basally. Spearing claws are more elongate, more conspicuously toothed, and much more slender, not inflated basally.



basic types of raptorial claw

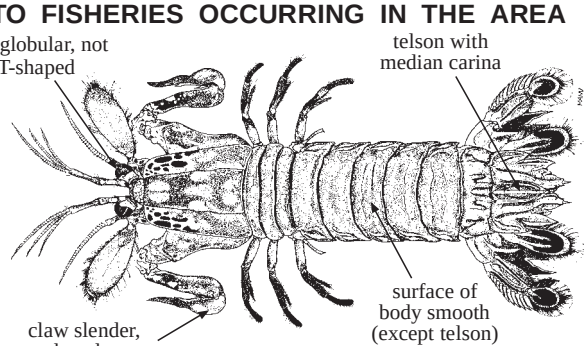
These are burrowing animals that hunt from the burrow or leave it to forage for food. Few, if any, mantis shrimps are fished commercially in the Western Central Pacific. However, very large, up to 38 cm long, representatives of 4 families can be found in markets or may be fished artisanally. They are often caught in trawls and fish traps, at night lights, and by hand.

GUIDE TO FAMILIES OF INTEREST TO FISHERIES OCCURRING IN THE AREA

ODONTODACTYLIDAE **Page 832**

Odontodactylid mantis shrimps

Body smooth, lacking longitudinal ridges or carinae anterior to terminal abdominal somite (= telson); telson with distinct median longitudinal carina; eyes subglobular, cornea not bilobed; raptorial claw short, with dactylus heavily buttressed, swollen basally. Four species of *Odontodactylus* occur in the area, only 1 of which, *O. scyllarus*, is large and common enough to occasionally be found in markets.

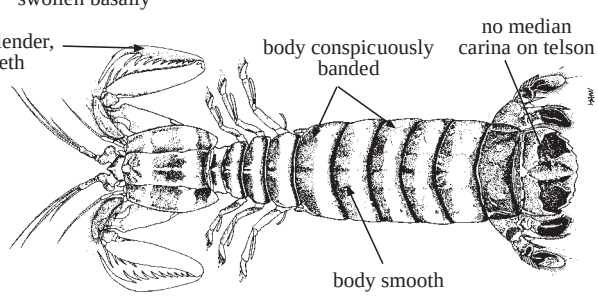


Odontodactylidae

LYSIOSQUILLIDAE **Page 835**

Banded mantis shrimps

Body smooth, lacking longitudinal ridges or carinae; telson without median carina; eyes T-shaped, with large, bilobed cornea; raptorial claw large and slender. Four species found in the area, 2 of *Lysiosquilla* and 2 of *Lysiosquillina*, only 1 of which, *Lysiosquillina maculata*, is known to be fished, at least artisanally.



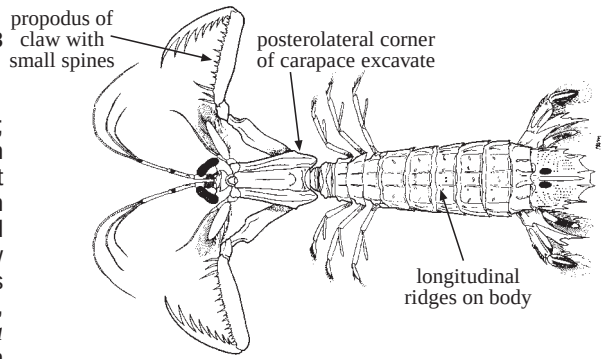
Lysiosquillidae

HARPIOSQUILLIDAE

Page 838

Harpiosquillid mantis shirmps

Body with longitudinal carinae or ridges; posterolateral angles of carapace with conspicuous excavation; telson with distinct median longitudinal carina; eyes T-shaped, with large bilobed cornea; raptorial claw large and slender; opposable margin of propodus of claw with erect spines. The larger, more conspicuous harpiosquillids belong to a single genus, *Harpiosquilla*. Nine species of *Harpiosquilla* found in the area, 2 of which are common enough to be found in markets.



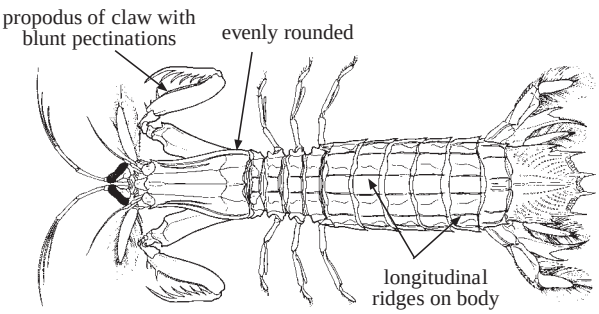
Harpiosquillidae

SQUILLIDAE

Page 842

Squillid mantis shrimps

Body with longitudinal carinae or ridges; telson with distinct median longitudinal carina; eyes T-shaped, with bilobed cornea; raptorial claw large and slender; opposable margin of propodus of claw lined with low, blunt pectinations; posterolateral angles of carapace rounded, convex, rather than excavate. The family Squillidae comprises some 40 genera, 20 of which are represented in the Indo-West Pacific, but members of only 5 genera are large enough or abundant enough to be used for food.



Squillidae

KEY TO MAJOR FAMILIES OF STOMATOPODS OCCURRING IN THE AREA

1a. Telson without median carina (Fig. 1a). . . . . → **2**

1b. Telson with distinct median carina (Fig. 1b). . . . . → **3**

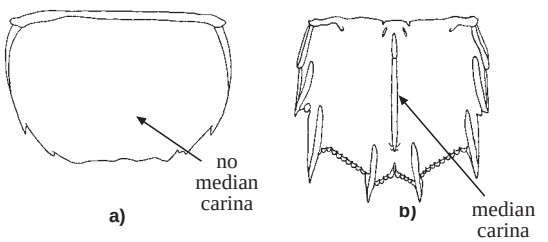
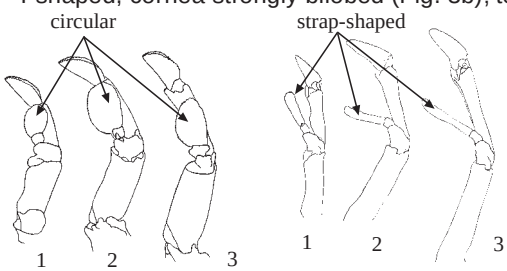


Fig. 1 telson (dorsal view)

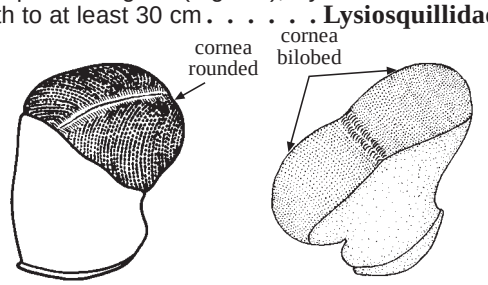
2a. Distal segment of endopod of walking legs circular or nearly so (Fig. 2a); eyes not T-shaped, with cornea rounded or oval, not bilobed (Fig. 3a); total length not exceeding 7 cm. . . . . **Nannosquillidae**

2b. Distal segment of endopod of walking legs strap-shaped, elongate (Fig. 2b); eyes T-shaped, cornea strongly bilobed (Fig. 3b); total length to at least 30 cm. . . . . **Lysiosquillidae**



a) Nannosquillidae **b) Lysiosquillidae**

Fig. 2 walking legs 1-3



a) Nannosquillidae **b) Lysiosquillidae**

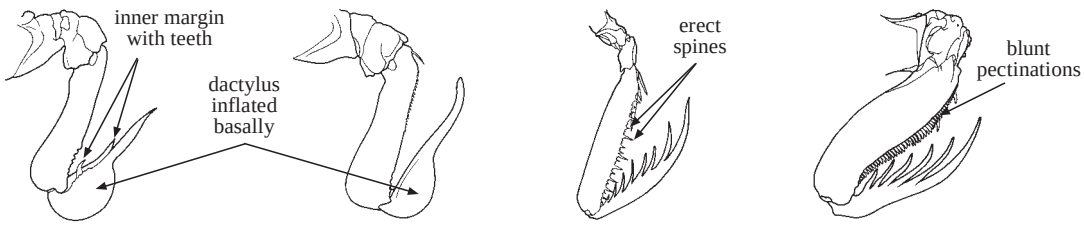
Fig. 3 eye

3a. Dactylus of raptorial claw inflated basally, strongly buttressed (Fig. 4a, b) . . . . . → **4**

3b. Dactylus of raptorial claw slender, not inflated or buttressed basally (Fig. 4c, d) . . . . . → **5**

4a. Dactylus of raptorial claw with teeth on inner margin (Fig. 4a); total length up to 17 cm . . . . . **Odontodactylidae**

4b. Dactylus of raptorial claw unarmed on inner margin (Fig. 4b); total length less than 10 to 11 cm . . . . . **Gonodactylidae**

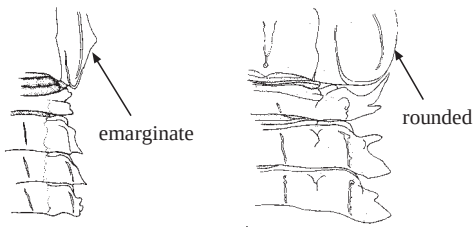


a) Odontodactylidae **b) Gonodactylidae** **c) Harpiosquillidae** **d) Squillidae**

Fig. 4 right claw

5a. Carapace with posterolateral excavation (Fig. 5a); propodus of raptorial claw lined with erect spines (Fig. 4c) . . . . . ***Harpiosquillidae***

5b. Carapace rounded posterolaterally, not excavate (Fig. 5b); propodus of raptorial claw lined with blunt pectinations (Fig. 4d). . . ***Squillidae***



a) Harpiosquillidae **b) Squillidae**

Fig. 5 posterolateral carapace and lateral processes of thoracic somites (dorsal view)

LIST OF FAMILIES OCCURRING IN THE AREA

The symbol is given for those families which are treated further in this contribution.

Superfamily BATHYSQUILLOIDEA Manning, 1967
BATHYSQUILLIDAE Manning, 1967
INDOSQUILLIDAE Manning, 1995

Superfamily ERYTHROSQUILLOIDEA Manning and Bruce, 1984
ERYTHROSQUILLIDAE Manning and Bruce, 1984

Superfamily GONODACTYLOIDEA Giesbrecht, 1910
ALAINOSQUILLIDAE Moosa, 1991
EURYSQUILLIDAE Manning, 1977
GONODACTYLIDAE Giesbrecht, 1910
HEMISQUILLIDAE Manning, 1980
ODONTODACTYLIDAE Manning, 1980
PARASQUILLIDAE Manning, 1995
PROTOSQUILLIDAE Manning, 1980
PSEUDOSQUILLIDAE Manning, 1977
TAKUIDAE Manning, 1995

Superfamily LYSIOSQUILLOIDEA Giesbrecht, 1910
CORONIDIDAE Manning, 1980
HETEROSQUILLIDAE Manning, 1995
LYSIOSQUILLIDAE Giesbrecht, 1910
NANNOSQUILLIDAE Manning, 1980
TETRASQUILLIDAE Manning and Camp, 1993

Superfamily SQUILLOIDEA Latreille, 1803
HARPIOSQUILLIDAE Manning, 1980
SQUILLIDAE Latreille, 1803

Reference

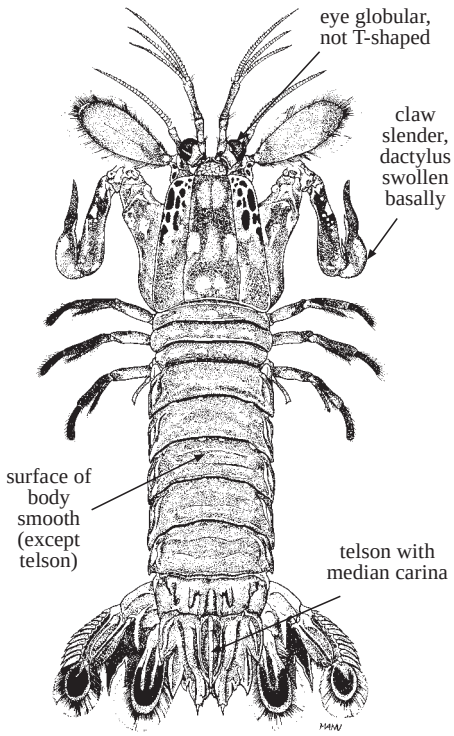
Manning, R.B. 1995. *Stomatopod Crustacea of Vietnam: the legacy of Raoul Serène*. Tokyo, Crustacean Research, The Carcinological Society of Japan, Special Number 4:339 p.

ODONTODACTYLIDAE

Odontodactylid mantis shrimps

Diagnostic characters: Moderate-sized mantis shrimps (maximum total length more than 17 to 18 cm). **Eyes globular**, not T-shaped, cornea not bilobed. **Carapace, thorax, and abdomen smooth**, not ornamented with any longitudinal ridges or carinae anterior to last abdominal somite (= telson). Telson with median longitudinal carina. Raptorial claw short and **heavily buttressed at base of terminal segment**, adapted for smashing prey; inner margin of dactylus toothed with no more than 5 short teeth.

Habitat, biology, and fisheries: In coarse-bottom or level-bottom habitats. Essentially nothing is known about the biology of odontodactylids and no organized fisheries are known to exist for them.

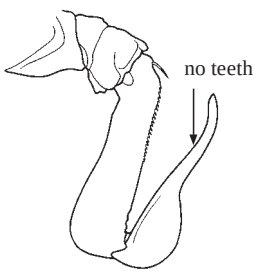


dorsal view

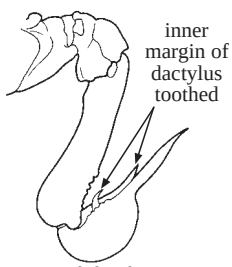
(after Manning, 1995)

Similar families occurring in the area

Gonodactylidae: share the buttressed, inflated claw, but have the inner margin of the claw unarmed and are much smaller.



right claw
Gonodactylidae

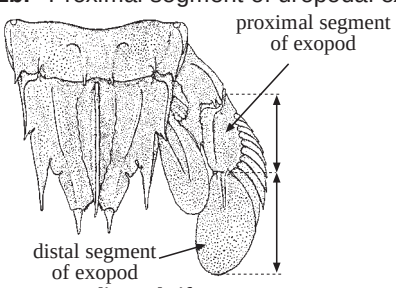


right claw
Odontodactylidae

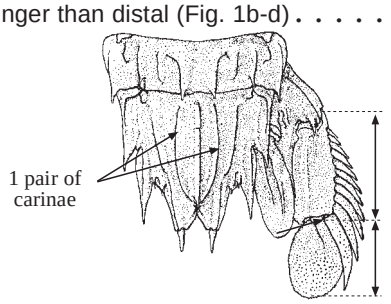
Key to the species of Odontodactylidae occurring in the area

1a. Proximal segment of uropodal exopod shorter than distal (Fig. 1a) . . . . . ***Raoulius cultrifer***

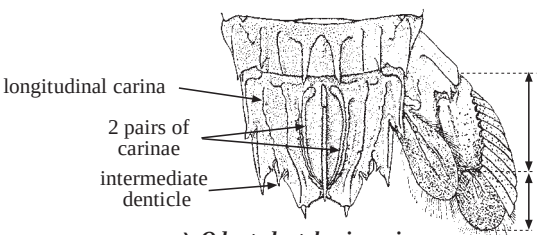
1b. Proximal segment of uropodal exopod longer than distal (Fig. 1b-d) . . . . . → ***2***



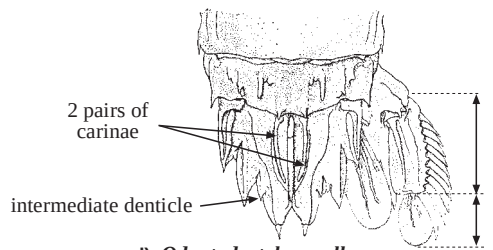
a) ***Raoulius cultrifer***



b) ***Odontodactylus brevirostris***



c) ***Odontodactylus japonicus***

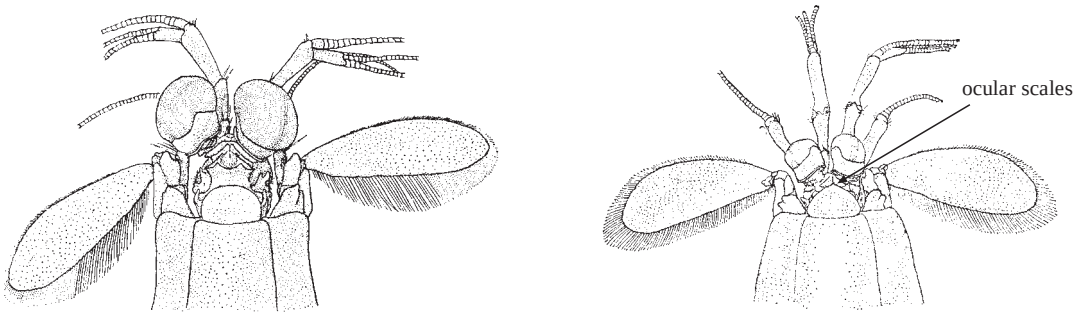


d) ***Odontodactylus scyllarus***

Fig. 1 sixth abdominal somite, telson, and right uropod (dorsal view) (from Manning, 1967)

2a. Ocular scales separate in midline (Fig. 2a); telson with 1 pair of carinae converging under apex of median carina (Fig. 1b) . . . . . ***Odontodactylus brevirostris***

2b. Ocular scales fused in midline (Fig. 2b); telson with 2 pairs of carinae converging under apex of median carina (Fig. 1c, d) . . . . . → ***3***

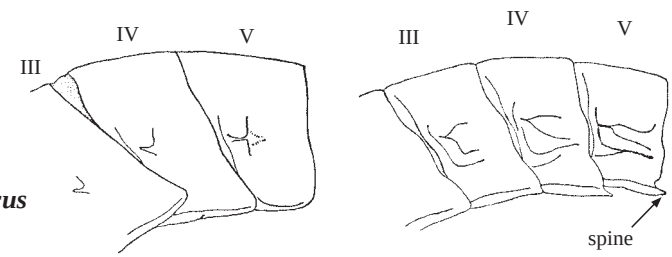


a) ***Odontodactylus brevirostris*** (from Manning, 1967) **b)** ***Odontodactylus scyllarus***

Fig. 2 anterior part of body (dorsal view)

3a. Fifth abdominal somite unarmed posterolaterally (Fig. 3a); telson with longitudinal carina extending anteriorly from inner intermediate denticle (Fig. 1c) . . . . . ***.Odontodactylus japonicus***

3b. Fifth abdominal somite with posterolateral spine (Fig. 3b); telson lacking longitudinal carina extending anteriorly from inner intermediate denticle (Fig. 1d) . . . ***Odontodactylus scyllarus***



a) ***Odontodactylus japonicus*** **b)** ***Odontodactylus scyllarus***

Fig. 3 abdominal somites III-V (lateral view)

List of species occurring in the area

The symbol is given when species accounts are included.

Odontodactylus brevirostris (Miers, 1884)
Odontodactylus japonicus (De Haan, 1844)
Odontodactylus scyllarus (Linnaeus, 1758)
Raoulius cultrifer (White, 1850)

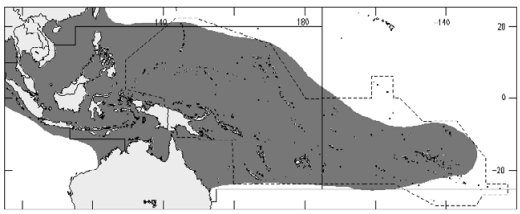
Reference

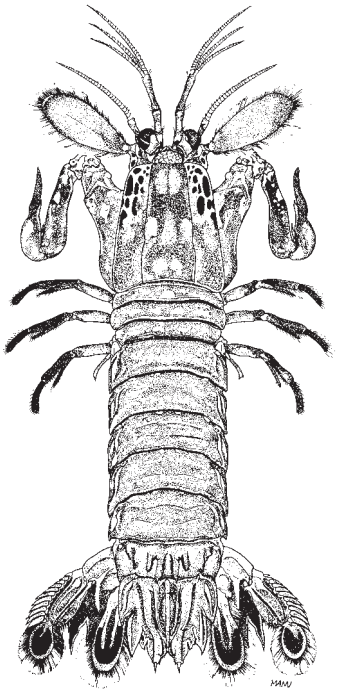
Manning, R.B. 1967. Review of the genus *Odontodactylus* (Crustacea: Stomatopoda). *Proc. U.S. Natl. Mus.*, 123(3606):1-33.

Odontodactylus scyllarus (Linnaeus, 1758)

En - Reef odontodactylid mantis shrimp.

Maximum total length about 17 cm, the largest “smasher”. One of the most brightly coloured stomatopods, with deep blue uropods and those and other appendages lined with bright red setae. Lives in existing burrows in shallow rough bottom habitats, often on or near coral reefs. Active during the day and uses its buttressed raptorial claws to smash hard-bodied prey like other scyllarids. Collected primarily by hand. Used in the aquarium trade because of its bright coloration. Widely distributed from Japan to the western Indian Ocean.





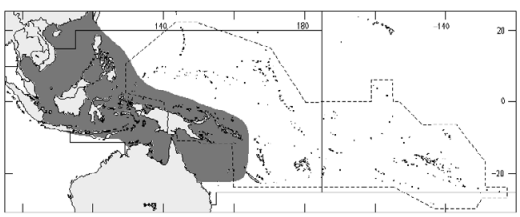
dorsal view

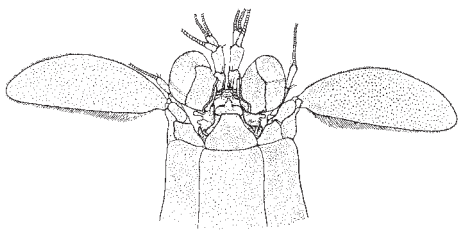
(after Manning, 1995)

Raoulius cultrifer (White, 1850)

En - Pastel odontodactylid mantis shrimp.

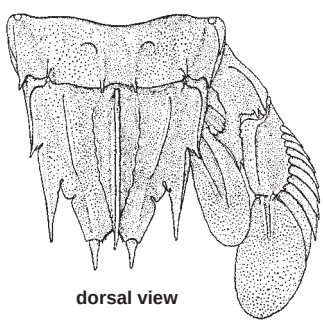
Maximum total length about 12 cm. Colour primarily in pastels, with pink or purple uropods and antennal scales. Burrows in level bottoms near shore, in depths to about 25 m. May be taken together with lysiosquillids and squillids in trawling operations and at night lights. Known from southern China to Australia.





dorsal view

anterior part of body



dorsal view

6th abdominal somite, telson, and right uropod

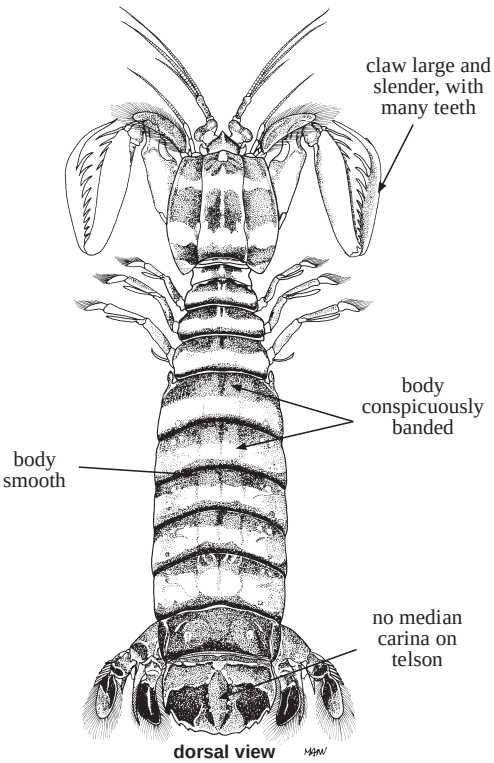
(from Manning, 1967)

LYSIOSQUILLIDAE

Banded mantis shrimps

Diagnostic characters: Eye T-shaped, cornea bilobed. **Carapace, thorax, and abdomen smooth, lacking longitudinal ridges or carinae**. **Telson lacking distinct median carina**; marginal teeth or spines of telson inconspicuous. Raptorial claw slender and elongate, adapted for spearing prey, with toothed edge of dactylus bearing numerous, large, serrated teeth or spines. Lysiosquillids **usually are clearly banded with alternate light and darkly pigmented bands**. Members of the 2 genera likely to be encountered in markets are readily distinguished by 2 features: in *Lysiosquilla*, (1) the antennal scale is slender, elongate, more than 3 times longer than wide and it is outlined by dark pigment, and (2) there is a spine-like projection on the anterior margin of the antennal peduncle; in *Lysiosquillina*, the antennal scale is oval, about 2 times longer than wide, and it bears a central spot or blotch of dark pigment; the antennal peduncle is smooth anteriorly, lacking a distinct spine-like projection.

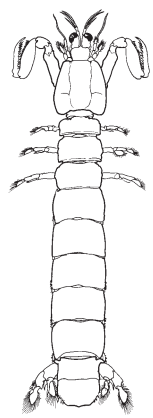
Habitat, biology, and fisheries: Almost nothing is known about the biology of lysiosquillids. They form simple burrows with 2 entrances, one at each end, in level-bottom habitats in shallow water, from shore to a depth of about 25 m. The burrow openings may be as much as 10 m apart. Although they generally hunt from the mouth of their burrow, they occasionally leave their burrows and may be caught at night lights or in trawls. Most fisheries for lysiosquillids are artisanal. Five species of lysiosquillids occur within the area, but information on distribution is limited and contradictory. Only 1 species, *Lysiosquillina maculata* (Fabricius, 1793), is particularly common and known to be fished artisanally.



(after Manning, 1995)

Similar families occurring in the area

Nannosquillidae: also smooth-bodied and also may be conspicuously banded with alternate dark and light bands of pigment, but much smaller, rarely exceeding 7 cm in length, and of no commercial importance.

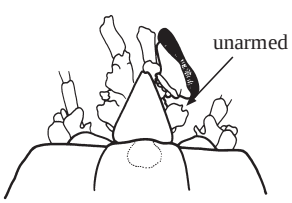


Nannosquillidae

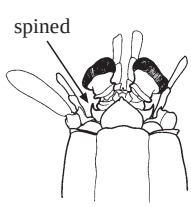
Key to the species of Lysiosquillidae occurring in the area

1a. Dorsal processes of antennular somite unarmed (Fig. 1a); telson with movable submedian teeth (Fig. 2a) . . . . . ***Lysiosquilloides siamensis***

1b. Dorsal processes of antennular somite produced into spines (Fig. 1b); telson lacking movable submedian teeth (Fig. 2b) . . . . . → ***2***

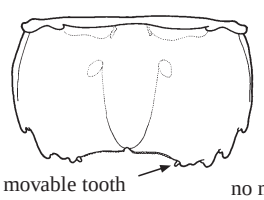


a) ***Lysiosquilloides siamensis***

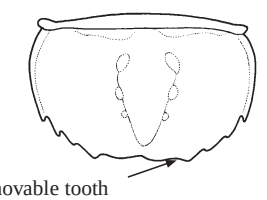


b) ***Lysiosquilla, Lysiosquillina***

Fig. 1 anterior part of body (dorsal view)



a) ***Lysiosquilloides siamensis***

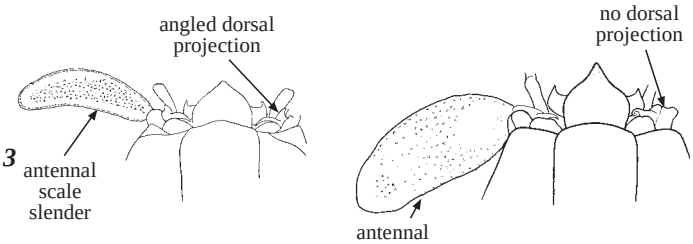


b) ***Lysiosquilla, Lysiosquillina***

Fig. 2 telson (dorsal view)

2a. Antennal protopod with angled dorsal projection (Fig. 3a); antennal scale slender, length more than 3 times width (Fig. 3a) . . . . . **(*Lysiosquilla*)** → ***3***

2b. Antennal protopod lacking angled dorsal projection (Fig. 3b); antennal scale broad, length less than 3 times width (Fig. 3b) . . . . **(*Lysiosquillina*)** → ***4***

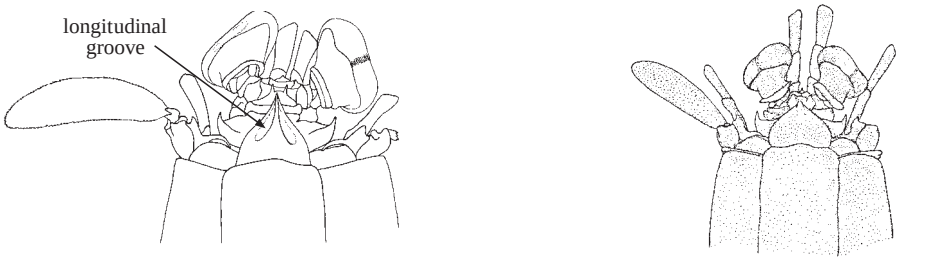


a) ***Lysiosquilla*** **b)** ***Lysiosquillina***

Fig. 3 anterior part of body (dorsal view)

3a. Median carina on rostral plate flanked by longitudinal grooves (Fig. 4a); dactylus of raptorial claw with 7 or 8 teeth (Fig. 5a) . . . . . ***Lysiosquilla sulcirostris***

3b. Median carina on rostral plate not flanked by longitudinal grooves (Fig. 4b); dactylus of raptorial claw with 10 to 13 teeth (Fig. 5b) . . . . . ***Lysiosquilla tredecimdentata***

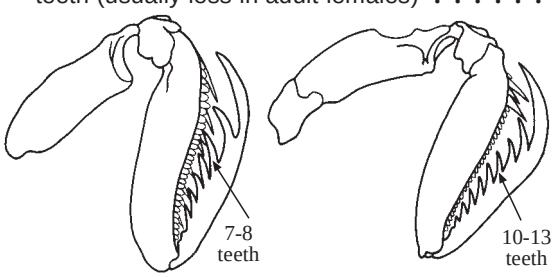


a) ***Lysiosquilla sulcirostris*** **b)** ***Lysiosquilla tredecimdentata***

Fig. 4 anterior part of body (dorsal view)

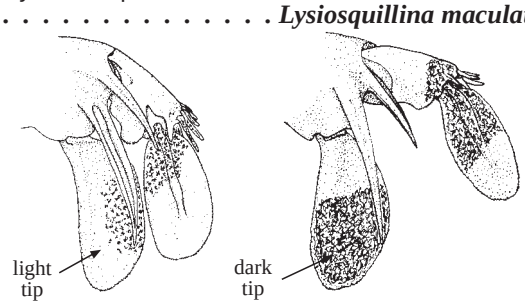
4a. Distal end of uropodal endopod light (Fig. 6a); dactylus of raptorial claw with 7 to 9 teeth . . . . . ***Lysiosquillina sulcata***

4b. Distal end of uropodal endopod dark (Fig. 6b); dactylus of raptorial claw with 10 or 11 teeth (usually less in adult females) . . . . . ***Lysiosquillina maculata***



a) ***Lysiosquilla sulcirostris*** **b)** ***Lysiosquilla tredecimdentata***

Fig. 5 right claw



a) ***Lysiosquillina sulcata*** **b)** ***Lysiosquillina maculata***

Fig. 6 left uropod (ventral view)

List of species occurring in the area

The symbol is given when species accounts are included.

Lysiosquilla sulcirostris Kemp, 1913
Lysiosquilla tredecimdentata Holthuis, 1941

Lysiosquillina maculata (Fabricius, 1793)
Lysiosquillina sulcata (Manning, 1978)

Lysiosquilloides siamensis Naiyanetr, 1980 (a single record from Thailand)

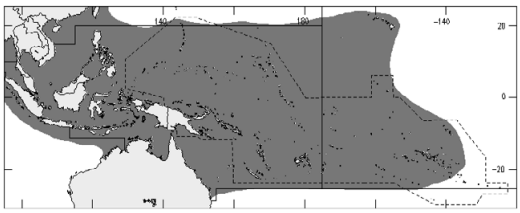
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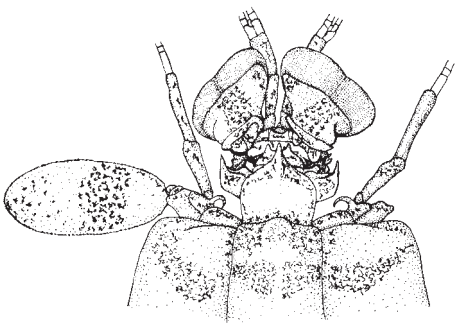
Manning, R.B. 1978. Synopses of the Indo-West-Pacific species of *Lysiosquilla* Dana, 1852 (Crustacea: Stomatopoda: Lysiosquillidae). *Smithson. Contrib. Zool.*, (259):16 p.

Lysiosquillina maculata (Fabricius, 1793)

En - Common banded mantis shrimp.

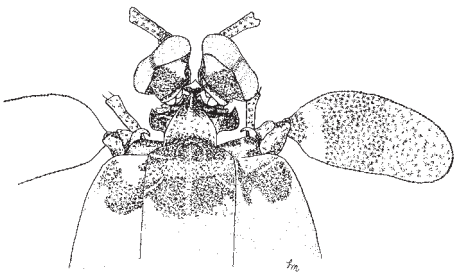
Maximum total length about 38 cm; the characteristic raptorial claw may be 4 cm long. Distinctly banded with alternate light and dark bands. Burrows in level bottoms near shore. Collected with spears, snares and bait, or at night lights. Widely distributed from Japan and Hawaii to the western Indian Ocean.





male

anterior part of body



female

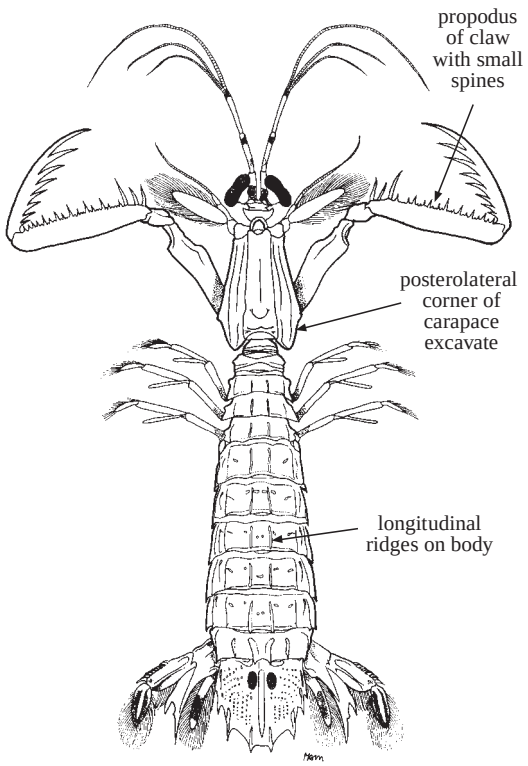
(from Manning, 1978)

HARPIOSQUILLIDAE

Harpiosquillid mantis shrimps

Diagnostic characters: Very large mantis shrimps (maximum total length at least 30 cm). Eye very large, T-shaped, cornea strongly bilobed. **Carapace, thorax, and abdomen with longitudinal ridges**. **Telson with median longitudinal carina** and conspicuous posterior spines. **Posterolateral corners of carapace deeply and conspicuously excavate**. Raptorial claw very large and conspicuous, adapted for spearing. In males outer edge of the claw forming an obtuse angle; in females it is evenly rounded. Propodus of raptorial claw with irregularly spaced, large and **small erect spines on margin opposite terminal segment** (= dactylus). Dactylus of claw usually with 7 or 8 large, serrated teeth.

Habitat, biology, and fisheries: Harpiosquillids are burrowers in level bottoms. They use the burrow as a refuge while waiting for prey and they also leave the burrow to hunt prey. Their large raptorial claws are well adapted for capturing fishes. There is no organized fishery for these species which reach markets as bycatch. At least 9 species occur within the area, but only 2 are abundant enough to be sold in markets.



dorsal view

Similar families occurring in the area

Squillidae: carapace rounded posterolaterally; propodus of raptorial claw lined with blunt pectinations.

Key to the species of Harpiosquillidae occurring in the area

1a. Carapace lacking median carina (Fig. 1a); distal segment of uropodal exopod entirely black (Fig. 2a) . . . . . ***Harpiosquilla melanoura***

1b. Carapace with median carina (Fig. 1b); distal segment of uropodal exopod with white midline, or inner half dark (Fig. 2b) . . . . . → ***2***

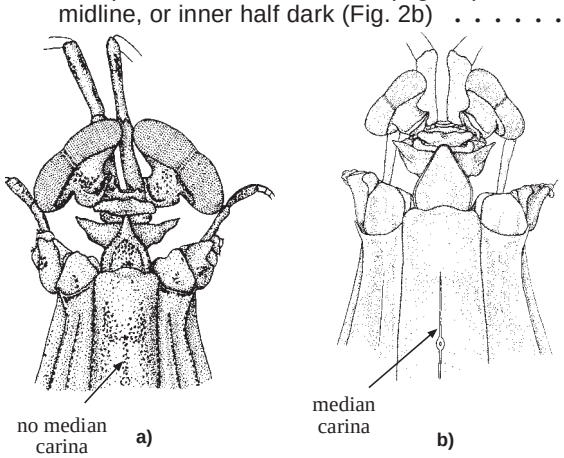


Fig. 1 anterior part of body (dorsal view)

(from Manning, 1969)

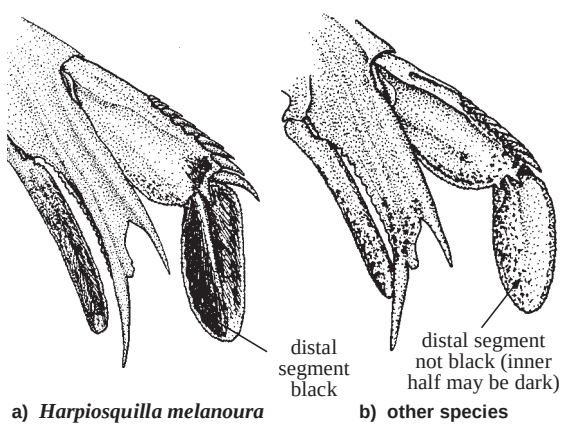
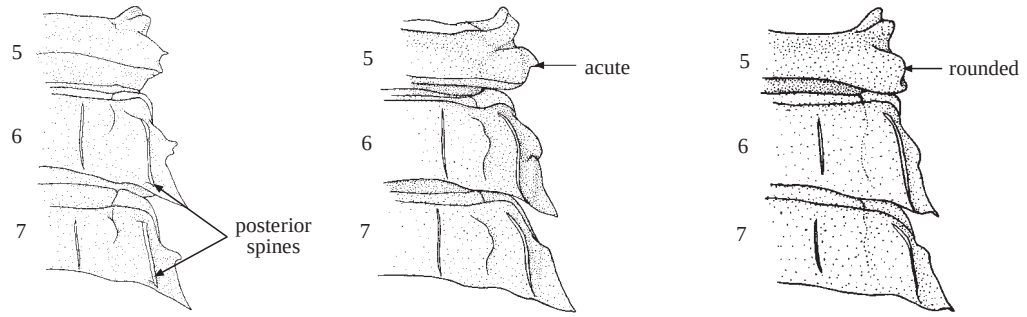


Fig. 2 left uropod (ventral view)

(from Manning, 1969)

2a. Intermediate carinae of thoracic somites with posterior spine (Fig. 3a) . . . . . →***3***

2b. Intermediate carinae of thoracic somites unarmed (Fig. 3b, c) . . . . . →***4***

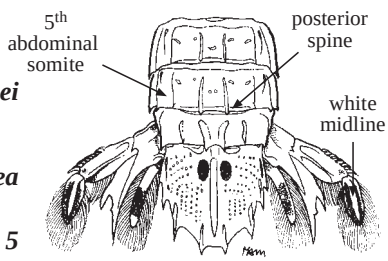


a) ***Harpiosquilla annandalei*** **b)** ***Harpiosquilla stephensoni*** **c)** ***Harpiosquilla japonica***

Fig. 3 lateral processes of thoracic somites 5-7
(from Manning, 1969)

3a. Submedian carinae of fifth abdominal somite with posterior spine (Fig. 4); distal segment of uropodal exopod black with white midline (Fig, 4); total length to 15 cm or less . . . . . ***Harpiosquilla annandalei***

3b. Submedian carina of fifth abdominal somite unarmed; distal segment of uropodal exopod with inner half dark; total length to at least 30 cm . . . . ***Harpiosquilla raphidea***



Harpiosquilla annandalei

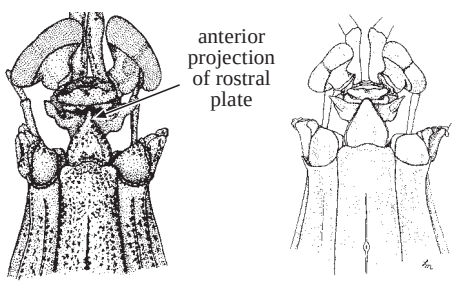
Fig. 4 posterior part of body (dorsal view)

4a. Rostral plate with anterior projection (Fig. 5a) . . . . . →***5***

4b. Rostral plate without anterior projection (Fig. 5b) . . . . . →***7***

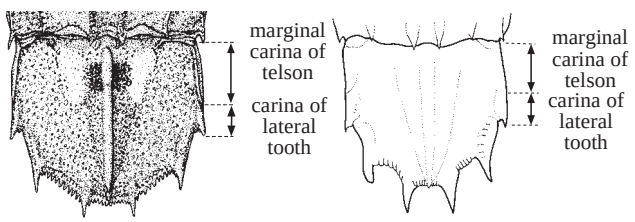
5a. Marginal carina of telson more than twice as long as carina of lateral tooth (Fig. 6a); dactylus of raptorial claw with 8 teeth . . . . . ***Harpiosquilla harpax***

5b. Marginal carina of telson twice or less than twice as long as carina of lateral tooth (Fig. 6b); dactylus of raptorial claw with 9 teeth . . . . . →***6***



a) ***Harpiosquilla harpax*** **b)** ***Harpiosquilla stephensoni***

Fig. 5 anterior part of body (dorsal view)
(from Manning, 1969)



a) ***Harpiosquilla harpax*** **b) other species**

Fig. 6 telson (dorsal view)

6a. Intermediate carinae of second abdominal somite with posterior spine . . . . ***Harpiosquilla indica***

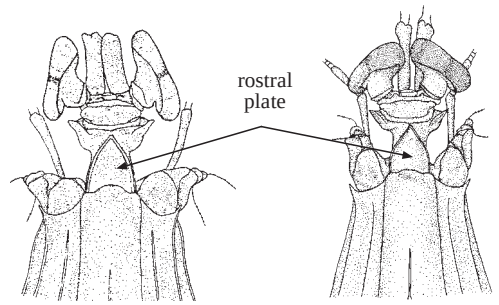
6b. Intermediate carinae of second abdominal somite unarmed . . . . . ***Harpiosquilla philippina***

7a. Dactylus of raptorial claw with 7 teeth; fifth thoracic somite acute laterally (Fig. 3b) . . . . . ***Harpiosquilla stephensoni***

7b. Dactylus of raptorial claw with 8 teeth; fifth thoracic somite rounded laterally (Fig. 3c) . . . . . →***8***

8a. Rostral plate longer than broad (Fig. 7a); marginal carina of telson twice as long as carina of lateral tooth . . . . . ***Harpiosquilla intermedia***

8b. Rostral plate length and width subequal (Fig. 7b); marginal carina of telson less than twice as long as carina of lateral tooth . . . . . ***Harpiosquilla japonica***



a) ***Harpiosquilla intermedia*** **b)** ***Harpiosquilla japonica***

Fig. 7 anterior part of body (dorsal view)

List of species occurring in the area

The symbol is given when species accounts are included.

Harpiosquilla annandalei (Kemp, 1911)
Harpiosquilla harpax (De Haan, 1844)
Harpiosquilla indica Manning, 1969
Harpiosquilla intermedia Manning and Michel, 1973
Harpiosquilla japonica Manning, 1969
Harpiosquilla melanoura Manning, 1968
Harpiosquilla philippina Garcia, 1978
Harpiosquilla raphidea (Fabricius, 1798)
Harpiosquilla stephensoni Manning, 1969

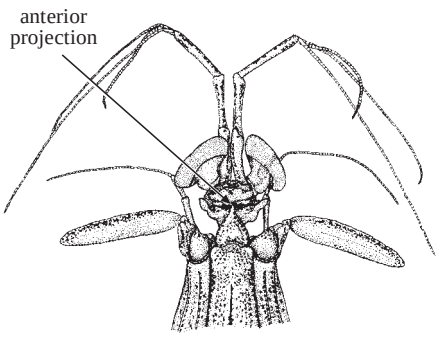
Reference

Manning, R.B. 1969. A review of the genus *Harpiosquilla* (Crustacea: Stomatopoda), with descriptions of three new species. *Smithson. Contrib. Zool.*, (36):41 p.

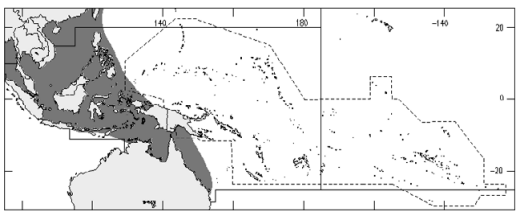
Harpiosquilla harpax (De Haan, 1844)

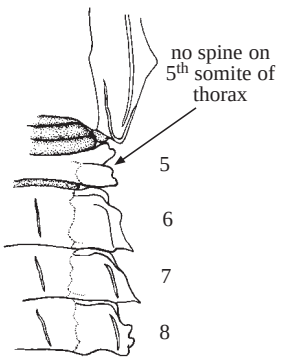
En - Robber harpiosquillid mantis shrimp.

Maximum total length about 25 cm; usually 17 cm or less. Inhabits level bottom habitats, near shore to depths of about 100 m. Collected by trawl, trapping, or hook-and-line. Japan to the Red Sea.



anterior part of body





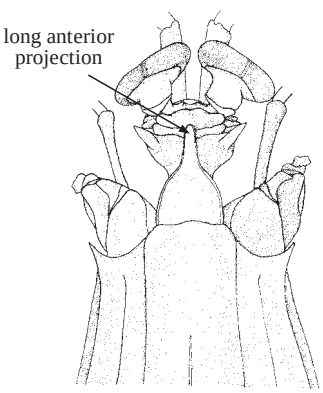
(from Manning, 1969)

lateral processes of thoracic somites 5-7

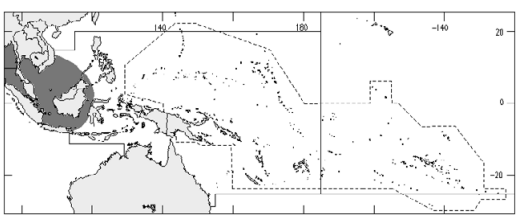
Harpiosquilla raphidea (Fabricius, 1798)

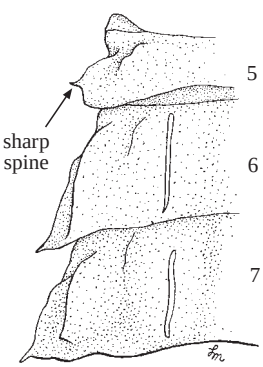
En - Giant harpiosquillid mantis shrimp.

The largest known squilloid; maximum total length more than 33 cm, although most specimens range from 16 to 29 cm. Inhabits level bottoms in shallow water and can be found in estuaries. Collected in traps, by trawls, and by hand. Indo-Malaya and Indonesia to East Africa.



anterior part of body





(from Manning, 1969)

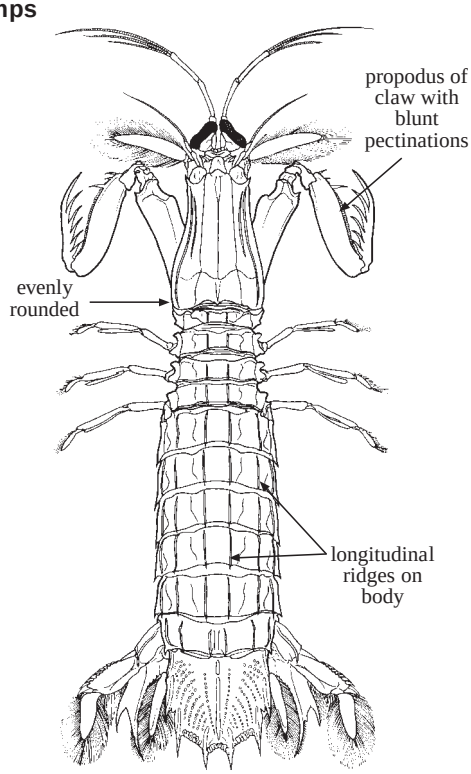
lateral processes of thoracic somites 5-7

SQUILLIDAE

Squillid mantis shrimps

Diagnostic characters: Large mantis shrimps (maximum total length more than 20 cm). Eye T-shaped, cornea bilobed. **Carapace, thorax, and abdomen with longitudinal ridges or carinae. Telson with median longitudinal ridge** and conspicuous posterior spines**. Posterolateral corners of carapace evenly rounded, not excavate**. Raptorial claw large and conspicuous, slender, adapted for spearing. Dactylus of raptorial claw usually with 5 or 6 serrated teeth on inner margin. Propodus of raptorial claw lined with short, **blunt pectinations on margin opposite toothed margin of distal segment** (= dactylus).

Habitat, biology, and fisheries: Squillids are burrowers in level bottoms and they seek prey at night. They are often collected by commercial trawls fishing for penaeid shrimps. Some of the larger and more abundant species have been reported to be edible and may be found in markets, but there is no organized fishery for them in the area. One species of *Oratosquilla* is fished commercially in Japan.



dorsal view
(after Manning, 1995)

Similar families ocurring in the area

Harpiosquillidae: carapace with posterolateral excavation; propodus of raptorial claw lined with erect spines.

Notes on genera of interest to fisheries

Species of at least 5 genera, *Cloridopsis*, *Erugosquilla*, *Miyakea*, *Oratosquilla*, and *Oratosquillina*, can be expected to be found in markets in the Philippines and in the continental parts of the area. These genera can be distinguished as follows:

Species of *Cloridopsis* differ from other squillids that might be found in markets in having but one broad, anteriorly-curved lateral spine on the fifth thoracic somite, the first free somite behind the carapace. In all of the other squillids large enough to be found in markets (except *Anchisquilla fasciata*), the lateral process on the fifth thoracic somite is distinctly bilobed, with an anteriorly-directed acute lobe and a shorter, laterally-directed acute lobe. The terminal segment of the raptorial claw usually is armed with 5 serrated spines. Adults rarely exceed 10 cm in length. Six species of *Cloridopsis* are known from the Indo-West Pacific, but only *C. scorpio* is relatively common.

Members of *Erugosquilla* can be distinguished by their broad, smooth, carapace, with its anterior margin more than half as long as its median length. The carapace is characteristically smooth and shiny, lacking any hint of roughness or pits. The median carina of the carapace completely lacks the anterior bifurcation, characteristic of members of *Miyakea*, *Oratosquilla*, and *Oratosquillina*. The raptorial claw is armed with 6 serrated teeth on the opposable margin of its terminal segment. Bright blue color on the uropods is characteristic of members of this genus, and in at least 1 species the usual rounded lobe between the spines of the basal prolongation of the uropod may be replaced by a sharp spine. *Erugosquilla woodmasoni* (Kemp, 1911) is the most common member of this genus, which contains 4 species.

A single species of *Miyakea* is abundant enough to be found in markets, and it occurs on level-bottom habitats throughout the area. *Miyakea nepa* has relatively small eyes and a distinctive median carina on the carapace that is uninterrupted, splits **posterior to** the dorsal pit on the midline of the carapace, and extends almost to the anterior margin of the carapace. The raptorial claw is armed with 6 teeth on its margin that folds. This is one of the most common species of squillids in the western part of the area. *Miyakea nepa* (Latreille, 1828) is the only abundant and widespread member of this genus which contains 1 other species.

Oratosquilla and *Oratosquillina* have much larger eyes than species of *Miyakea*, and in both genera the median carina of the carapace splits or bifurcates **anterior to** the pit on the midline of the carapace. In *Oratosquilla* the median carina of the carapace is entire, uninterrupted, from its base to its bifurcate anterior part near the anterior margin. In members of *Oratosquillina*, the median carina of the carapace is interrupted at its bifurcation, and the anterior branches of the bifurcation may be indistinct or absent. In both genera the distal segment of the claw usually is armed with 6 teeth, but some species of *Oratosquillina* have but 5 teeth on the claw.

Oratosquilla includes only 4 species, 1 of which, *O. oratoria*, occurs in the western part of the area, in the northern part of Viet Nam. A second species is known from a single record from New Caledonia, and a third from a single record in the Philippines.

Oratosquillina includes 22 species, 3 of which, *O. gravieri*, *O. interrupta*, and *O. perpensa* are common enough in the area to be found in markets. *Oratosquillina interrupta* is one of the most characteristic species of the genus, as it can be recognized at once by the convex lobe between the spines of the ventral prolongation of the uropod.

Key to species of interest to fisheries occurring in the area

1a. Lateral process of fifth thoracic somite a single, anteriorly- or anterolaterally-directed spine (Fig. 1a-c) . . . . . → ***2***

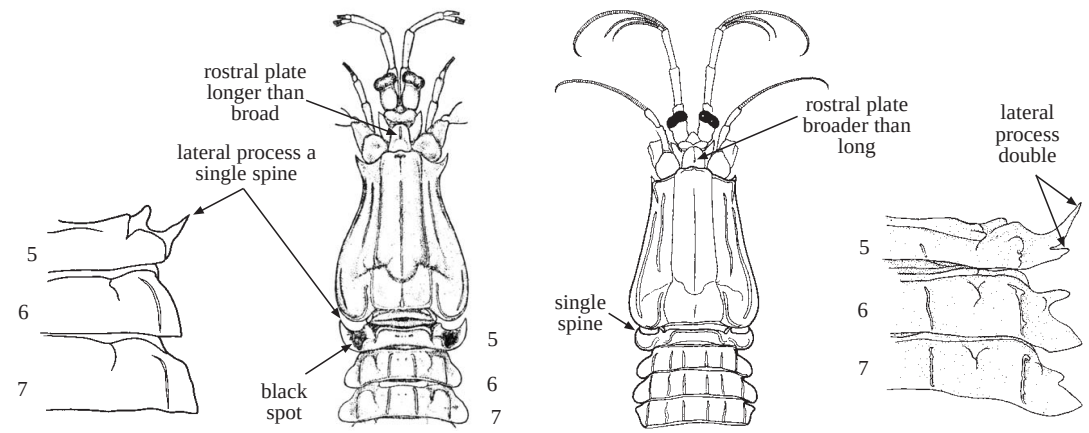
1b. Lateral process of fifth thoracic somite double, with an anteriorly-directed spine and a shorter, laterally-directed lobe (Fig. 1d) . . . . . → ***4***

2a. Lateral process of fifth thoracic somite a slender, straight spine, directed anterolaterally (Fig. 1a); telson with distinct longitudinal carinae on surface . . . . . ***Anchisquilla fasciata***

2b. Lateral process of fifth thoracic somite a broad, anteriorly-curved spine (Fig. 1b, c); telson lacking longitudinal carinae on surface . . . . . → ***3***

3a. Rostral plate longer than broad (Fig. 1b); lateral process of fifth thoracic somite with black spot (Fig. 1b) . . . . . ***Cloridopsis scorpio***

3b. Rostral plate broader than long (Fig. 1c); lateral process of fifth thoracic somite lacking any dark color (Fig. 1c) . . . . . ***Cloridopsis immaculata***



a) ***Anchisquilla fasciata*** **b)** ***Chloridopsis scorpio*** **c)** ***Chloridopsis immaculata*** **d)** ***Oratosquilla oratoria***

Fig. 1 anterior part of body and lateral thoracic somites 5-7 (dorsal view)

4a. Thorax and abdomen completely covered with longitudinal carinae . . . . . → ***5***

4b. Thorax and abdomen with no more than 8 longitudinal carinae . . . . . → ***6***

5a. Submedian carinae of sixth to eighth thoracic somites and fourth to sixth abdominal somites ending in spines . . . . . ***Keijia lirata***

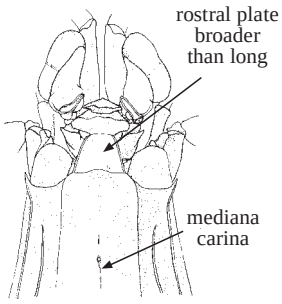
5b. Most carinae on thorax and abdomen terminating posteriorly in spines . . ***Carinosquilla multicarinata***

6a. Dorsal surface of carapace smooth, shiny, lacking any trace of an anterior bifurcation on the median carina (Fig. 2a, b) . . . . . → ***7***

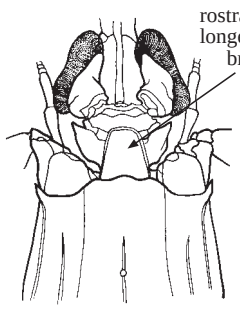
6b. Dorsal surface of carapace pitted or eroded, at least part of an anterior bifurcation of the median carina present (Fig. 4a, b) . . . . . → ***8***

7a. Dorsal surface of telson lacking a line of tubercles on each side of median carina (Fig. 3a); rostral plate broader than long (Fig. 2a) . . . . . ***Erugosquilla woodmasoni***

7b. Dorsal surface of telson with a line of tubercles on each side of median carina, the 2 lines converging posteriorly under apical spine of median carina (Fig. 3b); rostral plate longer than broad.(Fig. 2b) . . . . . ***Erugosquilla hesperia***

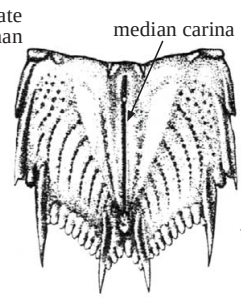


a) ***Erugosquilla woodmasoni***

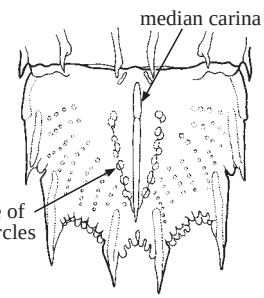


b) ***Erugosqilla hesperia***

Fig. 2 anterior part of body (dorsal view)



a) ***Erugosquilla woodmasoni***



b) ***Erugosquilla hesperia***

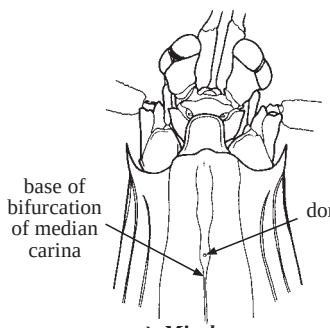
Fig. 3 telson (dorsal view)

8a. Median carina of carapace bifurcates posterior to dorsal pit (Fig. 4a) . . . . . ***Miyakea nepa***

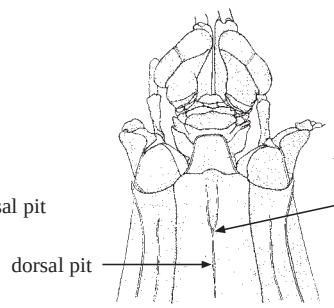
8b. Median carina of carapace bifurcates anterior to dorsal pit (Fig. 4b, c) . . . . . → ***9***

9a. Median carina of carapace entire, not interrupted at base of bifurcation (Fig. 4b) . . . . . ***Oratosquilla oratoria***

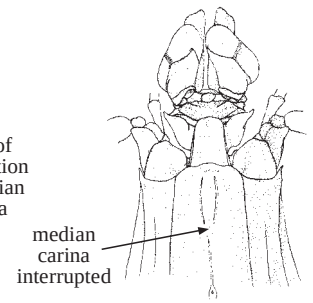
9b. Median carina of carapace interrupted at base of bifurcation (Fig. 4c) . . . . . → ***10***



a) ***Miyakea nepa***



b) ***Oratosquilla oratoria***



c) ***Oratosquillina gravieri***

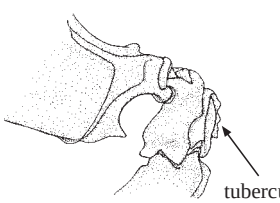
Fig. 4 anterior part of body (dorsal view)

10a. Dactylus of raptorial claw with 5 teeth . . . . . ***Oratosquillina quinquedentata***

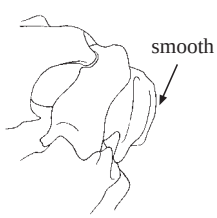
10b. Dactylus of raptorial claw with 6 teeth . . . . . → ***11***

11a. Dorsal ridge on carpus of raptorial claw tuberculate (Fig. 5a); lobe between spines of basal prolongation of uropod convex (Fig. 6a) . . . . . ***Oratosquillina interrupta***

11b. Dorsal ridge on carpus of raptorial claw smooth, undivided (Fig. 5b); lobe between spines of basal prolongation of uropod concave (Fig. 6b) . . . . . → ***12***



a) ***Oratosquillina interrupta***

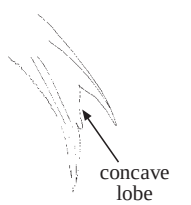


b) ***Oratosquillina perpensa***

Fig. 5 carpus of right raptorial claw (dorsal view)



a) ***Oratosquillina interrupta***



b) ***Oratosquillina perpensa***

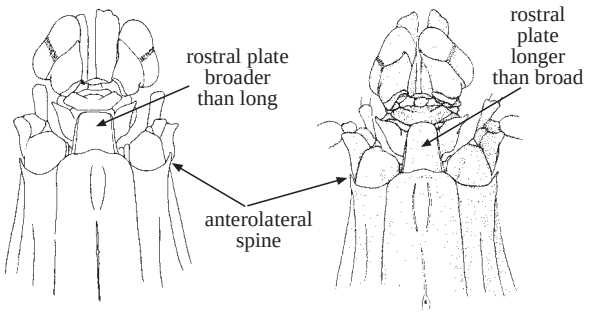
Fig. 6 basal prolongation of left uropod (ventral view)

12a. Rostral plate broader than long (Fig. 7a); anterolateral spines of carapace extending to or overreaching base of rostral plate (Fig. 7a) . . . . . ***.Oratosquillina perpensa***

12b. Rostral plate longer than broad (Fig. 7b); anterolateral spines of carapace not overreaching base of rostral plate (Fig. 7b) . . . . . → ***13***

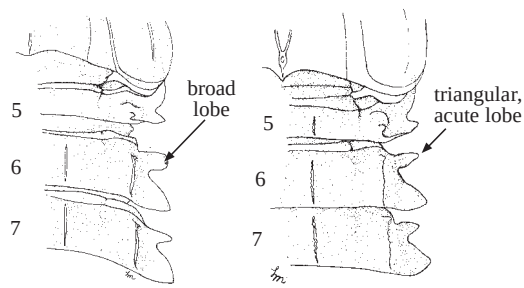
13a. Lateral process of sixth thoracic somite with broad, rectangular anterior lobe (Fig. 8a) . . . . . ***Oratosquillina solicitans***

13b. Lateral process of sixth thoracic somite with slender, triangular anterior lobe, acute apically (Fig. 8b) . . . . . ***Oratosquillina gravieri***



a) ***Oratosquillina perpensa*** **b)** ***Oratosquillina gravieri***

Fig. 7 anterior part of body (dorsal view)



a) ***Oratosquillina solicitans*** **b)** ***Oratosquillina gravieri***

Fig. 8 lateral processes of thoracic somites 5-7

(from Manning, 1978)

List of species occurring in the area

The symbol is given when species accounts are included.

Anchisquilla fasciata (De Haan, 1844)

Carinosquilla multicarinata (White, 1848)

Cloridopsis immaculata (Kemp, 1913)
Cloridopsis scorpio (Latreille, 1828)

Erugosquilla hesperia (Manning, 1968)
Erugosquilla woodmasoni (Kemp, 1911)

Keijia lirata (Kemp and Chopra, 1921)

Miyakea holoschista (Kemp, 1911)
Miyakea nepa (Latreille, 1828)

Oratosquilla calumnia (Townsley, 1953)
Oratosquilla mauritiana (Kemp, 1913)
Oratosquilla oratoria (De Haan, 1844)

Oratosquillina anomala (Tweedie, 1935)
Oratosquillina asiatica (Manning, 1978)
Oratosquillina fossulata (Moosa, 1986)
Oratosquillina gravieri (Manning, 1978)
Oratosquillina inornata (Tate, 1883)
Oratosquillina interrupta (Kemp, 1911)
Oratosquillina pentadactyla (Manning, 1978)
Oratosquillina perpensa (Kemp, 1911)
Oratosquillina quinquedentata (Brooks, 1886)
Oratosquillina solicitans (Manning, 1978)
Oratosquillina stephensoni (Manning, 1978)
Oratosquillina subtilis (Manning, 1978)

References

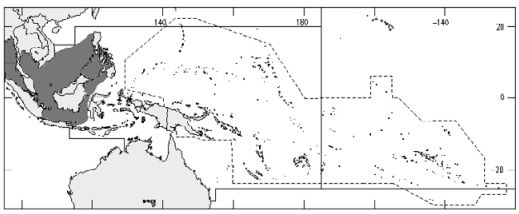
Manning, R.B. 1971. Keys to the species of *Oratosquilla*, (Crustacea: Stomatopoda), with descriptions of two new species. *Smithson. Contrib. Zool.*, (71):16 p.

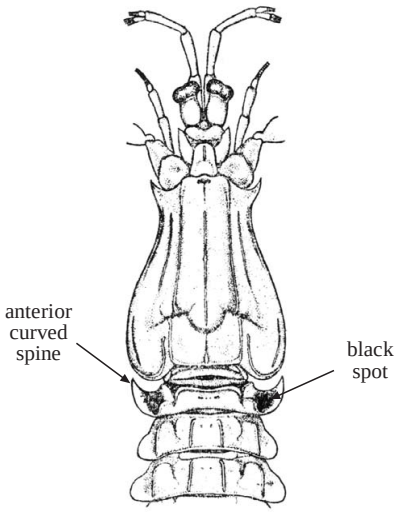
Manning, R.B. 1978. Further observations on *Oratosquilla*, with accounts of two new genera and nine new species (Crustacea: Stomatopoda: Squillidae). *Smithson. Contrib. Zool*., (272):44 p.

Cloridopsis scorpio (Latreille, 1828)

En - Spotted squillid mantis shrimp.

Maximum total length 10 cm or less. A shore species not known to occur in brackish water. Taken by traps. The most common species among the 6 *Cloridopsis* known from the Indo-West Pacific. Known from Viet Nam, Indonesia, and Malaysia to Pakistan.



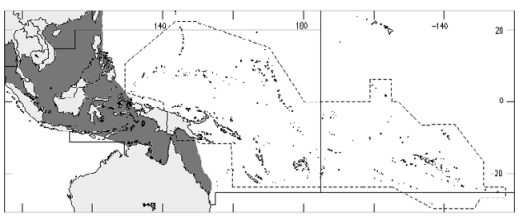


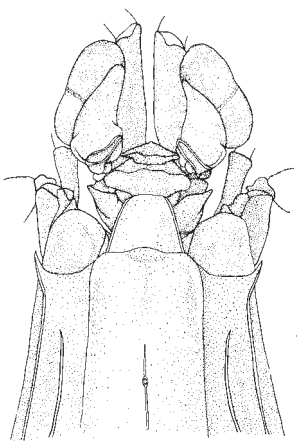
anterior part of body

Erugosquilla woodmasoni (Kemp, 1911)

En - Smooth squillid mantis shrimp.

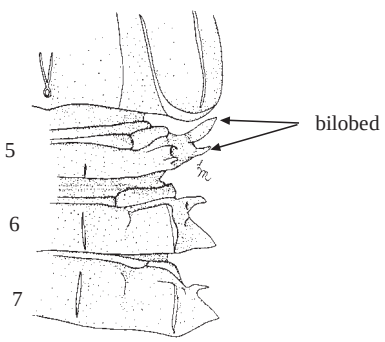
Maximum total length about 15 cm. A common shallow water species inhabiting burrows on level bottoms. Commonly taken by trawlers. Widely distributed from Japan to the western Indian Ocean.





anterior part of body

(from Manning, 1978)

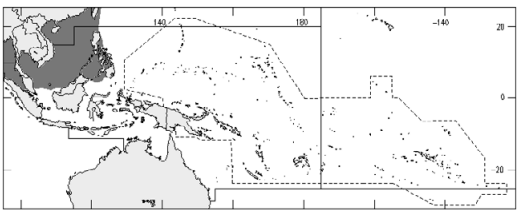


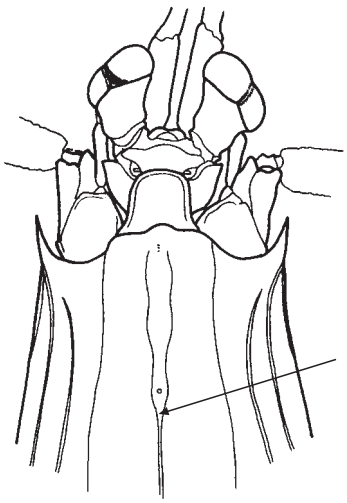
lateral processes of thoracic somites 5-7

Miyakea nepa (Latreille, 1828)

En - Smalleyed squillid mantis shrimp.

Maximum total length about 17 cm. A very common shore species that burrows in level-bottom habitats and one of the most common squillids in the western part of the area. Usually taken by trawls. Known from Taiwan Province of China to the Red Sea.



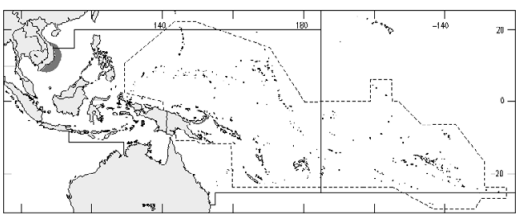


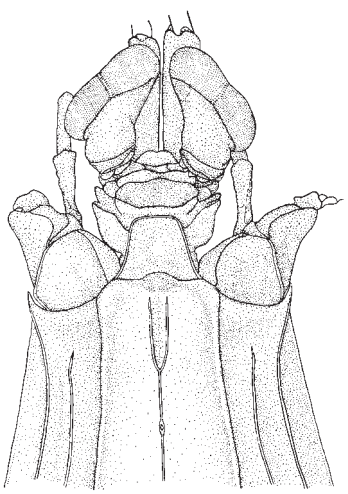
anterior part of body

Oratosquilla oratoria (De Haan, 1844)

En - Japanese squillid mantis shrimp.

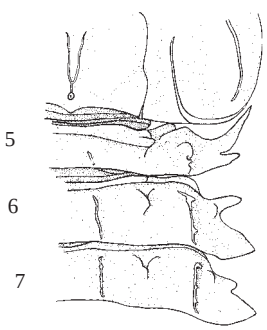
Maximum total length more than 18 cm. The common commercial species in Japan. Burrows in near-shore level-bottom habitats. Taken by trawls and traps. Known from Japan to Hong Kong (China) and Viet Nam, rare in southern part of its range.





anterior part of body

(from Manning, 1971)

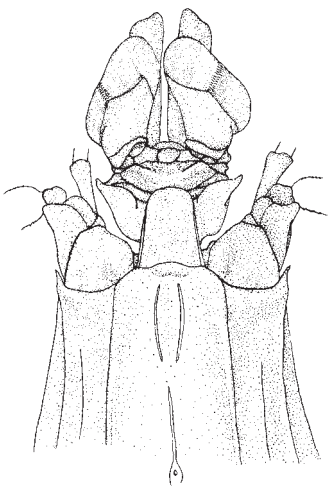


lateral processes of thoracic somites 5-7

Oratosquillina gravieri (Manning, 1978)

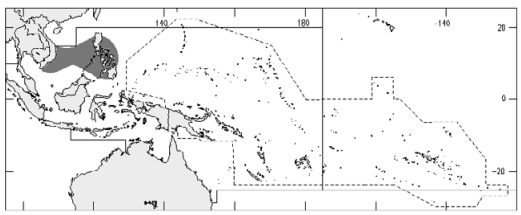
En - Vietnamese squillid mantis shrimp.

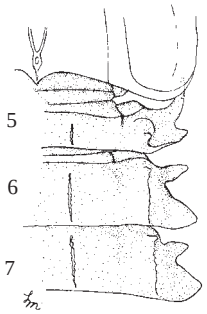
Maximum total length about 11 cm. Burrows in level bottoms in depths of 15 to 25 to more than 100 m. Taken by trawls. Known only from Viet Nam, where it is a common species, and the Philippines.



anterior part of body

(from Manning, 1978)



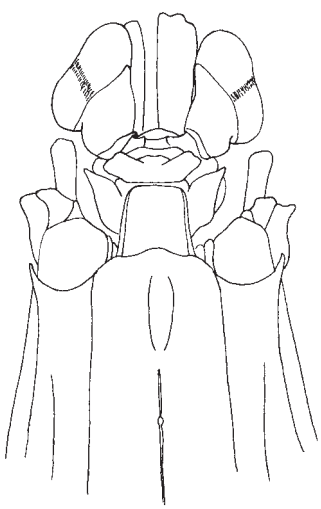


lateral processes of thoracic somites 5-7

Oratosquillina perpensa (Kemp, 1911)

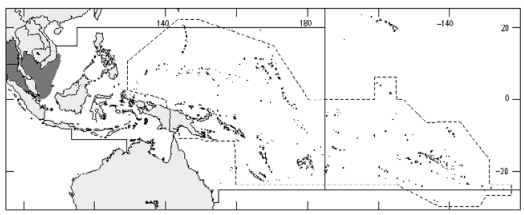
En - Common squillid mantis shrimp.

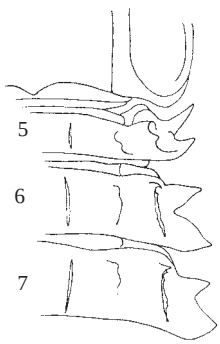
Maximum total length about 10 cm. Occurs in sublittoral, level-bottom habitats, in depths of 100 m or less. Usually taken in trawls. Known from localities between southern Taiwan Province of China and Myanmar.



anterior part of body

(from Manning, 1978)



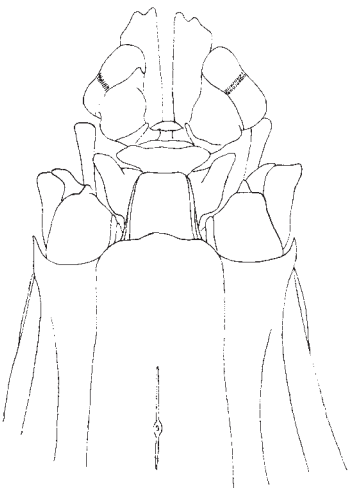


lateral processes of thoracic somites 5-7

Oratosquillina quinquedentata (Brooks, 1886)

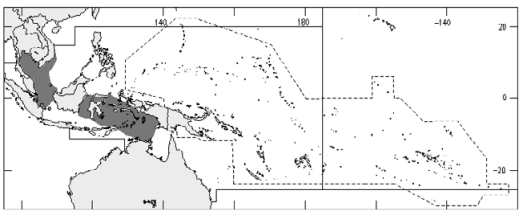
En - Fivespined squillid mantis shrimp.

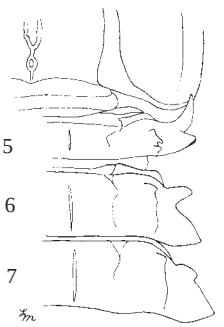
Maximum total length 14 cm. Occurs in sublittoral, level-bottom habitats in depths of at least 50 m. Usually taken in trawls. Known from the Arafura Sea, Gulf of Thailand, and Bombay, India.



anterior part of body

(from Manning, 1978)



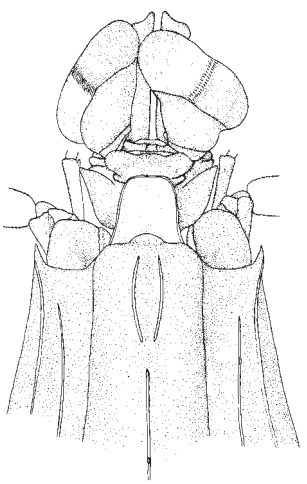


lateral processes of thoracic somites 5-7

Oratosquillina solicitans (Manning, 1978)

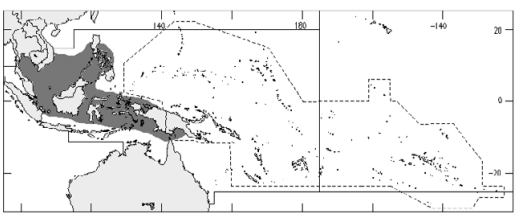
En - Variable squillid mantis shrimp.

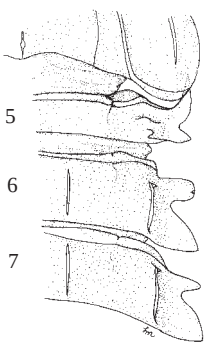
Maximum total length less than 10 cm. Occurs in level-bottom habitats near shore. Usually taken in trawls. Known from the western Pacific, Taiwan Province of China, the Gulf of Thailand, Malaysia, and Indonesia.



anterior part of body

(from Manning, 1978)





lateral processes of thoracic somites 5-7

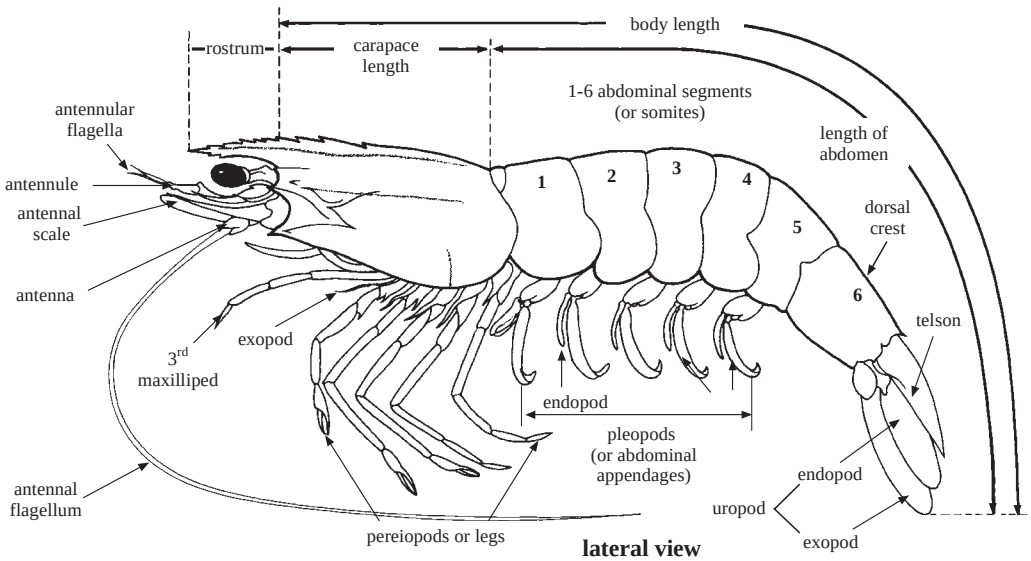
click for next page

click for previous page

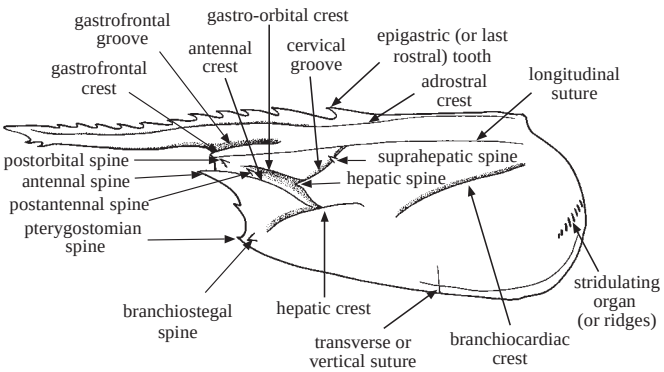
SHRIMPS AND PRAWNS

by T.Y. Chan

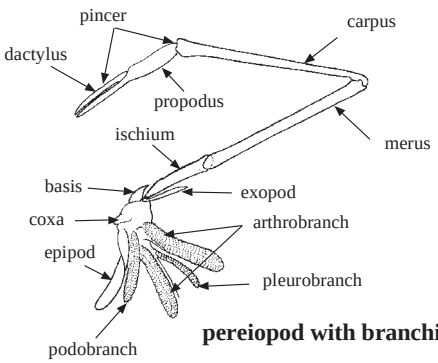
TECHNICAL TERMS AND MEASUREMENTS



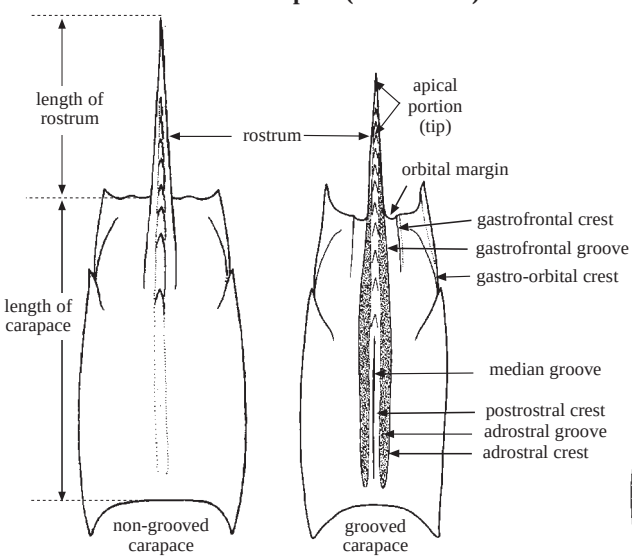
lateral view



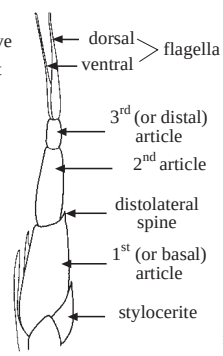
carapace (lateral view)



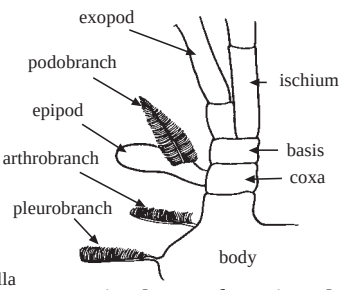
pereiopod with branchiae



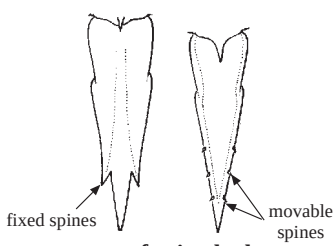
carapace (dorsal view)



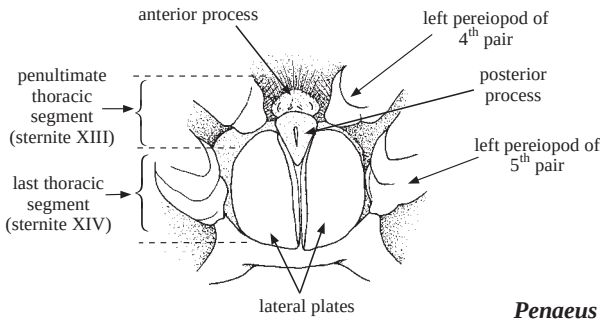
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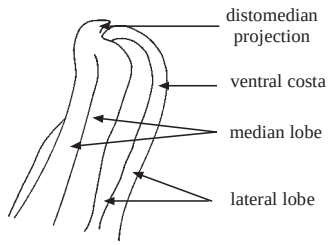


proximal part of pereiopod (schematic)

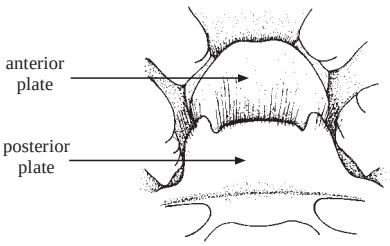


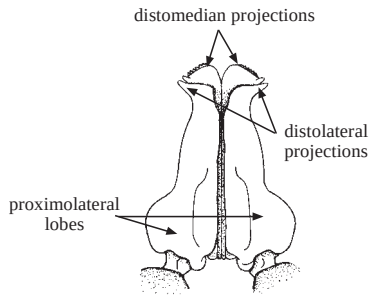
types of spined telsons



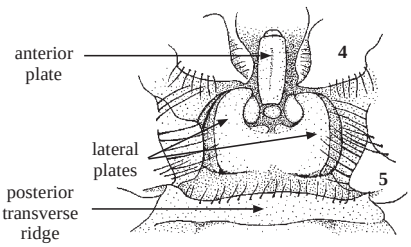


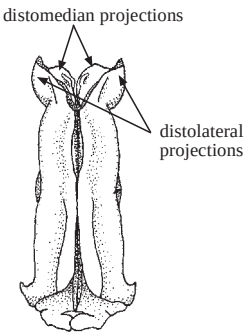
Penaeus



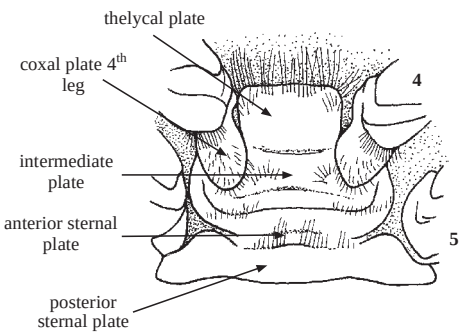


Parapenaeopsis

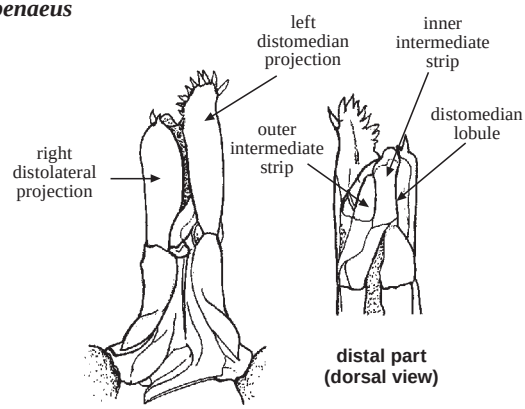




Metapenaeus



basic types of thelycum of female penaeid shrimps (ventral view)

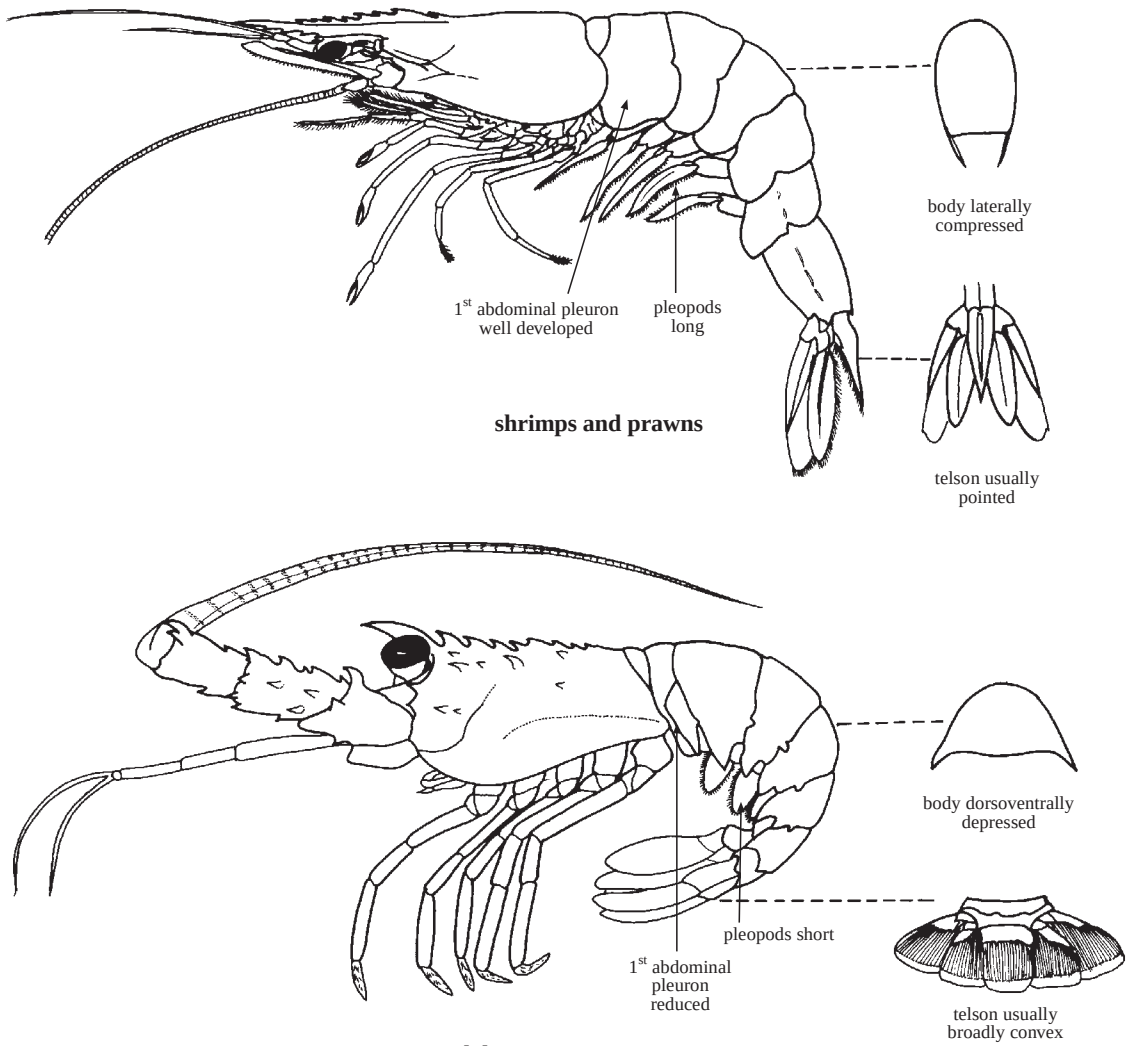


Metapenaeopsis

basic types of petasma (joined endopods of first pair of pleopods) of male penaeid shrimps (ventral view - except otherwise stated)

GENERAL REMARKS

Shrimps and prawns constitute a large group of crustaceans with an extended abdomen (or "tail"), varying in size from microscopic to about 35 cm body length (measured dorsally from the posterior orbital margin to the end of the tail, excluding the rostrum and the appendages). Taxonomically, shrimps and prawns belong to the "swimming group" of decapod crustaceans in the suborder Macrura Natantia. They differ from the lobsters (suborder Macrura Reptantia) by having the body generally more laterally compressed, the pleopods (abdominal appendages) well developed, the thoracic sternum (i.e. ventral part of thoracic body segments, between the legs) often narrow and not easy to observe, the first abdominal pleuron (or lateral plate) well developed (about as large as the pleura of following segments, see figure below), and the telson usually tapering distally.



(after Chan and Yu, 1993)

conspicuous morphological differences between shrimps and lobsters

The terms “shrimp” and “prawn” have no definite reference to any known taxonomic groups. Although the term “shrimp” is sometimes applied to smaller species, while “prawn” is more often used for larger forms, there is no clear distinction between both terms and their usage is often confused or even reverse in different countries or regions. Therefore, no attempt has been made here to restrict or define their meaning. Certain other crustaceans, such as the “mysid shrimps” (Mysidacea), “mantis shrimps” (Stomatopoda), and “mud shrimps” (Thalassinidea), are taxonomically not true shrimps.

Altogether, there are about 3 047 species of shrimps and prawns known to date, subdivided into 4 major groups, namely Sergestoidea (about 94 species), Penaeoidea (about 376 species), Stenopodidea (at least 60 species), and Caridea (at least 2 517 species). Although the Caridea comprise the majority of species, only some are abundant enough to be of interest to fisheries. Most of the commercial shrimps and prawns belong to the Penaeoidea. At present, only slightly less than 300 species of shrimps and prawns are of economic interest worldwide, and out of these, only about 100 comprise the principal share of the annual world catch. FAO’s Yearbook of Fishery Statistics reports in 1995 a worldwide production of all shrimps and prawns of around 3 200 000 t (both from capture fishery and aquaculture). Around 710 000 t of this production originated in the Western Central Pacific.

The exact number of species of shrimps and prawns present in the Western Central Pacific is uncertain. This is especially true for the carideans and stenopodids, most species of which have no economic value and thus only very few studies exist on them. However, recent extensive studies on carideans from the Philippines and adjacent areas have shown that 528 species occur in that region alone. Although caridean shrimps are widely distributed in marine waters, brackish and fresh waters, and are found from high mountain regions to coral reefs and the deep sea, at present only the giant river prawn *Macrobrachium rosenbergii* is of high economic importance in the Western Central Pacific. This is a very large species, sometimes found in marine waters, and extensively fished and cultured in several countries. The other coastal or fresh-water caridean shrimps in the area are either too small or not abundant enough to be fished on a large scale, although a few of them may locally be used as food. It should be noted, however, that the present commercial fishing activities in the area are generally rather simple and mainly limited to shallow waters with depths less than 100 m. Several deep-sea caridean shrimps, mostly belonging to the family Pandalidae, can often be caught in large quantities during exploratory trawling operations and may eventually prove to be of commercial interest with the development of a deep-sea fishery.

The Stenopodidea (with the single family Stenopodidae) generally have no economic importance, although a few of them, as well as some coral reef carideans, are sporadically seen in the aquarium trade and thus have some commercial value.

Most of the commercial species of shrimps and prawns belong to the Penaeoidea. Studies on penaeoids are more comprehensive and at present 4 families including 191 species are known to occur in the Western Central Pacific, with the Penaeidae being the most important family. As species of the Penaeidae are generally of moderate to large size and often occur in large quantities in shallow waters along the continental shelf on trawlable bottoms, they are fished extensively by trawls, seines, set nets, traps, and artisanal gear. Large-scale pond culture of penaeid shrimps is practised in several countries. Species of the penaeoid families Aristeidae and Solenoceridae are mainly deep-water dwellers and largely unexploited. The fact that larger representatives of these 2 families are often caught on the basis of exploratory deep-sea trawling, indicates that they have a high commercial potential with the future development of a deep-sea fishery in the area. In contrast, species of the penaeoid family Sicyoniidae are generally small, nowhere abundant, and do not have any commercial potential.

Sergestoid shrimps are usually small and of no interest to fisheries, except for the genus *Acetes*, 7 species of which are found in the Western Central Pacific. These epipelagic shrimps inhabit shallow coastal estuarine waters and often occur in great abundance. They are extensively fished by push nets, bag nets and seines, and are of considerable economic importance, particularly in the Southeast Asian countries of the area.

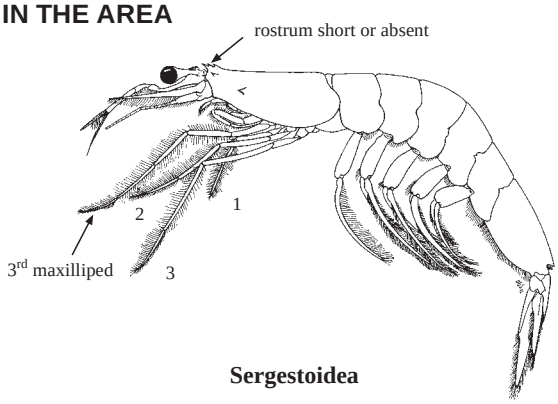
Shrimps and prawns in the Western Central Pacific are generally marketed fresh or frozen, sometimes live, except for species of *Acetes* which are usually processed into shrimp paste. They are locally consumed or exported. In the Philippines, Indonesia and Thailand, altogether 94 200 t of shrimps and prawns were exported in 1987.

GUIDE TO THE MAJOR GROUPS OF SHRIMPS AND PRAWNS OCCURRING IN THE AREA

SERGESTOIDEA **Page 858**

Sergestoid shrimps

Usually small to microscopic, body strongly compressed laterally, shell rather soft; rostrum and last 2 pairs of legs (pereiopods) reduced (absent in Luciferidae); abdomen with posterior part of pleura (lateral plates) covering anterior part of succeeding pleura; males with large copulatory organ (petasma) on first pair of pleopods (abdominal appendages); generally pelagic, with eggs released directly into the water (eggs carried on second pair of legs in Luciferidae).

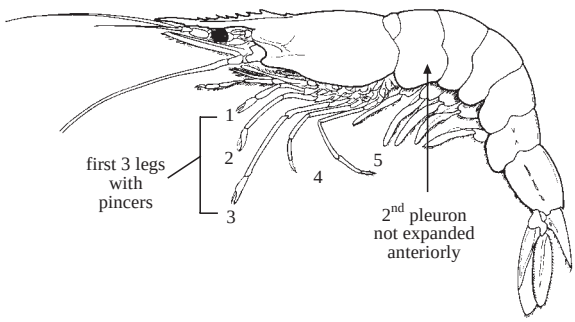


Sergestoidea

PENAEOIDEA **Page 866**

Penaeoid shrimps

Small to large; all 5 pairs of legs (pereiopods) well developed, with first 3 pairs forming a pincer, none of the pincers particularly large; abdomen with posterior part of pleura (or lateral plates) covering anterior part of succeeding pleura; with large specific copulatory organ on first pair of pleopods (abdominal appendages) in males (petasma), and on posterior thoracic sternites in females (thelycum); eggs released directly into the water, not retained by the females.

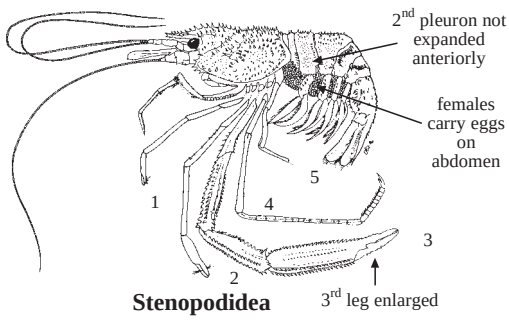


Penaeoidea

STENOPODIDEA **Page 955**

Stenopodid shrimps

Usually small; all 5 pairs of legs (pereiopods) well developed, with first 3 pairs forming a pincer, third pair huge and massive; abdomen with posterior part of pleura (lateral plates) covering anterior part of succeeding pleura; males and females without large specific copulatory organ on first pair of pleopods (abdominal appendages) or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.

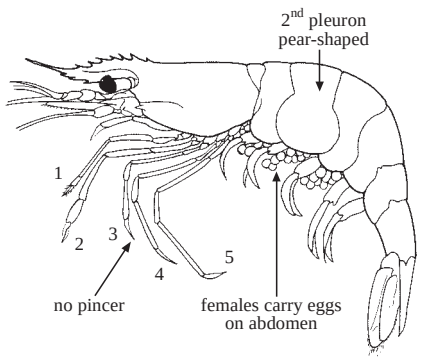


Stenopodidea

CARIDEA **Page 957**

Caridean shrimps

Size very small to large; all 5 pairs of legs (pereiopods) well developed, the first 2 pairs with or without pincer, but third pair never bearing a pincer; second abdominal pleuron (lateral plate) greatly expanded, pear-shaped and overlapping posterior part of first pleuron and anterior part of third pleuron; males and females without large specific copulatory organ on first pair of pleopods (abdominal appendages) or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.



Caridea

LIST OF FAMILIES OCCURRING IN THE AREA

The symbol  is given for those families which are treated further in this contribution.

Infraorder PENAEIDEA

Superfamily SERGESTOIDEA

LUCIFERIDAE

 SERGESTIDAE

Superfamily PENAEOIDEA

 ARISTEIDAE

 SOLENOCERIDAE

 PENAEIDAE

 SICYONIIDAE

Infraorder STENOPODIDEA

 STENOPODIDAE

Infraorder Caridea

Superfamily PASIPHAEOIDEA

PASIPHAEIDAE

Superfamily OPLOPHORIDEA

OPLOPHORIDAE

Superfamily ATYOIDEA

 ATYIDAE

Superfamily BRESILIOIDEA

BRESILIIDAE

Superfamily NEMATOCARCINOIDEA

EUGONATONOTIDAE

NEMATOCARCINIDAE

 RHYNCHOCINETIDAE

Superfamily PSALIDOPODOIDEA

PSALIDOPODIDAE

Superfamily STYLODACTYLOIDEA

STYLODACTYLIDAE

Superfamily CAMPYLONOTIDEA

BATHYPALAEMONELLIDAE

Superfamily PALAEMONOIDEA

ANCHISTIOIDIDAE

GNATHOPHYLLIDAE

 HYMENOCERIDAE

 PALAEMONIDAE

Superfamily ALPHEOIDEA

ALPHEIDAE

 HIPPOLYTIDAE

OGYRIDIDAE

Superfamily PROCESSOIDEA

PROCESSIDAE

Superfamily PANDALOIDEA

 PANDALIDAE

THALASSOCARIDIDAE

Superfamily CRANGONOIDEA

CRANGONIDAE

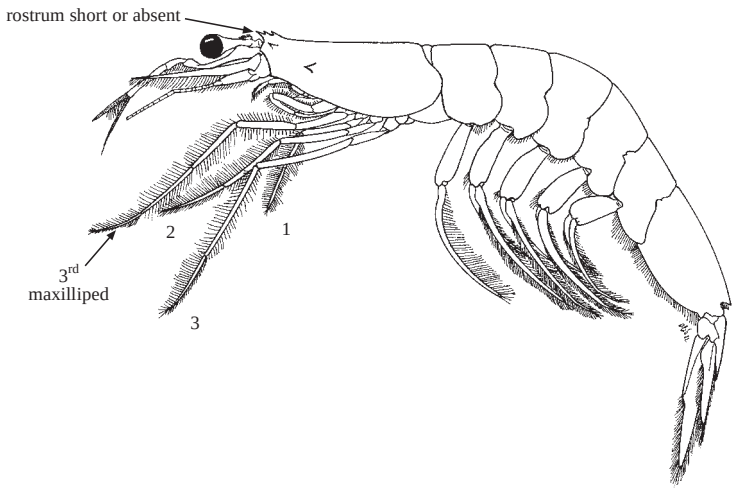
GLYPHOCRANGONIDAE

Infraorder PENAEIDEA

Superfamily SERGESTOIDEA

Sergestoid shrimps

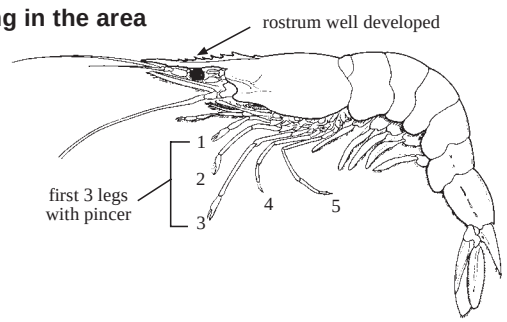
Diagnostic characters: Usually microscopic to small sized, with a body length from 1 to about 5 cm (exceptionally over 8.5 cm). **Body strongly compressed laterally**, shell soft. Carapace with crests and grooves poorly developed, often wanting. **Rostrum very short and small, sometimes absent**. In males, lower antennular flagella with a clasping organ. First leg with or without pincer, second and third legs bearing small pincers; **fourth and fifth legs reduced or absent**. Abdomen with **posterior part of pleura (lateral plates) covering anterior part of succeeding pleura**. **Males with large copulatory organ (petasma)** on first pair of pleopods (abdominal appendages). Generally pelagic; eggs released directly into the water (family Sergestidae), or carried on second pair of legs until hatching (family Luciferidae).



Habitat, biology, and fisheries: Members of this superfamily (including 2 families and 7 genera) mainly inhabit brackish and marine environments (a single species is found in pure fresh water). They can be found from shallow to deep waters (deeper than 2 100 m) and are generally pelagic, although a few (in the genus *Sicyonella*) have adapted to a benthic way of life. At present, 2 families and 4 genera of sergestoid shrimps are known from the Western Central Pacific, but all except the genus *Acetes* are without any economic importance as they are either too small, not abundant enough, or occur in very deep water. Members of the genus *Acetes* mainly occur in estuarine or shallow coastal waters and are seasonally very abundant. These are small shrimps with a body length of adults ranging between 1 and 4 cm. Their bodies are translucent or semi-translucent, with black eyes and several pairs of red pigment spots (chromatophores) on the bases of uropods. In the course of their fishing seasons, they are extensively caught by push nets, bag nets, and seines. They are mainly fished in the Southeast Asian countries of the area and are of significant commercial importance. From 1990 to 1995, the reported annual catch of sergestoid shrimps in the Western Central Pacific ranged from around 38 500 to 45 700 t (FAO Yearbook of Fishery Statistics). Only a small part of the catch is marketed fresh, and the greater fraction is dried, salted or fermented with salt and processed into shrimp paste. As only species of *Acetes* are of commercial interest, a key to species of this genus is given here.

Other major groups of shrimps and prawns occurring in the area

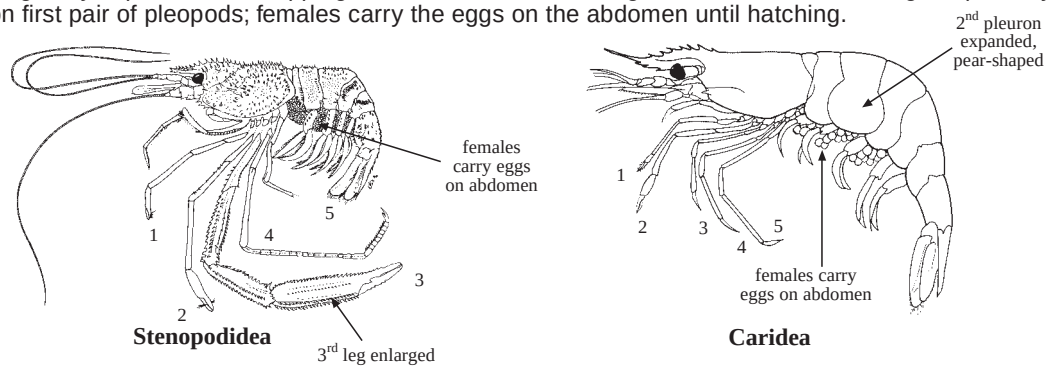
Penaeoidea: all 5 pairs of legs well developed, with first 3 pairs forming a pincer, none of the pincers particularly large; rostrum usually well developed, extending beyond eyes; numerous branchiae (more than 8 on each side).



Penaeoidea

Stenopodidea: all 5 pairs of legs well developed, first 3 pairs forming a pincer, third pair huge and massive; males without large copulatory organ on first pair of pleopods; females carry the eggs on the abdomen until hatching.

Caridea: all 5 pairs of legs well developed, third pair without pincer; abdomen with pleuron of second segment greatly expanded, overlapping those of first and third segments; males without large copulatory organ on first pair of pleopods; females carry the eggs on the abdomen until hatching.



Key to families and genera[1/] of Sergestoidea occurring in the area

1a. Head greatly elongated (Fig. 1); no branchiae; size very small, about 1 cm body length . . . . . **Luciferidae**

1b. Head not particularly elongate; branchiae present; size small, but generally adults with more than 2 cm body length . . . . . **(Sergestidae)** → *2*

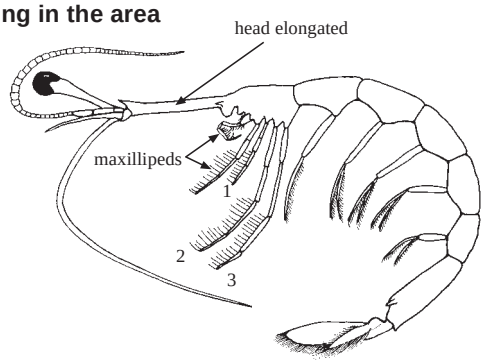


Fig. 1 Luciferidae

2a. Fourth and fifth legs entirely lacking, reduced to a pair of protuberances (genital coxae) in males (Fig. 2); first maxillae and first maxillipeds without palp; second maxillae with a single undivided lobe . . . . . ***Acetes***

2b. Fourth and fifth legs present, with fifth leg much shorter than fourth (Fig. 3); first maxillae and first maxillipeds with palp; second maxillae with 2 lobes . . . . . **other genera**

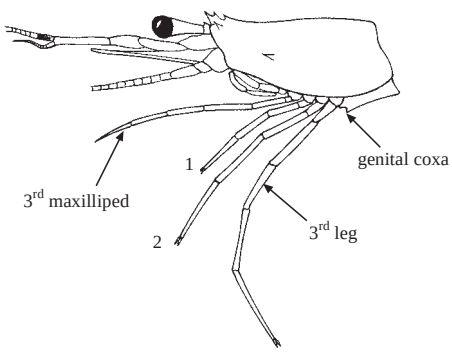


Fig. 2 *Acetes*

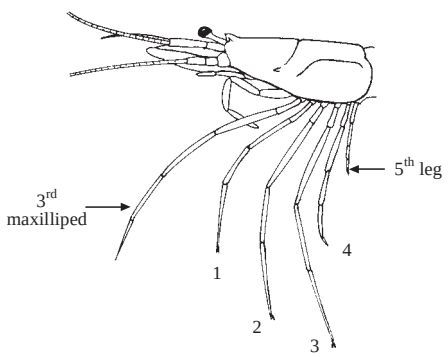


Fig. 3 *Sergestes*

1/ Restricted to the identification of *Acetes*, the only genus of interest to fisheries in the area.

SERGESTIDAE

Key to sexes of *Acetes*

1a. A pair of protuberances (genital coxae; Fig. 2) between third legs and first pleopods; lower antennular flagella with 1 or 2 clasping spines, or modification of these (Fig. 4); petasma (Fig. 5) present on first pleopods . . . . . **male**

1b. No protuberance in genital area; lower antennular flagella without spine; petasma absent . . . . . **female**

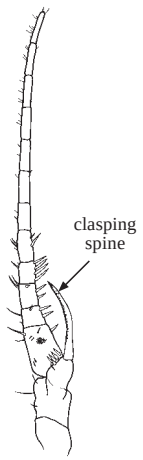


Fig. 4 lower antennular flagellum of a male

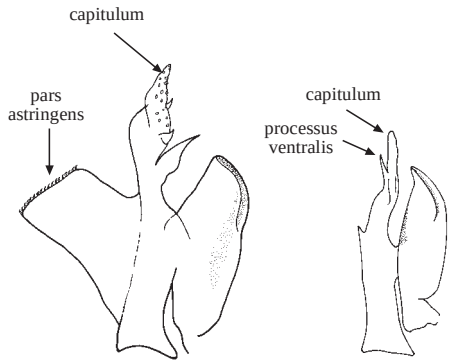


Fig. 5 examples of the petasma

Key to the species of *Acetes* occurring in the area

Remark on key characters: see the respective species accounts for illustrations of the petasma and lower antennular flagellum of males, and the basis of third leg of females.

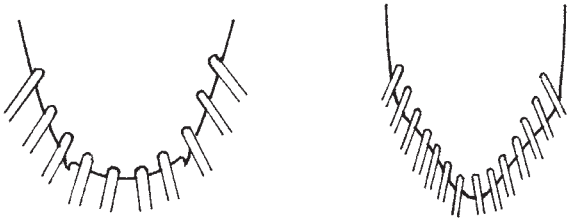
Females

1a. Apex of telson rounded or truncated (Fig. 6a) . . . . . → ***2***

1b. Apex of telson triangular (Fig. 6b) . . . . . → ***3***

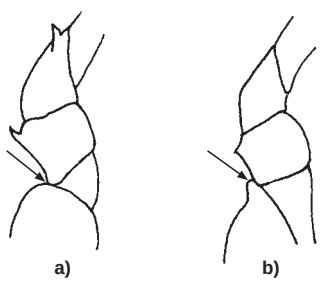
2a. Third thoracic sternite produced posteriorly (Fig. 7b) . . . . . ***Acetes japonicus***

2b. Third thoracic sternite not produced posteriorly (Fig. 7a) . . . . . ***Acetes serrulatus***



a) rounded or truncated **b) triangular**

Fig. 6 apex of telson



a) **b)**

Fig. 7 base of third leg

3a. Procurved tooth present between bases of first pleopods . . . . . → ***4***

3b. Procurved tooth absent between bases of first pleopods . . . . . → ***6***

4a. Inner margin of basis of third leg with sharply pointed projection; third and fourth thoracic sternites deeply channeled longitudinally . . . . . ***Acetes indicus***

4b. Inner margin of basis of third leg without sharply pointed projection; third and fourth thoracic sternites not channeled longitudinally . . . . . → ***5***

5a. First segment of antennular peduncle at most as long as second and third segments together; distal inner margin of basis of third leg ending in blunt projection . . . ***Acetes intermedius***

5b. First segment of antennular peduncle longer than second and third segments together; distal inner margin of basis of third leg without projection . . . . . ***Acetes erythraeus***

6a. Lower antennular flagellum with 20 segments or less; distal inner margin of basis of third leg ending in projection; pair of small protuberances on anterior part of third thoracic sternite . . . . . ***Acetes sibogae***

6b. Lower antennular flagellum with 20 segments or more; distal inner margin of basis of third leg without projection; pair of large protuberances on anterior part of third thoracic sternite . . . . . ***Acetes vulgaris***

Males

1a. Anterior margin of genital coxa rounded; petasma without pars astringens (Fig. 5) . . . . . → ***2***

1b. Anterior margin of genital coxa pointed; petasma with pars astringens (Fig. 5) . . . . . → ***4***

2a. Procurved tooth present between bases of first pleopods; lower antennular flagellum with 1 clasping spine . . . . . ***Acetes indicus***

2b. Procurved tooth absent between bases of first pleopods; lower antennular flagellum with 2 clasping spines . . . . . → ***3***

3a. Lower antennular flagellum with triangular projection from upper end of first segment of main branch . . . . . ***Acetes serrulatus***

3b. First segment of main branch of lower antennular flagellum without triangular projection . . . . . ***Acetes japonicus***

4a. Procurved tooth present between bases of first pleopods . . . . . → ***5***

4b. Procurved tooth absent between bases of first pleopods . . . . . → ***6***

5a. First segment of antennular peduncle shorter than second and third segments together; capitulum of petasma with 3 to 5 subequally large hooks along outer margin . . ***Acetes intermedius***

5b. First segment of antennular peduncle longer than second and third segments together; capitulum of petasma with 1 large hook at outer margin . . . . . ***Acetes erythraeus***

6a. Lower antennular flagellum with 12 segments or less; capitulum of petasma with 1 large hook and often additionally 1 small hook along outer margin . . . . . ***Acetes sibogae***

6b. Lower antennular flagellum with 17 segments or more; capitulum of petasma with 3 large hooks along outer margin . . . . . ***Acetes vulgaris***

List of genera and commercial species occurring in the area

The symbol is given when species accounts are included.

LUCIFERIDAE

Genus *Lucifer*

SERGESTIDAE

Genus *Acetes*

Acetes erythraeus Nobili, 1905
Acetes indicus H. Milne Edwards, 1830
Acetes intermedius Omori, 1975
Acetes japonicus Kishinouye, 1905
Acetes serrulatus (Krøyer, 1855)
Acetes sibogae Hansen, 1919
Acetes vulgaris Hansen, 1919

Genus *Sergestes*

Genus *Sergia*

Genus *Sicyonella*

References

Miquel, J.C. 1984. Shrimps and Prawns. In *FAO species identification sheets for fisheries purposes. Western Indian Ocean (Fishing Area 51),* edited by W. Fischer and G. Bianchi. Rome, FAO.

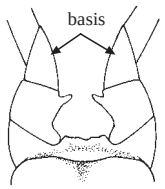
Omori, M. 1975. The systematics, biogeography, and fishery of epipelagic shrimps of the genus *Acetes* (Crustacea, Decapoda, Sergestidae). *Bull. Ocean Res. Inst., Univ. Tokyo*, 7:1-89.

Pérez Farfante, I. and B.F. Kensley. 1997. Penaeoid and sergestoid shrimps and prawns of the world. Keys and diagnosis for the families and genera. *Mem. Mus. Natn. Hist. Nat.*, 175:1-233.

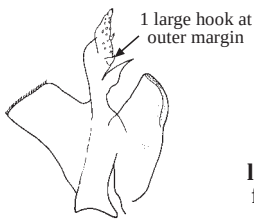
Acetes erythraeus Nobili, 1905

En - Tsivakihini paste shrimp; **Fr** - Chevrette tsivakihini; **Sp** - Camaroncillo tsivakihini.

Maximum body length 1.6 to 4.0 in females (rarely 4.8 cm) and 1.6 to 3.2 cm in males. Epipelagic, found over muddy or sandy bottoms, from the surface to a depth of 55 m. Marine or brackish, but usually brackish and fished in the intertidal zone and estuaries with mangroves. Probably the most common species of the genus in the area and of major commercial importance in its range, despite its very small size. Caught with triangular nets, lift nets, scoop nets, push nets, bag nets, set filter nets, and seines, occasionally encountered in penaeid shrimp culture ponds. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Indo-West Pacific from the eastern coast of Africa to southern China and northeastern Australia.



bases of 3rd legs (female)

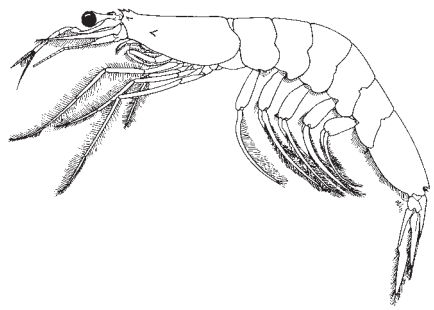


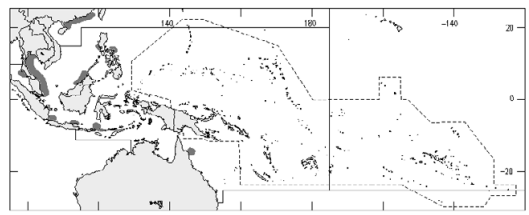
petasma



lower antennular flagellum (male)

(after Omori, 1975)

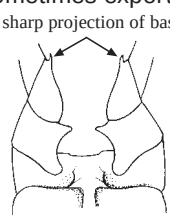




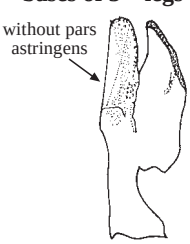
Acetes indicus H. Milne Edwards, 1830

En - Jawla paste shrimp; **Fr** - Chevrette jawla; **Sp** - Camaroncillo javlá.

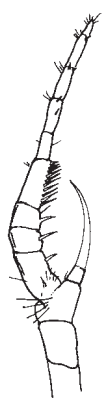
Maximum body length 2.3 to 4.0 cm (females) and 1.5 to 2.5 cm (males). Inhabits shallow, sometimes brackish coastal waters; epipelagic, usually swims in midwater or near the surface. One of the more common species of the genus in the area and of considerable economic importance. Caught with push nets, bag nets and seines, and sometimes by light fishing at night. Taken throughout its range. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Indo-West Pacific from India to Viet Nam and Indonesia.



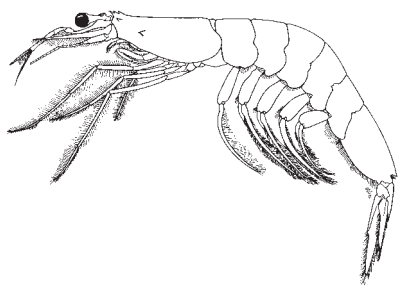
bases of 3rd legs (female)

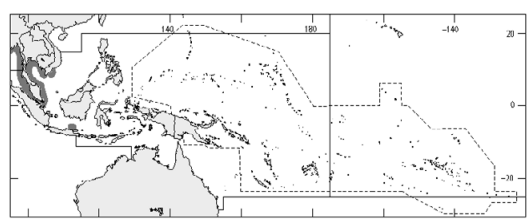


petasma



lower antennular flagellum (male)

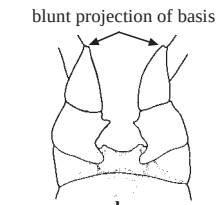




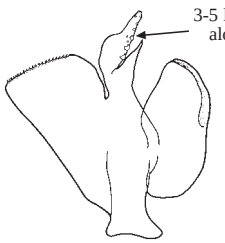
Acetes intermedius Omori, 1975

En - Taiwan mauxia shrimp; **Fr** - Chevrette mauxia de Formose; **Sp** - Camaroncillo mauxia dè Formosa.

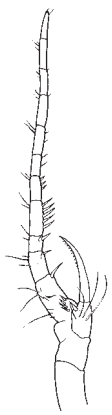
Maximum body length 2.0 to 2.6 cm (females) and 1.7 to 2.4 cm (males). Epipelagic, found mainly at sea. Within the area, reported from commercial catches made in the Philippines and Indonesia, and probably of moderately commercial importance. Caught with midwater trawls, triangular nets, lift nets, and scoop nets, and sometimes by light fishing at night. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Found in the western Pacific, but so far only reported from Taiwan Province of China, Philippines, and the southern coast of Java.



bases of 3rd legs (female)

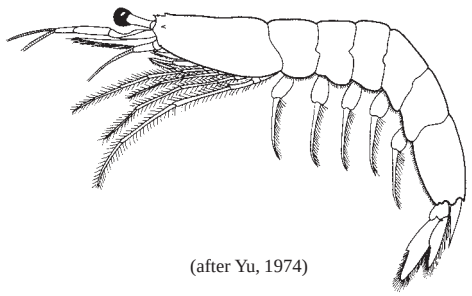


petasma

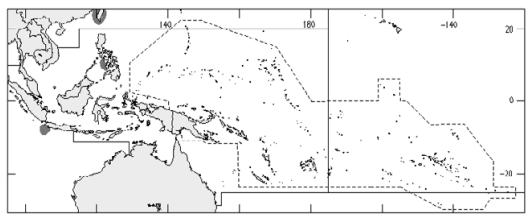


lower antennular flagellum (male)

(after Omori, 1975)



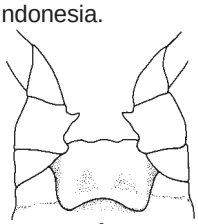
(after Yu, 1974)



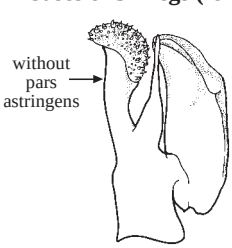
Acetes japonicus Kishinouye, 1905

En - Akiami paste shrimp; **Fr** - Chevrette akiami; **Sp** - Camaroncillo akiami.

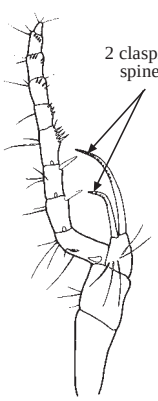
Maximum body length 1.5 to 3.0 cm (females) and 1.1 to 2.4 cm (males). Epipelagic, inhabits shallow coastal waters over muddy bottoms. One of the more common species of the genus in the area and of considerable economic importance; reported from commercial catches made in Viet Nam, Thailand, and Malaysia. Caught with push nets, bag nets, and seines, and sometimes by light fishing at night. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. In 1995, the reported production from culture ponds of this species in Indonesia amounted to 3 500 t (FAO Aquaculture Production Statistics). Widely distributed in the Indo-West Pacific from the Persian Gulf to Japan and Indonesia.



bases of 3rd legs (female)

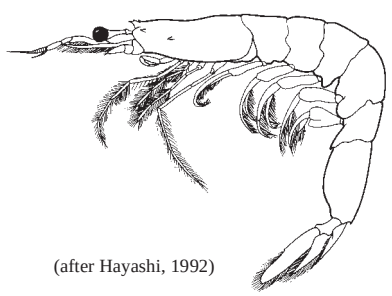


petasma

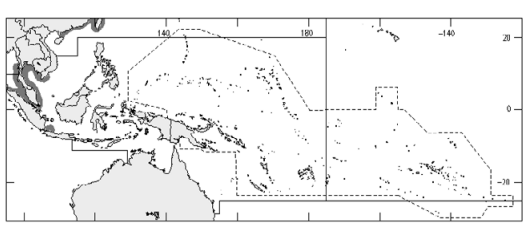


lower antennular flagellum (male)

(after Omori, 1975)



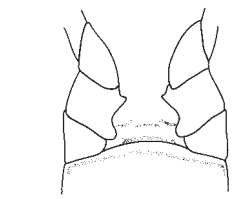
(after Hayashi, 1992)



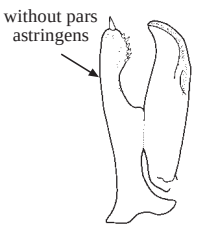
Acetes serrulatus (Krøyer, 1855)

En - Southern mauxia shrimp; **Fr** - Chevrette mauxia méridionale; **Sp** - Camaroncillo mauxia sureño.

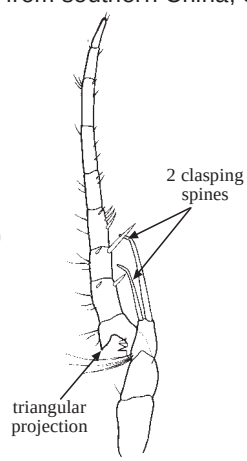
Maximum body length 1.5 to 2.1 cm (females) and 1.2 to 1.7 cm (males). Epipelagic, inhabits shallow coastal water. Probably less common than the other species of the genus. Within the area, reported from commercial catches made in Malaysia and Indonesia, but no further information on its economic status is presently available. Caught by push nets, bag nets, and seines. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Western Pacific and so far known only from southern China, Singapore, Malaysia, and Indonesia.



bases of 3rd legs (female)

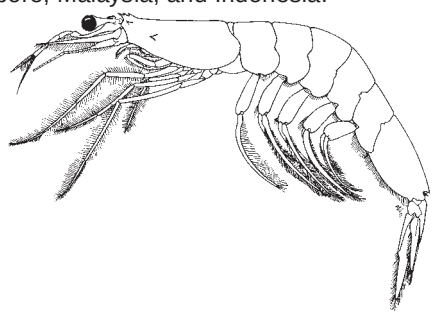


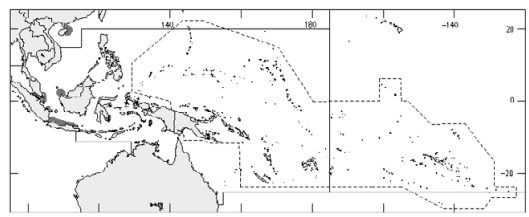
petasma



lower antennular flagellum (male)

(after Omori, 1975)

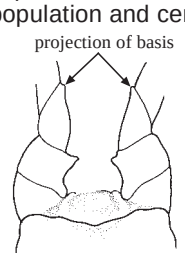




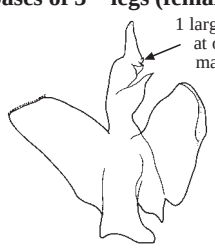
Acetes sibogae Hansen, 1919

En - Alamang shrimp; **Fr** - Chevrette alamang; **Sp** - Camaroncillo alamang.

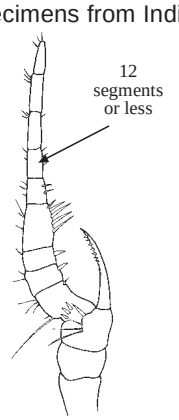
Maximum body length 1.4 to 3.4 cm (females) and 1.3 to 2.5 cm (males). Epipelagic, found over muddy bottoms in estuarine and marine waters to a depth of 55 m. Probably caught throughout its range in the area and of moderate commercial importance. Taken by triangular nets, lift nets and scoop nets. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Indo-West Pacific from India to the Philippines and eastern Australia (the Australian population and certain specimens from India are sometimes considered to be 2 subspecies).



bases of 3rd legs (female)

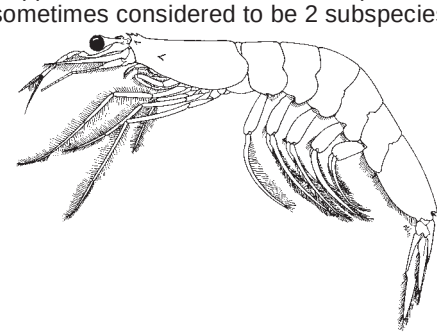


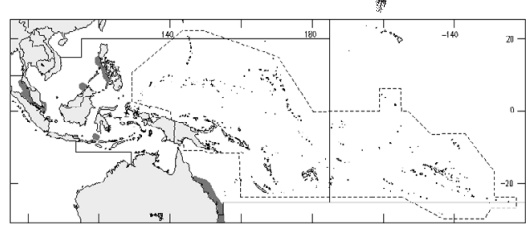
petasma



lower antennular flagellum (male)

(after Omori, 1975)

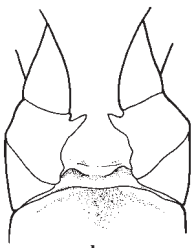




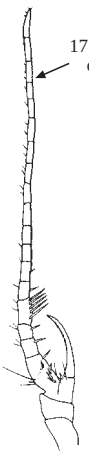
Acetes vulgaris Hansen, 1919

En - Jembret shrimp; **Fr** - Chevrette jembre; **Sp** - Camaroncillo jembre.

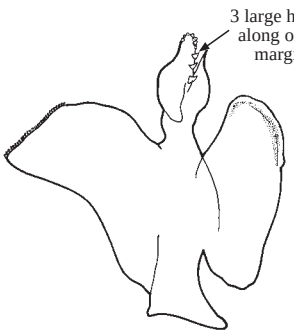
Maximum body length 2.0 to 3.4 cm (females) and 1.7 to 2.6 cm (males). Epipelagic, found over sandy and muddy bottoms in marine waters from depths of 9 to 55 m. One of the more common species of the genus in the area and of considerable economic importance; reported from commercial catches made in Thailand, Singapore, and Indonesia. Caught with push nets, bag nets, scoop nets, and seines, sometimes by light fishing at night. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Western Pacific from southern China to the Strait of Malacca and Indonesia.



bases of 3rd legs (female)

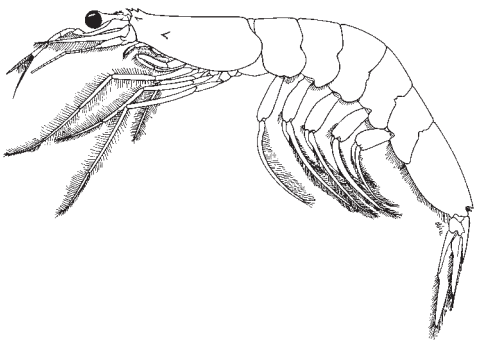


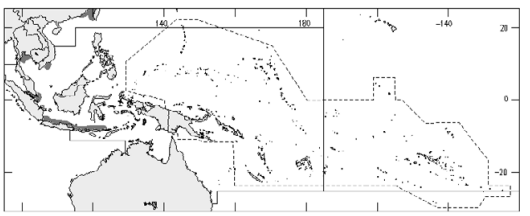
lower antennular flagellum (male)



petasma

(after Omori, 1975)





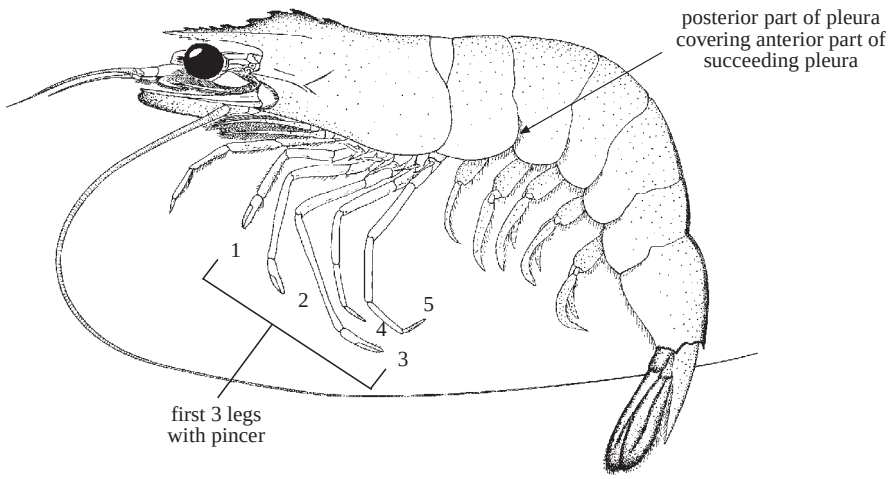
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Superfamily PENAEOIDEA

Penaeoid shrimps

Diagnostic characters: Small to large sized, with a body length from 2.5 to about 35 cm. All 5 pairs of legs well developed, with **first 3 pairs of legs forming a pincer**, none of the pincers particularly large. Abdomen with **posterior part of pleura (lateral plates) covering anterior part of succeeding pleura**. **With large copulatory organ, on first pair of pleopods in males (petasma), and on posterior thoracic sternites in females (thelycum)**. Eggs are released directly into the water and not retained by the females on the abdomen.

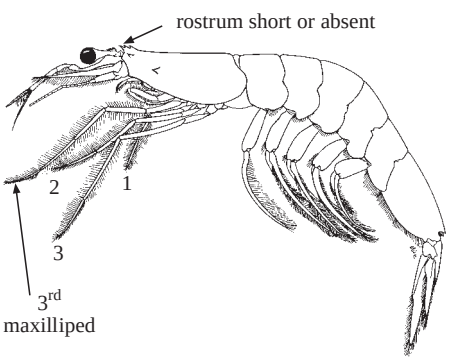


Habitat, biology, and fisheries: Members of this superfamily are all marine, although the juveniles of some species of Penaeidae inhabit brackish water and occasionally are even found in almost fresh water. The 4 families of penaeoids can all be found in the Western Central Pacific, with the family Penaeidae being of great economic importance in capture fisheries and aquaculture. Members of the 2 families Aristeidae and Solenoceridae mainly occur in deep water and are presently not exploited in the area. As some of them can reach a large size and are often taken on the basis of exploratory deep-water trawling, they may eventually prove to be of commercial interest. In contrast, species of the family Sicyoniidae are usually small and nowhere abundant. They are caught incidentally in prawn fisheries but do not have any economic importance.

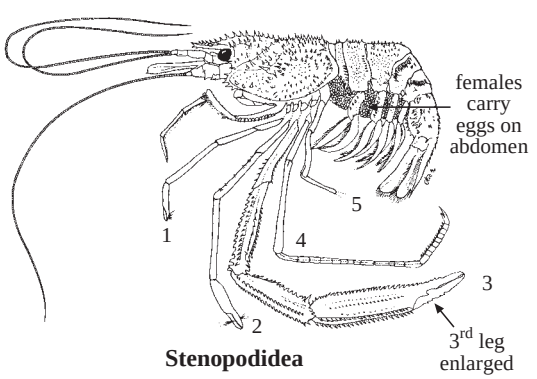
Other major groups of shrimps and prawns occurring in the area

Sergestoidea: usually small sized to microscopic; body strongly compressed laterally; shell rather soft; rostrum as well as last 2 pairs of legs reduced or absent; branchiae few, not more than 8 on each side.

Stenopodidea: third pincer very large and massive; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.

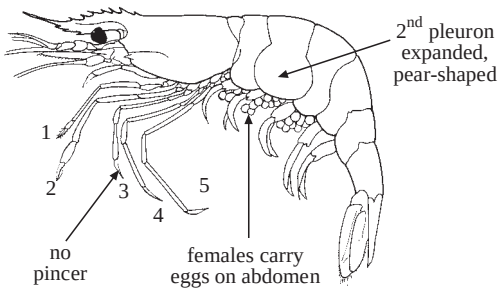


Sergestoidea



Stenopodidea

Caridea: third leg always without pincer; pleuron of second abdominal segment greatly expanded and overlapping those of first and third segments; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.



Caridea

Key to the families of Penaeoidea occurring in the area

1a. Either rostrum very short and armed with 1 or 2 upper teeth only, or upper antennular flagellum very short and attached to the base of distal antennular segment (Fig. 1) . . . . . **Aristeidae** (p. 868)

1b. Rostrum always armed with more than 3 upper teeth, and both upper and lower antennular flagella of similar length and attached to the tip of antennular peduncle . . . . . → ***2***

2a. Pleopods (abdominal appendages) with 1 branch only; abdomen often with many distinct furrows and grooves (Fig. 2) . . . . . **Sicyoniidae** (p. 952)

2b. Pleopods (abdominal appendages) with 2 branches; abdomen without or with very few distinct grooves . . . . . → ***3***

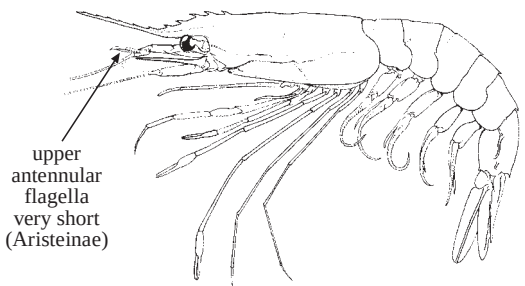


Fig. 1 Aristeidae

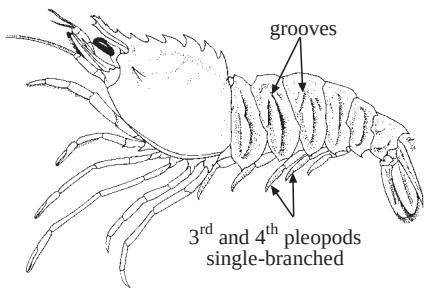


Fig. 2 Sicyoniidae

3a. Cervical groove prominent and extending to about dorsal carapace; either postorbital or postantennal spine present (Fig. 3) . . . . . **Solenoceridae** (p. 875)

3b. Distinct part of cervical groove far from dorsal carapace; postorbital and postantennal spine absent (Fig. 4) . . . . . **Penaeidae** (p. 889)

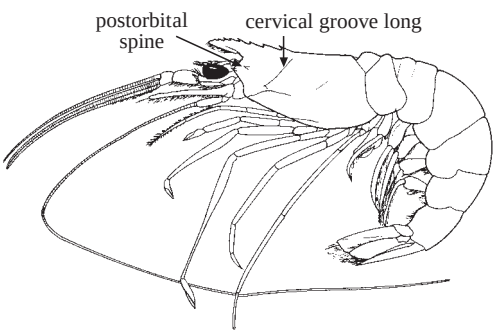


Fig. 3 Solenoceridae

(after Hayashi, 1992)

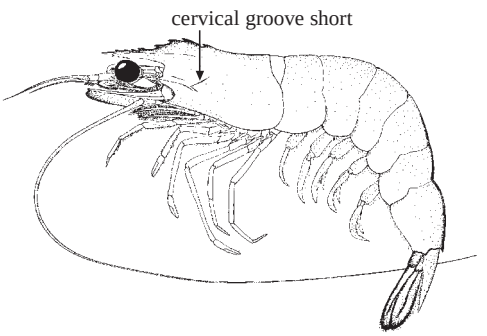
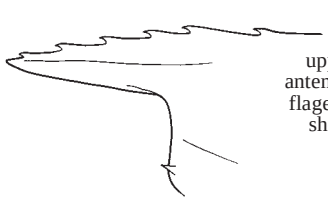


Fig. 4 Penaeidae

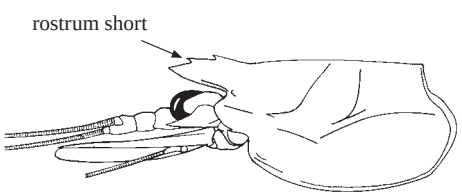
ARISTEIDAE

Aristeid shrimps

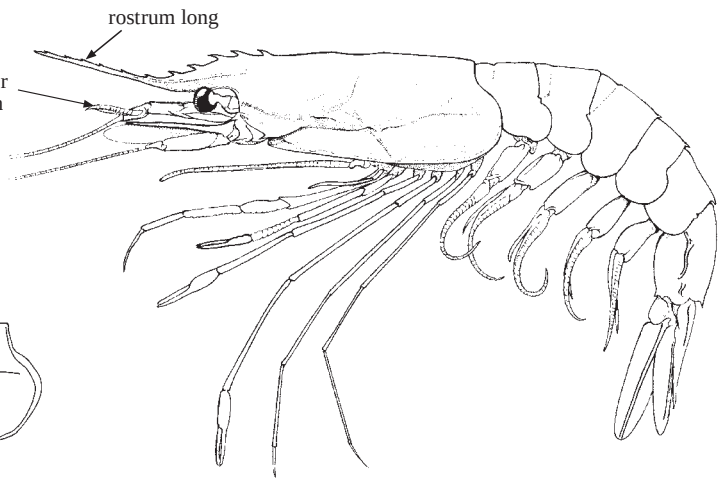
Diagnostic characters: Animals either a) with rostrum very long in females and young males, but becoming rather short in adult males, and **always bearing more than 2 upper teeth (subfamily Aristeinae)**; or b) **rostrum short, not extending beyond eyes and armed with 1 or 2 upper teeth (subfamily Benthesicyminae)**. No styliform projection at base of eyestalk, but a tubercle present on its inner border (very small in *Aristaeomorpha*). **In the subfamily Aristeinae, upper antennular flagellum very short and attached to the base of distal antennular segment. Carapace lacks both postorbital and postantennal spines;** cervical groove either long, extending almost to dorsal carapace, or very short. All 5 pairs of legs well developed, **fourth leg bearing 2 well-developed arthrobranchs (hidden beneath carapace). In males, endopod of second pair of pleopods (abdominal appendages) with appendix masculina and appendix interna, but without lateral projection**. Third and fourth pleopods divided into 2 branches. Telson with 1 to 4 pairs of movable lateral spines. **Colour: typical coloration of deep-sea crustaceans:** body reddish or scarlet, sometimes pale white and with red cross bands on abdomen.



rostrum of male (Aristeinae)



Subfamily Benthesicyminae

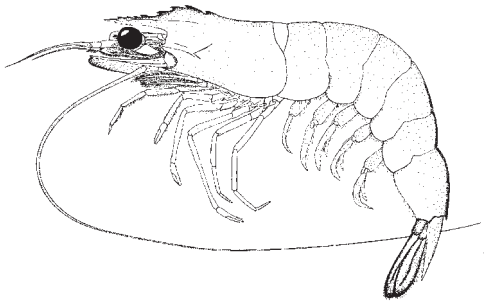


subfamily Aristeinae female

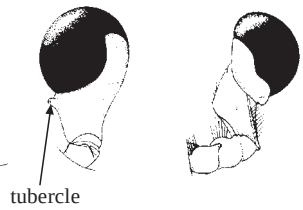
Habitat, biology, and fisheries: All representatives of this family are marine and occur in very deep waters (generally deeper than 300 m), with the members of the subfamily Benthesicyminae being exclusively bathypelagic (to depths of at least 5 413 m), whereas those of the Aristeinae are benthic and prefer soft bottom. Aristeid shrimps are generally of large size and can reach a body length of 33 cm. The sexes are easily distinguished by the presence of a large copulatory organ (petasma) on the first pair of pleopods (abdominal appendages) of males, while the females have the posterior thoracic sternites modified into a large sperm receptacle process (thelycum) which holds the spermatophores or sperm sacs (usually whitish or yellowish in colour) after mating. The shape of the petasma and thelycum is often specific and very useful for species identification. The eggs are small and numerous, and are released directly into the water and not retained on the female abdomen. The larvae are planktonic and have the nauplius stage. At present, 11 genera and 29 species of aristeid shrimps are known from the Western Central Pacific, but none of them are fished commercially because there is virtually no deep-sea fishery in the area. Nevertheless, the fact that some species reach a large size and are commonly taken on the basis of exploratory deep-water trawling, suggests they may have future commercial potential once that suitable deep-sea fishing gear is used in the area. In view of the present non-commercial status of the whole family in the area, no identification key to all species is provided here. Instead, a simplified key and species accounts are given for 3 species that have high potential interest.

Similar families occurring in the area

Penaeidae: rostrum always armed with more than 3 upper teeth; both upper and lower antennular flagella of similar length, attached to tip of antennular peduncle; eyestalk without tubercle on inner border; in males, endopod of second pair of pleopods with appendix masculina only; a single well-developed arthrobranch on fourth leg (hidden beneath carapace).



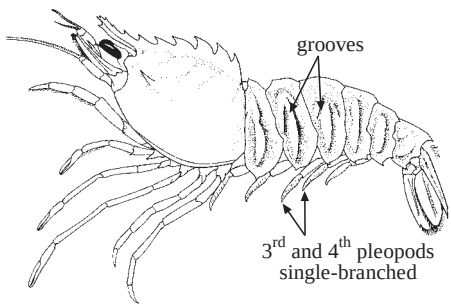
Penaeidae



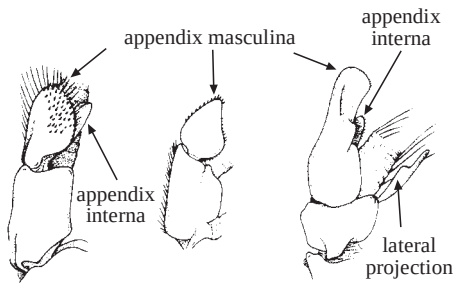
Aristeidae **Penaeidae**

eyes

Sicyoniidae: shell generally hard and body "stony" in appearance; abdomen often with deep grooves and numerous tubercles; rostrum always armed with more than 3 upper teeth; both upper and lower antennular flagella of similar length, attached to tip of antennular peduncle; third and fourth pleopods single-branched.



Sicyoniidae

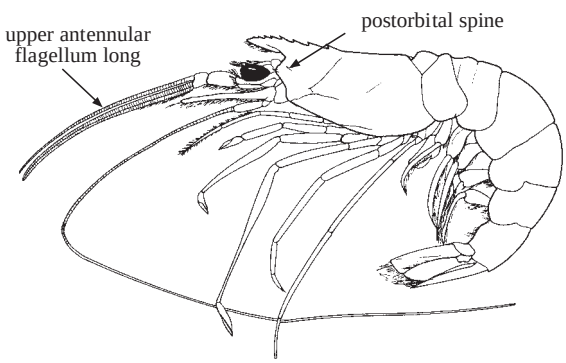


Aristeidae **Penaeidae** **Solenoceridae**

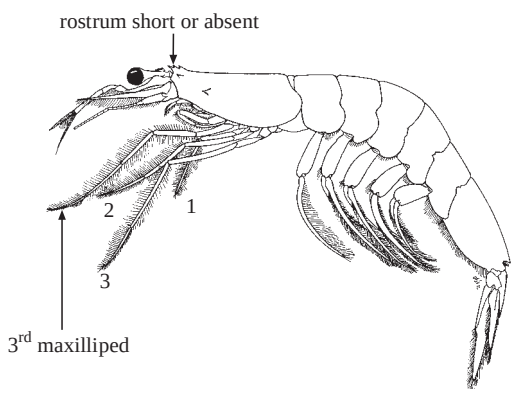
various types of appendices masculinae on endopods of 2nd pair of pleopods

Solenoceridae: either postorbital or postantennal spine present on carapace; rostrum always armed with more than 3 upper teeth; both upper and lower antennular flagella long, of similar length and attached to tip of antennular peduncle; telson usually armed with fixed lateral spines; in males, endopod of second pair of pleopods with appendix masculina, appendix interna, and lateral projection.

Sergestidae: generally small sized; rostrum very short; body strongly compressed laterally, shell soft; last 2 pairs of legs reduced or absent.



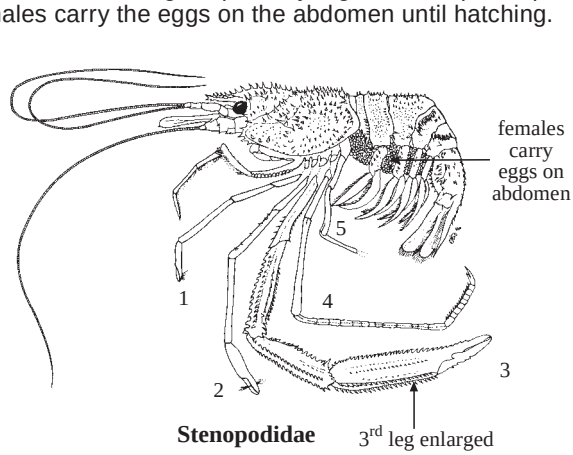
Solenoceridae

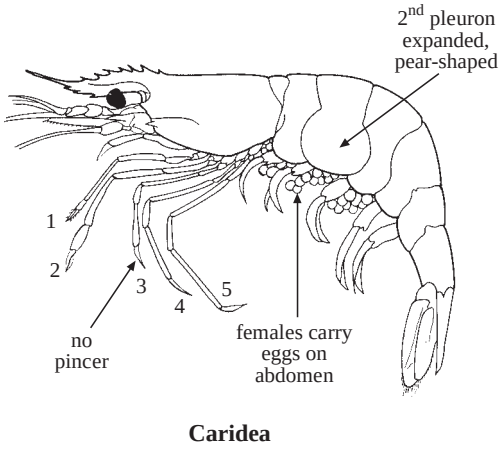


Sergestidae

Stenopodidae: third pincer very large and massive; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.

Shrimps of the infraorder Caridea: third leg without pincer; second abdominal pleuron (lateral plate) greatly expanded, overlapping posterior part of first pleuron as well as anterior part of third pleuron; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.





Key to species with commercial potential in the area

1a. Rostrum armed with more than 5 upper teeth; hepatic spine present (Fig. 1) (*Aristaeomorpha*) . . . . . ***Aristaeomorpha foliacea***

1b. Rostrum armed with 3 upper teeth only; hepatic spine absent (Fig. 2) . . . . . → ***2***

2a. Crests on carapace without sharp edges (*Aristeus*) . . . . . ***Aristeus virilis***

2b. Crests on carapace very prominent and sharply edged (*Plesiopenaeus*) . . . . . ***Plesiopenaeus edwardsianus***

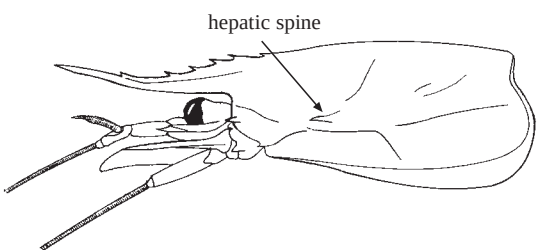


Fig. 1 ***Aristaeomorpha***

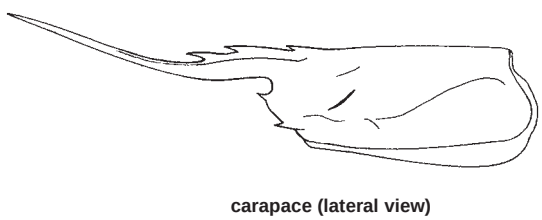


Fig. 2 ***Aristeus***

List of species occurring in the area

The symbol is given when species accounts are included.

Aristaeomorpha foliacea (Risso, 1827)

Aristeus mabahissae Ramadan, 1938
Aristeus semidentatus Bate, 1881
Aristeus virilis (Bate, 1881)

Benthonectes filipes Smith, 1885

Betheogennema pasithea (De Man, 1907)

Bethesicymus altus Bate, 1881
Bethesicymus bartletti Smith, 1882
Bethesicymus investigatoris Alcock and Anderson, 1889
Bethesicymus iridescens Bate, 1881
Bethesicymus tirmiziae Crosnier, 1978
Bethesicymus urinator Burkenroad, 1936

Gennadas bouvieri Kemp, 1909
Gennadas capensis Calman, 1925
Gennadas gilchristi Calman, 1925
Gennadas incertus (Balss, 1927)
Gennadas kempi Stebbing, 1914
Gennadas propinquus Rathbun, 1906
Gennadas scutatus Bouvier, 1906

Hemipenaeus carpenteri Wood-Mason, 1891
Hemipenaeus spinidoralis Bate, 1881

Hepomadus tener Smith, 1884

Parahepomadus vaubani Crosnier, 1978

Plesiopenaeus armatus (Bate, 1881)
Plesiopenaeus edwardsianus (Johnson, 1867)

Pseudaristeus crassipes (Wood-Mason, 1891)
Pseudaristeus gracilis (Bate, 1888)
Pseudaristeus kathleenae Pérez Farfante, 1987
Pseudaristeus sibogae (De Man, 1911)

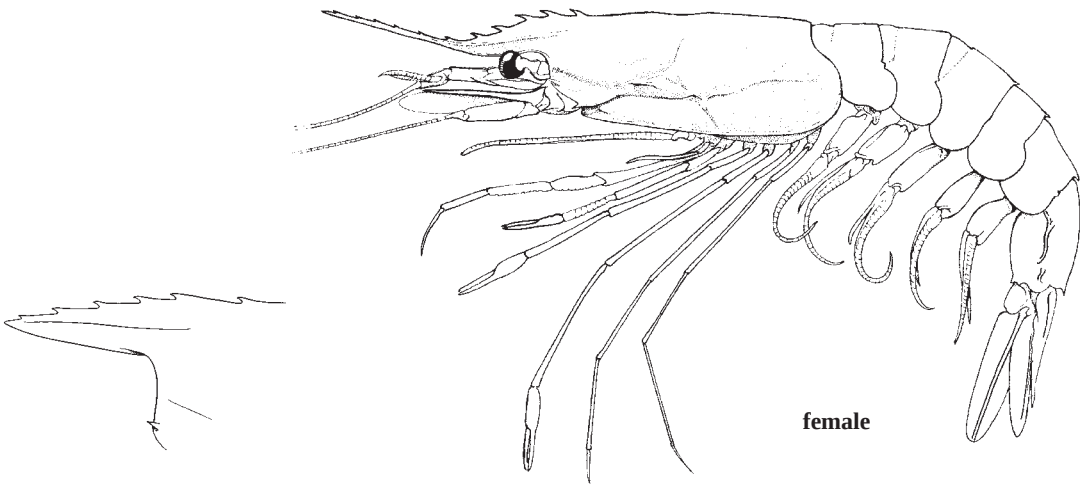
References

Crosnier, A. 1978. Crustacés Décapodes Péneides Aristaeidae (Benthesicyminae, Aristeinae, Solenocerinae). *Faune de Madagascar*, 46:1-197.

Crosnier, A. 1989. Benthesicymidae, Aristeidae, Solenoceridae (Crustacea Penaeoidea). In Résultats des Campagnes MUSORSTOM, Vol. 5, edited by J. Forest. *Mém. Mus. natn. Hist. nat.*, (A), 144:37-67.

Aristaeomorpha foliacea (Risso, 1827)

Frequent synonyms / misidentifications: *Aristaeomorpha rostridentata* (Risso, 1827) / None.
FAO names: En - Giant red shrimp; **Fr** - Gambon rouge; **Sp** - Gamba española.



female

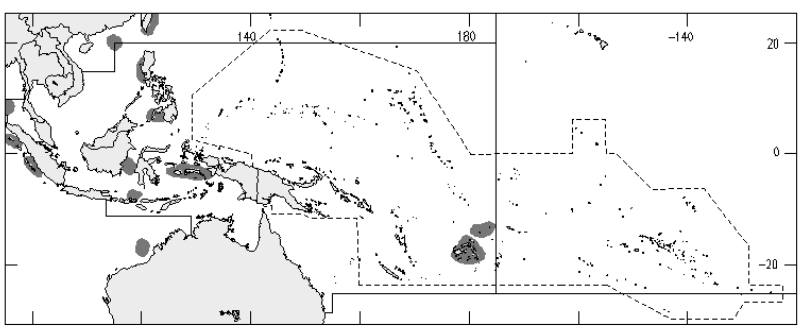
rostrum of male

Diagnostic characters: A large shrimp. **Rostrum with 6 to 12 upper teeth (including 2 teeth on carapace)**; very long in females and extending far beyond antennal scale, but short in males and not exceeding tip of antennular peduncle. **Carapace with antennal, hepatic, and branchiostegal spines. Upper antennal flagella very short. Third to sixth abdominal segments each bearing a strong posteromedian spine.** Telson with 4 pairs of small movable lateral spines. **Colour:** body uniformly vermilion; eyes black.

Size: Maximum body length 22.5 cm in females (carapace length 5.9 cm) and 17 cm in males (carapace length 4.5 cm); commonly between 12 and 16 cm.

Habitat, biology, and fisheries: Found from depths of 61 to 1 300 m, but more often between 300 and 750 m; prefers mud bottoms. Moves to midwater at night. One of the common larger shrimps caught during deep-water exploratory trawling operations, often encountered in large quantities. Not yet fished commercially in the area, but with high potential for deep-sea fisheries.

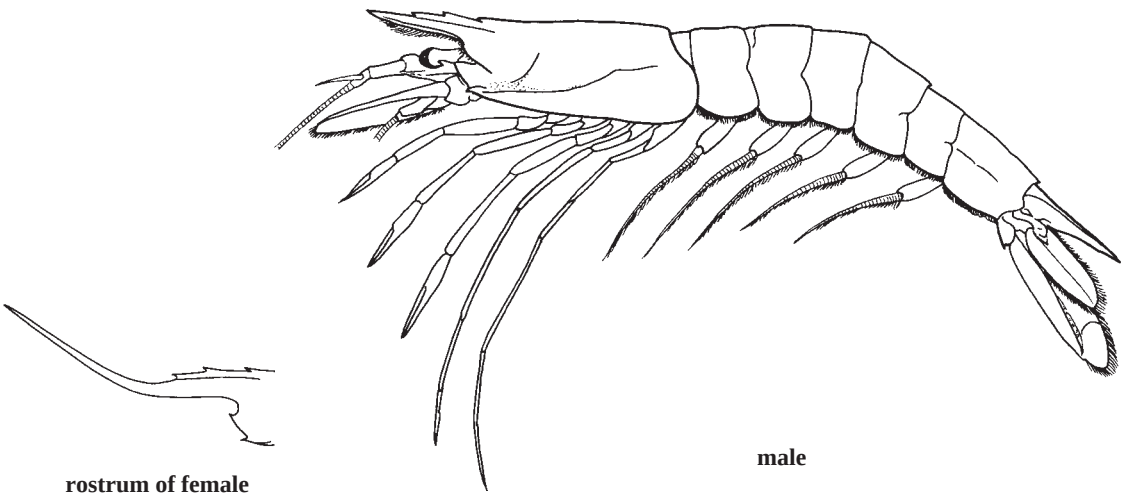
Distribution: Cosmopolitan, reported to be widely distributed in the Western Atlantic, Mediterranean, and Indo-West Pacific.



Aristeus virilis (Bate, 1881)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Stout red shrimp; **Fr** - Gambon gaillard; **Sp** - Gambón colorado.



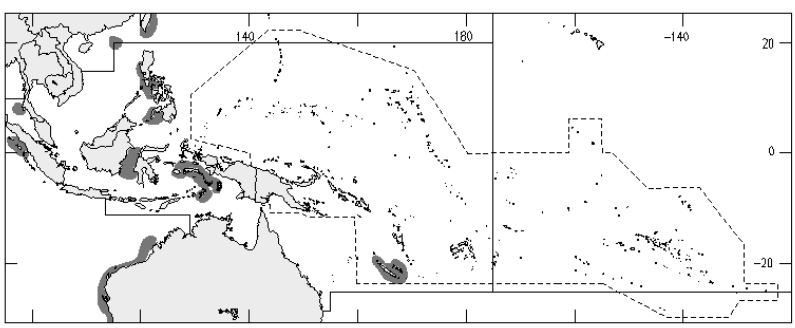
(after Lee and Yu, 1977)

Diagnostic characters: A large shrimp; **body covered with pubescence**. **Rostrum armed with 3 upper teeth only (including 1 tooth on carapace)**; very long in females and extending far beyond antennal scale, but short in males and not exceeding tip of antennal scale. Carapace with antennal and branchiostegal spines but **lacking hepatic spine. Crests on carapace without sharp edges. Upper antennal flagella very short. Legs with photophores; first to third legs armed with a movable spine on merus. Fourth to sixth abdominal segments each bearing a strong posteromedian spine**. Telson with 4 pairs of small movable lateral spines. **Colour: body pale white, with red bands on posterior margin of abdominal segments**; eyes black; tip of rostrum, antennal scale, distal half of uropods, antennular and antennal flagella reddish; upper and lateral carapace, as well as legs and pleopods somewhat reddish; photophores on legs purple-red; some young individuals with body rather uniformly reddish.

Size: Maximum body length about 22.2 cm in females (carapace length 6.1 cm) and 14.6 cm in males (carapace length 4.6 cm); commonly between 9 and 12 cm.

Habitat, biology, and fisheries: Found on sand and mud bottom, at depths from 188 to 936 m, usually between 350 and 700 m, apparently not migrating into midwater at night. Not yet fished commercially in the area. However, the size of this species and the fact that it is commonly taken during experimental trawling operations in the Philippines, Indonesia, and New Caledonia suggest it has high potential with the development of a deep-sea fishery in these countries.

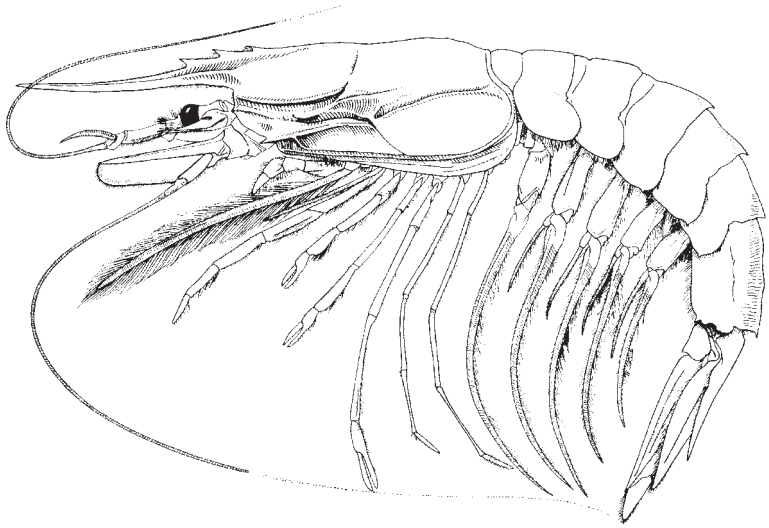
Distribution: Indo-West Pacific from eastern coast of Africa to India, western Australia, the Philippines, Japan, Indonesia, New Caledonia, and Vanuatu.



Plesiopenaeus edwardsianus (Johnson, 1867)

Frequent synonyms / misidentifications: *Aristaeopsis edwardsiana* (Johnson, 1867) / None.

FAO names: En - Scarlet shrimp; **Fr** - Gambon écarlat; **Sp** - Gamba carabinero.

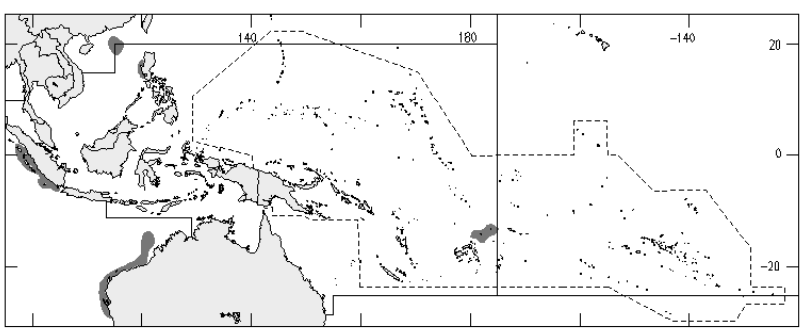


Diagnostic characters: Size very large. **Rostrum armed with 3 upper teeth only (including 1 tooth on carapace)**; very long in females, reaching far beyond antennal scale, but short in males and not exceeding tip of antennal scale. Carapace with antennal and branchiostegal spines but **lacking hepatic spine. Crests on carapace very sharp and prominent. Upper antennal flagella very short. Exopod of second maxilliped about 2 times as large as endopod. Legs without exopods. Third to sixth abdominal segments each bearing a sharp posteromedian spine.** Telson with 4 pairs of small movable lateral spines. **Colour:** uniformly scarlet; eyes black.

Size: Maximum body length 33.4 cm in females (carapace length 10.4 cm) and 19.3 cm in males (carapace length 6.3 cm); commonly between 15 and 19.5 cm.

Habitat, biology, and fisheries: Found on sandy or muddy bottom, at depths of 200 to 1 850 m, usually between 400 and 900 m. A very large species, often trawled at depths of more than 500 m. With very high potential for deep-sea fisheries in the area, although so far only encountered during exploratory trawling operations off the Philippines, Willis and Fortuna islands.

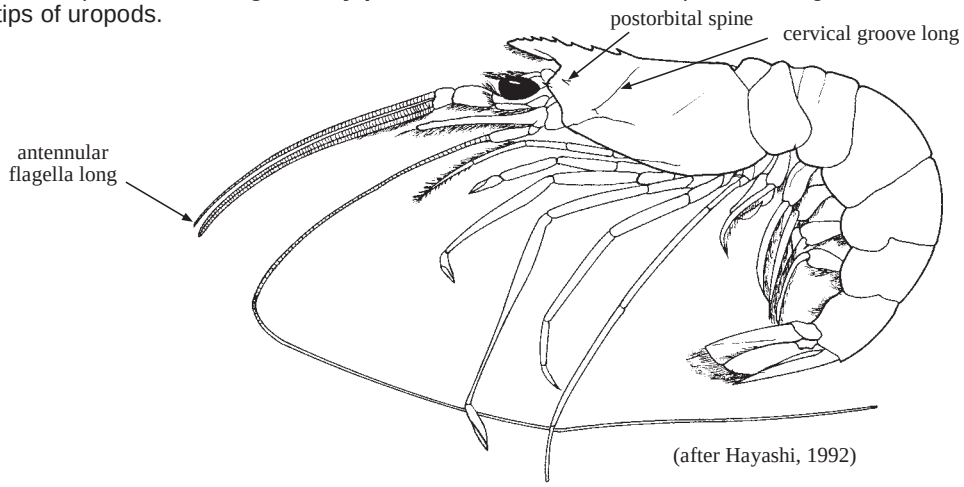
Distribution: Cosmopolitan, widely distributed in the Atlantic and the Indo-West Pacific.



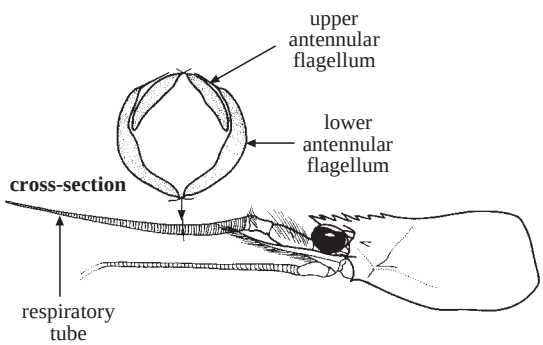
SOLENOCERIDAE

Solenocerid shrimps

Diagnostic characters: Rostrum well developed (extending at least to middle of eye), always bearing more than 3 upper teeth (including those on carapace); **no styliform projection at base of eyestalk, but a tubercle present on its inner border. Both upper and lower antennular flagella long (additionally strongly compressed laterally and tube-like in *Solenocera*), of the same length, and attached to tip of antennular peduncle. Carapace either with postorbital or postantennal spine; cervical groove long, extending to about dorsal carapace.** All 5 pairs of legs well developed, fourth leg bearing 2 well-developed arthrobranchs (hidden beneath carapace). **In males, endopod of second pair of pleopods (abdominal appendages) with appendix masculina, appendix interna, and lateral projection.** Third and fourth pleopods divided into 2 branches. Telson generally armed with at least 1 pair of fixed lateral spines. **Colour: generally pink to red**; sometimes with pale markings on antennular flagella and tips of uropods.



(after Hayashi, 1992)



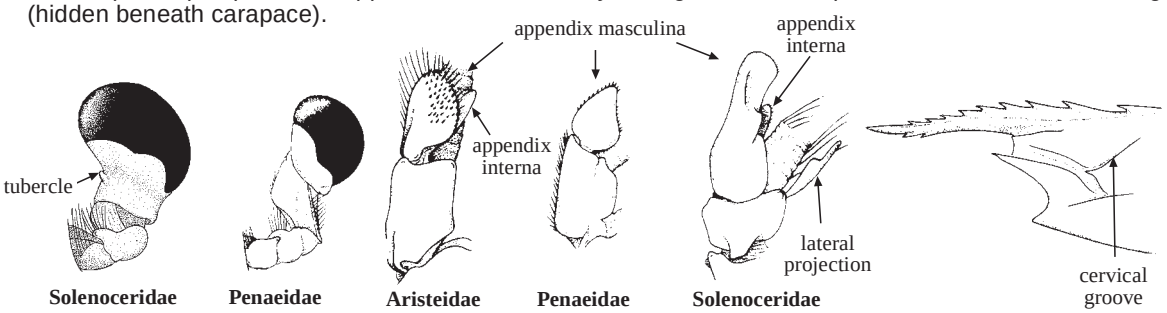
(genus *Solenocera*)

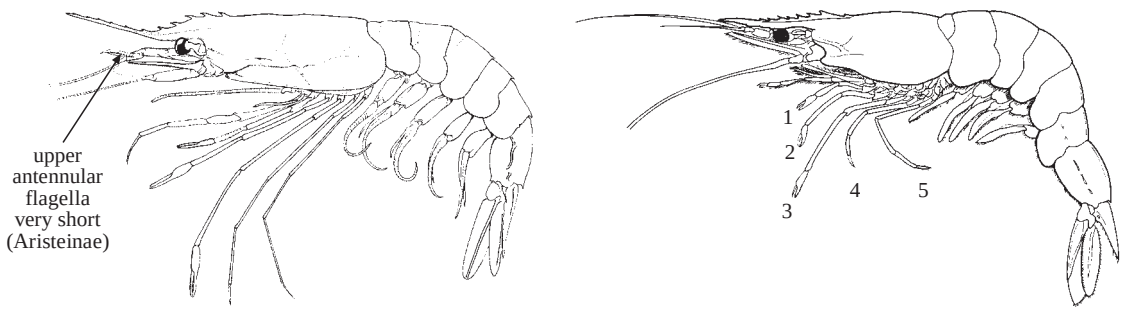
Habitat, biology, and fisheries: Found in deeper marine waters offshore from depths of 2 to over 5 700 m (usually deeper than 20 m). Generally benthic animals with preference for soft bottoms. Species of the genus *Solenocera* often burrow in mud during the daytime, with only the tube-like antennular flagella sticking out for respiration. Their size range from 2.5 to 21.5 cm body length but most species are of moderate size. The sexes are easily distinguished by the presence of a large copulatory organ (petasma) on the first pair of pleopods (abdominal appendages) of males, while the females have the posterior thoracic sternites modified into a large sperm receptacle process (thelycum) which holds the spermatophores or sperm sacs (usually whitish or yellowish in colour) after mating. The shape of the petasma and thelycum is often specific and very useful for species identification. The eggs are small and numerous, and are released directly into the water and not retained on the female abdomen. The larvae are planktonic and have the nauplius stage. In the Western Central Pacific, about 8 genera and 36 species of solenocerid shrimps have been recorded. Since they are generally found in deeper waters, at present only a few of them are taken as bycatch in commercial trawl fisheries. Nevertheless, results of many exploratory deep-water trawling operations have shown that several species are abundant and have fishery potential. Nevertheless, no key to all species of Solenoceridae occurring in the area is given here as most of them are not yet commercially caught and the taxonomic status of some species is still unclear. Species accounts and a key are included below for 2 genera and 11 species which are either more commonly found in commercial catches or that can be easily confused with those commercial species.

Similar families occurring in the area

Aristeidae: either rostrum very short and armed with 1 or 2 upper teeth only, or upper antennular flagellum very short and not attached to tip of antennular peduncle; no postorbital or postantennal spine present on carapace; telson armed only with movable lateral spines; in males, endopod of second pair of pleopods with appendix masculina, appendix interna, but without lateral projection.

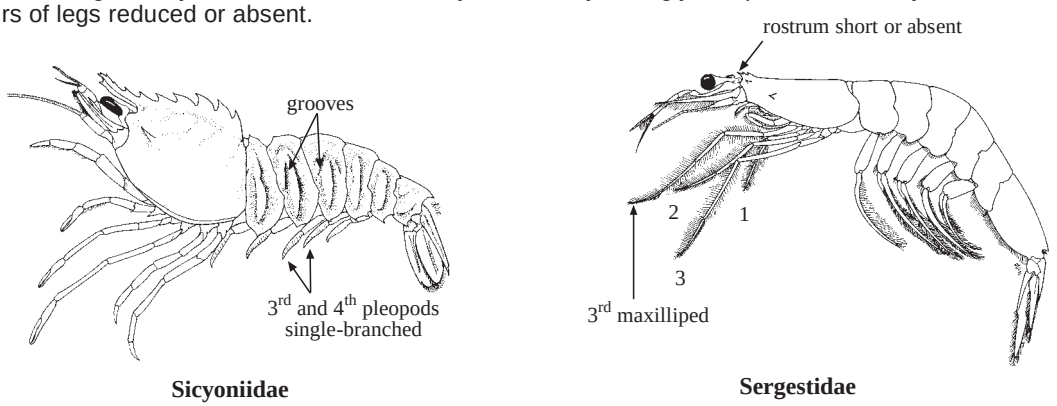
Penaeidae: no postorbital or postantennal spine present on carapace; cervical groove short, with distinct part always far from dorsal carapace; eyestalk without tubercle on inner border; in males, endopod of second pair of pleopods with appendix masculina only; a single well-developed arthrobranch on fourth leg (hidden beneath carapace).





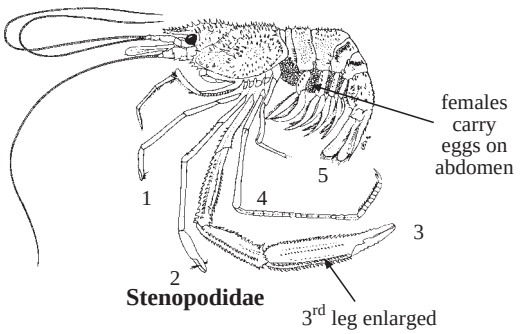
Sicyoniidae: shell generally hard and body “stony” in appearance; abdomen often with deep grooves and numerous tubercles; no postorbital or postantennal spine present on carapace, cervical groove generally indistinct or absent; third and fourth pleopods single-branched.

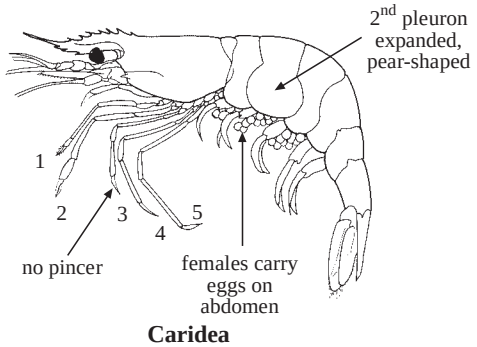
Sergestidae: generally small sized; rostrum very short; body strongly compressed laterally, shell soft; last 2 pairs of legs reduced or absent.



Stenopodidae: third pincer very large and massive; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.

Shrimps of the infraorder Caridea: third leg without pincer; second abdominal pleuron (lateral plate) greatly expanded, overlapping posterior part of first pleuron and anterior part of third pleuron; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.





Key to species of interest to fisheries occurring in the area

1a. Antennular flagella subcylindrical and thread-like (Fig. 1a); rostrum strongly convex (Fig. 2a); exopod of uropod armed with a distolateral spine (*Haliporoides*) . . ***Haliporoides sibogae***

1b. Antennular flagella flattened and tube-like (Fig. 1b); rostrum nearly horizontal (Fig. 2b); exopod of uropod without distolateral spine . . . . . **(*Solenocera*)** → ***2***

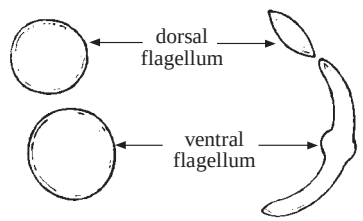


Fig. 1 cross-section of antennular flagella

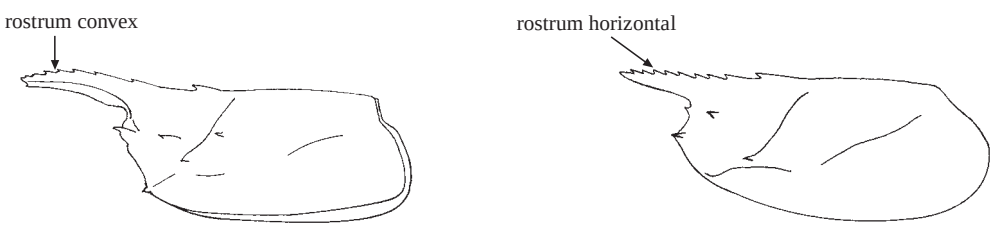


Fig. 2 carapace (lateral view)

2a. Telson without lateral spine (Fig. 3a) . . . . ***Solenocera crassicornis***

2b. Telson armed with lateral spines (Fig. 3b) . . . . . → ***3***

3a. Postrostral crest elevated . . . . . → ***4***

3b. Postrostral crest weak and low . . . . . → ***10***

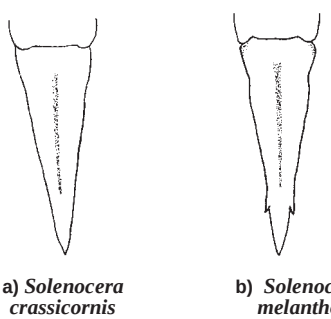


Fig. 3 telson (dorsal view)

4a. Postrostral crest very high and plate-like (Figs 4 and 5) . . . . . → ***5***

4b. Postrostral crest distinct but not plate-like (Figs 6 and 7) . . . . . → ***6***

5a. Rostrum extending to 2/3 of eye; postrostral crest behind cervical notch with anterior part distinctly higher than posterior part (Fig. 4) . . . . . ***Solenocera choprai***

5b. Rostrum extending to 1/2 of eye; postrostral crest behind cervical notch with posterior part distinctly higher than anterior part (Fig. 5) . . . . . ***Solenocera alticarinata***

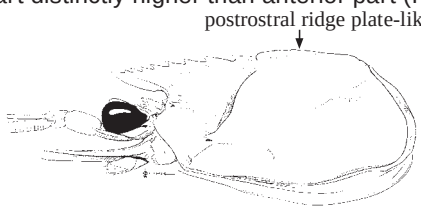


Fig. 4 ***Solenocera choprai***
(from Crosnier, 1978)

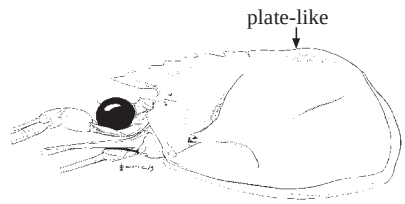


Fig. 5 ***Solenocera alticarinata***
(from Crosnier, 1978)

6a. Postrostral crest well separated from postrostral teeth by a distinct notch above cervical groove (Fig. 6) . . . . . ***Solenocera koelbeli***

6b. No distinct notch present between postrostral teeth and postrostral crest (Fig. 7) . . . . . → ***7***

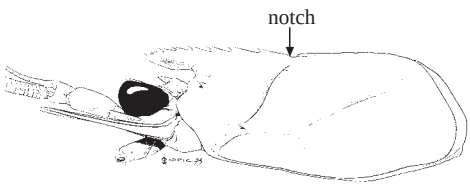


Fig. 6 ***Solenocera koelbeli***
(from Crosnier, 1978)

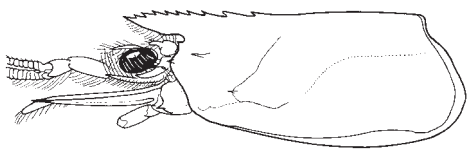
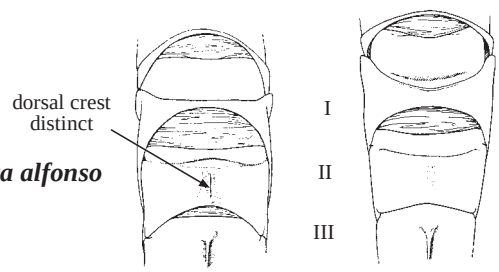


Fig. 7 ***Solenocera australiana***
(after Pérez Farfante and Grey, 1980)

7a. Posterior part of hepatic groove and anterior part of brachiocardiac groove both very distinct and strongly curving downward; postrostral crest behind cervical groove sometimes with an upper tooth; median part of first abdominal segment very narrow and dorsal crest of second abdominal segment distinct (Fig. 8a) . . . . . ***Solenocera alfonso***

7b. Never both posterior part of hepatic groove and anterior part of brachiocardiac groove distinct and curving downward together; postrostral crest behind cervical groove without any teeth; median part of first abdominal segment moderately wide and dorsal crest of second abdominal segment indistinct (Fig. 8b) . . . . . → ***8***

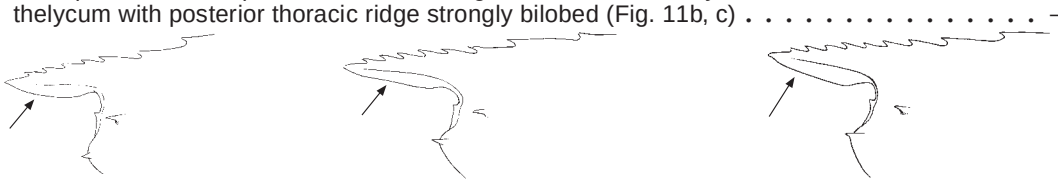


a) ***Solenocera alfonso*** **b)** ***Solenocera melantho***

Fig. 8 abdomen (dorsal view)
(from Crosnier, 1989)

8a. Rostrum with lower border nearly convex (Fig. 9a); male petasma with distal margin armed with many well-defined long spinules (Fig. 10a); female thelycum with posterior thoracic ridge almost straight (Fig. 11a) . . . . . ***Solenocera australiana***

8b. Rostrum with lower border razor-shaped, very straight or slightly concave (Figs 9b, c); male petasma with spinules on distal margin short and not very well defined; female thelycum with posterior thoracic ridge strongly bilobed (Fig. 11b, c) . . . . . → ***9***



a) ***Solenocera australiana*** **b)** ***Solenocera melantho*** **c)** ***Solenocera halli***

(from Crosnier, 1989)

Fig. 9 rostrum (lateral view)

9a. Anterior end of hepatic crest very strongly convex (Fig. 12a); male petasma with dorsolateral lobule bearing 0 to 13 terminal spinules (Fig. 10a); female thelycum bearing 2 or 3 pairs of protuberances in the middle, with submedian pair larger than lateral ones (Fig. 11b) . . . . . ***Solenocera melantho***

9b. Anterior end of hepatic crest only slightly convex or nearly straight (Fig. 12b); male petasma with dorsolateral lobule bearing 18 to 40 terminal spinules (Fig. 10c); female thelycum always bearing 2 pairs of protuberances in the middle, with submedian pair smaller than lateral pair (Fig. 11c) . . . ***Solenocera halli***

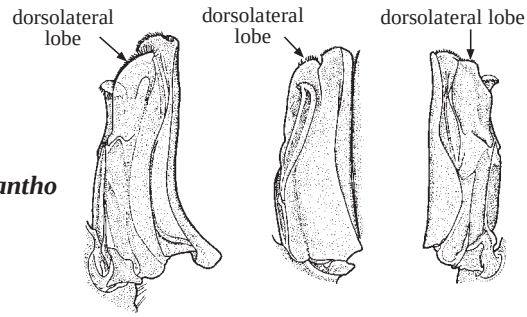


Fig. 10 petasma

(after Pérez Farfante and Grey, 1980)

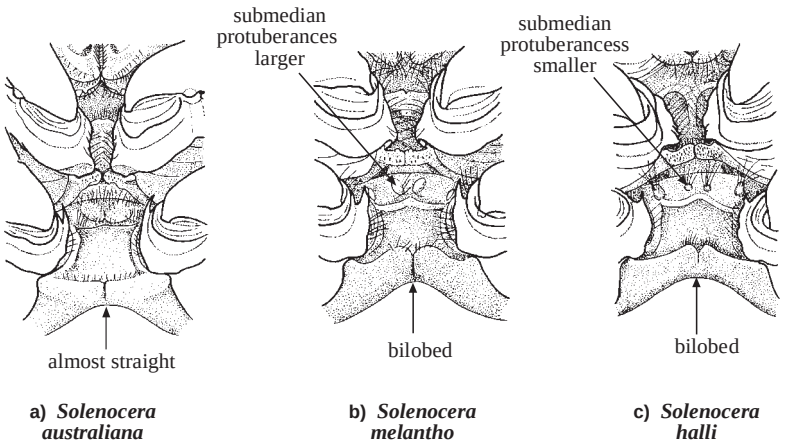


Fig. 11 thelycum

(after Pérez Farfante and Grey, 1980)

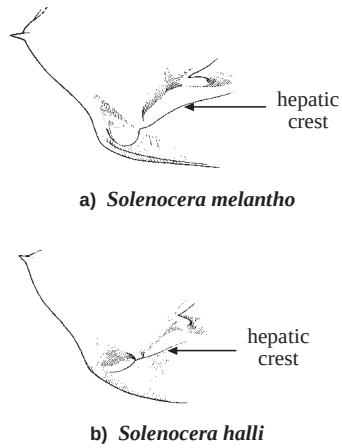


Fig. 12 anterolateral corner of carapace

(from Crosnier, 1989)

10a. Rostrum with 6 or 7 large and well-separated upper teeth (Fig. 13); antennular flagella 0.8 to 1.2 times as long as carapace and generally composed of less than 60 articles . . . . . ***Solenocera pectinulata***

10b. Rostrum generally with 8 or 9 densely packed small upper teeth (Fig. 14); antennular flagella 1.3 to 1.9 times as long as carapace and composed of more than 60 articles . . . . . ***Solenocera pectinata***

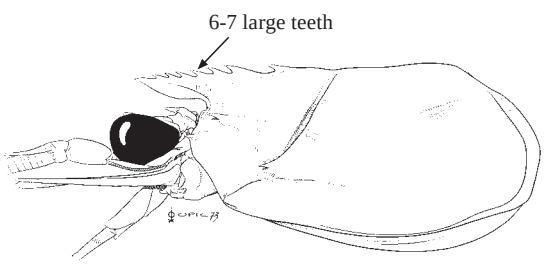


Fig. 13 ***Solenocera pectinulata***

(from Crosnier, 1978)

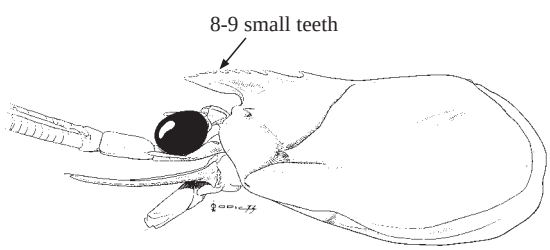


Fig. 14 ***Solenocera pectinata***

(from Crosnier, 1978)

List of species occurring in the area

The symbol is given when species accounts are included.

Cryptopenaeus clevai Crosnier, 1985
Cryptopenaeus crosnieri Pérez Farfante and Kensley, 1985

Gordonella kensleyi Crosnier, 1988
Gordonella paravillosa Crosnier, 1988

Hadropenaeus lucasii (Bate, 1881)

Haliporoides cristatus Kensley, Tranter, and Griffin, 1987
Haliporoides sibogae (De Man, 1907)

Haliporus curvirostris Bate, 1881
Haliporus taprobanensis Alcock and Anderson, 1899

Hymenopenaeus equalis (Bate, 1881)
Hymenopenaeus halli Bruce, 1966
Hymenopenaeus laevis (Bate, 1881)
Hymenopenaeus neptunus (Bate, 1881)
Hymenopenaeus propinquus (De Man, 1907)

Mesopenaeus brucei Crosnier, 1986
Mesopenaeus mariae Pérez Farfante and Ivanov, 1982

Solenocera alfonso Pérez Farfante, 1981
Solenocera alticarinata Kubo, 1949
Solenocera annectens (Wood-Mason, 1891)
Solenocera australiana Pérez Farfante and Grey, 1980
Solenocera barunajaya Crosnier, 1994
Solenocera bedokensis Hall, 1962
Solenocera choprai Nataraj, 1945
Solenocera comata Stebbing, 1915
Solenocera crassicornis (H. Milne Edwards, 1837)
Solenocera faxoni De Man, 1907
Solenocera halli Starobogatov, 1972
Solenocera koelbeli De Man, 1911
Solenocera melantho De Man, 1907
Solenocera moosai Crosnier, 1985
Solenocera pectinata (Bate, 1888)
Solenocera pectinulata Kubo, 1949
? *Solenocera phuongi* Starobogatov, 1972
Solenocera rathbunae Ramadan, 1938
Solenocera spinajugo Hall, 1961
Solenocera waltairensis George and Muthu, 1970

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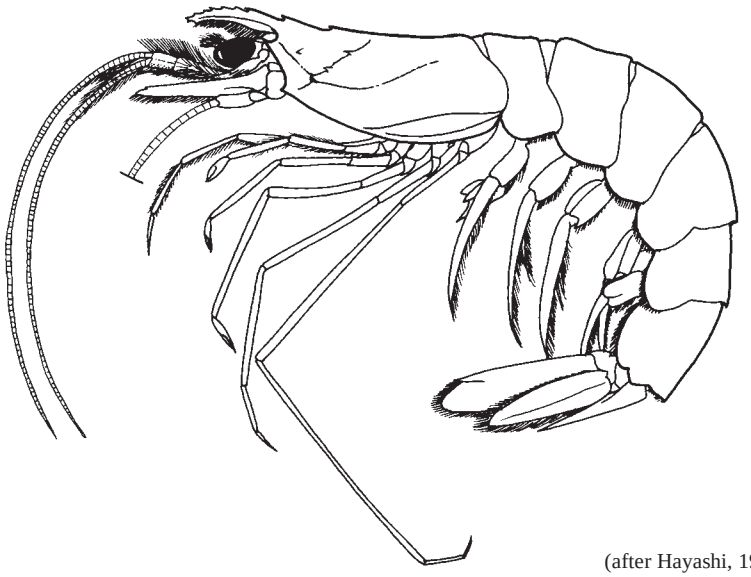
Crosnier, A. 1989. Benthesicymidae, Aristeidae, Solenoceridae (Crustacea Penaeoidea). In Résultats des Campagnes MUSORSTOM, Vol. 5, edited by J. Forest. *Mém. Mus. natn. Hist. nat.*, (A), 144:37-67.

Crosnier, A. 1994. Crustacea Decapoda: Penaeoidea récoltés lors de la campagne KARUBAR en Indonésie. In Résultats des Campagnes MUSORSTOM, Vol. 12, edited by A. Crosnier. *Mém. Mus. natn. Hist. nat.*, (A), 161: 351-365.

Haliporoides sibogae (De Man, 1907) JAQ

Frequent synonyms / misidentifications: *Haliporoides sibogae australiensis* Kensley, Tranter, and Griffin, 1987; *H. sibogae madagascariensis* Crosnier, 1987; *Hymenopenaeus sibogae* (De Man, 1907) / None.

FAO names: En - Jack-knife shrimp; **Fr** - Salicoque canif; **Sp** - Camarón cortapluma.



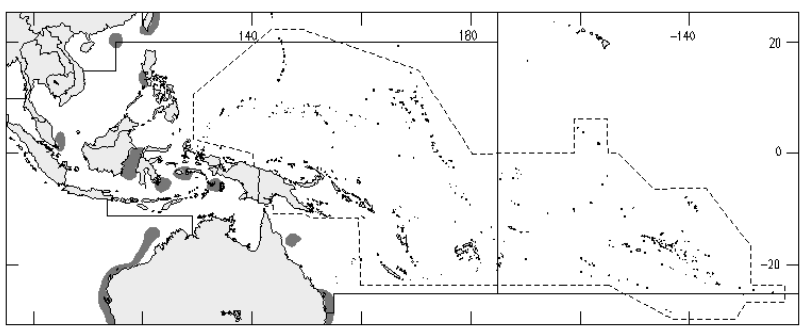
(after Hayashi, 1992)

Diagnostic characters: Body somewhat hairy. **Both upper and lower antennular flagella very long, thread-like. Rostrum strongly convex and short, extending just beyond eyes;** upper border armed with 4 to 7 teeth; lower border concave, armed with 1 to 3 teeth. **Carapace with 1 postrostral and 1 epigastric tooth, as well as antennal, postantennal, branchiostegal, hepatic, and suprahepatic spines. Cervical groove distinct, extending to dorsal carapace.** Legs progressively longer posteriorly. Telson with a pair of fixed lateral spines. **Colour:** body orange to pink; **antennal flagella whitish**; eyes dark brown; **uropods reddish with white tips.**

Size: Maximum body length 16.5 cm in males (carapace length 3.3 cm) and 20 cm in females (carapace length 4.9 cm), commonly between 7 and 10 cm.

Habitat, biology, and fisheries: Deep sea from depths of 100 to 1 463 m, usually between 300 and 600 m, on soft bottom. Taken in large quantities on the basis of experimental deep-water trawling in the Philippines and Indonesia. Generally considered as a species with high potential for commercial deep-sea fisheries. In the area, so far only fished on a small scale off the northeastern coast of Australia (about 50 t in the annual period of 1989/1990). Marketed mainly frozen, consumed locally, sometimes exported.

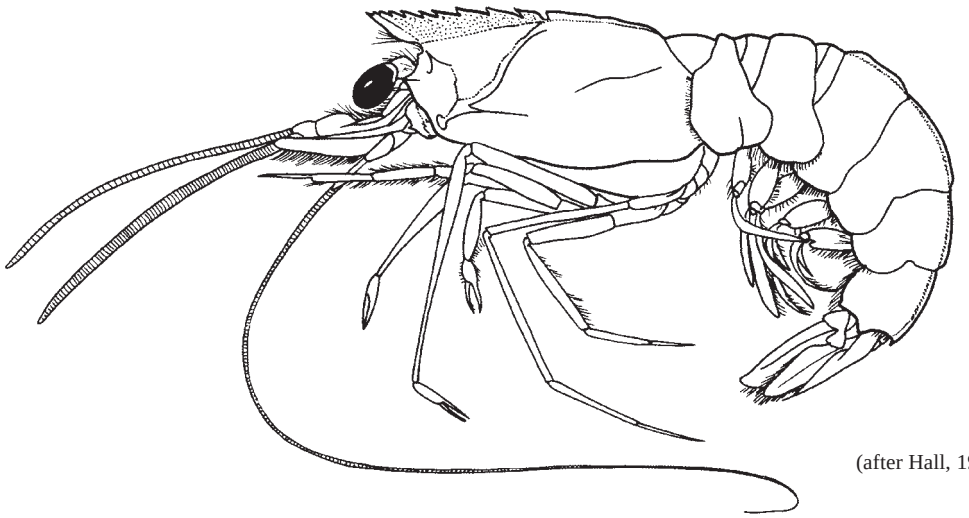
Distribution: Widely distributed in the Indo-West Pacific from Madagascar to Japan, Australia, and New Zealand (populations from Madagascar and eastern Australia are sometimes considered as 2 different subspecies).



Solenocera choprai Nataraj, 1945

Frequent synonyms / misidentifications: None / *Solenocera alticarinata* Kubo, 1949.

FAO names: En - Ridgeback shrimp; **Fr** - Salicoque balafrée; **Sp** - Camarón costurón.



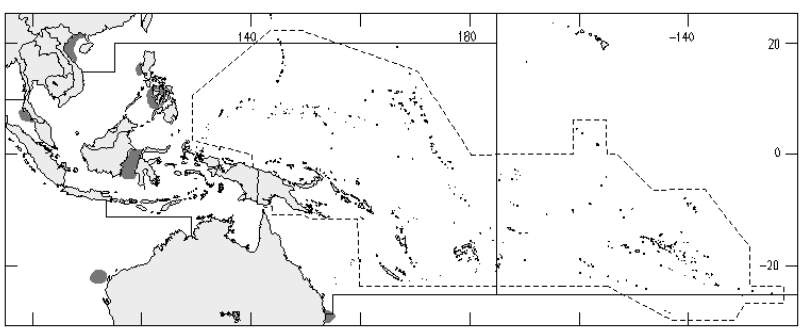
(after Hall, 1962)

Diagnostic characters: Rostrum short, extending to about 2/3 of eyes; upper border with 8 to 10 teeth (including 4 teeth on carapace); lower border moderately convex. **Postrostral crest markedly elevated and plate-like, slightly interrupted by a small notch above cervical groove; height of posterior part progressively decreasing posteriorly**. Carapace with orbital, postorbital, antennal and hepatic spines, but without pterygostomian spines. Antennular flagella moderately long and tube-like. **Telson with a pair of lateral spines. Colour:** body and legs reddish; **antennae banded with dark red and white**; uropods dark red, except for some white areas.

Size: Maximum body length 13 cm (females) and 9.5 cm (males).

Habitat, biology, and fisheries: Found on soft bottoms at depths between 50 and 175 m. Probably burrows in mud during the daytime, with only the tube-like antennular flagella sticking out for respiration. A bycatch of trawling operations in slightly deeper waters. Nowhere abundant, but of some commercial value because of its moderately large size. In the Philippines, this shrimp is occasionally marked together with other *Solenocera* species. Marketed mainly fresh for local consumption. Often confused with *Solenocera alticarinata*, which has a more northeastern distribution (from Japan to the Philippines), but they are both sometimes considered as a single species.

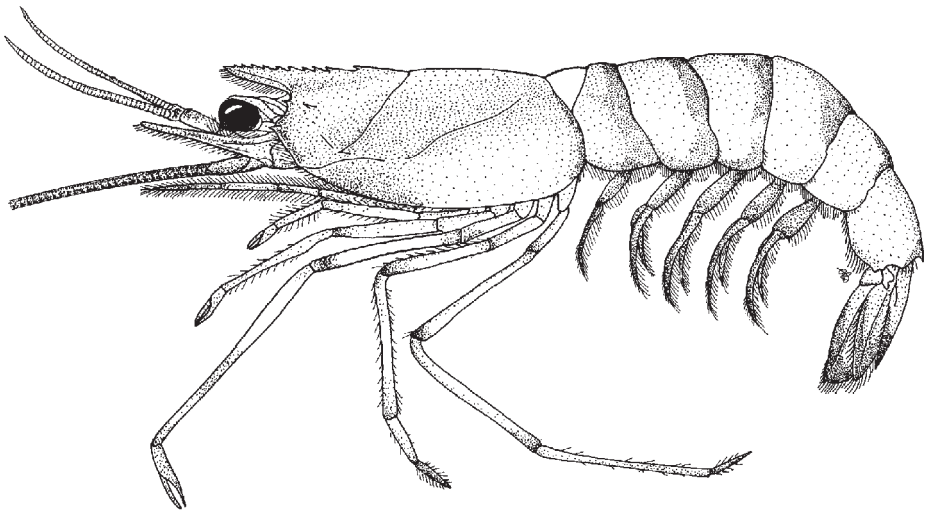
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Philippines and Australia.



Solenocera crassicornis (H. Milne Edwards, 1837)

Frequent synonyms / misidentifications: *Solenocera indicus* Nataraj, 1945; *S. kuboi* Hall, 1956; *S. sinensis* Yu, 1937; *S. subnuda* Kubo, 1949 / None.

FAO names: En - Coastal mud shrimp; **Fr** - Salicoque des vases côtières; **Sp** - Camarón fanguero de orilla.

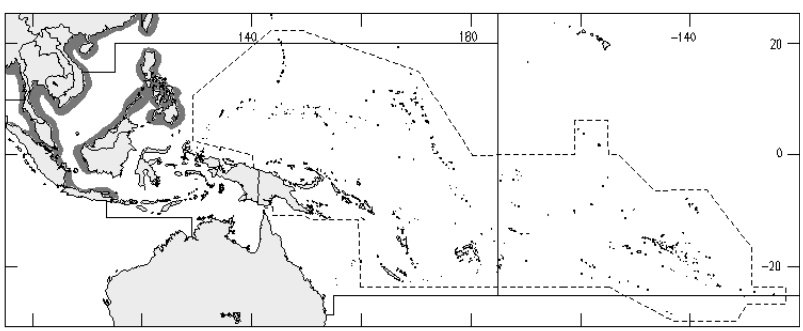


Diagnostic characters: Rostrum short and nearly straight, about as long as eyes; upper border armed with 4 to 7 (mostly 5) teeth; lower border unarmed and somewhat convex. Carapace with 3 postrostral teeth and 1 epigastric tooth, and orbital, postorbital, antennal and hepatic spines, but without pterygostomian spines; **postrostral crest low and rounded.** Antennular flagella moderately long and tube-like. **Telson unarmed, without lateral spines. Colour:** body pink to pinkish orange; **posterior border of each abdominal segment covered with a red cross band**; eyes dark brown; antennular flagella and distal part of tail fan reddish.

Size: Maximum body length 9 cm (males) and 14 cm (females), commonly between 6 and 8 cm.

Habitat, biology, and fisheries: Inhabits muddy bottoms close to shore, at depths from 20 to 85 m. Probably burrows in mud during the daytime, with only the tube-like antennular flagella sticking out for respiration. Mainly forms a bycatch of trawlers. In the area, this shrimp seems to be more common around Thailand and is of minor commercial importance.

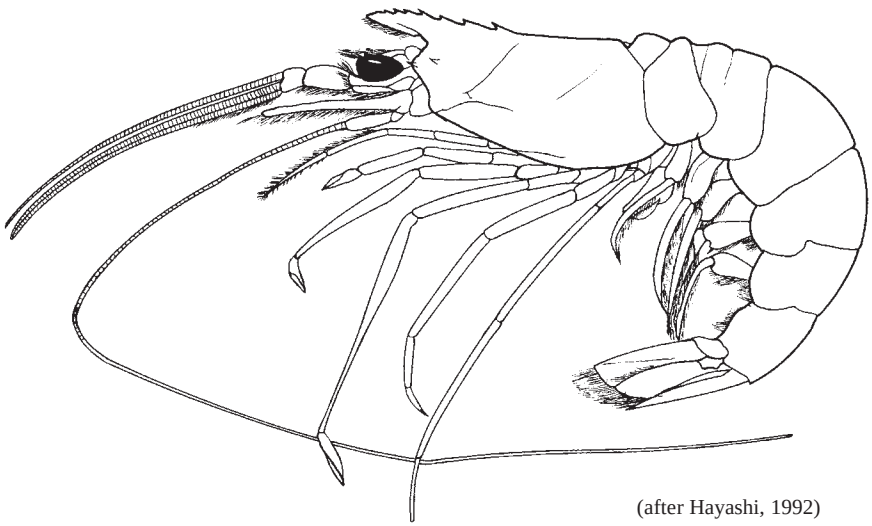
Distribution: Widely distributed in the Indo-West Pacific from the Persian Gulf to Japan and Indonesia.



Solenocera melantho De Man, 1907

Frequent synonyms / misidentifications: *Solenocera prominentis* Kubo, 1949 / *Solenocera alfonso* Pérez Farfante, 1981; *S. australiana* Pérez Farfante and Grey, 1980; *S. halli* Starobogatov, 1972; *S. koelbeli* De Man, 1911.

FAO names: En - Razor mud shrimp.



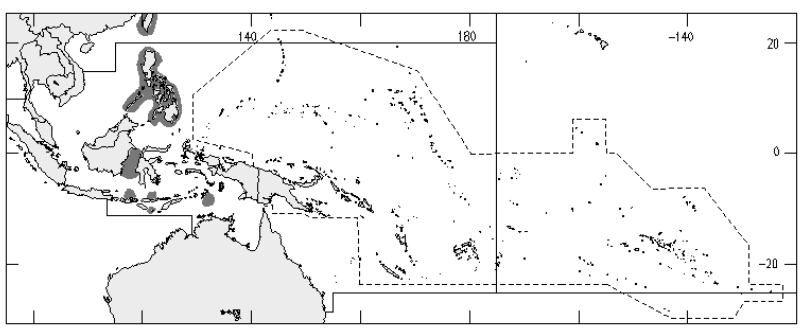
(after Hayashi, 1992)

Diagnostic characters: Rostrum short, not extending beyond eyes; upper border with 6 to 10 teeth (including 3 teeth on carapace); **lower border straight or slightly concave, razor-shaped. Postrostral crest distinct but not very high and plate-like, without a distinct notch above cervical groove.** Carapace with orbital, postorbital, antennal and hepatic spines, but without pterygostomian spines. **Anterior end of hepatic crest strongly concave and curving upward.** Antennular flagella moderately long and tube-like. Telson with a pair of lateral spines. **Colour:** body pink to red and somewhat semi-transparent; **some irregular red markings on abdomen**; eyes black-brown; **antennular flagella reddish with a white (or pale yellowish) band at midlength;** distal part of uropods slightly yellowish.

Size: Maximum body length 15 cm, commonly between 7 and 12 cm.

Habitat, biology, and fisheries: Inhabits the upper slopes of continental shelves at depths from 78 to 400 m, on sandy mud bottom. Mainly forms a bycatch of trawling operations in slightly deeper waters. Probably the most common species of the genus in the Philippines, but still not very abundant and only occasionally sold in local fish markets. Marketed mainly fresh for local consumption. This species, *Solenocera alfonso*, *S. australiana*, and *S. halli* are probably often confused with each other.

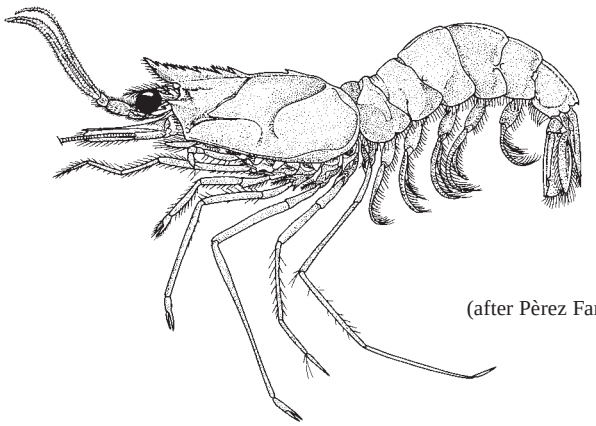
Distribution: Western Pacific and definitely known from Japan, Korea, Taiwan Province of China, coasts of China, the Philippines, and Indonesia.

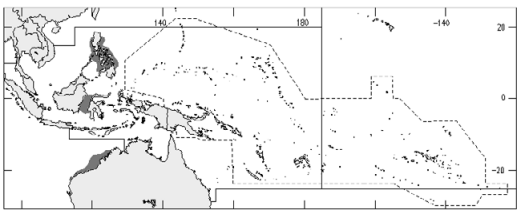


Solenocera alfonso Pérez Farfante, 1981

En - Deep-water mud shrimp.

Maximum body length about 12 cm (at a maximum carapace length of 4 cm). Inhabits the upper slopes of island shelves at depths from 176 to 547 m, on bottoms of green mud or fine sandy mud. So far only taken on the basis of experimental deep-water trawling. However, the size of this species and the fact that it is sometimes found in large quantities suggest it may have commercial potential with the development of a deep-sea fishery in the area. Indo-West Pacific and so far only known with certainty from the Philippines, Indonesia, and Northwestern Australia.



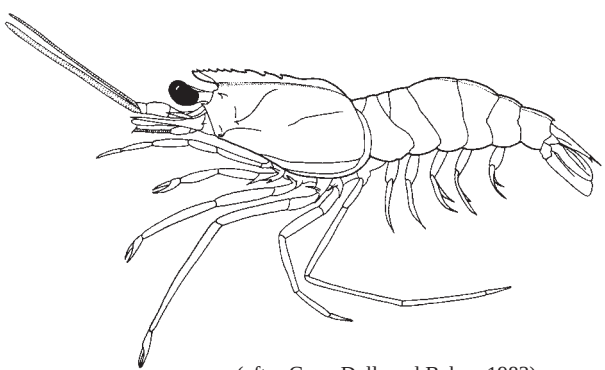


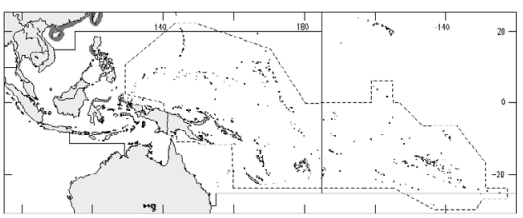
(after Pèrez Farfante, 1981)

Solenocera alticarinata Kubo, 1949

En - High ridge mud shrimp.

Maximum body length 11 cm (females) and 9 cm (males), commonly between 7 and 9 cm. On sandy mud bottom, at depths from 50 to 180 m. Taken by trawls. Apparently restricted to the Western Pacific from Japan to Taiwan Province of China, the South China Sea, and the Philippines. Often confused with the closely related *Solenocera choprai*. In the area, so far only recorded from the Philippines where it is probably less common than *S. choprai*.



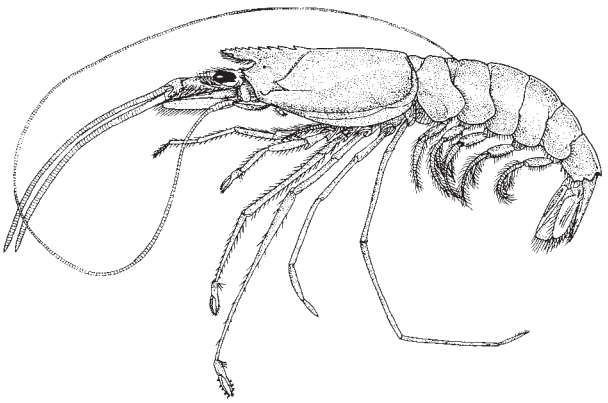


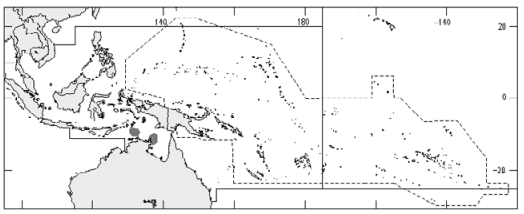
(after Grey, Dall, and Baker, 1983)

Solenocera australiana Pérez Farfante and Grey, 1980

En - Australia mud shrimp.

Maximum body length 12 cm (females) and 9 cm (males). In shallow water at depths from 15 to 40 m, over mud bottom with or without coral debris, rock, shell, or vegetation. Taken by commercial trawlers fishing for large penaeids in northern Australia, but so far without significant economic importance. Restricted to northern Australia.



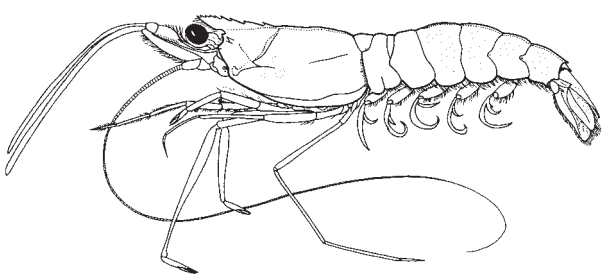


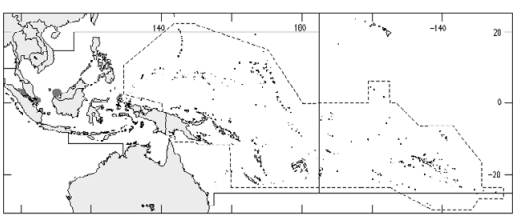
(after Pèrez Farfante and Grey, 1980)

Solenocera halli Starobogatov, 1972

En - Malayan mud shrimp.

Maximum body length about 10 cm (at a maximum carapace length of 2.75 cm). Found in shallow waters at depths from 48 and 75 m. So far mainly caught by experimental trawlers but probably more common around Malaysia and Singapore. Indo-West Pacific; thus far known from Bay of Bengal, Strait of Malacca, Singapore, and the South China Sea. Often confused with *Solenocera melantho*.



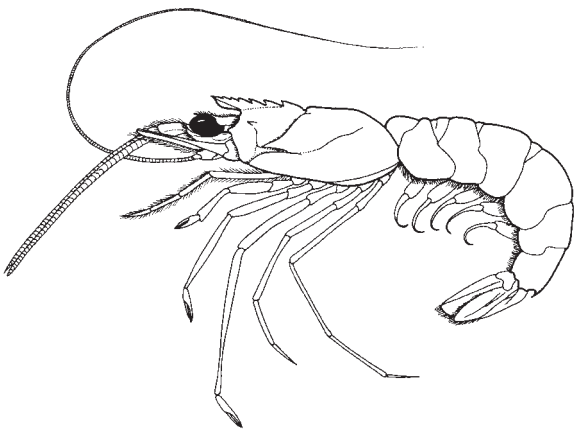


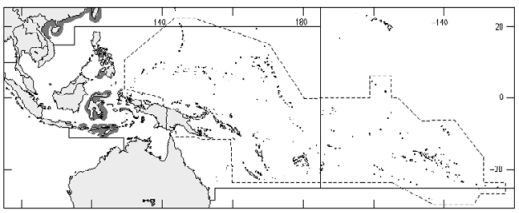
(after Hall, 1962)

Solenocera koelbeli De Man, 1911

En - Chinese mud shrimp; **Fr** - Salicoque chinoise de vase; **Sp** - Camarón fanguero chino.

Maximum body length 15 cm, commonly between 5 and 10 cm. On soft bottom at depths from 21 to 241 m, usually between 60 and 90 m. A bycatch in trawl fisheries. Western Pacific from Japan to Taiwan Province of China, the South China Sea, Viet Nam, the Philippines, and Indonesia. Apparently not abundant in the area. Sometimes confused with *Solenocera alticarinata*, *S. choprai*, or *S. melantho*.



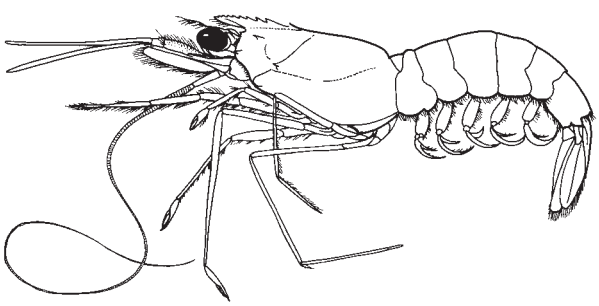


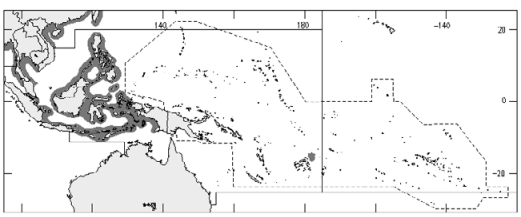
(after Lee and Yu, 1977)

Solenocera pectinata (Bate, 1888)

En - Comb shrimp; **Fr** - Salicoque peigne; **Sp** - Camarón peine.

Maximum body length 6 cm. On soft bottom at depths from 4 to 205 m. A common bycatch of commercial trawlers but of no economic importance, due to its small size. Widely distributed in the Indo-West Pacific, from the eastern coast of Africa to Japan and Wallis Island in the South Pacific. Often confused with *Solenocera pectinulata* but generally found at shallower depths.



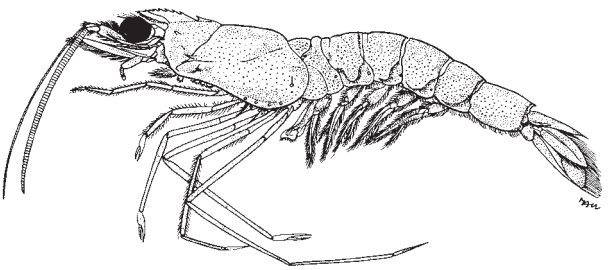


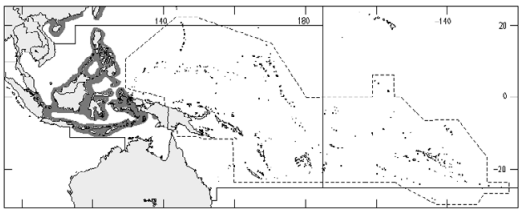
(after Hall, 1962)

Solenocera pectinulata Kubo, 1949

En - False comb shrimp.

Maximum body length 6.5 cm (carapace length to 2.2 cm), commonly between 3 and 5.5 cm. On bottoms of sand and/or mud, at depths from 75 to 350 m, usually deeper than 175 m. A common bycatch of commercial trawlers but without economic importance, due to its small size. Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan and Indonesia. Often confused with *Solenocera pectinata* but generally has a deeper distribution.





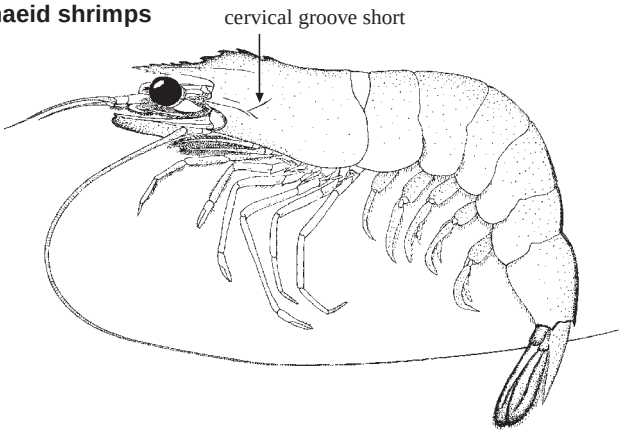
(after Motoh and Buri, 1984)

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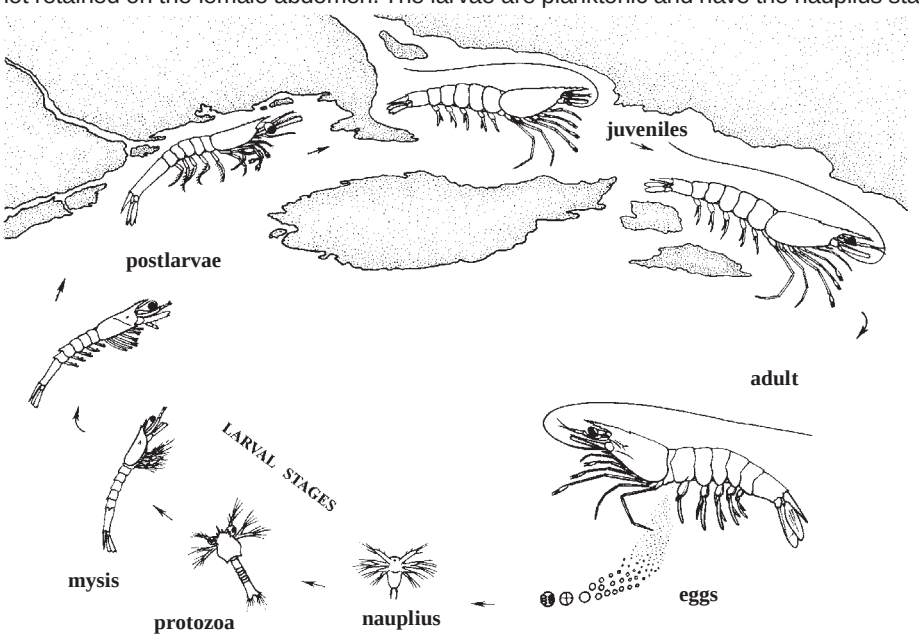
PENAEIDAE

Penaeid shrimps



Diagnostic characters: Rostrum well developed and generally extending beyond eyes, **always bearing more than 3 upper teeth. No styliform projection at base of eyestalk and no tubercle on its inner border**. Both upper and lower antennular flagella of similar length, attached to tip of antennular peduncle. **Carapace lacking both postorbital or postantennal spines. Cervical groove generally short, always with a distance from dorsal carapace.** All 5 pairs of legs well developed, **fourth leg bearing a single well-developed arthrobranch (hidden beneath carapace, occasionally accompanied by a second, rudimentary arthrobranch)**. In males, endopod of second pair of pleopods (abdominal appendages) with appendix masculina only. Third and fourth pleopods divided into 2 branches. Telson sharply pointed, with or without fixed and/or movable lateral spines. **Colour:** body colour varies from semi-translucent to dark greyish green or reddish, **often with distinct spots, cross bands and/or other markings on the abdomen and uropods; live or fresh specimens, particularly those of the genus *Penaeus*, can often be easily distinguished by their coloration.**

Habitat, biology, and fisheries: Members of this family are usually marine, although juveniles and young are often found in brackish water or estuaries, sometimes with very low salinities (a few unconfirmed fresh-water records exist). Some penaeids, mainly those of the genera *Parapenaeus* and *Penaeopsis*, occur in deep water at depths of more than 750 m. Penaeids are mostly benthic and mainly found on soft bottom of sand and/or mud, but a few species (e.g. genus *Funchalia*) are pelagic and others are known to inhabit coral reefs (e.g. the genera *Heteropenaeus*, *Trachypenaeopsis*, also some *Metapenaeopsis*). Their size ranges from 2.5 to 35 cm body length. The sexes are easily distinguished by the presence of a very large copulatory organ (petasma) on the first pair of pleopods (abdominal appendages) of males, while the females have the posterior thoracic sternites modified into a large sperm receptacle process (thelycum) which holds the spermatophores or sperm sacs (usually whitish or yellowish in colour) after mating. The shape of the petasma and thelycum is often specific and very useful for species identification. The eggs are small and numerous, and are released directly into the water and not retained on the female abdomen. The larvae are planktonic and have the nauplius stage.



life-cycle of shrimps of the genus *Penaeus*

The life cycle of species of *Penaeus* and *Metapenaeus*, the 2 most important commercial shrimp genera, is complex (see figure on previous page). Adults generally move from shallow coastal waters to offshore and spawn at depths between 10 to 80 m. The eggs hatch within 14 to 24 hours and release very small, simple larvae, the nauplii. The nauplius larva passes through several substages before it metamorphoses into the mysis stage. These larvae are planktonic and are carried by currents toward shore where they arrive as postlarvae; this occurs about three weeks after hatching when the animals are 6 to 14 mm long and shrimp-like in appearance. The postlarvae invade inshore brackish waters, abandon their planktonic way of life, and become bottom dwellers living in shallow littoral areas. In these rich nursery grounds they grow rapidly, develop into juveniles and, as size increases, move gradually back toward the mouths of bays or estuaries, where they become subadults. Soon the shrimps migrate offshore, continue growing and mate, and when they finally reach the spawning grounds, the mature females spawn and the cycle is repeated; most shrimps in these grounds are about 1 year old, rarely older than 2 (or perhaps 3) years old.

At present, 11 genera and 112 species of penaeids are known to occur in the Western Central Pacific. Among these, the genus *Penaeus* is of greatest economical importance. Species of *Penaeus* are caught extensively by trawls, seines, set nets, traps, and artisanal gear, with *P. merguiensis* and *P. monodon* probably being the 2 most important species. Moreover, aquaculture of *Penaeus* is very popular in many countries, mostly using Penaeus monodon. The genus of secondary importance is *Metapenaeus*, often taken together with Penaeus and also extensively cultured in ponds. The third commercially important genus is probably *Parapenaeopsis*, which is quite common in the western part of the area and often forms a significant part of the bycatch in prawn fisheries. Therefore, species accounts are provided here for all species of *Penaeus*, *Metapenaeus*, and *Parapenaeopsis* that are known from the Western Central Pacific. The other genera seem to be less abundant, although species of *Metapenaeopsis* and *Trachypenaeus* are frequently found among catches of prawn fisheries and have some commercial value. The 2 deep-water genera *Parapenaeus* and *Penaeopsis* are not fished at present, although experimental deep-water trawling operations have shown that representatives of these 2 genera, particularly *Parapenaeus*, can be caught in large quantities and are potentially of interest to fisheries. The remaining 4 genera are all without economic interest: species of *Atypopenaeus* are generally too small and not abundant, *Heteropenaeus* and *Trachypenaeopsis* occur in coral reefs and are small, and *Funchalia* is a pelagic deep-sea genus.

Since this family is of greatest commercial importance in the area, identification keys are given here for all penaeids, except for *Metapenaeopsis*, 40 species of which occur in the area, but most of these are either not common enough or found in deep waters, without any commercial potential. Therefore, an identification key is provided only for those species of *Metapenaeopsis* that may be found in commercial catches. For a full key to *Metapenaeopsis*, see the detailed revisions by A. Crosnier (1987-1994, published in "*Bull. Mus. natn. Hist. nat.*, Paris", and "Rèsultats des Campagnes MUSORSTOM").

Identification note

The shapes of the male petasma and female thelycum are very important taxonomic characters in several genera of penaeid shrimps, such as *Metapenaeopsis*, *Metapenaeus*, *Parapenaeopsis*, *Parapenaeus*, and *Trachypenaeus*. However, as the petasma and thelycum are not fully developed in juveniles, a positive identification of juvenile specimens is often difficult. Therefore, it is highly recommended to use, if possible, adult specimens rather than juveniles when using the keys.

For the differentiation between adult and juvenile males, it should be remembered that, in adult males, the left and right parts of the petasma are very rigid and strongly fused to each other (i.e. very difficult to separate), while in juvenile males the left and right parts of the petasma are either not fused or only weakly united (i.e. easy to separate) and somewhat soft with the scultpure not well defined.

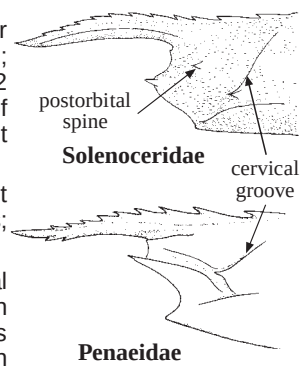
In adult females, the thelycum is clearly sculptured with the ridges and depressions very well marked, while in juvenile females the thelycum has only a shallow sculpture, not well defined.

Similar families occurring in the area

Aristeidae: either rostrum very short, armed with 1 or 2 upper teeth only, or upper antennular flagellum very short, not attached to tip of antennular peduncle; eyestalks generally with a tubercle on inner border; fourth leg bears 2 well-developed arthrobranchs (hidden beneath carapace); in males, endopod of second pair of pleopods with appendix masculina, appendix interna, but without lateral projection.

Sicyoniidae: shell generally hard and body "stony" in appearance; exopod present on first maxilliped only; abdomen often with deep grooves and numerous tubercles; third and fourth pleopods single-branched.

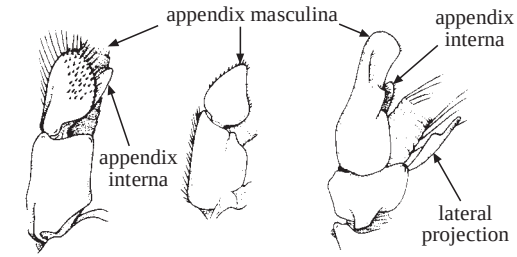
Solenoceridae: carapace either with postorbital or postantennal spine; cervical groove distinct and extending to about dorsal carapace; eyestalks generally with a tubercle on inner border; fourth leg bears 2 well-developed arthrobranchs (hidden beneath carapace); in males, endopod of second pair of pleopods with appendix masculina, appendix interna, and lateral projection.

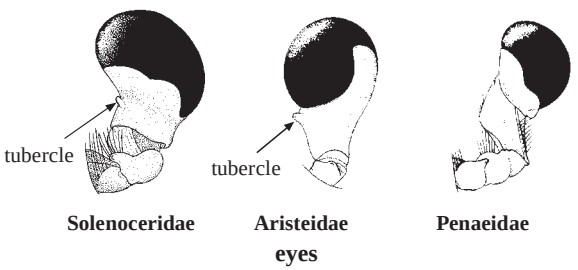


Sergestidae: size small; rostrum very short; body strongly compressed laterally; shell soft; last 2 pairs of legs reduced or absent.

Stenopodidae: third pincer very large and massive; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.

Shrimps of the infraorder Caridea: third leg without pincer; second abdominal pleuron (lateral plate) greatly expanded, overlapping posterior part of first pleuron and anterior part of third pleuron; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.

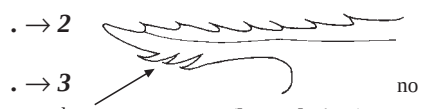




Key to the genera of Penaeidae occurring in the area

1a. Rostrum with lower teeth (Fig. 1) . . . . . → ***2***

1b. Rostrum without lower teeth (Fig. 2) . . . . . → ***3***



rostrum (lateral view)

Fig. 1 ***Penaeus***



rostrum (lateral view)

Fig. 2 ***Metapenaeus***

2a. Abdomen with many deep pubescent grooves (Fig. 3) . . . . . ***Heteropenaeus*** (a single species, *H. longimanus*)

2b. Abdomen glabrous and smooth (Fig. 4) . . . . . ***Penaeus***

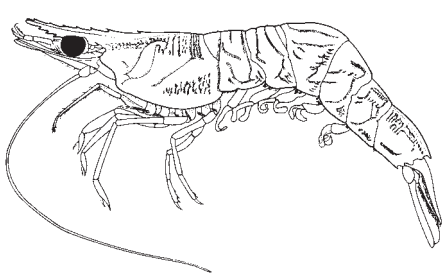


Fig. 3 ***Heteropenaeus longimanus***
(after Hall, 1961)

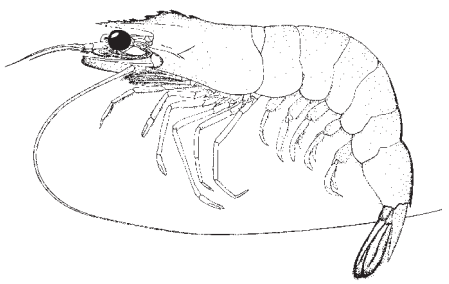


Fig. 4 ***Penaeus***

3a. Telson with a pair of large subapical fixed lateral spines (Fig. 5) . . . . . → ***4***

3b. Telson without large subapical fixed lateral spines . . . . . → ***7***

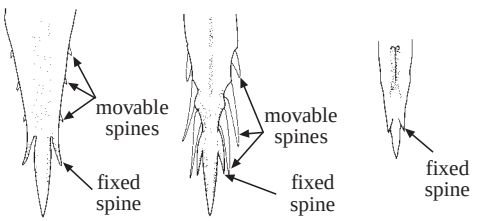


Fig. 5 telson (dorsal view)
(after Lee and Yu, 1977)

4a. Body densely covered with short hairs, with grooves and crests on carapace obscure (Fig. 6a); petasma asymmetrical (Fig. 6b) . . . . . ***Metapenaeopsis***

4b. Body almost naked, with crests and grooves on carapace distinct (Fig. 7a); petasma symmetrical (Figs 7b and 8b) . . . . . → ***5***

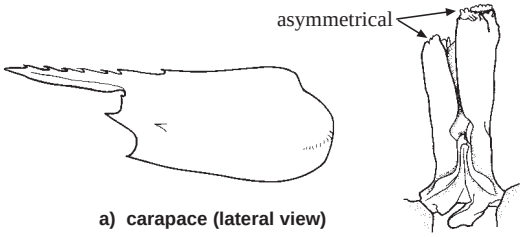


Fig. 6 ***Metapenaeopsis***

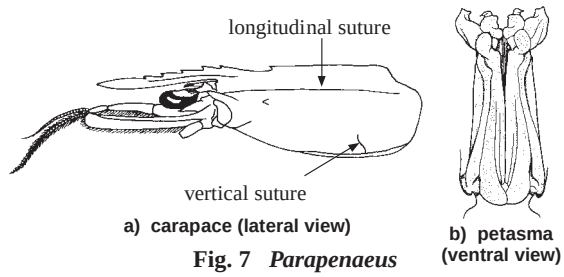


Fig. 7 ***Parapenaeus***

5b. Carapace with longitudinal and vertical sutures (Fig. 7a); telson without movable lateral spines (Fig. 5c) . . . . . ***Parapenaeus***

5a. Carapace lacking longitudinal and vertical sutures (Fig. 8a); telson with movable lateral spines . . . . . → ***6***

6a. Rostrum extending far beyond eye; pterygostomian spine present (Fig. 8a); deep water. ***.Penaeopsis***

6b. Rostrum short, not extending beyong eye; pterygostomian spine absent (Fig. 9); on reefs . . . . . ***Trachypenaeopsis***
(a single species, *T. richtersii*, in the area)

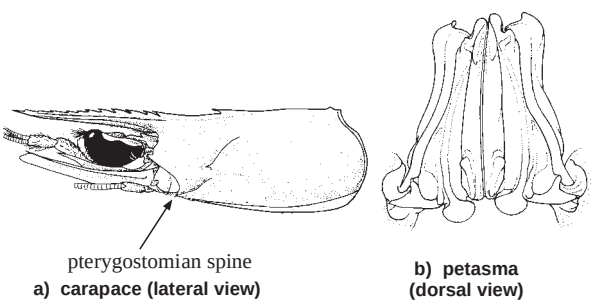


Fig. 8 ***Penaeopsis***

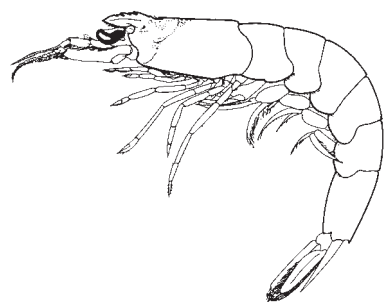


Fig. 9 ***Trachypenaeopsis richtersii***
(after Hayashi, 1992)

7a. Third maxilliped with epipod; male petasma asymmetrical (Fig. 10b); pelagic (Fig. 10a) . ***.Funchalia***
(a single species, *F. taaningi*, in the area)

7b. Third maxilliped without epipod; male petasma symmetrical (Fig. 11b); benthic . . . . . → ***8***

8a. Fifth leg without exopod (carapace without longitudinal or vertical sutures, Fig. 11a). ***.Metapenaeus***

8b. Fifth leg with exopod . . . . . →***9***

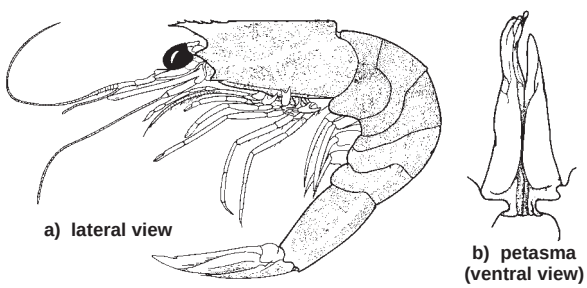


Fig. 10 ***Funchalia taaningi***
(after Hayashi, 1992)

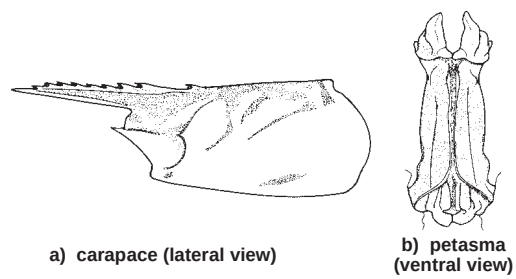


Fig. 11 ***Metapenaeus***

9a. Carapace without longitudinal or vertical sutures; second leg with ischial spine; eyes small (Fig. 12) . . . . . ***Atypopenaeus***
(the genus *Miyadiella* is not included in this key, as its status is rather controversial and specimens are interpreted as juveniles of *Atypopenaeus* by some authors)

9b. Carapace with both longitudinal and vertical sutures (Figs 13 and 14); second leg without ischial spine; eyes large . . . . . ***→10***

10a. Body naked, with crests and grooves on carapace distinct; longitudinal suture usually long (Fig. 13); third leg without epipod . . . . . ***Parapenaeopsis***

10b. Body usually hairy, with crests and grooves on carapace obscure (Fig. 14); longitudinal suture short; third leg generally with epipod . . . . . ***Trachypenaeus***

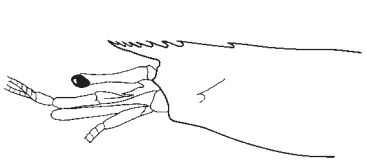


Fig. 12 ***Atypopenaeus***

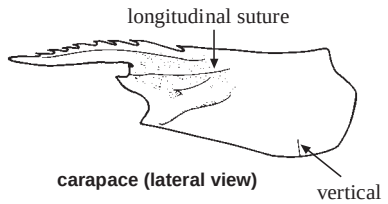


Fig. 13 ***Parapenaeopsis***

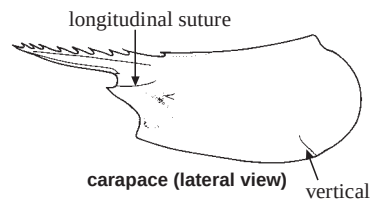


Fig. 14 ***Trachypenaeus***

Key to the species of *Atypopenaeus* occurring in the area

1a. Rostrum short, not extending beyond eye . . . . . → ***2***

1b. Rostrum extending far beyond eye . . . . . → ***3***

2a. Hepatic spine present . . . . . ***Atypopenaeus stenodactylus***

2b. Hepatic spine absent . . . . . ***Atypopenaeus dearmatus***

3a. Crests on fourth and fifth abdominal segments very high and blade-like; fifth leg very slender, extending beyond body; colour pale pink . . . . . ***Atypopenaeus bicornis***

3b. Crests on fourth and fifth abdominal segments not blade-like; fifth leg about 2/3 the length of the body; colour reddish orange . . . . . ***Atypopenaeus formosus***

Key to species of *Metapenaeopsis* likely to be encountered in fishing activities in the area

Note: in addition to the following key characters, the shape of the petasma and thelycum can be very helpful for quick identification of mature specimens (see figures shown in the respective species accounts). For a full key to *Metapenaeopsis*, see the revisions by A.Crosnier (1987-1994), in "*Bull. Mus. natn. Hist. nat.*, Paris" and "Rèsultats des Campagnes MUSORSTOM".

1a. Posterolateral carapace with stridulating organs (Fig. 15) . . . . . → ***2***

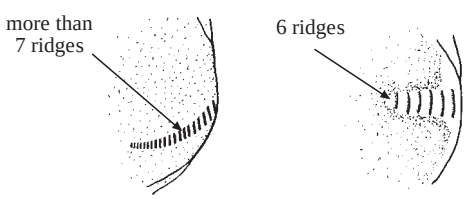
1b. Posterolateral carapace without stridulating organs . . . . . → ***7***

2a. Stridulating ridges usually 4 to 6 (Fig. 15b) . . . . . ***Metapenaeopsis stridulans***

2b. Stridulating ridges more than 7 (Fig. 15a) . . . . . → ***3***

3a. Rostrum far exceeding antennular peduncle, usually bearing 5 widely spaced upper teeth (Fig. 16) . . . . . ***Metapenaeopsis novaeguineae***

3b. Rostrum extending to about tip of antennular peduncle, bearing more than 6 regularly spaced upper teeth . . . . . → ***4***



a) ***Metapenaeopsis toloensis*** **b)** ***Metapenaeopsis stridulans***

Fig. 15 stridulating ridges on posterolateral carapace

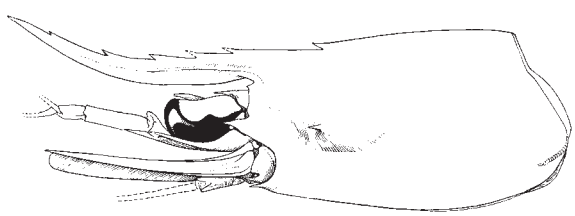


Fig. 16 ***Metapenaeopsis novaeguineae***

(from Crosnier, 1994)

4a. Pterygostomian spine moderately to well developed (Fig. 17) . . . . . → ***5***

4b. Pterygostomian spine reduced (Fig. 18) . . . . . → ***6***

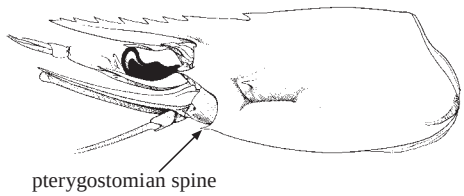


Fig. 17 ***Metapenaeopsis barbata***
(from Crosnier, 1994)

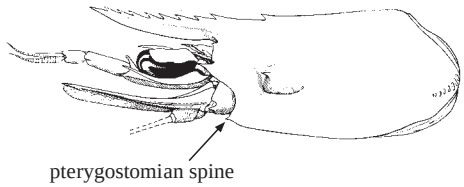


Fig. 18 ***Metapenaeopsis palmensis***
(from Crosnier, 1994)

5a. Dorsal crest of third abdominal segment flat or very slightly concave (Fig. 19a) . . ***Metapenaeopsis barbata***

5b. Dorsal crest of third abdominal segment with deep median groove (Fig. 19b) . . ***Metapenaeopsis toloensis***

6a. Rostrum with 9 or 10 upper teeth . . ***Metapenaeopsis rosea***

6b. Rostrum with 7 or 8 upper teeth (Fig. 18) . . . . . ***Metapenaeopsis palmensis***

7a. Rostrum forming a crest (Fig. 20) . . . . . ***Metapenaeopsis lamellata***

7b. Rostrum not forming a crest . . . . . → ***8***

8a. Pterygostomian spine very strong (Fig. 21) . . . . . ***Metapenaeopsis wellsi***

8b. Pterygostomain spine minute or absent (Fig. 22) . . . . . ***Metapenaeopsis mogiensis***

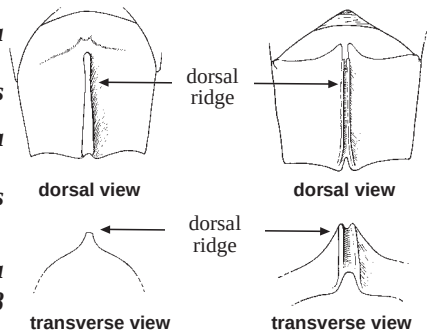


Fig. 19 third abdominal segment
(from Crosnier, 1994)



Fig. 20 ***Metapenaeopsis lamellata***

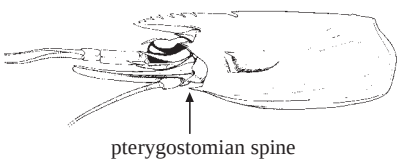


Fig. 21 ***Metapenaeopsis wellsi***
(from Crosnier, 1991)

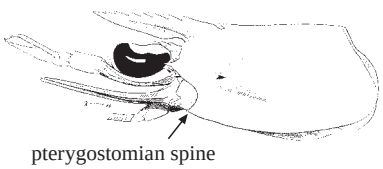


Fig. 22 ***Metapenaeopsis mogiensis***
(from Crosnier, 1991)

Key to the species of *Metapenaeus* occurring in the area

Remarks on key characters: the shape of the petasma and thelycum are the main taxonomic characters to separate species of this genus (see figures shown in the respective species accounts). Therefore, correct identification of juveniles and immature specimens is sometimes difficult. See Miquel (1982, *Zool. Verh.*, 195) for more information on the species of this genus.

1a. Rostrum very short and high, not extending beyond eye (Fig. 23) . . . ***Metapenaeus lysianassa***

1b. Rostrum extending beyond eye . . . . . → ***2***

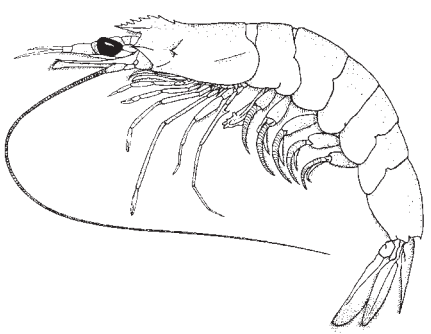


Fig. 23 ***Metapenaeus lysianassa***

2a. Rostrum armed with teeth along entire upper border (Fig. 24) . . . . . → ***3***

2b. Rostrum unarmed in its distal 1/3 to 1/2 (Figs 25 and 26) . . . . . →***16***

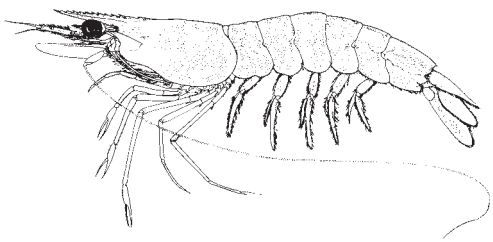


Fig. 24 ***Metapenaeus ensis***

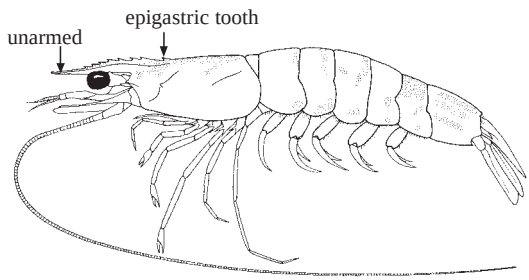


Fig. 25 ***Metapenaeus eboracensis***
(after Miguel, 1982)

3a. Telson with 3 pairs of large movable spines (Fig. 27b) . . . . . → ***4***

3b. Telson without large movable spines (although sometimes with many minute spinules; Fig. 27a) . . . . . → ***6***

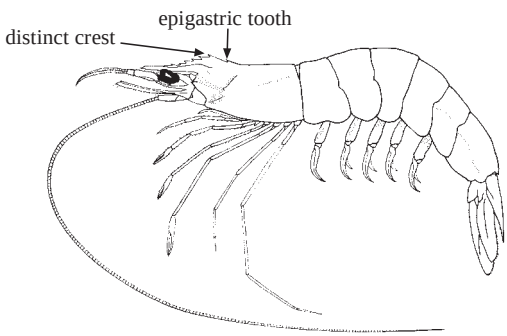
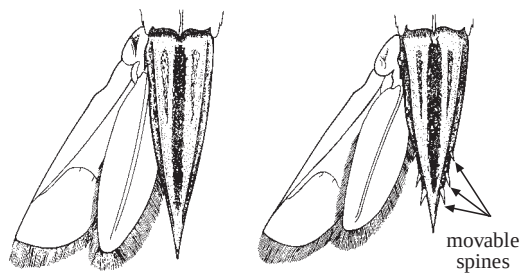


Fig. 26 ***Metapenaeus tenuipes***
(after Miguel, 1982)



a) ***Metapenaeus ensis*** **b)** ***Metapenaeus anchistus***

Fig. 27 telson and left uropod (dorsal view)
(after Motoh and Buri, 1984)

4a. In males, distolateral projections of petasma not reaching as far as distomedian ones, armed with a pair of spinules on each externodistal side; in females, thelycum with a posteromedian ogival boss, coxal projection of fourth leg very long, flat and truncate . . . . . ***Metapenaeus intermedius***

4b. In males, distolateral projections of petasma exceeding distomedian ones, without external spinules; in females, thelycum without a posteromedian boss, coxal projection of fourth leg a conical process . . . . . → ***5***

5a. In males, a wide space between distomedian projections of petasma; in females, lateral plates of thelycum with raised posterior edge, a deep fissure between lateral plates and posterior transverse ridge . . . . . ***Metapenaeus endeavouri***

5b. In males, a narrow space between distomedian projections of petasma; in females, lateral plates of thelycum without raised posterior edge and continuous to posterior transverse ridge . . . . . ***Metapenaeus anchistus***

6a. First leg with ischial spine subequal to basial spine . . . . . ***Metapenaeus suluensis***

6b. Ischial spine of first leg much smaller then basial spine, minute or absent . . . . . → ***7***

7a. In males, distomedian projection of petasma swollen; in females, lateral plates of thelycum with raised lateral or ventral ridges . . . . . → ***8***

7b. In males, distomedian projection of petasma not swollen; in females, lateral plates of thelycum without raised ridges . . . . . → ***12***

8a. In males, each distomedian projection of petasma forming a broad outward curved distal tooth; in females, anterior plate of thelycum with a pair of anterolateral rounded tubercles, each lateral plate with a short anteromedian ridge and a patch of setae . . . . . ***Metapenaeus insolitus***

8b. In males, each distomedian projection of petasma without distolateral teeth; in females, anterior plate of thelycum without tubercles, lateral plates with long ridges and without patches of setae . . . . . .→ ***9***

9a. In males, distomedian projections of petasma concealing distolateral ones in ventral view, merus of fifth leg with a long inward curved spiniform process followed by a distinct row of tubercles; in females, ridges on lateral plates of thelycum subparallel or forming posteriorly distinctly inward curved processes . . . . . → ***10***

9b. In males, distomedian projections of petasma not concealing distolateral ones in ventral view, merus of fifth leg with a tubercle; in females, ridges on lateral plates of thelycum closer to each other posteriorly and without distinctly inward curved processes . . . . . → ***11***

10a. Rostrum armed with 7 to 9 upper teeth; in males, distomedian projections of petasma reaching about as far as distolateral ones; in females, lateral plates of thelycum with strongly raised crescent-shaped ventral ridges, coming close together posteromedially . . . . . ***Metapenaeus conjunctus***

10b. Rostrum armed with 8 to 12 upper teeth; in males, distomedian projections of petasma reaching well beyond distolateral ones; in females, lateral plates of thelycum with strongly raised externolateral edges, a wide space separating them . . . . . ***Metapenaeus ensis***

11a. In males, distomedian projections of petasma directed forward, their inner margins almost parallel, tubercle on merus of fifth leg slightly bent inward; in females, ridges on lateral plates of thelycum curved outward posteriorly . . . . . ***Metapenaeus papuensis***

11b. In males, distomedian projections of petasma directed anterolaterally, diverging, with distinct longitudinal grooves, tubercle on merus of fifth leg slightly bent outward; in females, ridges on lateral plates of thelycum curved inward posteriorly . . . . ***Metapenaeus elegans***

12a. Branchiocardiac crest reaching posterior extension of hepatic spine; in males, distomedian projections of petasma crescent-shaped; in females, posterior transverse ridge behind thelycum with 2 anterolateral rounded projections . . . . . ***Metapenaeus affinis***

12b. Branchiocardiac crest ending near posterior 1/3 of carapace; in males, distomedian projections of petasma never crescent-shaped; in females, posterior transverse ridge behind thelycum without projections . . . . . →***13***

13a. In males, distolateral projections of petasma widening distally, distomedian projections not reaching as far as distolateral ones; in females, anterior plate of thelycum very broad in its distal half and very narrow posteriorly, lateral plates fused and rounded W-shape . . . . . ***Metapenaeus demani***

13b. In males, distolateral projections of petasma tapering distally, distomedian projections exceeding distolateral ones; in females, anterior plate of thelycum about same width on anterior and posterior margins, lateral plates not rounded W-shape . . . . . →***14***

14a. In males, distomedian projections of petasma tubular and diverging; in females, anterior margin of anterior plate of thelycum with 2 fang-like teeth and a median indistinct tubercle . . . . . ***Metapenaeus dalli***

14b. In males, distomedian projections of petasma either tubular and subparallel or laminose and diverging; in females, anterior margin of anterior plate of thelycum with 3 tubercles . . . . . →***15***

15a. In males, distomedian projections of petasma tubular and almost parallel, their distal part twisted dorsoventrally; in females, distal margin of anterior plate of thelycum triangular, median tubercle more prominent than lateral ones . . . . . ***Metapenaeus bennettae***

15b. In males, distomedian projections of petasma laminose and diverging; in females, distal margin of anterior plate of thelycum convex, all tubercles of subequal size . . ***Metapenaeus moyebi***

16a. Telson armed with 4 pairs of large movable spines . . . . . ***Metapenaeus macleayi***

16b. Telson without large movable lateral spines (though sometimes with many minute spinules) . . . . . →***17***

17a. In males, basal spine of third leg extremely long and barbed; in females, lateral plates of thelycum partially sheathing anterior plate . . . . . ***Metapenaeus dobsoni***

17b. In males, basal spine of third leg sample, not barbed; in females, lateral plates of thelycum not sheathing anterior plate . . . . . →***18***

18a. Rostrum without a distinct crest; adrostral groove extending beyond epigastric tooth (Fig. 25) . . . . . ***Metapenaeus eboracensis***

18b. Rostrum with a distinct crest; adrostral groove not reaching epigastric tooth (Fig. 26) . . . . . →***19***

19a. In males, distolateral projections of petasma directed outward, distomedian projections with slender apical filaments; in females, thelycum with a large anterior and small lateral plates . . . . . ***Metapenaeus brevicornis***

19b. In males, distolateral projections of petasma directed forward, distomedian projections with ribbon-like apical filaments; in females, thelycum with a small anterior and large lateral plates . . . . . ***Metapenaeus tenuipes***

Key to the species of *Parapenaeopsis* occurring in the area[1/]

Note: in addition to the following key characters, the shape of the petasma and thelycum can also be very helpful for quick identification of mature specimens (see figures shown in the respective species accounts).

1a. First and second legs with epipods . . . . . → ***2***

1b. First and second legs without epipods . . . . . → ***8***

2a. First leg without basial spine . . . . . ***Parapenaeopsis gracillima***

2b. First leg with basial spine . . . . . → ***3***

3a. Second leg with basial spine absent or minute; carapace with a large dorsoposterior dark brown patch . . . . . ***Parapenaeopsis uncta***

3b. Second leg usually with a distinct basial spine; carapace without conspicuous dark patches on dorsal surface . . . . . → ***4***

4a. Telson armed with 1 or 2 pairs of fixed lateral spines (Fig. 28) . . . . . ***Parapenaeopsis coromandelica***

4b. Telson without fixed lateral spines . . . . . → ***5***



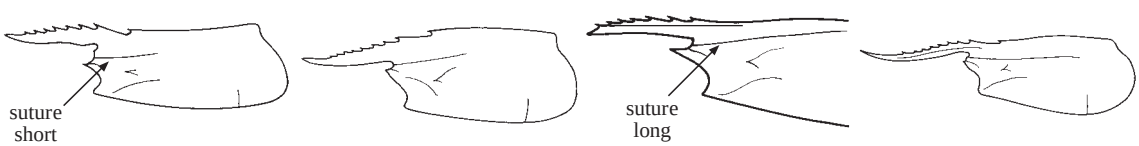
Fig. 28 ***Parapenaeopsis coromandelica***

5a. Longitudinal suture short, reaching to about level of hepatic spine (Figs 29a, b); male petasma horn-like; in females, anterior and posterior plates of thelycum fused medially . . . . . → ***6***

5b. Longitudinal suture long, extending near to posterior carapace (Figs 29c, d); male petasma not horn-like; in females, anterior and posterior plates of thelycum separated . . . . . → ***7***

6a. Rostrum usually with 7 or 8 upper teeth (Fig. 29a); third leg without basial spine; in males, tip of distolateral projection of petasma with a small dorsal spiniform process; in females, posterior plate of thelycum without a median boss . . . . . ***Parapenaeopsis cornuta***

6b. Rostrum usually with 9 or 10 upper teeth (Fig. 29b); third leg with a basial spine; in males, tip of distolateral projection of petasma without dorsal spiniform processes; in females, posterior plate of thelycum with a median boss . . . . . ***Parapenaeopsis maxillipedo***



a) ***Parapenaeopsis cornuta*** **b)** ***Parapenaeopsis maxillipedo*** **c)** ***Parapenaeopsis hardwickii*** **d)** ***Parapenaeopsis sculptilis***

Fig. 29 carapace (lateral view)

1/ The taxonomic status and the relationships of some species of this genus are still unclear. For example, *Parapenaeopsis probata* Hall, 1961 is here treated as a synonym of *P. uncta* Alcock, 1905, but its status probably should be re-examined.

7a. In males, distomedian projections wing-like, wider than long and with anterior margin often crenulate; in females, posterior plate of thelycum with a pair of anterolateral tooth-like projections and anteromedian margin bearing a transverse row of long hairs; body not strikingly cross-banded . . . . . ***Parapenaeopsis hardwickii***

7b. In males, distomedian projections rabbit ear-shaped, long and deeply concave ventrally; in females, posterior plate of thelycum without anterolateral tooth-like projections but with a median tubercle bearing a tuft of long hairs; body strikingly cross-banded . . ***Parapenaeopsis sculptilis***

8a. Epigastric tooth present . . . . . → ***9***

8b. Epigastric tooth absent . . . . . →***10***

9a. Rostrum long and exceeding antennular peduncle; longitudinal suture extending almost to posterior carapace . . . . . ***Parapenaeopsis hungerfordii***

9b. Rostrum short and extending just beyond eyes; longitudinal suture only reaching as far as level of hepatic spine . . . . . ***Parapenaeopsis venusta***

10a. Rostrum extending far beyond antennular peduncle; longitudinal suture reaching as far as level of hepatic spine; vertical suture absent . . . . . .***Parapenaeopsis arafurica***

10b. Rostrum not exceeding second antennular segment; longitudinal suture extending far behind level of hepatic spine; vertical suture present . . . . . ***Parapenaeopsis tenella***

Key to the species of *Parapenaeus* occurring in the area

Note: the shape of the petasma and thelycum can be very helpful for quick identification of mature specimens, and these are therefore depicted at the end of the key (Figs 39, 40, and 41). For more information on the species of this genus, see the work of Crosnier (1986, Résultats des Campagnes MUSORSTOM, Vol 2).

1a. Branchiostegal spine absent (Fig. 30) . . . . . ***Parapenaeus longipes***

1b. Branchiostegal spine present (Figs 31 to 38) . . . . . → ***2***

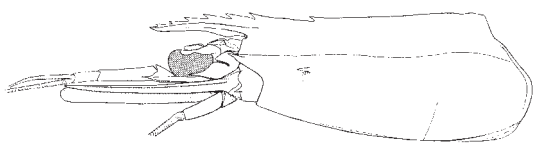


Fig. 30 ***Parapenaeus longipes***
(from Crosnier, 1985)

2a. Branchiostegal spine situated behind anterior edge of carapace (Figs 31and 32) . . . . . → ***3***

2b. Branchiostegal spine situated on anterior edge of carapace (Figs 33 to 38) . . . . . → ***4***

3a. Rostrum slightly curved downward; postrostral crest extending close to posterior border of carapace (Fig. 31) (see also Figs 39a and 41a) . . . . . ***Parapenaeus investigatoris***

3b. Rostrum slightly curved upward; postrostral crest extending to slightly beyond midcarapace (Fig. 32; see also Figs 39b and 41b) . . . . . ***Parapenaeus murrayi***

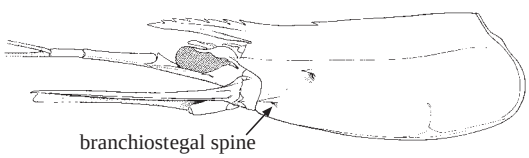


Fig. 31 ***Parapenaeus investigatoris***
(from Crosnier, 1985)

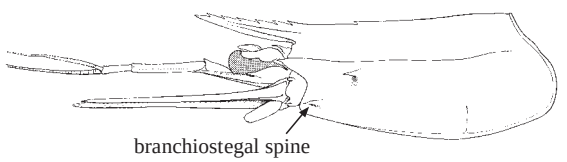


Fig. 32 ***Parapenaeus murrayi***
(from Crosnier, 1985)

4a. Rostrum usually not exceeding basial segment of antennular peduncle (Figs 33; see also Figs 39c and 41c) . . . ***Parapenaeus fissurus***

4b. Rostrum extending far beyond basial segment of antennular peduncle . . . . . → ***5***

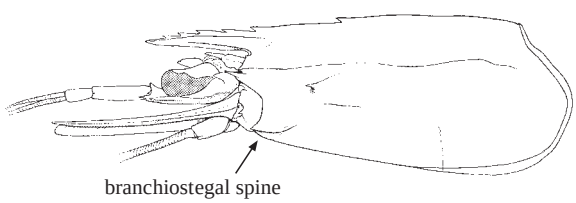


Fig. 33 ***Parapenaeus fissurus***
(from Crosnier, 1985)

5a. Epigastric spine approximately above level of hepatic spine (Fig. 34; see also Figs 39d and 41d) . . . . . ***Parapenaeus perezfarfante***

5b. Epigastric spine distinctly behind level of hepatic spine (Fig. 35) . . . . . → ***6***

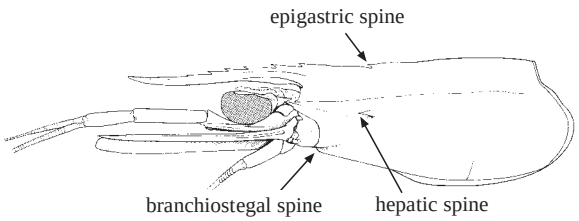


Fig. 34 ***Parapenaeus perezfarfante***
(from Crosnier, 1985)

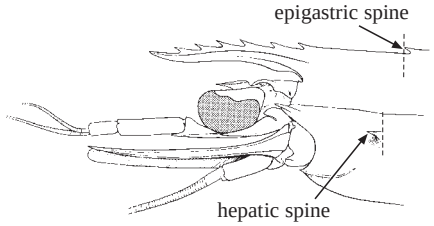


Fig. 35 ***Parapenaeus sextuberculatus***
(from Crosnier, 1985)

6a. Rostrum slender and almost straight (see also Fig. 40a) . . ***Parapenaeus ruberoculatus***

6b. Rostrum robust and sinuous . . . . . → ***7***

7a. Rostrum extending to about the middle of second segment of antennular peduncle (Fig. 35; see also 40b and 41e) . . . . . ***Parapenaeus sextuberculatus***

7b. Rostrum extending beyond second segment of antennular peduncle (Figs 36 to 38) . . . . . → ***8***

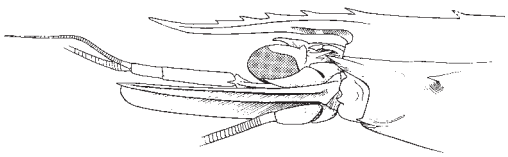


Fig. 36 ***Parapenaeus fissuroides***
(from Crosnier, 1985)

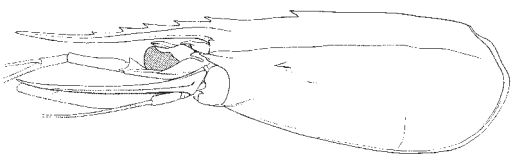


Fig. 37 ***Parapenaeus lanceolatus***
(from Crosnier, 1985)

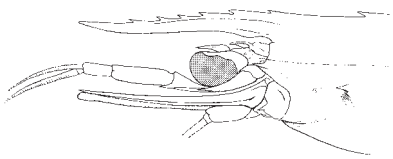


Fig. 38 ***Parapenaeus australiensis***
(from Crosnier, 1985)

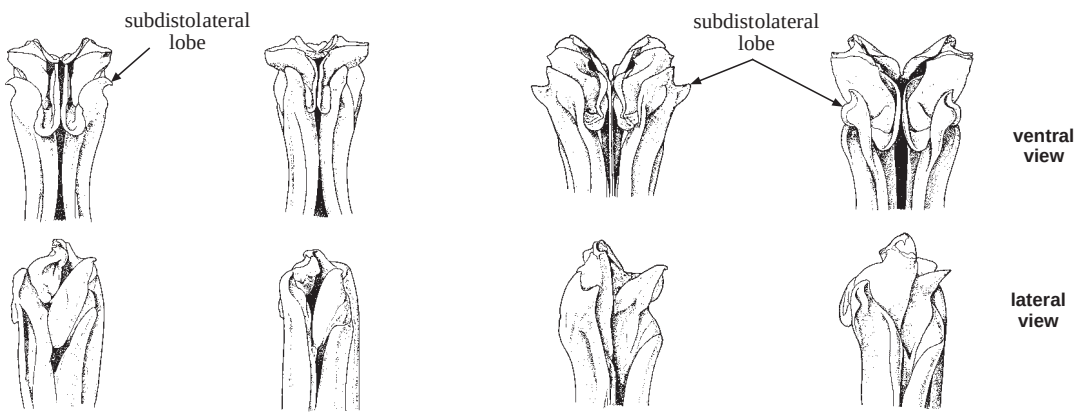


Fig. 39 distal part of petasma
(after Crosnier, 1985)

8a. In males, petasma with subdistolateral lobes bifurcate (Fig. 40c); in females median part of thelycum bearing a pair of longitudinal swellings (Fig. 41f) . . . . . ***Parapenaeus fissuroides***

8b. In males, petasma with subdistolateral lobes not bifurcate; in females, median part of thelycum without longitudinal swellings . . . . . → ***9***

9a. In males, petasma with subdistolateral lobes pointed (Fig. 40d); in females, thelycum with a distinct median pit (Fig. 41g) . . . . . ***Parapenaeus lanceolatus***

9b. In males, petasma with subdistolateral lobes rounded (Fig. 40e); in females, thelycum without a pit at middle (Fig. 41h, sometimes bearing a tubercle) . . . . . ***Parapenaeus australiensis***

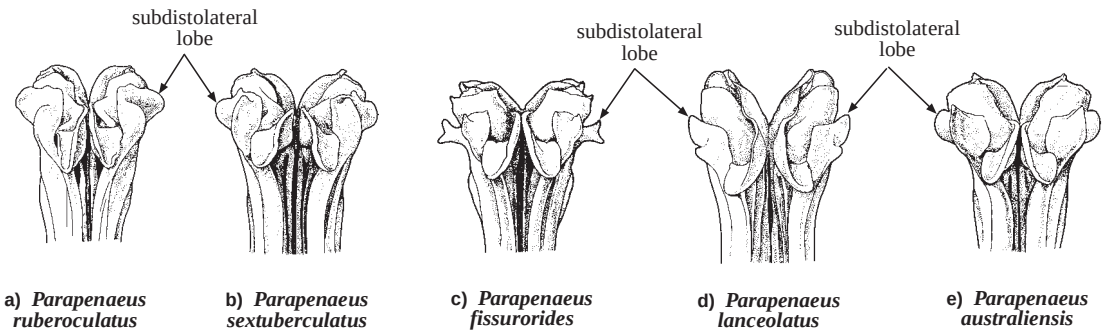


Fig. 40 distal part of petasma (ventral view)
(after Crosnier, 1985)

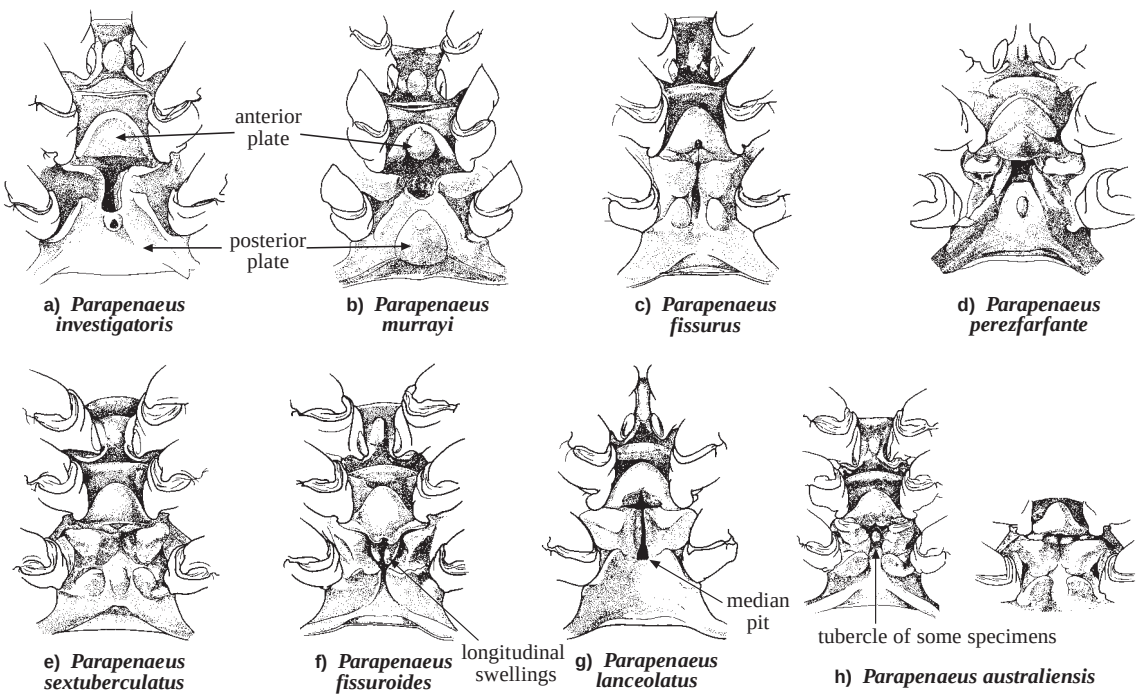


Fig. 41 thelycum
(after Crosnier, 1985)

Key to the species of *Penaeopsis* occurring in the area

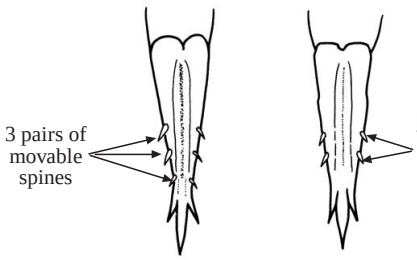
Note: for more information on the species of this genus, see the work of Pérez Farfante (1980, *Fish. Bull.*: 77).

1a. Telson generally with 3 pairs of movable spines (Fig. 42a); pterygostomian spine above anterolateral corner of carapace (Fig. 43a) . . . . . ***Penaeopsis rectacuta***

1b. Telson generally with 2 pairs of movable spines (Fig. 42b); pterygostomian spine at anterolateral corner of carapace (Fig. 43b) . . . . . → ***2***

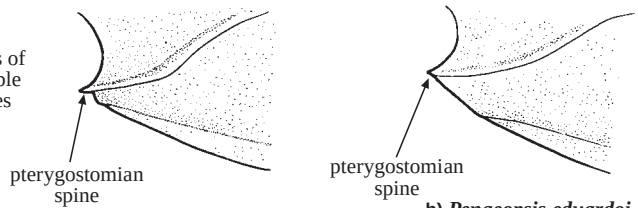
2a. In males, petasma with ventral costa produced distally into long spine considerably extending beyond level of row of cincinnuli; in females, thelycum with lateral plates turning abruptly mesially posterior to midlength, plate bearing short, pedunculate posteromedian protuberance . . . . . ***Penaeopsis eduardoi***

2b. In males, petasma with ventral costa ending distally in a blunt, short process or spine not extending beyond level of row of cincinnuli; in females, thelycum with lateral plates not turning abruptly mesially posterior to midlength, plate bearing short, subrectangular posteromedian protuberance . . . . . ***Penaeopsis challengeri***



a) ***Penaeopsis rectacuta*** **b)** ***Penaeopsis eduardoi***

Fig. 42 telson (dorsal view)



a) ***Penaeopsis rectacuta*** **b)** ***Penaeopsis eduardoi, P. challengeri***

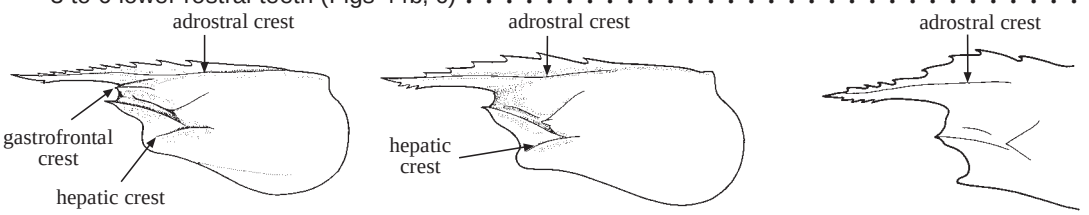
Fig. 43 anterolateral corner of carapace

Key to the species of *Penaeus* occurring in the area[2*l*]

Note: live or fresh specimens of this genus can often be easily distinguished on the basis of their coloration.

1a. Adrostral crest extending almost to posterior border of carapace; gastrofrontal crest present; generally 1 or 2 lower rostral teeth (Fig. 44a) . . . . . → ***2***

1b. Adrostral crest not extending beyond midcarapace; gastrofrontal crest absent; generally 3 to 6 lower rostral teeth (Figs 44b, c) . . . . . → ***7***

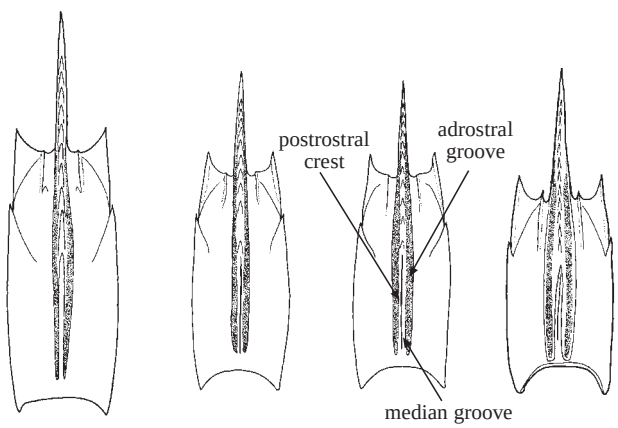


a) ***Penaeus japonicus*** **b)** ***Penaeus semisulcatus*** **c)** ***Penaeus merguiensis***

Fig. 44 carapace (lateral view)

2a. Postrostral crest without median groove (Fig. 45a); usually 2 lower rostral teeth (body uniform colour) . . . . . ***Penaeus marginatus***

2b. Postrostral crest with median groove (Figs 45b, c, d); usually 1 lower rostral tooth . . . . . → ***3***



a) ***Penaeus marginatus*** **b)** ***Penaeus japonicus*** **c)** ***Penaeus latisulcatus*** **d)** ***Penaeus longistylus***

Fig. 45 carapace (dorsal view)

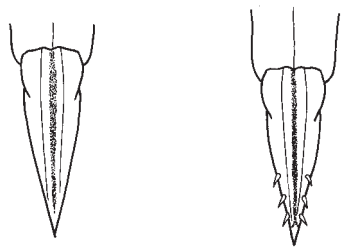
2*l* This genus is sometimes subdivided into many subgenera or genera by some authors.

3a. Telson unarmed (Fig. 46a; body covered with cross bands) . . . . . ***Penaeus canaliculatus***

3b. Telson armed with movable lateral spines (Fig. 46b) . . . . . → ***4***

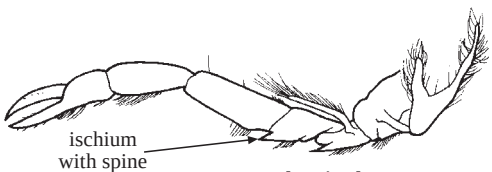
4a. First leg bearing a distinct ischial spine (Fig. 47a); median groove on postrostral crest less than half carapace length (Fig. 45d, body without cross bands). . . . . ***Penaeus longistylus***

4b. First leg with ischial spine minute or absent (Fig. 47b); median groove on postrostral crest extending almost to posterior carapace (Figs 45b, c). . . . . → ***5***

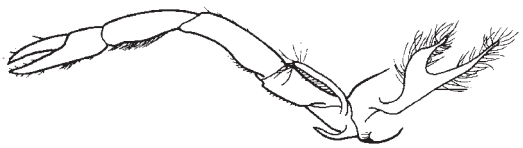


a) ***Penaeus canaliculatus*** b) ***Penaeus japonicus***

Fig. 46 telson (dorsal view)



a) ***Penaeus longistylus***

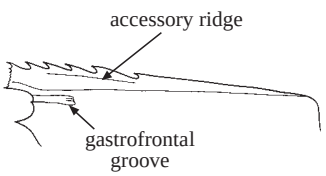


b) ***Penaeus japonicus***

Fig. 47 first leg
(after Hayashi, 1992)

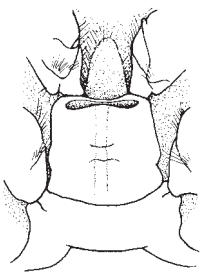
5a. Rostrum with accessory ridges; gastrofrontal groove divided into 3 at posterior end (Fig. 48; body uniformly coloured) . . . . . ***Penaeus plebejus***

5b. Rostrum without distinct accessory ridges; gastrofrontal groove divided into 2 at posterior end. . . . . → ***6***



upper part of carapace (lateral view)

Fig. 48 ***Penaeus plebejus***



thelycum

Fig. 49 ***Penaeus***

6a. Adrostral groove about as long as wide as postrostral crest (Fig. 45b, body covered with cross bands; shape of thelycum unique and pouch-like, Fig. 49, those of all other species flap-like) . . . . . ***Penaeus japonicus***

6b. Adrostral groove distinctly wider than postrostral crest (Fig. 45c, body without cross bands) . . . . . ***Penaeus latisulcatus***

7a. Hepatic crest present; body covered with cross bands; generally 3 lower rostral teeth (Fig. 44b) . . . . . → ***8***

7b. Hepatic crest absent; body semi-translucent and densely covered with minute dark brown dots; generally 4 to 6 lower rostral teeth (Fig. 44c) . . . . . →***10***

8a. Fifth leg without exopod; hepatic crest nearly horizontal (Fig. 50); antennal flagella not banded . . . . . ***Penaeus monodon***

8b. Fifth leg bearing a small exopod; hepatic crest sloping anteroventrally (Fig. 51); antennal flagella banded . . . . . → ***9***

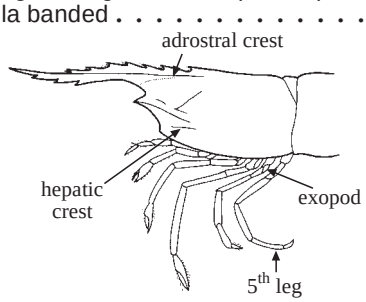


Fig. 50 ***Penaeus monodon***
(after Yu and Chan, 1986)

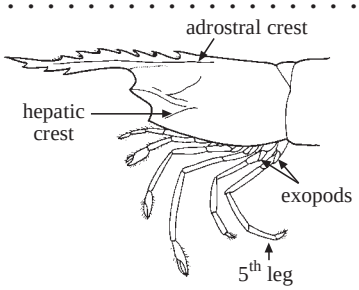
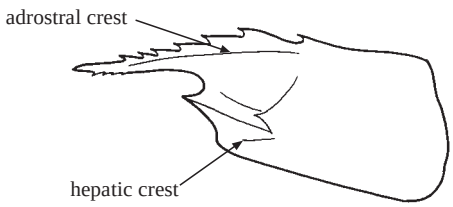


Fig. 51 ***Penaeus semisulcatus***
(after Yu and Chan, 1986)

9a. Adrostral crest extending behind last postrostral tooth (Fig. 51); postrostral crest distinctly grooved (Fig. 53a); hepatic crest extending well behind antennal crest (Fig. 51) . . . . . .***Penaeus semisulcatus***

9b. Adrostral crest at most extending to last postrostral tooth (Fig. 52); postrostral crest without a distinct groove (Fig. 53b); hepatic crest not extending behind antennal crest (Fig. 52) . . . . . ***Penaeus esculentus***



carapace (lateral view)
Fig. 52 ***Penaeus esculentus***

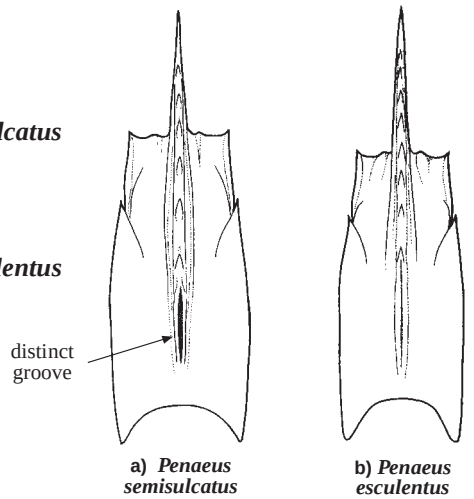


Fig. 53 dorsal view of carapace

10a. Third maxilliped of males with distal segment about half as long as second segment which bears a tuft of hairs at tip (Fig. 54a, rostral crest high and broadly triangular in both sexes; body yellowish to greenish, antennal flagella reddish brown) . . . ***Penaeus merguiensis***

10b. Third maxilliped of males with distal segment longer or as long as second segment . . . . . → ***11***

11a. Rostrum slightly curved at tip and sigmoidal shaped; antennal flagella yellowish (third maxilliped of males with second segment as long as distal segment and bearing a tuft of long hairs at tip, Fig. 54b; rostral crest slightly elevated in both sexes; body yellowish white to greyish green) . . . . . ***Penaeus indicus***

11b. Rostrum nearly horizontal straight; antennal flagella reddish brown . . . . . → ***12***

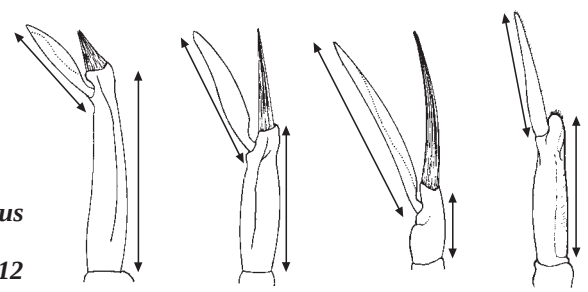


Fig. 54 distal part of third maxilliped in adult males

12a. Third maxilliped of males with distal segment 1.5 to 2.5 times longer than second segment which bearing a tuft of very long hairs at tip (Fig. 54c); rostral crest slightly elevated in males and moderately high in large females; body somewhat greenish . . . . . ***Penaeus penicillatus***

12b. Third maxilliped of males with distal segment as long as second segment which only bears a rudimentary tuft of hairs at tip (Fig. 54d); rostral crest slightly to moderately elevated in males but broadly triangular in large females; body yellowish white to pinkish . . . . . ***Penaeus silasi***

Key to the species of *Trachypenaeus* occurring in the area[3/]

Remarks on key characters: occasionally, spermatophores or sperm sacs (a white or yellowish cement-like mass) are attached to the thelycum of mature females, making observation difficult. Nevertheless, they can be easily removed by using a pin, forceps, or finger nail.

1a. Second leg with epipod . . . . . → ***2***

1b. Second leg without epipod . . . . . → ***6***

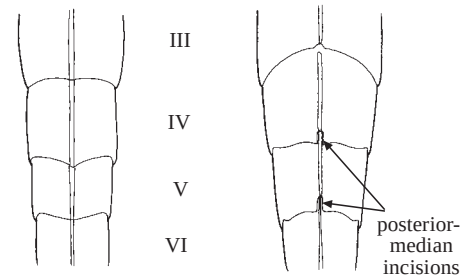
3/ The taxonomic status and relationships of some species of this genus are still unclear, and this genus is sometimes subdivided into many genera by some authors.

2a. First leg without epipod . . . . . ***Trachypenaeus villaluzi***
2b. First leg with epipod . . . . . → ***3***

3a. Rostrum curved downward (female thelycum with sharply pointed apex) . ***Trachypenaeus gonospinifer***
3b. Rostrum straight or curved upward . . . . . → ***4***

4a. Male petasma horn-like; female thelycum with sharply pointed apex . . . . . .***Trachypenaeus sedili***
4b. Male petasma T-shaped, female thelycum with round apex . . . . . → ***5***

5a. Rostrum straight and armed with 8 to 11 upper teeth; fourth and fifth abdominal segments without posteromedian incisions (Fig. 55a); fifth leg extending beyond antennal scale; posterior plate of female thelycum without distinct notch . . ***Trachypenaeus longipes***
5b. Rostrum upturned at tip and armed with 6 to 8 upper teeth; fourth and fifth abdominal segments with posteromedian incisions (Fig. 55b); fifth leg not reaching tip of antennal scale; posterior plate of female thelycum having a distinct median notch . . . . ***Trachypenaeus curvirostris***



a) ***Trachypenaeus longipes*** **b)** ***Trachypenaeus curvirostris***

Fig. 55 abdominal segments (dorsal view)
(after Hayashi, 1992)

6a. Male petasma T-shaped; posterior plate of female thelycum as a forwardly directed pocket . . . . . .***Trachypenaeus malaiana***
6b. Male petasma horn-like; posterior plate of female thelycum not forming a pocket . . . . . →***7***

7a. In males, distolateral projections of petasma narrow; in females, anterior plate of thelycum without a backwardly directed projection . . . . . ***Trachypenaeus anchoralis***
7b. In males, distolateral projections of petasma widely apart; in females, anterior plate of thelycum with a backwardly directed projection . . . . . ***Trachypenaeus granulosus***

List of species occurring in the area

The symbol is given when species accounts are included.

Atypopenaeus bricornis Racek and Dall, 1965
Atypopenaeus dearmatus De Man, 1907
Atypopenaeus formosus Dall, 1957
Atypopenaeus stenodactylus (Stimpson, 1860)

Funchalia taaningi Burekenroad, 1940

Heteropenaeus longimanus De Man, 1896

Metapenaeopsis aegyptia Galil and Golani, 1990
Metapenaeopsis angusta Crosnier, 1987
Metapenaeopsis assimilis (De Man, 1920)
Metapenaeopsis barbata (De Haan, 1844)
Metapenaeopsis ceylonica Starobogatov, 1972
Metapenaeopsis commensalis Borradaile, 1898
Metapenaeopsis costata Crosnier, 1991
Metapenaeopsis difficilis Crosnier, 1991
Metapenaeopsis distincta (De Man, 1907)
Metapenaeopsis evermanni (Rathbun, 1906)
Metapenaeopsis fusca R.J.G. Manning, 1988
Metapenaeopsis gaillardi Crosnier, 1991
Metapenaeopsis gallensis (Pearson, 1905)
Metapenaeopsis hilarula (De Man, 1911)
Metapenaeopsis lamellata (De Haan, 1844)
Metapenaeopsis laubieri Crosnier, 1991
Metapenaeopsis liui Crosnier, 1987

Metapenaeopsis mannarensis De Bruin, 1965
Metapenaeopsis marquesas Crosnier, 1991
Metapenaeopsis menoui Crosnier, 1991
Metapenaeopsis mogiensis (Rathbun, 1902)
Metapenaeopsis novaeguineae (Haswell, 1879)
Metapenaeopsis palmensis (Haswell, 1879)
Metapenaeopsis parahilarula Crosnier, 1991
Metapenaeopsis parapalmensis Crosnier, 1994
Metapenaeopsis philippii (Bate, 1881)
Metapenaeopsis propinqua Crosnier, 1991
Metapenaeopsis provocatoria Racek and Dall, 1965
Metapenaeopsis quinquedentata (De Man, 1907)
Metapenaeopsis richeri Crosnier, 1991
Metapenaeopsis rosea Racek and Dall, 1965
Metapenaeopsis sibogae (De Man, 1907)
Metapenaeopsis sinica Liu and Zhong, 1988
Metapenaeopsis sinuosa Dall, 1957
Metapenaeopsis spatulata Crosnier, 1991
Metapenaeopsis stridulans (Alcock, 1905)
Metapenaeopsis tarawensis Racek and Dall, 1965
Metapenaeopsis toloensis Hall, 1962
Metapenaeopsis velutina (Dana, 1852)
Metapenaeopsis wellsi Racek, 1967

Metapenaeus affinis (H. Milne Edwards, 1837)
Metapenaeus anchistus (De Man, 1920)
Metapenaeus benettae Racek and Dall, 1965
Metapenaeus brevicornis (H. Milne Edwards, 1837)
Metapenaeus conjunctus Racek and Dall, 1965
Metapenaeus dalli Racek, 1957
Metapenaeus demani (Roux, 1921)
Metapenaeus dobsoni (Miers, 1878)
Metapenaeus eboracensis Dall, 1957
Metapenaeus elegans De Man, 1907
Metapenaeus endeavouri (Schmitt, 1926)
Metapenaeus ensis (De Haan, 1844)
Metapenaeus insolitus Racek and Dall, 1965
Metapenaeus intermedius (Kishinouye, 1900)
Metapenaeus lysianassa (De Man, 1888)
Metapenaeus macleayi (Haswell, 1879)
Metapenaeus moyebi (Kishinouye, 1896)
Metapenaeus papuensis Racek and Dall, 1965
Metapenaeus suluensis Racek and Dall, 1965
Metapenaeus tenuipes Kubo, 1949

Parapenaeopsis arafurica Racek and Dall, 1965
Parapenaeopsis cornuta (Kishinouye, 1900)
Parapenaeopsis coromandelica Alcock, 1906
Parapenaeopsis gracillima Nobili, 1903
Parapenaeopsis hardwickii (Miers, 1878)
Parapenaeopsis hungerfordi Alcock, 1905
Parapenaeopsis maxillipedo Alcock, 1906
Parapenaeopsis sculptilis (Heller, 1862)
Parapenaeopsis tenella (Bate, 1888)
Parapenaeopsis uncta Alcock, 1905
Parapenaeopsis venusta De Man, 1907

Parapenaeus australiensis Dall, 1957
Parapenaeus fissuroides Crosnier, 1986
Parapenaeus fissurus (Bate, 1881)
Parapenaeus investigatoris Alcock and Anderson, 1899

Parapenaeus lanceolatus Kubo, 1949
Parapenaeus longipes Alcock, 1905
Parapenaeus murrayi Ramadan, 1938
Parapenaeus perezfarfante Crosnier, 1986
Parapenaeus ruberoculatus Hall, 1962
Parapenaeus sextuberculatus Kubo, 1949

Penaeopsis challengeri De Man, 1911
Penaeopsis eduardoi Pérez Farfante, 1977
Penaeopsis rectacuta (Bate, 1881)

Penaeus canaliculatus (Olivier, 1811)
Penaeus esculentus Haswell, 1879
Penaeus indicus H. Milne Edwards, 1837
Penaeus japonicus Bate, 1888
Penaeus latisulcatus Kishinouye, 1896
Penaeus longistylus Kubo, 1943
Penaeus marginatus Randall, 1840
Penaeus merguiensis De Man, 1888
Penaeus monodon Fabricius, 1798
Penaeus penicillatus Alcock, 1905
Penaeus plebejus Hess, 1865
Penaeus semisulcatus De Haan, 1844
Penaeus silasi Muthu and Motoh, 1979

Trachypenaeopsis richtersii (Miers, 1844)

Trachypenaeus anchoralis (Bate, 1881)
Trachypenaeus curvirostris (Stimpson, 1860)[4/]
Trachypenaeus gonospinifer Racek and Dall, 1965
Trachypenaeus granulosus (Haswell, 1879)[5/]
Trachypenaeus longipes (Paulson, 1875)
Trachypenaeus malaiana Balss, 1933
Trachypenaeus sedili Hall, 1961
Trachypenaeus villaluzi Muthu and Motoh, 1979

References

Crosnier, A. 1986. Crustacés Décapodes: Penaeidae les espéces indo-ouest-pacifiques du genre *Parapenaeus*. In Résultats des Campagnes MUSORSTOM, Vol. 2, edited by J. Forest. *Mém. Mus. natn. Hist. nat., sér. A, Zool.*, 133:303-353.

Crosnier, A. 1991. Crustacea Decapoda: Les *Metapenaeopsis* indo-ouest-pacifiques sans appareil stridulant (Penaeidae). Deuxiéme partie. In Résultats des Campagnes MUSORSTOM, Vol. 9, edited by A. Crosnier. *Mém. Mus. natn. Hist. nat.*, (A), 152:155-297.

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Crosnier, A. 1994. Crustacea Decapoda: Les *Metapenaeopsis* indo-ouest-pacifiques sans appareil stridulant (Penaeidae). Description de deux espéces nouvelles. In Résultats des Campagnes MUSORSTOM, Vol. 12, edited by A. Crosnier. *Mém. Mus. natn. Hist. nat.*, (A), 16:339-349.

Dall, W. and P.C. Rothlisberg. 1990. Taxonomy. In *The biology of Penaeidae*, edited by W. Dall, B.J. Hill, P.C. Rothlisberg and D.J. Staples. *Adv. Mar. Biol.*, 27:55-126.

Miguel, J.C. 1982. Le genera *Metapenaeus* (Crustacea, Penaeidae): taxonomie, biologie et peches mondiales. *Zool. Verh.*, 195:1-137.

Pérez Farfante, I. and B.F. Kensley. 1997. Penaeoid and Sergestoid shrimps and prawns of the world. Keys and diagnosis for the families and genera. *Mém. Mus. natn. Hist. nat.*, 175:1-233.

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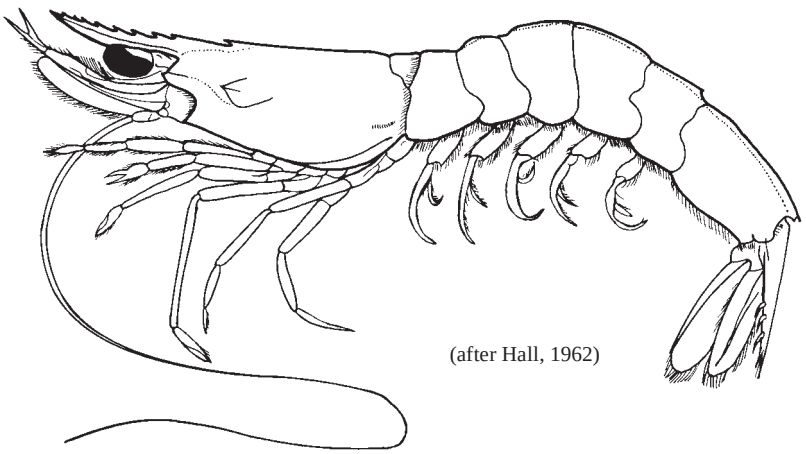
4/ Includes *Trachypenaeus asper* Alcock, 1905 which is probably a synonym of *T. curvirostris*.
5/ Includes *Trachypenaeus pescadoreensis* Schmitt, 1931 which is probably a synonym of *T. granulosus*.

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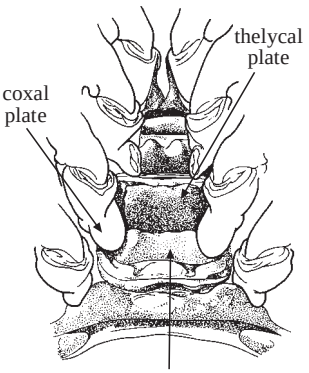
Metapenaeopsis barbata (De Haan, 1844)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Whiskered velvet shrimp; **Fr** - Crevette chamois barbulée; **Sp** - Camarón gamuza barbudo.



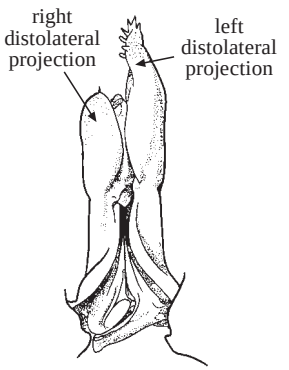
(after Hall, 1962)



thelycum

(after Crosnier, 1994)

Diagnostic characters: Body densely covered with short hairs; grooves and crests on carapace obscure. **Rostrum directed slightly upward, almost straight and armed with 6 or 7 regularly spaced upper teeth** (excluding epigastric tooth on carapace); rostrum **extending to about tip of antennal scale. Pterygostomian spine well developed; generally 16 to 27 stridulating organs present on posterolateral carapace. Abdomen with dorsal crest on third segment narrow and more than 9 times as long as broad, median groove on crest indistinct or very shallow**; sixth segment about 2 times as long as fifth segment. **Petasma of males asymmetrical, left distoventral projection longer, bearing 7 to 12 well-developed sharp projections at tip, while right distoventral projection bears 1 or 2 small spinule(s) at tip. Thelycum of females with thelycal plate broadly subquadrate, 0.5 to 0.6 times as long as broad; intermediate plate broadly trapezoidal and slightly concave, posterior ridge with a small but distinct median tubercle.** Telson with 1 pair of fixed and 3 pairs of movable lateral spines. **Colour: body whitish and mottled with irregular red blotches**; eyes dark brown; antennal flagella indistinctly crossed with red and white bands; legs reddish; pleopods with white markings on sides; **uropods reddish, with distal and basal parts pale yellowish.**



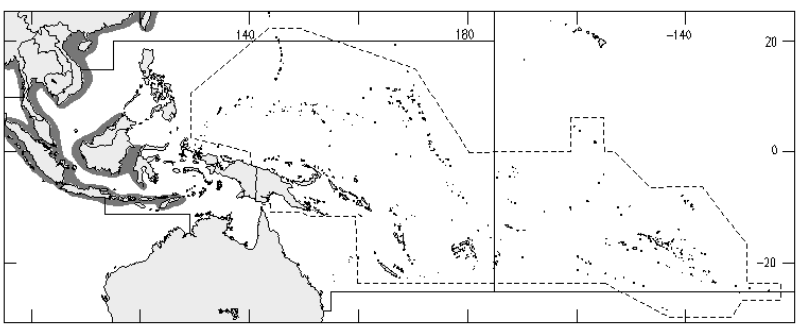
petasma (ventral view)

(after Crosnier, 1994)

Size: Maximum body length 11.6 cm (females) and 7.8 mm (males), commonly between 7 and 9 cm.

Habitat, biology, and fisheries: Found on sand, mud or sandy-mud bottoms, from depths of 2 to 219 m, usually less than 90 m. Taken mainly by trawls. Appears to be common but nowhere abundant throughout its range in the area. Of minor commercial importance, generally taken as bycatch. Marketed mainly fresh for local consumption.

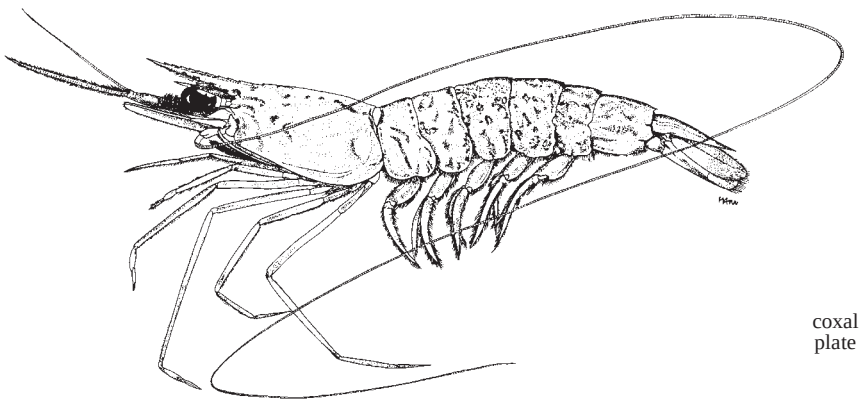
Distribution: Indo-West Pacific from the Gulf of Bengal to Japan and Indonesia.



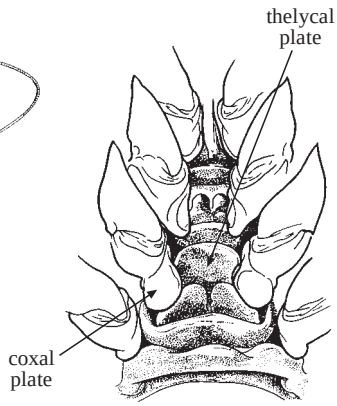
Metapenaeopsis palmensis (Haswell, 1879)

Frequent synonyms / misidentifications: *Metapenaeopsis barbeensis* Hall, 1962 / *Metapenaeopsis novaeguineae* (Haswell, 1879); *M. stridulans* (Alcock, 1905).

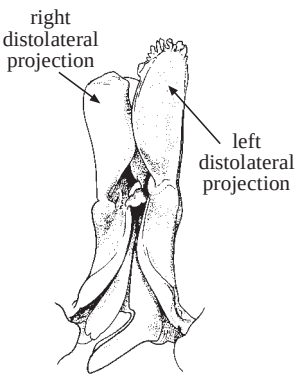
FAO names: En - Southern velvet shrimp; **Fr** - Crevette chamois méridionale; **Sp** - Camarón gamuza sureño.



(after Motoh and Buri, 1984)



thelycum
(after Crosnier, 1994)



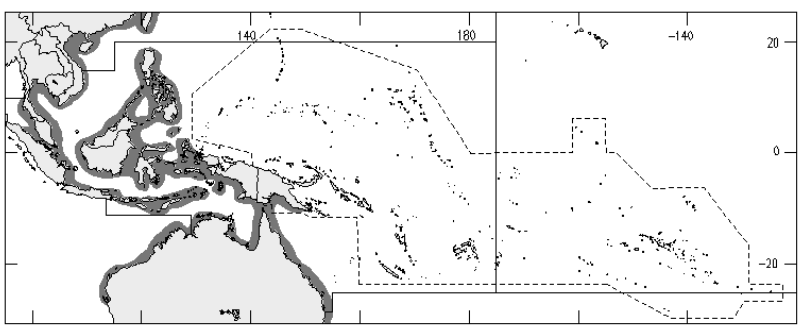
petasma (ventral view)
(after Crosnier, 1994)

Diagnostic characters: Body densely covered with hairs; grooves and crests on carapace obscure. **Rostrum nearly straight or slightly curved upward, armed with 7 or 8 regularly spaced upper teeth** (excluding epigastric tooth on carapace); rostrum **extending just to distal antennular segment. Pterygostomian spine reduced and small; 8 to 13 (mostly 9 or 10) stridulating organs present on posterolateral carapace**. Abdomen with dorsal crest on third segment narrow and more than 9 times as long as broad, **median groove on crest narrow but deep**; sixth segment about 2 times as long as fifth segment. **Petasma of males asymmetrical, left distoventral projection longer, bearing about 10 rather blunt projections at tip; right distoventral projection usually without spinules at tip. Thelycum of females with thelycal plate slightly concave, inverted trapezoidal, 0.6 to 0.7 times as long as broad; intermediate plate concave, with lateral parts expanded into 2 small flaps, posterior edge very thick**. Telson with 1 pair of fixed and 3 pairs of movable lateral spines. **Colour: body whitish, mottled with irregular red stripes**; eyes dark brown; antennal flagella pale red; legs whitish, with some red spots on the sides of pleopods; **distal half of uropods reddish.**

Size: Maximum body length 12 cm (females) and 8.5mm (males), commonly between 5 and 8 cm.

Habitat, biology, and fisheries: Found on sandy-mud or mud bottoms, from depths of 5 to 100 m, usually less than 90 m. Taken mainly as bycatch in trawls. Probably the most common species of the genus in the area, but nowhere very abundant and only of limited commercial importance, due to its small size. Marketed mainly fresh for local consumption.

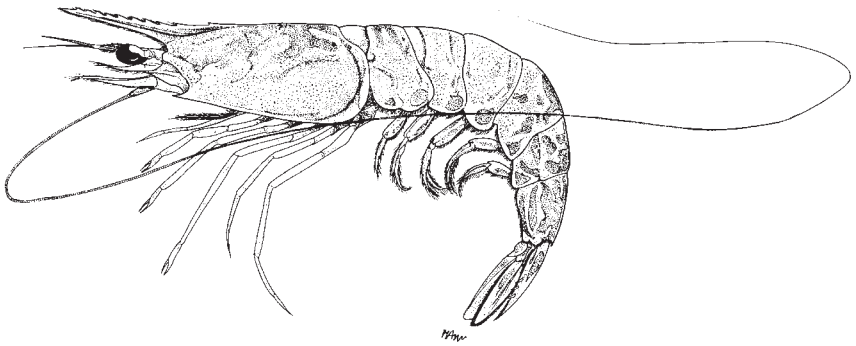
Distribution: Indo-West Pacific from the western coast of Thailand to Japan and Australia.

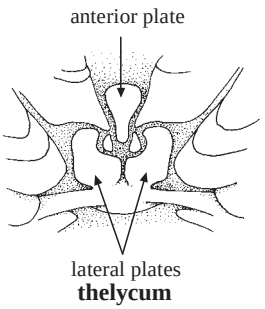


Metapenaeus anchistus (De Man, 1920)

Frequent synonyms / misidentifications: None / *Metapenaeus endeavouri* Schmitt, 1926; *M. intermedius* (Kishinouye, 1900).

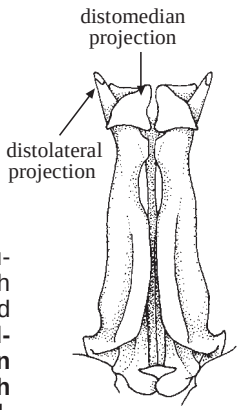
FAO names: En - Spiny greasyback shrimp.







merus of fifth leg (male)



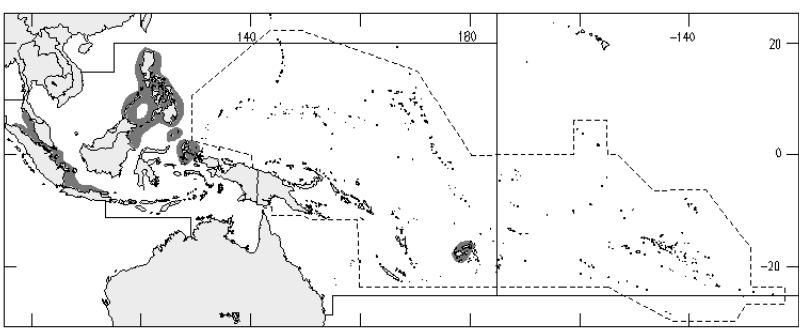
petasma (ventral view)

Diagnostic characters: Body covered with fine pubescence. **Rostrum distinctly directed upward, bearing 10 to 12 teeth along entire upper margin, almost straight and slightly curved downward at tip**; rostrum extending to about distal segment of antennular peduncle. Postrostral crest low. **Branchiocardiac crest distinct**. First leg with distinct ischial spine. In adult males, merus of fifth leg with a basal notch followed by a prominent keel. **Petasma of males with distolateral projections exceeding distomedian processes and without external spinules; distomedian processes triangular and close to each other. Thelycum of females with anterior plate expanded at anterior half; lateral plates generally leveled, posterior margin not raised and continuous with posterior transverse ridge; coxal projections of fourth leg conical. Telson with 3 pairs of large lateral spines. Colour: body rather yellowish** and covered with dense dark brown dots; eyes dark brown; rostrum and dorsal abdominal crest black-brown; antennal flagella reddish brown; legs somewhat yellowish or pink; pleopods more pinkish, with white markings on outer sides; **distal part of uropods bluish, with margins reddish brown to somewhat purplish.**

Size: Maximum body length 16.5 cm (females) and 14.6 cm (males), commonly between 7 and 14 cm.

Habitat, biology, and fisheries: Found mainly in depths to about 30 m. Caught by trawls and fish corrals. Commonly found in the Philippines and of moderate commercial importance because of its relatively large size; apparently less common or even rare in other parts of the area. Marketed mainly fresh for local consumption.

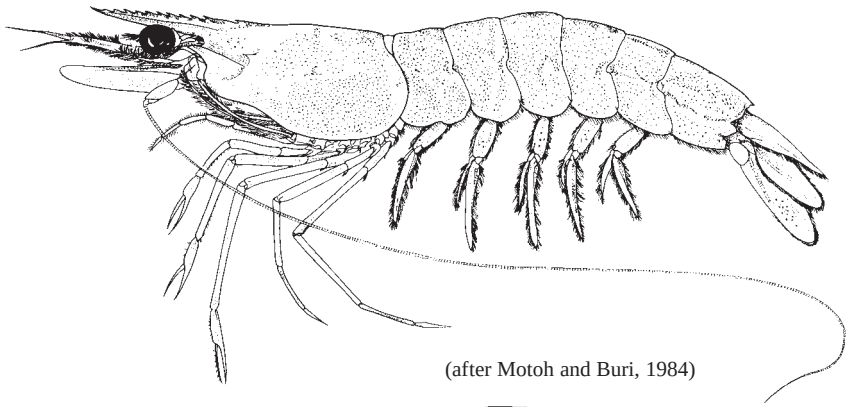
Distribution: Western Pacific from the Strait of Malacca to the Philippines and Fiji.



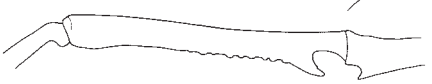
Metapenaeus ensis (De Haan, 1844)

Frequent synonyms / misidentifications: *Metapenaeus ensis baramensis* Hall, 1962; *M. incisipes* (Bato, 1888); *M. mastersii* (Haswell, 1879); *M. philippinensis* Motoh and Muthu, 1979 / *Metapenaeus monoceros* (Fabricius, 1798).

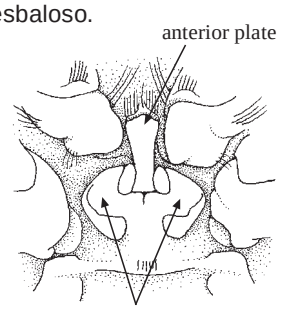
FAO names: En - Greasyback shrimp; **Fr** - Crevette glissante; **Sp** - Camarón resbaloso.



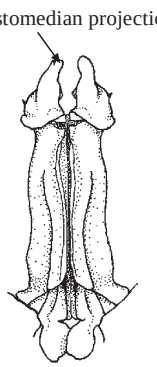
(after Motoh and Buri, 1984)



merus of fifth leg (male)



thelycum

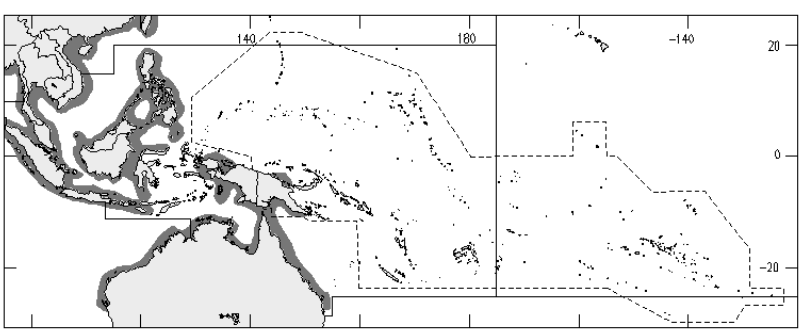


petasma (ventral view)

Diagnostic characters: Body covered with fine pubescence. **Rostrum armed with 8 to 11 teeth along entire upper margin, nearly straight** and extending to about tip of antennular peduncle. **Postrostral crest low. Branchiocardiac crest generally distinct and curved, almost reaching hepatic spine**. First leg bearing a small ischial spine. **In adult males, merus of fifth leg with a basal notch followed by a long, inwardly curved spine-like process and a row of tubercles. Petasma of males with distomedian process very large and triangular, covering almost entire distolateral projection in ventral view. Thelycum of females with long anterior plate; lateral plates with posterolateral edges strongly raised and curving inward, forming a pair of triangular projections.** Telson without distinct lateral spines. **Colour: body greyish green or dark green and covered with dense dark brown dots, large adults somewhat pinkish**; eyes black-brown; antennal flagella reddish; legs generally whitish, in large adults basal segments covered with red bands; **distal part of uropods somewhat bluish with reddish brown margins**.

Size: Maximum body length 18.9 cm (females) and 15.4 cm (males), commonly between 7 and 14 cm.

Habitat, biology, and fisheries: Mainly in turbid waters down to a depth of 95 m over bottoms of mud, sandy-mud or silt. Juveniles are found in estuaries and backwaters, sometimes also in seagrass beds, mangrove banks, mud flats, and open channels. Caught by trawls, set nets, scoop nets, traps, and artisanal gear. Also a common byproduct or a secondary species in prawn culture. Probably the most abundant and the most commercially important species of the genus in the area, constituting a large part of the *Metapenaeus* catches and pond industry in the Philippines (609 t and 670 t, respectively, in 1987), Singapore, Thailand (11 400 t and 2 700 t, respectively, in 1987), Indonesia (17 588 t and 13 784 t, respectively, in 1987), Viet Nam, and Malaysia. Fished commercially in northern Australia, with a catch of about 2 400 t (together with *Metapenaeus endeavouri*, catches from western Australia not included) during the annual period of 1989/1990. Marketed mainly fresh or frozen, also cooked or salted and sometimes used as bait, consumed locally and exported.

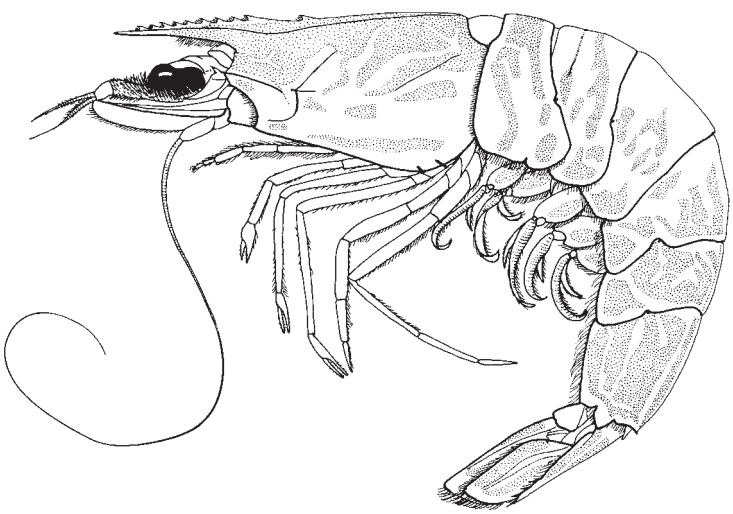


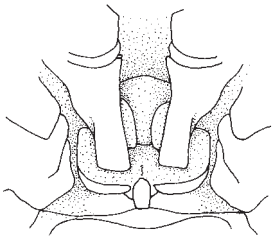
Distribution: Indo-West Pacific from the eastern coast of India and Sri Lanka to Japan and Australia.

Metapenaeus intermedius (Kishinouye, 1900)

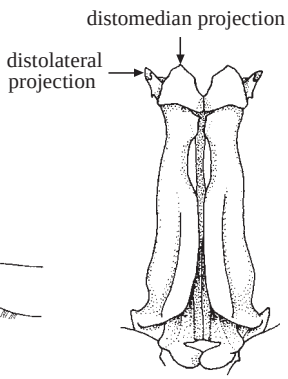
Frequent synonyms / misidentifications: None / None.

FAO names: En - Middle shrimp; **Fr** - Crevette ceinture; **Sp** - Camarón cintura.





thelycum



petasma (ventral view)

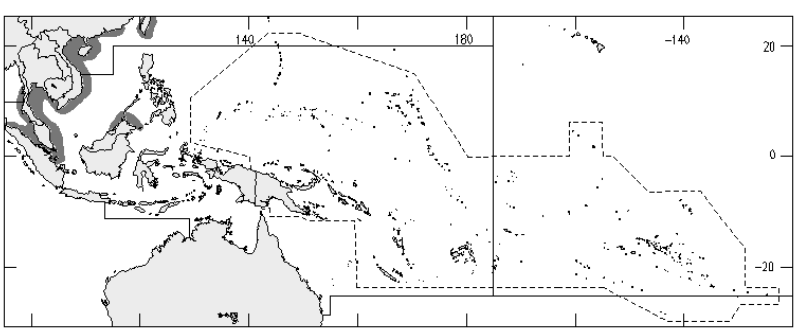


merus of fifth leg (male)

Diagnostic characters: Body covered with fine pubescence. **Rostrum distinctly directed upward and very straight, bearing 8 to 12 teeth along entire upper margin** and extending to about distal segment of antennular peduncle. **Postrostral crest low. Branchiocardiac crest distinct.** First leg bearing a distinct ischial spine. In adult males, merus of fifth leg with a basal notch followed by a distinct keel. **Petasma of males with distomedian processes triangular and exceeding distolateral projections; outer margin of distomedian processes bearing an external spinule. Thelycum of females bearing a posteromedian ogival boss; posterior edges of lateral plates slightly raised; coxal projections of fourth leg long, flat and truncate. Telson with 3 pairs of large lateral spines. Colour: body somewhat whitish, becoming slightly pinkish in large adults, covered with dense dark brown dots**; eyes dark brown; rostrum, outer margin of antennal scale, and dorsal abdominal crest black-brown; antennal flagella reddish brown; legs whitish; pleopods slightly reddish with white markings on outer sides; **distal part of uropods bluish, with margins reddish brown to somewhat purplish.**

Size: Maximum body length 19.3 cm (females) and 13.6 cm (males), commonly between 10 and 14 cm.

Habitat, biology, and fisheries: Found mainly in depths to 130 m, usually between 20 and 60 m. Taken mainly by trawls. Very common in the Strait of Malacca and Gulf of Thailand, probably also abundant in Viet Nam. Of moderate commercial importance because of its relatively large size. Marketed mostly fresh for local consumption.

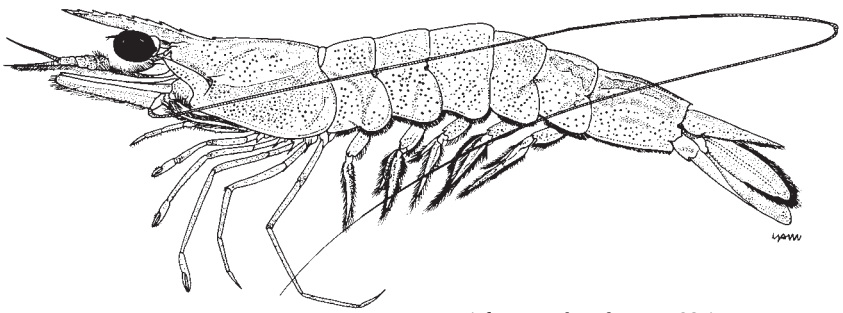


Distribution: Indo-West Pacific from the Andaman Sea to Malaysia, southern coast of China, and Japan.

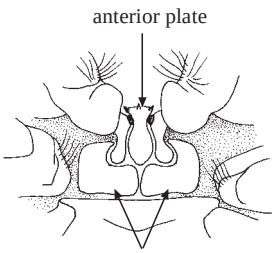
Metapenaeus moyebi (Kishinouye, 1896)

Frequent synonyms / misidentifications: *Metapenaeus burkenroadi* Kubo, 1954 / *Metapenaeus dalli* Racek, 1957; *M. mastersii* (Haswell, 1879) (= *M. ensis* (De Haan, 1844)).

FAO names: En - Moyebi shrimp; **Fr** - Crevette moyebi; **Sp** - Camarón moyebi.



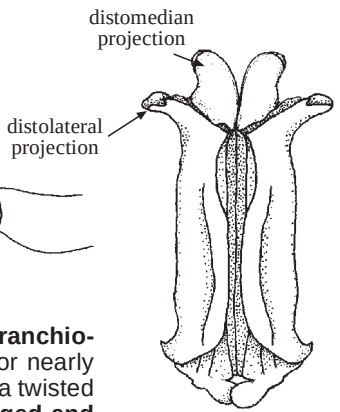
(after Motoh and Buri, 1984)



thelycum



merus of fifth leg (male)

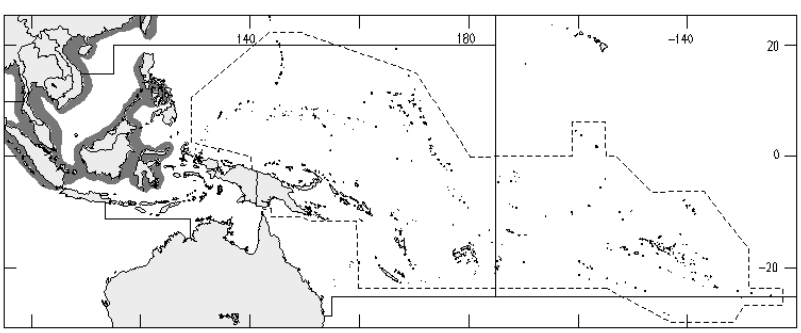


petasma (ventral view)

Diagnostic characters: Body covered with fine pubescence. **Rostrum armed with 7 to 10 teeth along entire upper margin, nearly straight or slightly uptilted at tip, extending to about middle of distal antennular article. Postrostral crest low. Branchiocardiac crest weak and indistinct**. First leg with ischial spine small or nearly absent. In adult males, merus of fifth leg with a basal notch followed by a twisted keeled tubercle. **Petasma of males with distomedian process enlarged and laminose or flap-like, strongly projected forward and diverging; distolateral projection directed anterolaterally. Thelycum of females with anterior plate flask-shaped, its anterior margin slightly convex and bearing 3 tubercles of subequal size; lateral plates kidney-shaped and often with angular contours. Telson without distinct lateral spines. Colour: body semi-translucent, somewhat pale green and covered with with dense dark brown dots;** eyes black-brown; antennal flagella reddish; pleopods slightly pinkish; **distal part of uropods somewhat yellowish green and with reddish brown margins.**

Size: Maximum body length 12.6 cm (females) and 8.3 cm (males), commonly between 5.5 and 9.5 cm.

Habitat, biology, and fisheries: Found on mud or sandy-mud bottom in estuaries, backwaters, and nearshore waters to depths of about 45 m. Caught by trawls, set nets, seines, traps, and artisanal gear. Appears to be quite abundant throughout its range in the area and is frequently seen in local markets, but only of secondary economic importance due to its relatively small size. Also reported to be used for aquaculture in Malaysia and Singapore but probably not the main cultured species there. Marketed mainly fresh for local consumption.

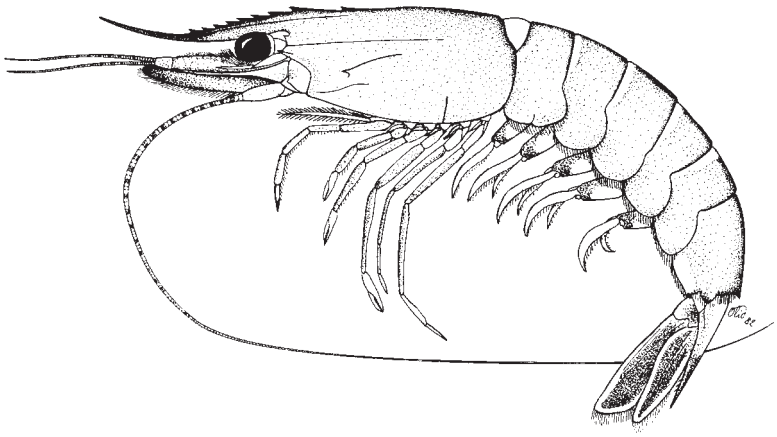


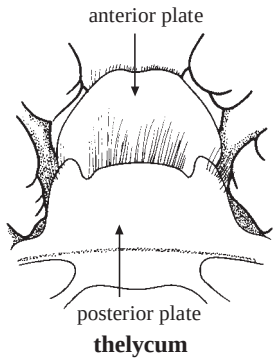
Distribution: Indo-West Pacific from the eastern coast of India and Sri Lanka to Japan and Indonesia.

Parapenaeopsis hardwickii (Miers, 1878)

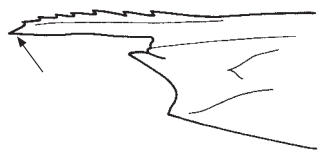
Frequent synonyms / misidentifications: None / *Parapenaeopsis cultrirostris* Alcock, 1906 (undetermined taxonomic status; generally considered as a synonym of *Parapenaeopsis sculptilis* (Heller, 1862).

FAO names: En - Spear shrimp; **Fr** - Crevette javelot; **Sp** - Camarón lanzón.

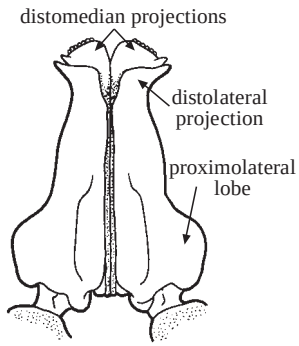




thelycum



rostrum of large males



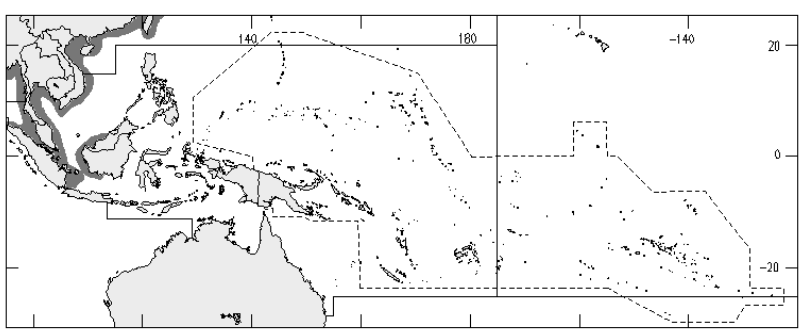
petasma (ventral view)

Diagnostic characters: Body naked and smooth. **Rostrum armed with 9 to 11 upper teeth; in females, rostrum very long and of sigmoidal shape, with distal 1/3 to 1/2 toothless, extending far beyond antennular peduncle; in adult males, unarmed portion absent and slightly curving downward, only reaching to middle of second antennular segment. Longitudinal suture extending to about 3/4 or more carapace length.** First and second legs bearing epipod and basial spine, basis of third leg unarmed. **Petasma of males with distomedian projection bluntly protruded and short, somewhat wing-like,** anterior margin often crenulate; distolateral projection short and directed laterally. **Thelycum of females with anterior plate concave and semi-circular in shape; posterior plate flat, its anterior margin slightly convex and bearing a transverse row of long hairs, with anterolateral angles strongly protruded forward.** Telson bearing only 3 to 5 pairs of minute movable lateral spinules. **Colour: body greyish to greenish grey, sometimes pink, and densely covered with dark-coloured dots**; eyes dark brown; rostrum black-brown; basal 1/3 of antennal flagella crossed with brown narrow bands; legs generally whitish to pinkish; pleopods reddish and with white and yellowish green markings on lateral surfaces; **uropods dark reddish brown with yellowish margins.**

Size: Maximum body length 13.5 cm (females) and 11.1 cm (males), commonly between 6 and 10 cm.

Habitat, biology, and fisheries: Found from the coastline to depths of about 90 m, usually less than 20 m, on bottom of mud, sandy-mud or sand. Juveniles mainly inhabit estuaries and backwaters. Caught by trawls, sometimes also by boat seines and stake nets, with females usually outnumbering males in the catches. Probably the most common species of the genus in the area and of moderate commercial importance. Appears to be rather abundant along the Malay Peninsula and in adjacent waters, where it often constitutes a significant part of the bycatch of prawn fishery. Marketed mainly fresh for local consumption.

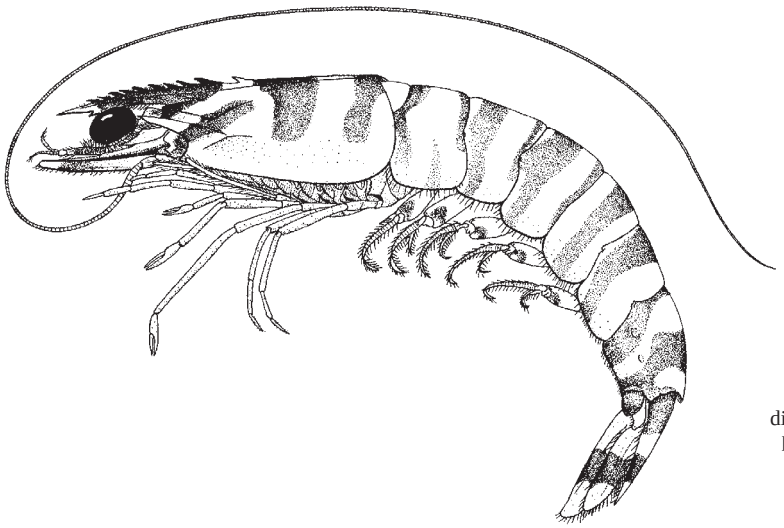
Distribution: Indo-West Pacific from Pakistan to Taiwan Province of China and Indonesia.

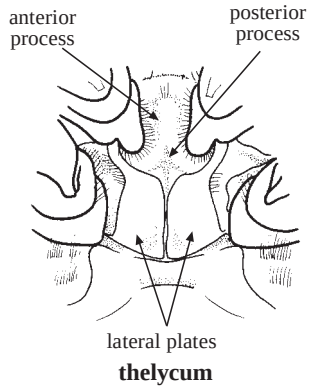


Penaeus canaliculatus (Olivier, 1811)

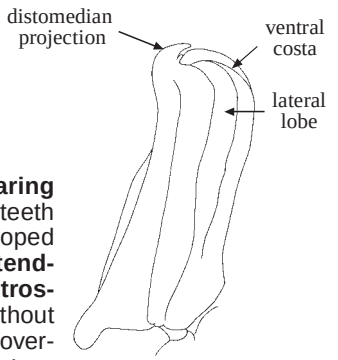
Frequent synonyms / misidentifications: None / *Penaeus japonicus* Bate, 1888.

FAO names: En - Witch prawn; **Fr** - Crevette soricère; **Sp** - Camarón brujo.





thelycum



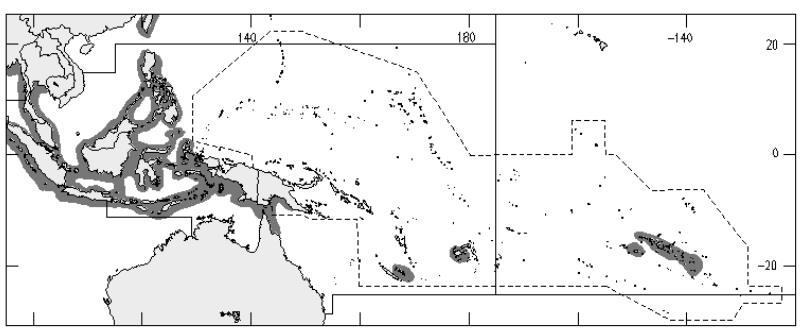
petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum armed with 10 or 11 upper teeth (including those on carapace) and **1 lower tooth;** postrostral crest well developed and with a deep median groove throughout its length; **adrostral groove extending almost to posterior margin of carapace and slightly wider than postrostral crest;** posterior end of gastrofrontal groove divided into 2. First leg without ischial spine. Petasma of males with very short distomedian projections overhanging distal margin of costae. **Thelycum of females formed by 2 subrectangular lateral plates, with their anterolateral angles diverging; anterior process suboval;** posterior process somewhat triangular. **Telson without lateral spines. Colour: body pale yellowish and crossed with dark brown transverse bands; those on carapace not extending over lower half of carapace while those on last abdominal segment usually continuous to the ventral margin**; eyes dark brown; antennal scale somewhat greenish and with white tips, flagella yellowish; legs yellowish to whitish; pleopods yellowish to reddish and with brown and white spots at bases; **distal part of uropods with a patch of bright yellow, followed by another patch of bright blue, and with reddish margins.**

Size: Maximum body length 18.2 cm (females) and 14.5 cm (males), commonly between 10 and 13 cm.

Habitat, biology, and fisheries: Found on sandy bottoms, from shallow water to depths of about 50 m. Taken by trawls and artisanal gear. An occasional bycatch in fisheries for other *Penaeus* species throughout its range in the area, but reported to be rather common in eastern New Guinea. Marketed fresh and frozen, often mixed with other species of *Penaeus*, and consumed locally. Can be easily confused with *Penaeus japonicus* in colour, and *Penaeus latisulcatus* when without colour.

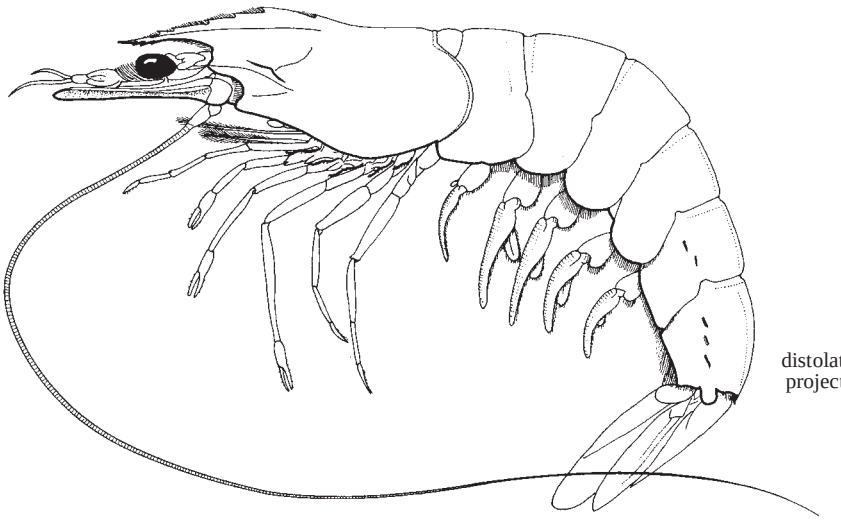
Distribution: Widely distributed in the Indo-West Pacific, from the eastern coast of Africa to the Red Sea, Taiwan Province of China, Okinawa, and Polynesia.

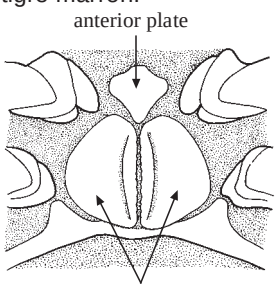


Penaeus esculentus Haswell, 1879

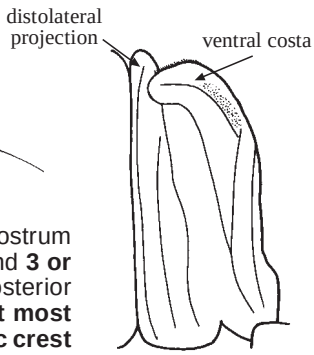
Frequent synonyms / misidentifications: None / None.

FAO names: En - Brown tiger prawn; **Fr** - Crevette tigrée brune; **Sp** - Camarón tigre marrón.





thelycum
(after Dall, 1957)

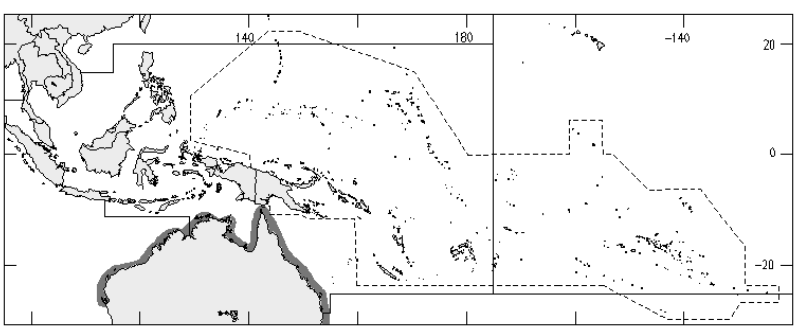


petasma (ventral view)
(after Dall, 1957)

Diagnostic characters: Carapace with grooves and crests distinct, rostrum generally armed with 5 to 7 upper teeth (including those on carapace) and **3 or 4 lower teeth**; postrostral crest well developed and reaching nearly to posterior margin of carapace, without a distinct median groove; **adrostral crest at most extending to last postrostral tooth; gastrofrontal crest absent; hepatic crest short, not extending behind antennal crest and slightly sloping anteroventrally. Fifth leg bearing an exopod (somewhat hidden beneath carapace)**. Petasma of males with distomedian projections overhanging distal margin of costae. Thelycum of females formed by 2 suboval lateral plates with tumid lips; anterior process rounded and with lateral edges somewhat raised, posterior process convex and partly inserted between lateral plates. Telson without lateral spines. **Colour: body brownish and covered with mud-yellow cross bands**; eyes light brown with many black dots; rostral teeth reddish brown; **antennal flagella alternated with white and brown bands**; both legs and pleopods reddish and with some white markings on basal segments; **distal half of uropods brown with red margins.**

Size: Maximum body length 23.5 cm (females) and 19 cm (males), commonly between 15 and 20 cm.

Habitat, biology, and fisheries: On the continental shelf from the coastline to a depth of 200 m, but usually between 10 and 20 m, on mud, sandy-mud or coarse bottoms. Juveniles inhabit shallow waters in estuaries, or are associated with seagrass beds, and sometimes found on the top of coral reef platforms. Feed primarily at night and are caught then by demersal otter trawls or beam trawls. Fished commercially in Australia, with a catch of about 3 300 t (together with *Penaeus semisulcatus*) in the Northern Prawn Fishery during the annual period of 1989/1990. Most of the catch is exported (mainly to Japan) and packed as frozen whole "green" (uncooked) prawns.

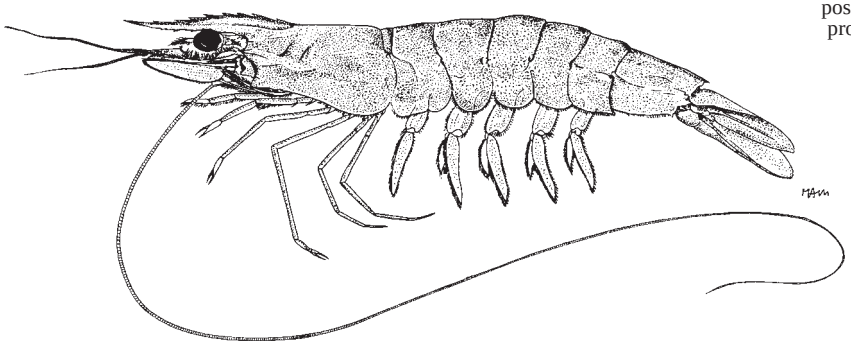


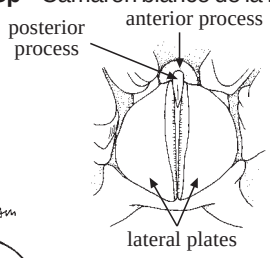
Distribution: Endemic to Australia from Sharks Bay (Western Australia) to Wallis Lake (New South Wales).

Penaeus indicus H. Milne Edwards, 1837 PNI

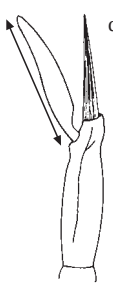
Frequent synonyms / misidentifications: None / *Penaeus merguiensis* De Man, 1888; *P. penicillatus* Alcock, 1905; *P. silasi* Muthu and Motoh, 1979.

FAO names: En - Indian white prawn; **Fr** - Crevette royale blanche (des Indes); **Sp** - Camarón blanco de la India.

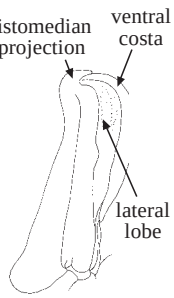




thelycum



distal 2 segments of third maxilliped (male)



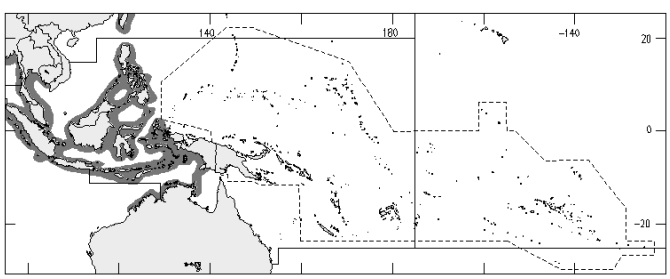
petasma (ventral view)

Diagnostic characters: Carapace rather smooth, **lacking gastrofrontal and hepatic crests**; adrostral crest extending as far as or just before epigastric tooth; **rostrum slightly curved at tip and sigmoidal-shaped**, usually bearing 7 to 9 upper teeth (including those on carapace) and **3 to 6 lower teeth; rostral crest generally slightly elevated in large specimens including adult females (but still with crest in females slightly higher than in males)**; postrostral crest extending near to posterior margin of carapace; **gastro-orbital crest distinct, extending over posterior 3/5 to 2/3 of distance between hepatic spine and orbital margin. In adult males, third maxilliped with distal segment about as long as second segment which bears a tuft of dense long hairs (same length as distal segment) at tip.** Petasma of males with distomedian projections strongly curved and overhanging distal margin of costae. Thelycum of females formed by 2 semi-circular lateral plates, with their median margins forming tumid lips; anterior process slightly rounded and slightly convex; posterior process elongated and inserted between anterior part of lateral plates; **both anterior and posterior processes rather distinct.** Telson lacking lateral spines. **Colour: body semi-translucent, somewhat yellowish white (small specimens) or greyish green and covered with numerous minute dark brown dots**; eyes light brown and covered with some dark brown mesh-like stripes; rostral and abdominal dorsal crests reddish brown to dark brown; **antennal flagella yellowish**; antennular flagella of same colour as body and covered with many dark spots; legs translucent and somewhat whitish, pleopods yellowish to pinkish; **distal part of uropods yellowish with red margins.**

Size: Maximum body length 23 cm (females) and 18.4 cm (males), usually less than 17 cm.

Habitat, biology, and fisheries: On sandy and muddy bottoms, from the coastline to depths of about 90 m. Caught by trawls, fish corrals, gill nets, beach seines, and artisanal gear. Also a suitable candidate for the prawn pond industry. An abundant species and of commercial importance in the Philippines, Singapore, and Australia. Also reported to be very abundant in Thailand (where it is one of the main pond cultured prawn species), Malaysia, and Indonesia. However, as this shrimp is often confused with *Penaeus silasi*, its reported abundance from Thailand to Indonesia remains uncertain. In the Philippines, it is often mixed and sold together with *Penaeus merguiensis*. In northern Australia, it occurs in deeper waters (deeper than 35 m) and is sold at slightly higher prices than *P. merguiensis* (together their catches were about 3 000 t in the annual period of 1989/1990). Marketed fresh and frozen, consumed locally and exported.

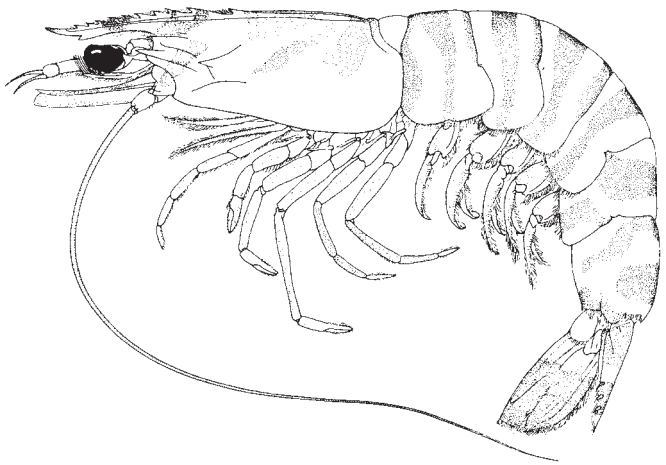
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Red Sea, Japan, and Australia.

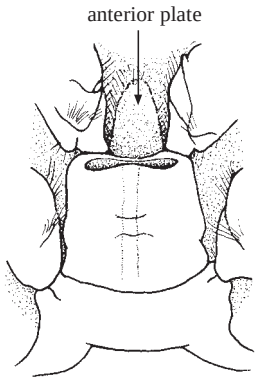


Penaeus japonicus Bate, 1888 KUP

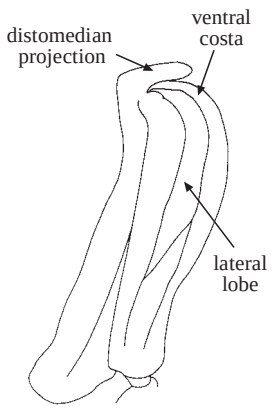
Frequent synonyms / misidentifications: None / None.

FAO names: En - Kuruma prawn; **Fr** - Crevette kuruma; **Sp** - Camarón kuruma.





thelycum

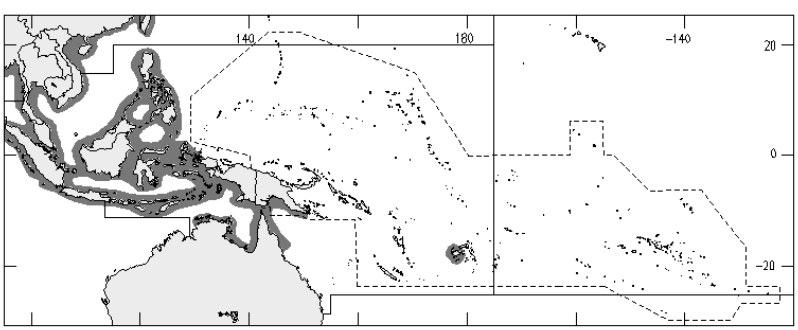


petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum generally armed with 9 or 10 upper teeth (including those on carapace) and **1 lower tooth, lacking distinct accessory crest on the blade;** postrostral crest well developed and with a deep median groove throughout its length; **adrostral groove extending near to posterior margin of carapace and almost as wide as postrostral crest; posterior end of gastrofrontal groove divided into 2**. First leg without ischial spine. Petasma of males with very long distomedian projections overhanging distal margin of costae. **Thelycum of females a well-developed pouch with double tubes, opened anteriorly;** anterior and posterior processes fused, forming a subtriangular concave plate. **Telson with 3 pairs of movable lateral spines. Colour: body pale yellowish and crossed with dark brown transverse bands; those on carapace generally extending to lower half of carapace, last abdominal band interrupted;** eyes dark brown; antennal scale somewhat greenish with white tips, flagella yellowish; legs whitish to yellowish (large specimens); pleopods yellowish to reddish (large specimens) and with brown and/or white spots at bases; **distal part of uropods with a patch of bright yellow, followed by another patch of bright blue, and with red margins.**

Size: Maximum body length 30 cm (females) and 20 cm (males), commonly between 11 and 20 cm.

Habitat, biology, and fisheries: Inhabits shelf areas from the coastline to depths of about 90 m, but usually less than 50 m, on sandy or sandy-mud bottoms. Adults usually are buried in the substrate during the daytime and are active at night. Caught by trawls, drift nets, set nets, traps, and artisanal gear. Common, but apparently not particularly abundant in the area; usually taken as bycatch in fisheries for other *Penaeus* species. Marketed fresh and frozen, often sold together with other species of *Penaeus*. Consumed locally and probably also exported to some extent.

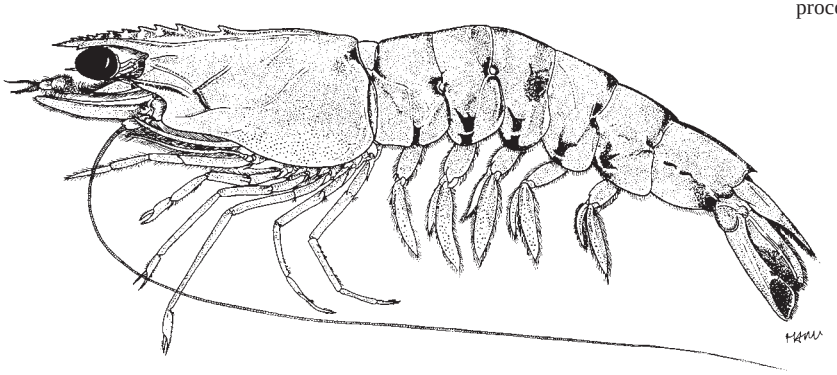


Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Red Sea, Japan, Australia, and Fiji; also entered the eastern Mediterranean through the Suez Canal.

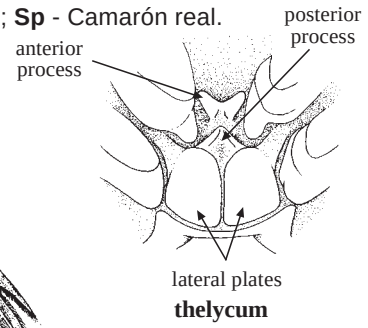
Penaeus latisulcatus Kishinouye, 1896 WKP

Frequent synonyms / misidentifications: *Penaeus latisulcatus hathor* Burkenroad, 1959 / None.

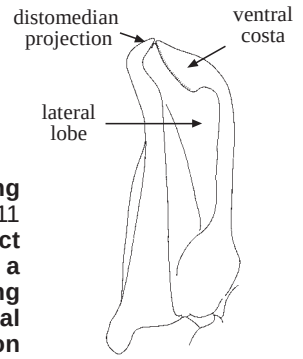
FAO names: En - Western king prawn; **Fr** - Crevette royale occidentale; **Sp** - Camarón real.



(after Motoh and Buri, 1984)



thelycum



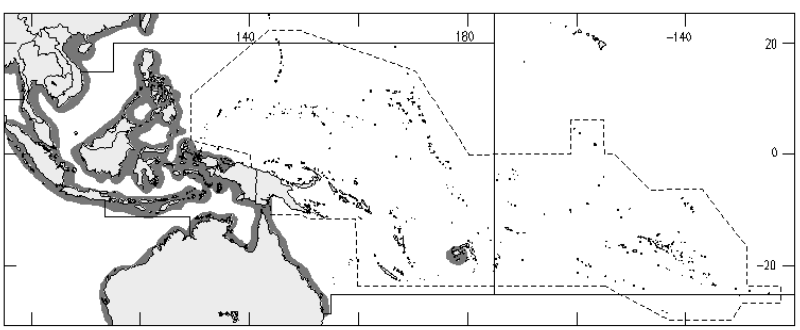
petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum generally armed with 10 or 11 upper teeth (including those on carapace) and **1 lower tooth, lacking distinct accessory crest on the blade; postrostral crest well developed and with a deep median groove throughout its length; adrostral groove extending almost to posterior margin of carapace and distinctly wider than postrostral crest; posterior end of gastrofrontal groove divided into 2. Ischial spine on first leg indistinct or nearly absent.** Petasma of males with short distomedian projections slightly overhanging distal margin of costae. **Thelycum of females formed by 2 subrectangular lateral plates and with anterolateral angles diverging; anterior process strongly bifurcate and horn-like**; posterior process triangular. Telson with 3 pairs of movable lateral spines. **Colour: body generally yellowish green, becoming slightly reddish in large adults; abdominal segments each with a short vertical black bar on pleuron;** hinges on abdomen often bearing dark brown spots and posterolateral part of carapace also sometimes with 2 black stripes positioned at a right angle (these 2 markings usually absent in specimens from Australia); eyes brownish and with many dark dots; rostrum, postrostral crest, antennal crest, and dorsal crests of abdomen dark brown to reddish brown; antennal scale with tip whitish and outer margin dark brown, **flagella whitish, becoming yellowish distally**; legs whitish to bluish or reddish; pleopods yellowish, with bases somewhat reddish; **uropods bright yellow, with distal half and outer margins of exopods bright blue, other margins reddish.**

Size: Maximum body length 20.2 cm (females) and 16.2 cm (males), commonly between 10 and 16 cm.

Habitat, biology, and fisheries: From the coastline to depths of about 90 m, on bottoms of sand, mud, or gravel, with a clear preference for sandy substrates. Adults are buried in the substrate during the daytime and come out to feed at night. Mainly taken offshore by trawls, sometimes also caught in shallow waters by traps, fish corrals, and other artisanal gear. Common in the area. From 1990 to 1995, the reported annual catch of *Penaeus latisulcatus* in the Western Central Pacific (Thailand) ranged from 1 271 to 1 624 t (FAO Yearbook of Fishery Statistics). Its annual catch (together with *Penaeus longistylus*) in northern Australia was about 100 t in the period of 1989/1990. Marketed fresh or frozen, consumed locally and exported.

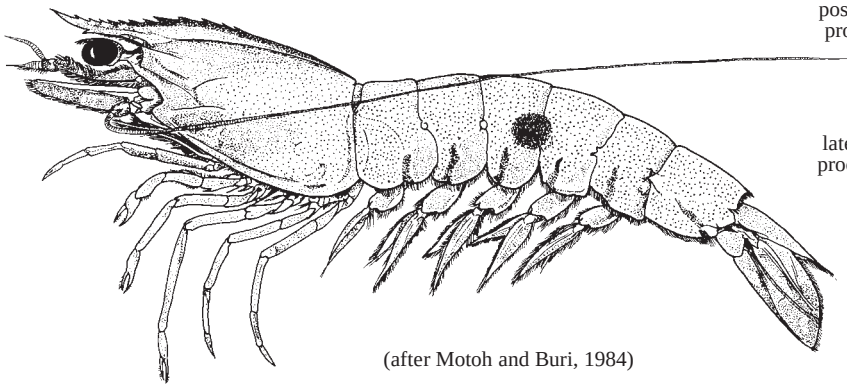
Distribution: Widely distributed in the Indo-West Pacific and reported from the eastern coast of Africa to the Red Sea, Japan, Australia, and Fiji (specimens from the Indian Ocean are sometimes treated as a different subspecies).



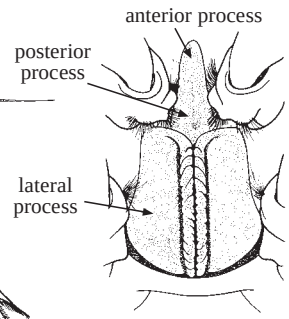
Penaeus longistylus Kubo, 1943

Frequent synonyms / misidentifications: *Penaeus caesius* Dall, 1957; *P. jejunus* Hall, 1956 / None.

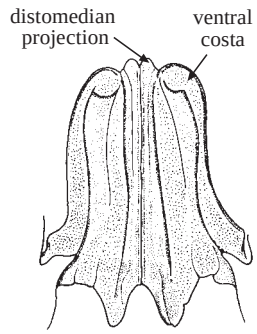
FAO names: En - Red-spot king prawn; **Fr** - Crevette royale à taches rouges; **Sp** - Camarón real manchado.



(after Motoh and Buri, 1984)



thelycum



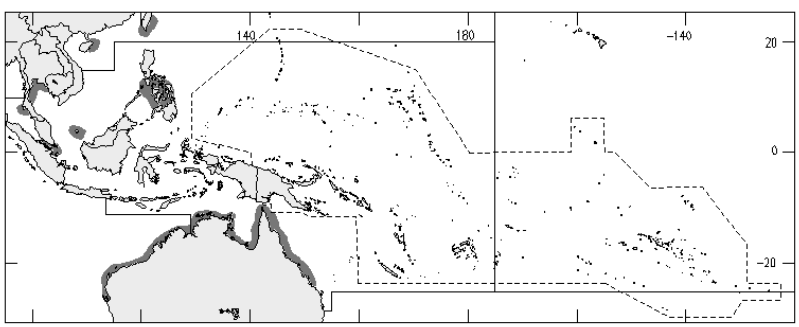
petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum with tip distinctly upturned, armed with 10 to 12 upper teeth (including those on carapace) and **1 lower tooth, lacking distinct accessory crest on the blade; postrostral crest well developed, with a deep median groove extending to about half of its length; adrostral groove extending almost to posterior margin of carapace and about twice as wide as postrostral crest;** posterior end of gastrofrontal groove divided into 2. **First leg bearing a strong ischial spine.** Petasma of males with short distomedian projections not overhanging distal margin of costae. Thelycum of females formed by 2 subrectangular lateral plates with tumid lips; anterior and posterior processes somewhat fused, with anterior end rounded. Telson with 3 pairs of movable lateral spines. **Colour: body generally yellowish green, becoming slightly pinkish in large adults; lower border of carapace reddish; posteroventral carapace and abdominal pleura each with a short vertical black bar except fifth pleuron which bears 2 vertical bars; lateral side of third abdominal segment often with a large red-brown circular spot**; eyes brownish and with many dark dots. Rostrum, postrostral crest, distal part of antennal scale, antennal carina, and dorsal crests of abdomen dark brown to red-brown; **antennal flagella yellowish white**; legs yellowish to reddish; pleopods yellowish; **uropods yellowish at basal half and purplish at distal half, with margins red and black except outer margins of exopods bright blue.**

Size: Maximum body length 18 cm (females) and 15 cm (males), commonly between 10 and 15 cm.

Habitat, biology, and fisheries: Inhabits reefs, sand or sandy-mud bottoms in depths from 18 to 60 m. Taken by trawlers offshore at night and in the vicinity of coral reefs, often together with *Penaeus latisulcatus*. Less common than *P. latisulcatus* in the area, except off northeastern Australia, where a commercial fishery has been developed for this species, with an annual catch ranging from 600 t to 1 800 t between 1983 and 1990. Marketed fresh or frozen, often sold together with *P. latisulcatus*, both locally consumed and exported.

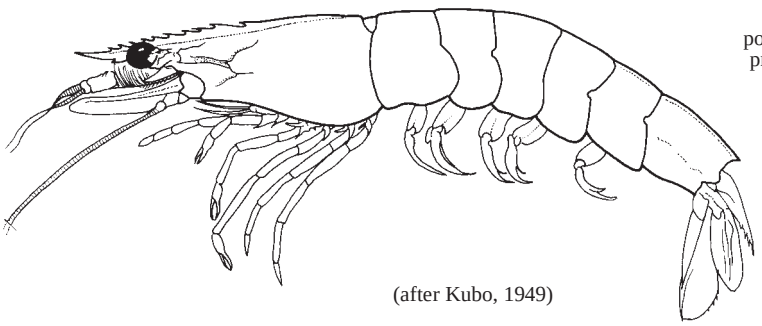
Distribution: Western Pacific; reported from Thailand, Malaysia, Singapore, South China Sea, Taiwan Province of China, the Philippines, Australia, and Lord Howe Island.



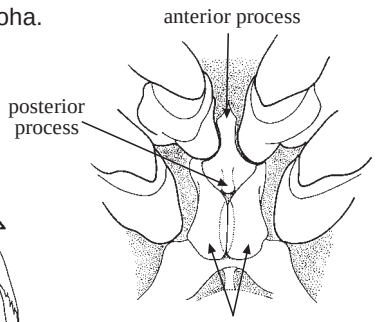
Penaeus marginatus Randall, 1840

Frequent synonyms / misidentifications: *Penaeus teraoi* Kubo, 1949 / None.

FAO names: En - Aloha prawn; **Fr** - Crevette aloha; **Sp** - Camarón aloha.

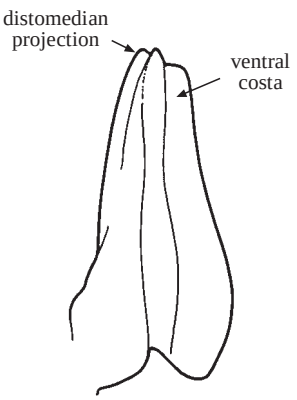


(after Kubo, 1949)



thelycum

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum armed with 9 or 10 upper teeth (including those on carapace) and 1 to 3 **(mostly 2) lower teeth; postrostral crest well developed but lacking median groove**; adrostral groove extending almost to posterior margin of carapace and about as long as wide as postrostral crest; posterior end of gastrofrontal groove divided into 2. First leg armed with a strong ischial spine. Petasma of males with very short distomedian projections. **Thelycum of females formed by 2 subrectangular lateral plates and with anterolateral angles diverging; anterior and posterior processes fused with anterior end sharply pointed**. Telson with 3 pairs of movable lateral spines. **Colour: body generally yellowish brown and becoming pinkish brown in large adults**; eyes brownish and with many dark dots; rostrum, and dorsal crests of abdomen dark brown; **antennal scale reddish brown with white tips, flagella whitish but distally becoming somewhat yellowish**; legs whitish at distal parts and orange-red at basal parts; pleopods pale red; **uropods bright yellow at basal part and pinkish purple at distal part, submarginal regions bright blue, margins reddish.**



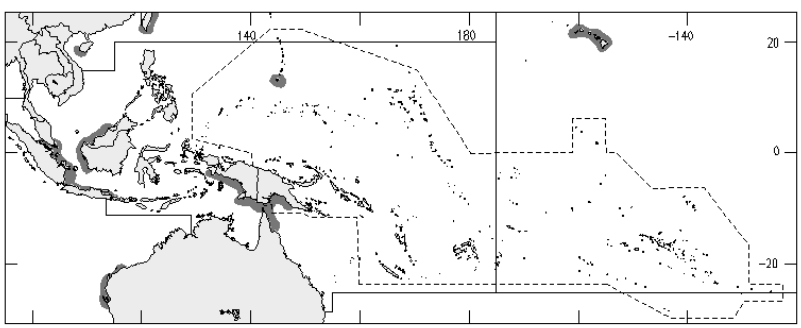
petasma (ventral view)

(after Lee and Yu, 1977)

Size: Maximum body length 20.5 cm, commonly between 13 and 17 cm.

Habitat, biology, and fisheries: Found on bottoms of sand and sandy mud, from the surface to a depth of 300 m, with adults preferring deeper waters. Mainly caught offshore by trawlers and apparently not very common in the area.

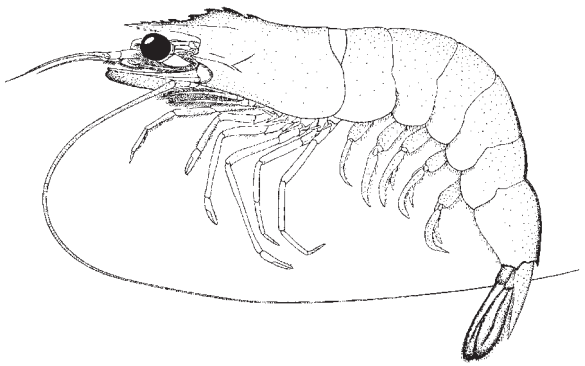
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan, Australia, Hawaii, and Cocos Islands.

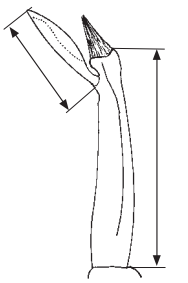


Penaeus merguiensis De Man, 1888 PBA

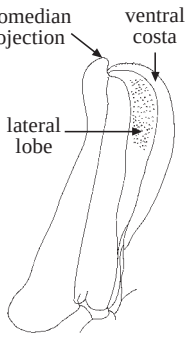
Frequent synonyms / misidentifications: None / *Penaeus indicus* H. Milne Edwards, 1837; *P. penicillatus* Alcock, 1905; *P. silasi* Muthu and Motoh, 1979.

FAO names: En - Banana prawn; **Fr** - Crevette banane; **Sp** - Camarón banana.

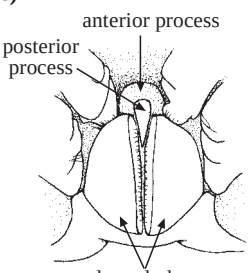




distal 2 segments of third maxilliped (male)



petasma (ventral view)

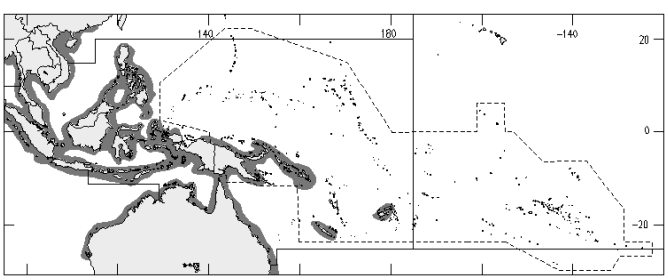


thelycum

Diagnostic characters: Carapace rather smooth, **lacking gastrofrontal and hepatic crests**; adrostral crest extending to, or just before, epigastric tooth; **tip of rostrum horizontally straight, and rostral crest becoming very high and broadly triangular in large specimens (even stronger in females)**, generally bearing 6 to 9 upper teeth (including those on carapace) and **mostly 3 to 5 lower teeth;** postrostral crest extending near to posterior margin of carapace; **gastro-orbital crest varying from distinct to nearly absent (in some specimens from the Philippines to Australia), extending over middle third to posterior 2/3 of the distance between hepatic spine and orbital margin. In adult males, third maxilliped with distal segment only about half as long as second segment which bears a tuft of dense short hairs (slightly shorter than distal segment) at tip.** Petasma of males with distomedian projections short, not reaching distal margin of costae. Thelycum of females formed by 2 semi-circular lateral plates, with their median margins forming tumid lips; **anterior process slightly rounded and concave, obscured by hairs**; posterior process elongated and inserted between anterior part of lateral plates. Telson lacking lateral spines. **Colour: body semi-translucent, somewhat yellowish (in youngs and moderate-sized specimens) to greenish (in very large specimens) and covered with numerous minute dark brown dots**; eyes light brown and covered with some dark brown mesh-like stripes; rostral and abdominal dorsal crests reddish brown to dark brown; **antennal flagella reddish brown**; antennular flagella of same colour as body and covered with many dark spots; legs translucent and somewhat whitish; pleopods pinkish to reddish; **distal part of uropods yellowish green with red margins; young specimens often with many longitudinal black broken lines on abdomen.**

Size: Maximum body length 24 cm (carapace length about 6 cm) in females and 20 cm (carapace length about 5 cm) in males, commonly between 13 and 15 cm.

Habitat, biology, and fisheries: On bottoms of sand and mud, from the coastline and river mouths to depths of about 55 m, usually less than 20 m; prefers turbid waters. Sometimes forms very dense shoals and good catches are often linked with heavy rainfall. One of the economically most important shrimp species in the area. From 1990 to 1995, the reported annual catch of *P. merguiensis* in the Western Central Pacific ranged from 44 303 to 52 087 t. About 4/5 of this production originated in Indonesia. Caught by trawls, fish corrals, pocket netting, beach seining, cast nets, and artisanal gear. Also plays an important role in pond culture in Thailand (1 814 t in 1995), Malaysia (66 t in 1995), Indonesia (24 610 t in 1995), and the Philippines (all these data from FAO Aquaculture Statistics). Marketed mostly fresh and frozen, consumed locally and exported. In the Philippines, this prawn has only about half the market value of *P. monodon* and in Australia it is sold at slightly lower prices than *P. indicus*.



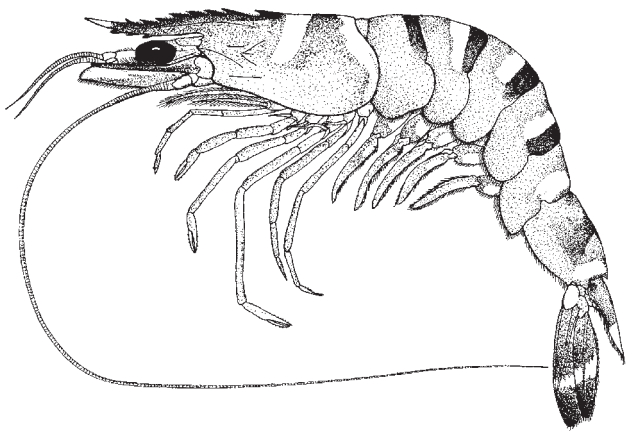
Distribution: Indo-West Pacific from the Arabian Sea to the South China Sea and Fiji.

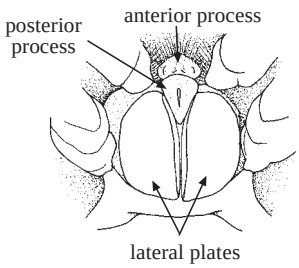
Penaeus monodon Fabricius, 1798

GIT

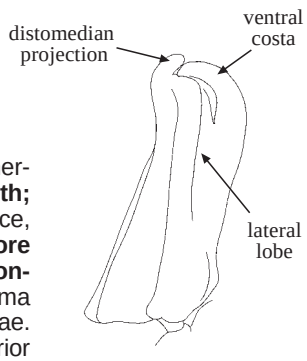
Frequent synonyms / misidentifications: *Penaeus bubulus* Kubo, 1949; *P. carinatus* Dana, 1852; *P. semisulcatus exsulcatus* Hilgendorf, 1879 / None.

FAO names: En - Giant tiger prawn; **Fr** - Crevette géante tigrée; **Sp** - Camarón tigre gigante.





thelycum

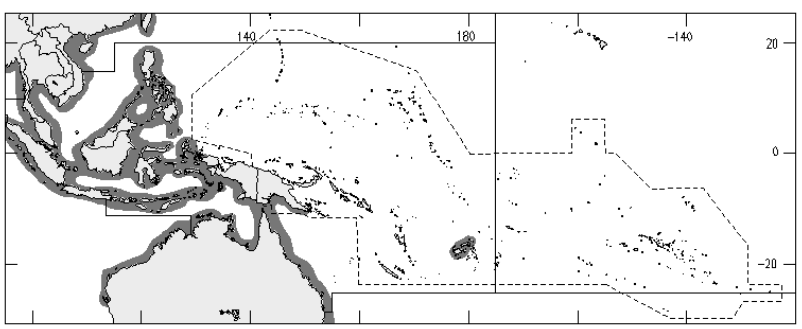


petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests distinct, rostrum generally armed with 6 to 8 upper teeth (including those on carapace) and **3 lower teeth;** postrostral crest well developed and reaching nearly to posterior margin of carapace, with or without a feeble median groove; **adrostral crest extending to just before last postrostral tooth; gastrofrontal crest absent; hepatic crest almost horizontal and extending far behind antennal crest. Fifth leg without exopod.** Petasma of males with distomedian projections slightly overhanging distal margin of costae. Thelycum of females formed by 2 suboval lateral plates with tumid lips; anterior process concave and rounded distally; posterior process subtriangular and partly inserted between lateral plates. Telson without lateral spines. **Colour: body greyish greenish or dark greenish blue; becoming reddish brown in large adults; carapace covered with mud-yellow transverse bands, while abdomen bears dark brown and mud-yellow cross bands**; eyes light brown with many black dots; **antennal flagella uniformly greenish brown**; legs of same colour as body but sometimes reddish or provided with bright yellow and blue bands; pleopods somewhat reddish or pale red, with bases bright yellow and blue; **distal half of uropods dark blue or dark brown with a red or mud-yellow median transverse band, and margins reddish.**

Size: Probably the largest known penaeid, with a maximum body length of 35 cm (females) and 26.8 cm (males), commonly between 12 and 20 cm.

Habitat, biology, and fisheries: From the coastline to depths of about 150 m, usually less than 30 m, on bottoms of sand, mud, or slits. Juveniles usually inhabit seagrass beds, mangrove swamps, and estuaries. Taken by trawls, gill nets, seine nets, stake nets, traps, and artisanal gear. More abundant in the western part of the area and of major economic importance. From 1990 to 1995, the reported yearly catch of *Penaeus monodon* in the Western Central Pacific ranged from 8 513 to 17 194 t (FAO Yearbook of Fishery Statistics). Also commercially very important for aquaculture. Large-scale pond culture of this prawn is practised in many Southeast Asian countries such as Thailand (276 982 t in 1995), Malaysia (6 713 t in 1995), Indonesia (84 100 t in 1995), Philippines (88 815 t in 1995), and Australia (1 613 t in 1995). Marketed mostly fresh and frozen, consumed locally and exported. In the Philippines, it is an expensive food item and ranks above other *Penaeus* species.



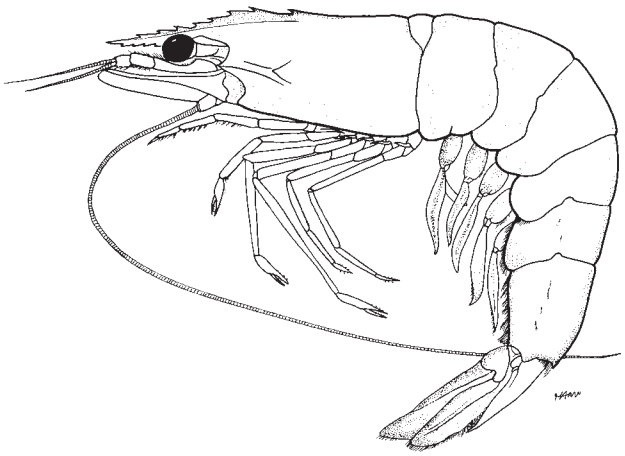
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Red Sea, Japan, Australia, and Fiji.

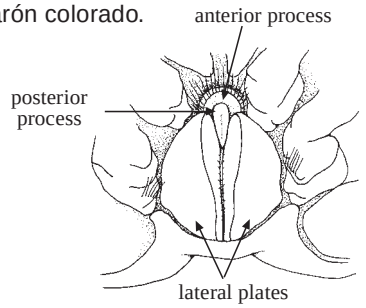
Penaeus penicillatus Alcock, 1905

REP

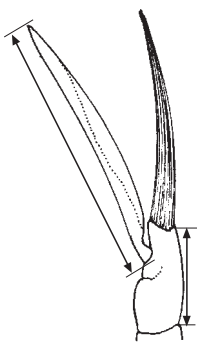
Frequent synonyms / misidentifications: None / *Penaeus indicus* H. Milne Edwards, 1837; *P. merguiensis* De Man, 1988; *P. silasi* Muthu and Motoh, 1979.

FAO names: En - Redtail prawn; **Fr** - Crevette queue rouge; **Sp** - Camarón colorado.

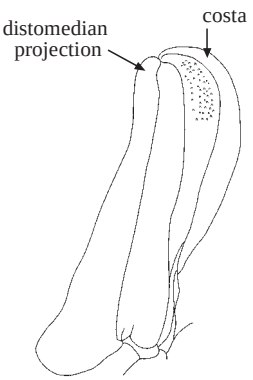




thelycum



distal 2 segments of third maxilliped (male)



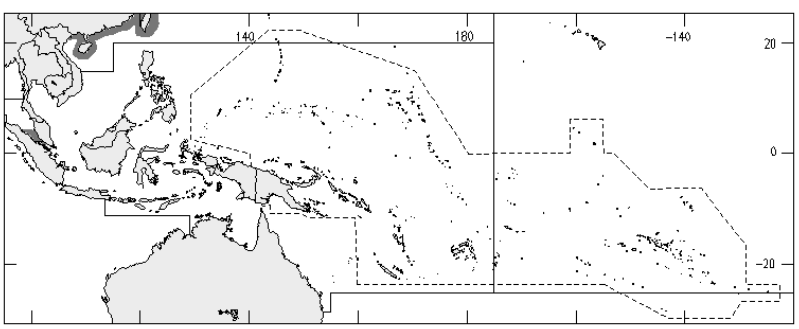
petasma (ventral view)

Diagnostic characters: Carapace rather smooth, **lacking gastrofrontal and hepatic crests**; adrostral crest extending just beyond epigastric tooth; **tip of rostrum horizontally straight, and rostral crest generally slightly elevated in youngs and adult males, to moderately high in large females**; rostrum usually armed with 7 to 9 upper teeth (including those on carapace) and **3 to 5 lower teeth;** postrostral crest extending near to posterior margin of carapace; **gastro-orbital crest distinct, occupying 1/2 to 1/3 the distance between hepatic spine and orbital margin. In adult males, third maxilliped with distal segment much longer than second segment which bears a tuft of dense long hairs (as long as distal segment) at tip.** Petasma of males with distomedian projections slightly bent and not reaching distal margin of costae. Thelycum of females formed by 2 semi-circular lateral plates, with their median margins as tumid lips; **anterior process slightly rounded and obscured by hairs**; posterior process elongated and inserted between anterior part of lateral plates. Telson lacking lateral spines. **Colour: body semi-translucent, slightly greenish and covered with numerous minute dark brown dots**; eyes light brown and covered with some dark brown mesh-like stripes; rostral and abdominal dorsal crests reddish brown to dark brown; **antennal flagella reddish brown**; antennular flagella of same colour as body and covered with many dark spots; legs translucent and somewhat whitish; pleopods rather reddish; **distal half of uropods yellowish to greenish but always with reddish tips.**

Size: Maximum body length 21.2 cm (carapace length 3.3 cm) in females and 16.3 cm (carapace length 3.1 cm) in males, commonly between 10 and 16 cm.

Habitat, biology, and fisheries: On soft bottoms, from the coastline to a depth of about 90 m. Caught by trawls, seines, scoop nets, and artisanal gear. Marketed fresh and frozen. Reported to be rather common in Malaysia, but can be easily confused with *Penaeus indicus*, *P. merguiensis*, and *P. silasi*, and is probably not so common in the area.

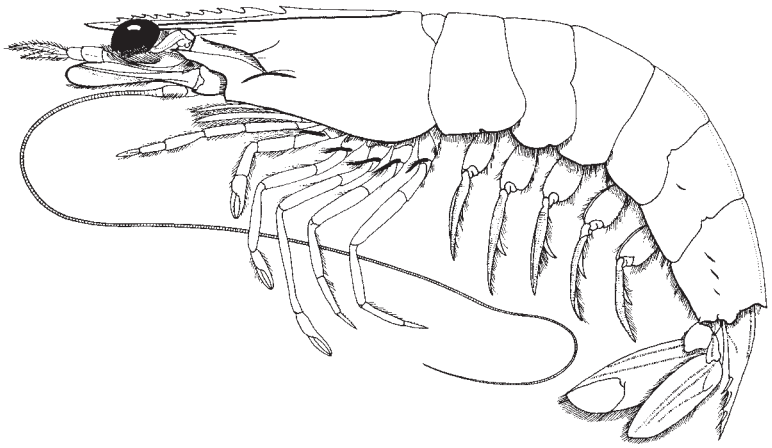
Distribution: Indo-West Pacific from Pakistan to Taiwan Province of China and Indonesia.

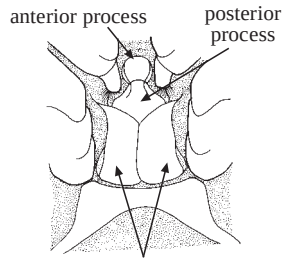


Penaeus plebejus Hess, 1865 PNP

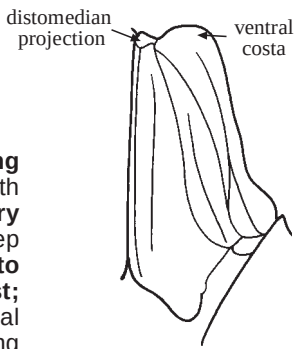
Frequent synonyms / misidentifications: None / None.

FAO names: En - Eastern king prawn; **Fr** - Crevette royale orientale; **Sp** - Camarón real oriental.





thelycum



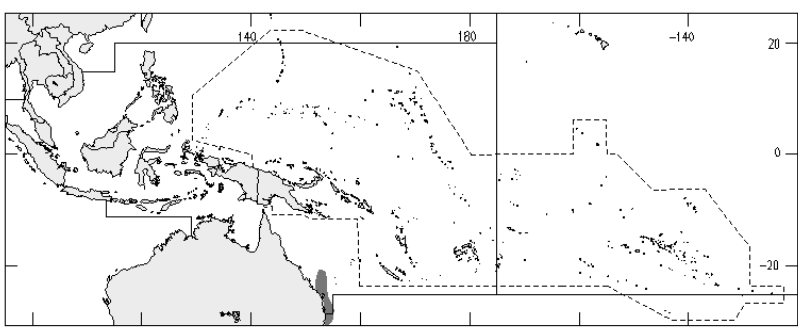
petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum armed with 10 or 11 upper teeth (including those on carapace) and **1 lower tooth, bearing distinct accessory crest on blade also in adults**; postrostral crest well developed, with a deep median groove all along its length; **adrostral groove extending almost to posterior margin of carapace and distinctly wider than postrostral crest; posterior end of gastrofrontal groove divided into 3.** First leg without ischial spine. Petasma of males with short distomedian projections not overhanging distal margin of costae. Thelycum of females formed by 2 subrectangular lateral plates and with anterolateral angles diverging; **anterior process bearing 2 minute, almost contiguous horns**; posterior process somewhat triangular. Telson with 3 pairs of movable lateral spines. **Colour: body generally yellowish cream, abdominal segments with faint dark spots at hinges and a faint dark vertical bar on each pleuron**; rostrum dark brown with white tip; eyes deep brown; **antennal scale with dark brown outer margins and white tip, flagella whitish**; postrostral crest and dorsal crests of abdomen dark brown to red-brown; legs slightly pinkish; pleopods pinkish to slightly yellowish; **uropods of same colour as body but with pale blue margins and red-brown fringes.**

Size: Maximum body length 30 cm (females) and 19 cm (males), commonly between 14 and 20.5 cm.

Habitat, biology, and fisheries: Found on sandy bottoms of bare and vegetated areas from depths of 2 to 220 m, with a migration pattern from estuaries to deeper marine waters northward along the coasts. This prawn forms the basis of an important fishery in eastern Australia, with a catch of about 3 250 t in the annual period of 1989/1990 (60% of the total commercial catch originating in southern Queensland). Subadults and adults are mainly caught by trawlers offshore at depths below 60 m. Juveniles are caught mainly within estuaries by trawling, set pocket, running netting, hauling, seining, and hand netting. Marketed locally fresh, frozen, or cooked. Larger specimens are exported mainly to Spain and Japan as “green” (uncooked), frozen, or headed prawns.

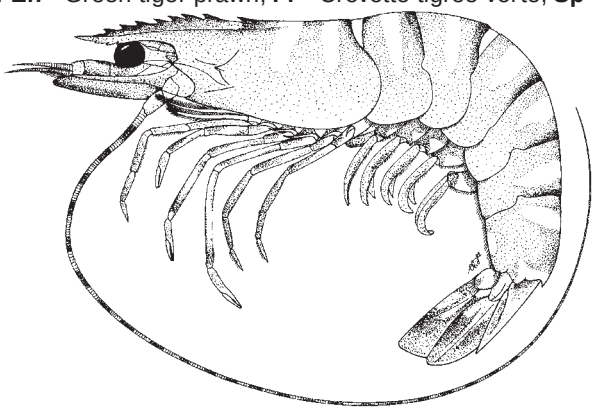
Distribution: Restricted to eastern Australia, from southern Queensland to Victoria and Lord Howe Island.

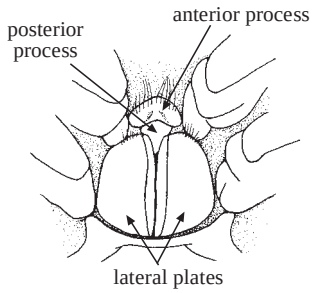


Penaeus semisulcatus De Haan, 1844 TIP

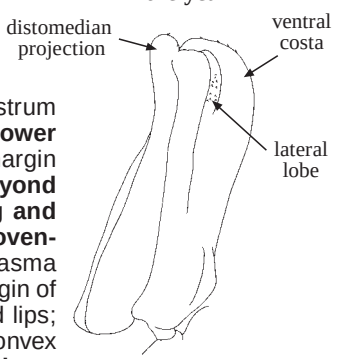
Frequent synonyms / misidentifications: *Penaeus ashiaka* Kishinouye, 1900; *P. monodon manillensis* Villaluz and Arriola, 1938; *P. semisulcatus paucidentatus* Parisi, 1919 / None.

FAO names: En - Green tiger prawn; **Fr** - Crevette tigrée verte; **Sp** - Camarón tigre verde.





thelycum

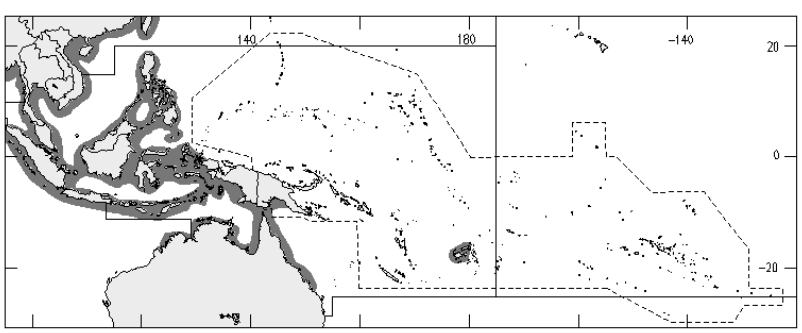


petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests distinct, rostrum generally armed with 6 to 8 upper teeth (including those on carapace) and **3 lower teeth;** postrostral crest well developed and reaching nearly to posterior margin of carapace, with a distinct median groove; **adrostral crest extending beyond last postrostral tooth; gastrofrontal crest absent; hepatic crest long and extending behind antennal crest, straight but distinctly sloping anteroventrally. Fifth leg with exopod (somewhat hidden beneath carapace).** Petasma of males with distomedian projections short and not overhanging distal margin of costae. Thelycum of females formed by 2 suboval lateral plates with tumid lips; anterior process subtriangular and with raised edges, posterior process convex and partly inserted between lateral plates. Telson without lateral spines. **Colour: body reddish brown to pale brown or dark green, carapace covered with mud-yellow transverse bands while abdomen including tail fan bears greyish brown and mud-yellow cross bands;** eyes light brown with many black dots; rostral teeth dark brown; **antennal flagella alternated with white and brown bands**; both legs and pleopods reddish and covered with some white markings, with tips of legs whitish, and bases of legs and pleopods also whitish; **distal half of uropods dark reddish brown and with red margins.**

Size: Maximum body length 25 cm (females) and 18 cm (males), commonly between 13 and 18 cm.

Habitat, biology, and fisheries: On the continental shelf from the coastline to depths of about 130 m, usually less than 60 m, over bottoms of sand, mud, or sandy-mud. Seems to prefer high salinity waters, with juveniles often associated with seagrass beds and sometimes found on the top of coral reef platforms. Reported to form small shoals and to be predominantly nocturnal, buried in the substrate during the daytime. Mainly taken offshore by trawls, sometimes also caught by fish corrals in coastal areas. Commonly seen in the markets of Thailand and Indonesia, and the most dominant prawn species in offshore fisheries in the Philippines. FAO's Yearbook of Fishery Statistics records 650 t of this species taken in 1995 from the Western Central Pacific, this figure comprising exclusively catches from Thailand. Also caught commercially in Australia, with an annual catch of about 3 300 t (together with *Penaeus esculentus*) from the Northern Prawn Fishery during the annual period of 1989/1990. Marketed mostly fresh and frozen, consumed locally and exported.

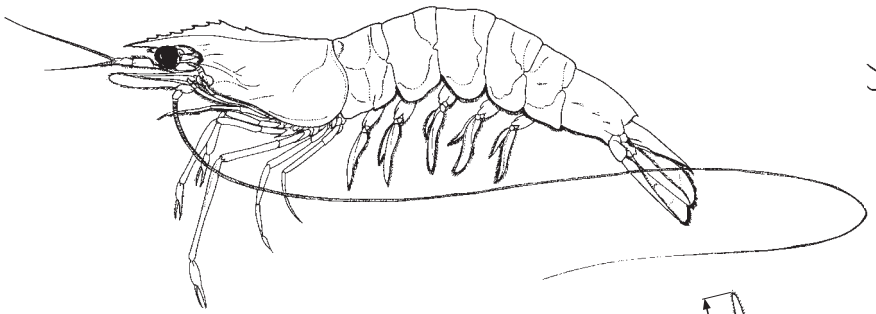


Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan, Australia, and Fiji; also entered the eastern Mediterranean through the Suez Canal.

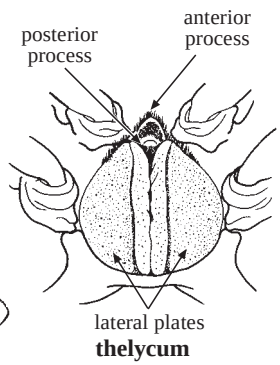
Penaeus silasi Muthu and Motoh, 1979

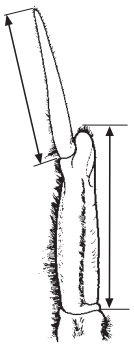
Frequent synonyms / misidentifications: None / *Penaeus indicus* H. Milne Edwards, 1837; *P. merguiensis* De Man, 1888; *P. penicillatus* Alcock, 1905.

FAO names: En - False white prawn.

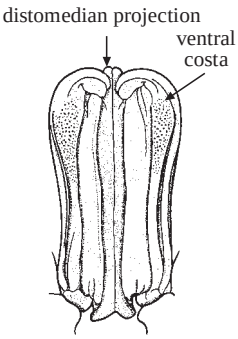


(after Muthu and Motoh, 1979)





distal 2 segments of third maxilliped (male)



petasma (ventral view)

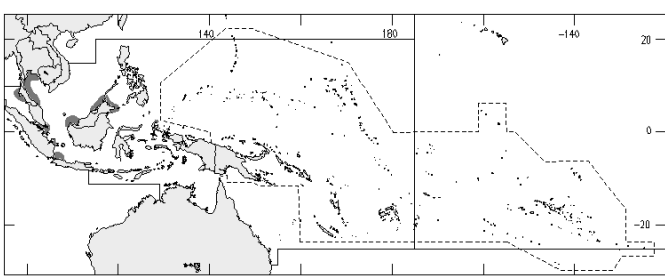
(after Muthu and Motoh, 1979)

Diagnostic characters: Carapace rather smooth, **lacking gastrofrontal and hepatic crests**; adrostral crest extending to about epigastric tooth; **tip of rostrum horizontally straight; rostral crest slightly to moderately elevated in youngs and adult males but high and broadly triangular in large females**, with 7 to 9 upper teeth (including those on carapace) and **4 or 5 lower teeth;** postrostral crest extending near to posterior margin of carapace; **gastro-orbital crest distinct, extending over posterior 3/5 to 2/3 of distance between hepatic spine and orbital margin. In adult males, third maxilliped with distal segment about as long as second segment which bears only a rudimentary tuft of hairs at tip.** Petasma of males with distomedian projections slightly bent and not overhanging distal margin of costae. Thelycum of females formed by 2 semi-circular lateral plates, with their median margins forming tumid lips; **anterior process rounded and slightly concave, generally distinct and not obscured by hairs (more clear in adults)**; posterior process elongated and inserted between anterior part of lateral plates. Telson without lateral spines. **Colour: body semi-translucent, somewhat yellowish white (small specimens) to pinkish (large specimens) and covered with numerous minute dark brown dots (dots becoming obscure in large specimens)**; eyes light brown and covered with some dark brown mesh-like stripes; rostral and abdominal dorsal crests reddish brown to dark brown; **antennal flagella reddish brown**; antennular flagella of same colour as body and covered with many dark spots; legs translucent and somewhat whitish, while pleopods yellowish to pinkish; **distal part of uropods yellowish with red margins; young specimens often with short longitudinal black broken lines on abdomen.**

Size: Maximum body length 20 cm in females (carapace length 4.8 cm) and 15.3 cm in males (carapace length 4.1 cm), commonly between 12 and 16 cm.

Habitat, biology, and fisheries: Found on muddy bottom in shallow waters to a depth of about 36 m. Caught by trawlers and probably artisanal gear. An abundant species in the markets of Singapore and of commercial importance. Probably also common in Thailand, Malaysia, and Indonesia, where it is often confused with *Penaeus indicus*. Marketed fresh and frozen, mainly for local consumption.

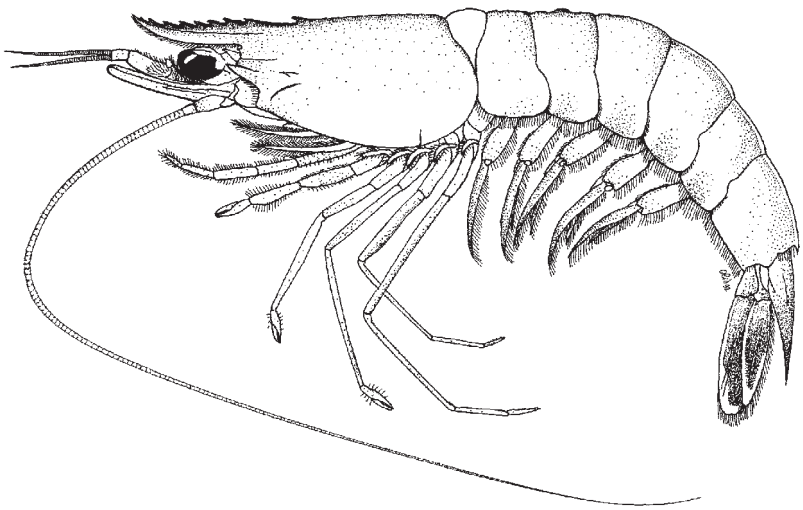
Distribution: Indo-West Pacific; so far only reported from Thailand (Andaman Sea and Gulf of Thailand), Indonesia, Malaysia, and Singapore. Since this shrimp can be easily confused with *P. indicus*, *P. merguiensis*, and *P. penicillatus*, its actual distribution is likely to be wider in the Indo-Malay region.

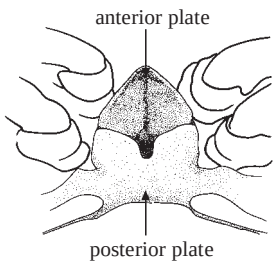


Trachypenaeus curvirostris (Stimpson, 1860) TRV

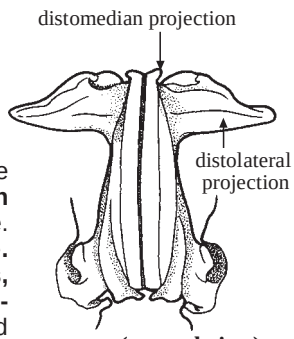
Frequent synonyms / misidentifications: ? *Trachypenaeus asper* Alcock, 1905 / *Trachypenaeus longipes* (Paulson, 1875); *T. malaiana* Balss, 1933.

FAO names: En - Southern rough shrimp; **Fr** - Crevette gambri archée; **Sp** - Camarón fijador arquero.





thelycum



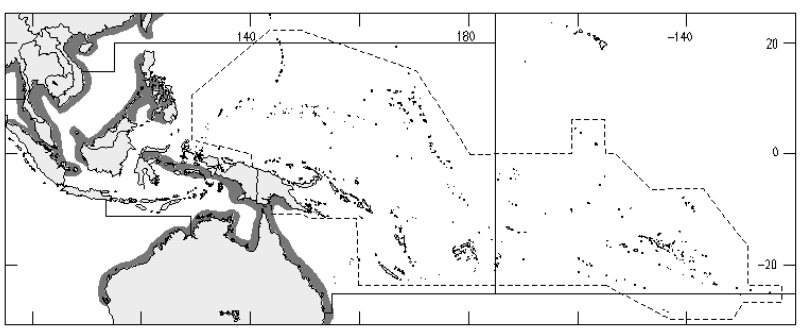
petasma (ventral view)

Diagnostic characters: Entire body hairy, with grooves and crests on carapace obscure. **Rostrum slightly upcurved at tip, armed with 6 to 8 upper teeth (including those on carapace)** and extending to about distal antennular article. **Postrostral crest low and extending almost to posterior margin of carapace.** Longitudinal suture on carapace short. **First 3 pairs of legs bearing epipods, first leg additionally armed with a distinct ischial spine, fifth leg not exceeding tip of antennal scale.** Abdomen with a small median tubercle on second segment, **last 4 segments with a low dorsal crest, distinctly incised posteriorly. Petasma of males T-shaped, distolateral projections broadly wing-like and directed laterally,** distomedian projections small. **Thelycum of females with anterior plate concave and bluntly pointed anteriorly, bearing a median groove; posterior plate with a distinct median notch on anterior margin.** Telson generally armed with 3 or 4 pairs of small movable lateral spines. **Colour: body greyish pink to greyish blue, sometimes whitish on sides**; eyes dark brown; **antennal flagella reddish**; legs pinkish and with some white patches; pleopods reddish with white markings on sides; **uropods almost entirely reddish, with margins whitish to yellowish.**

Size: Maximum body length 10.5 cm (females) and 8.1 cm (males), commonly between 5 and 8 cm.

Habitat, biology, and fisheries: Found on sand, mud, or sandy-mud bottom, from depths of 10 to 300 m, but usually between 30 and 60 m. Reported from many places in the area, but its actual distribution is unclear as it is often confused with other species of the genus. Probably of minor commercial importance. Caught mainly at night by trawls and bottom gill nets, also by artisanal gear. Marketed mainly fresh for local consumption.

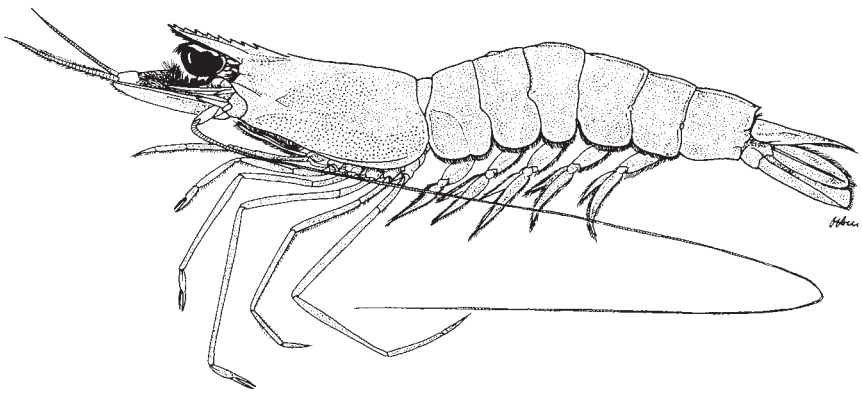
Distribution: Indo-West Pacific from eastern coast of Africa to Japan and northern Australia, also entered the eastern Mediterranean through the Suez Canal.



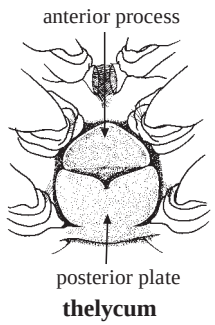
Trachypenaeus malaiana Balss, 1933

Frequent synonyms / misidentifications: *Trachypenaeus fulvus* Dall, 1957; *T. unicus* Hall, 1961 / *Trachypenaeus curvirostris* (Stimpson, 1860).

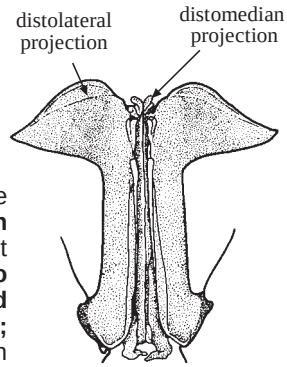
FAO names: En - Malayan rough shrimp; **Fr** - Crevette gambri malaise; **Sp** - Camarón fijador malayo. (these FAO names were previously used for *Trachypenaeus sedili*).



(after Motoh and Buri, 1984)



thelycum



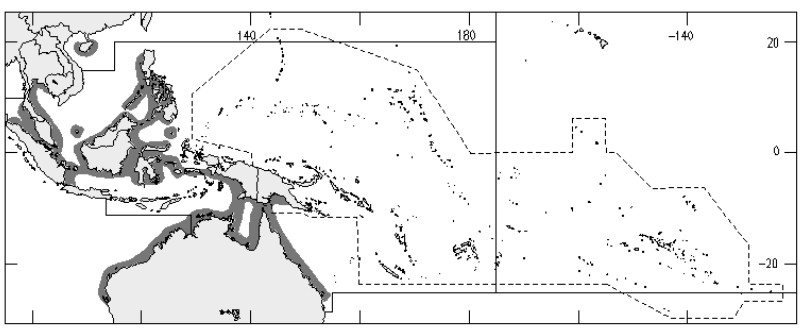
petasma (ventral view)
(after Motoh and Buri, 1984)

Diagnostic characters: Entire body hairy, with grooves and crests on carapace obscure. **Rostrum armed with 9 or 10 upper teeth (including those on carapace), nearly straight or slightly curved upward at tip,** extending to about second antennular article. **Postrostral crest low and extending almost to posterior margin of carapace.** Longitudinal suture on carapace short. **Epipod present only on third leg; ischial spine on first leg small to entirely absent; fifth leg extending beyond antennal scale.** Abdomen bearing a small median tubercle on second segment, last 4 segments with a low dorsal crest. **Petasma of males T-shaped, with distolateral projections broadly wing-like and directed laterally,** distomedian projections small. **Thelycum of females with anterior plate semi-circular and edges slightly raised, bearing a low median groove; posterior plate with anterior margin broadly V-shaped and bearing a narrow but deep median notch.** Telson generally armed with 1 pair of small movable lateral spines. **Colour: body generally greyish to greyish blue, posterior margin of each abdominal segment covered with an indistinct narrow dark grey band**; eyes dark brown; **antennal flagella greyish brown**; legs yellowish to pinkish; pleopods pinkish, with whitish to yellowish markings on sides; **uropods almost entirely dark grey to brownish and with yellowish margins.**

Size: Maximum body length 10.5 cm (females) and 8 cm (males), commonly between 5.5 and 8 cm.

Habitat, biology, and fisheries: Found in offshore waters at depths from 5 to 60 m, over muddy bottoms, juveniles in brackish water. Taken mainly by trawls. Probably the most common species of the genus in the area, but of limited commercial importance due to its small size and nowhere very abundant. Forms a bycatch in prawn fisheries. Marketed mainly fresh or frozen for local consumption.

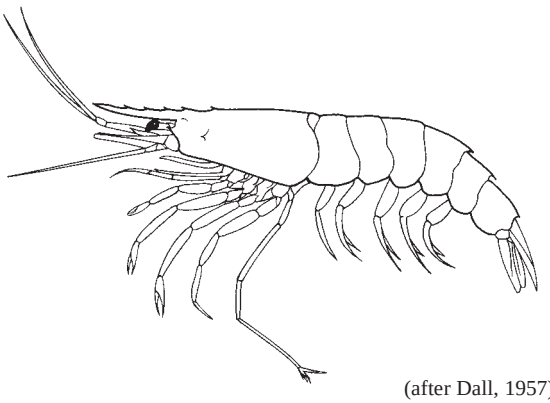
Distribution: Western Pacific from the Strait of Malacca to the Philippines, South China Sea, and northern Australia.



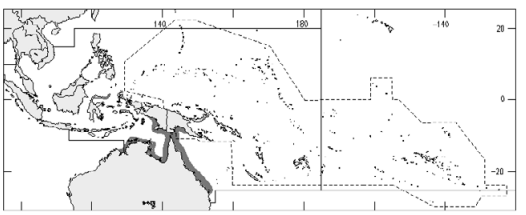
Atypopenaeus formosus Dall, 1957

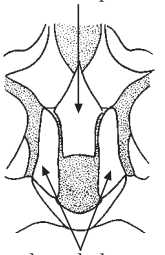
En - Orange shrimp; **Fr** - Crevette orange; **Sp** - Camarón naranji.

Maximum body length 10 cm (females) and 8 cm (males). Inhabits shallow inshore waters to depths of about 30 m, usually less than 10 m, over soft mud bottoms. Taken as bycatch in trawls. Of minor commercial importance. Its local name in Australia, “go home prawn”, refers to the common reaction of fishermen upon finding large numbers of this shrimp in their catches. Marketed fresh or frozen for local consumption. Restricted to the waters between New Guinea and northern Australia.

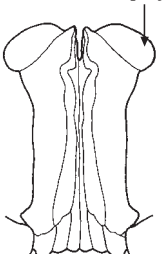


(after Dall, 1957)





thelycum

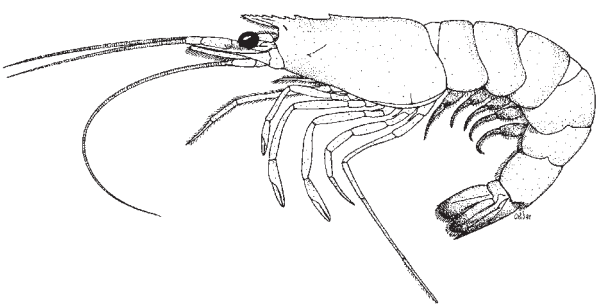


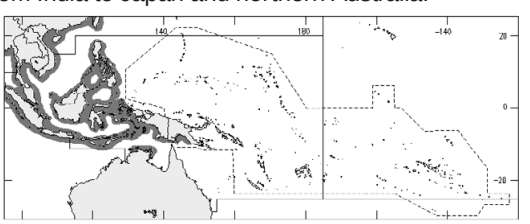
petasma (ventral view)

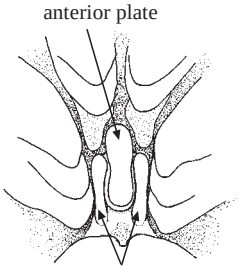
Atypopenaeus stenodactylus (Stimpson, 1860)

En - Periscope shrimp; **Fr** - Crevette périscope; **Sp** - Camarón periscopio.

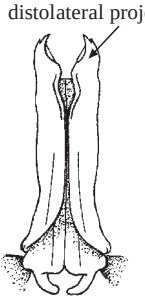
Maximum body length 5 cm (females) and 4 cm (males). On muddy bottoms close to the shore, from depths of 10 to 30 m. Taken by trawls, bag nets, and artisanal gear. Generally of no commercial importance in the area, due to its very small size, and not particularly abundant in the catches. Marketed mainly fresh for local consumption. Indo-West Pacific from India to Japan and northern Australia.







thelycum



petasma (ventral view)

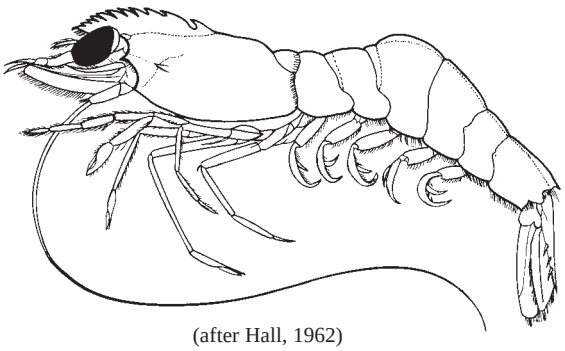
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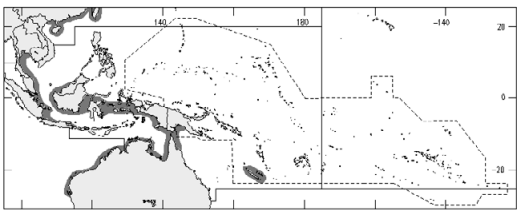
Metapenaeopsis lamellata (De Haan, 1844)

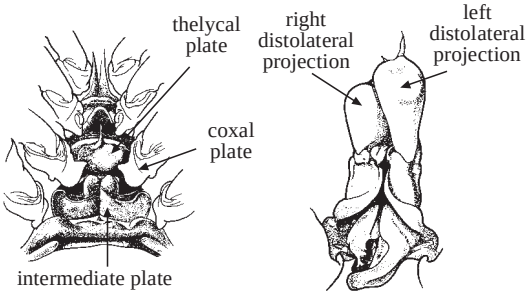
En - Humpback shrimp; **Fr** - Crevette bossue; **Sp** - Camarón jorobado.

Maximum body length 10 cm (females) and 6 cm (males). At depths between 4 and 200 m, associated with hard bottoms of reef and coral debris. Sometimes taken by trawls. Not very common throughout its range in the area and of very limited commercial interest. Marketed fresh for local consumption. Western Pacific from the Gulf of Thailand to Japan, Australia, and New Caledonia.



(after Hall, 1962)



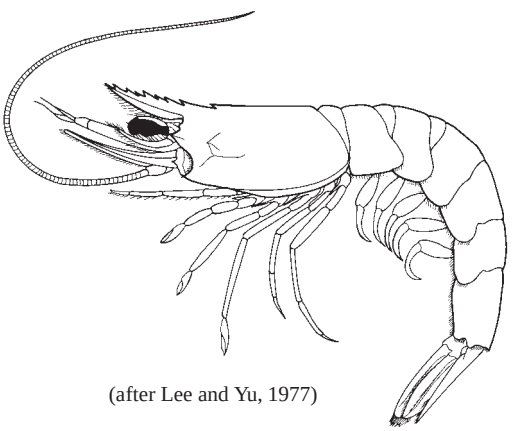


(after Crosnier, 1994)

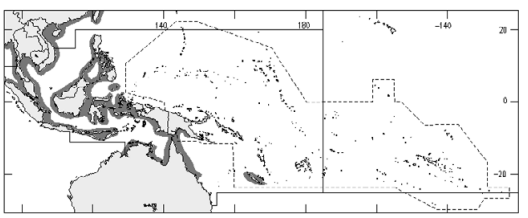
Metapenaeopsis mogiensis (Rathbun, 1902)

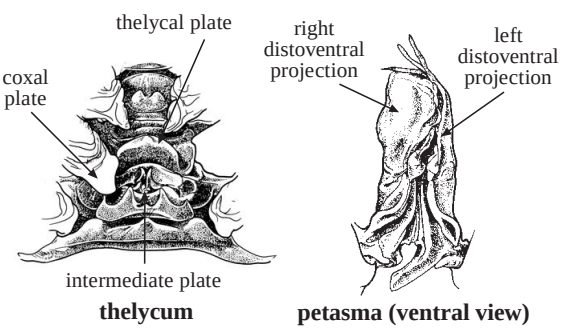
En - Mogi velvet shrimp; **Fr** - Crevette chamois mogi; **Sp** - Camarón gamuza mogi.

Maximum body length 10.1 cm (females) and 8.2 cm (males); commonly between 5 and 7 cm. Over hard bottoms adjacent to coral reefs, from depths of 10 to 156 m, usually less than 50 m. Not particularly common in the area and of very limited commercial importance; sometimes taken as bycatch in trawls. Marketed fresh for local consumption. Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan, Australia, and New Caledonia (sometimes divided into 4 subspecies).



(after Lee and Yu, 1977)



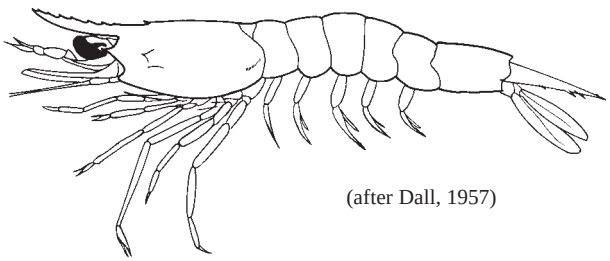


(after Crosnier, 1991)

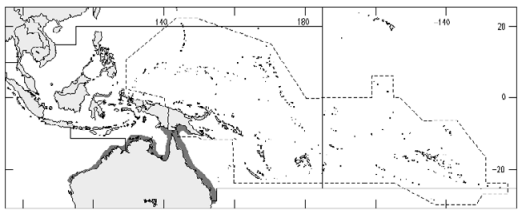
Metapenaeopsis novaeguineae (Haswell, 1879)

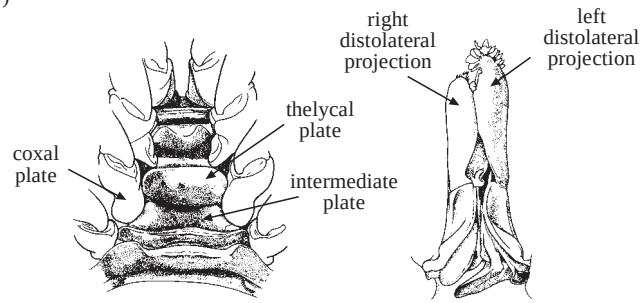
En - Northern velvet shrimp; **Fr** - Crevette chamois nordique; **Sp** - Camarón gamuza norteño.

Maximum body length 11.5 cm (females) and 7 cm (males). Over muddy to sandy bottoms, from depths of 5 to 30 m. Taken by trawls. A common bycatch in the prawn fishery operating in its range, but of minor commercial importance, due to its small size. Marketed fresh or frozen together with other small species and used for local consumption. Restricted to the waters between New Guinea and Australia.



(after Dall, 1957)





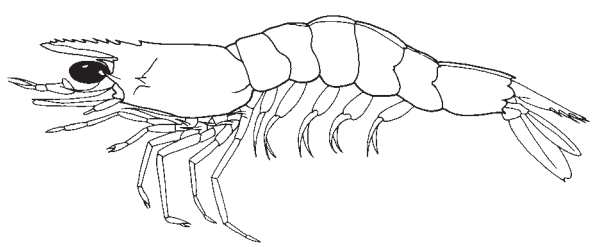
thelycum **petasma (ventral view)**

(after Crosnier, 1994)

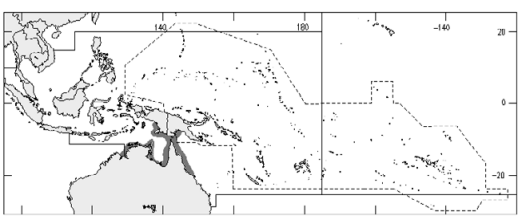
Metapenaeopsis rosea Racek and Dall, 1965

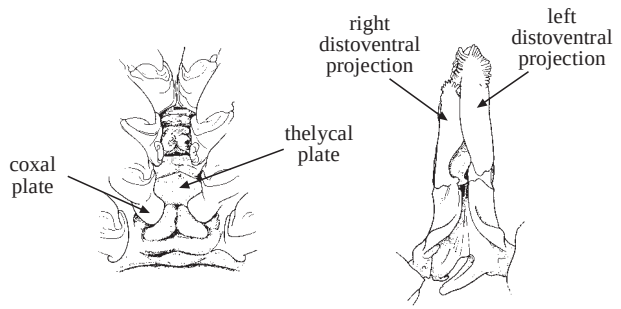
En - Pink velvet shrimp; **Fr** - Crevette chamois rosée; **Sp** - Camarón gamuza rosado.

Maximum body length 12.2 cm (females) and 11 cm (males). On muddy bottoms, from depths of 7 to 52 m. Restricted to the waters between New Guinea and Australia. Not abundant and of very limited commercial importance.



(from Crosnier, 1994)





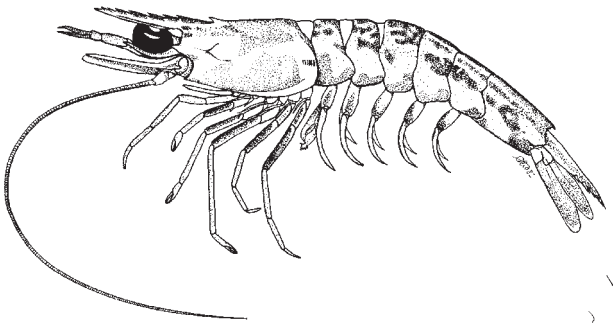
thelycum **petasma (ventral view)**

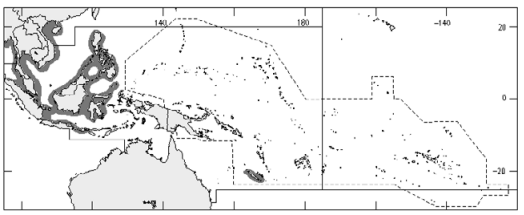
(after Crosnier, 1994)

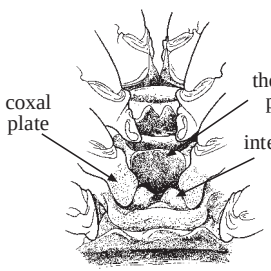
Metapenaeopsis stridulans (Alcock, 1905)

En - Fiddler shrimp; **Fr** - Crevette violoneux; **Sp** - Camarón violinista.

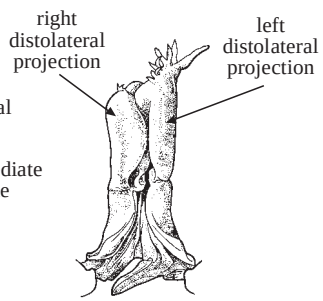
Maximum body length 10.6 cm (females) and 8.9 cm (males); commonly between 6 and 9 cm. On sandy or muddy bottoms, from depths of 9 to 90 m. Taken by trawls, gill nets, seines, and artisanal gear. Of limited commercial importance and apparently nowhere abundant in the area. Marketed mainly fresh for local consumption. Indo-West Pacific from the Persian Gulf to the South China Sea and New Caledonia.







thelycum



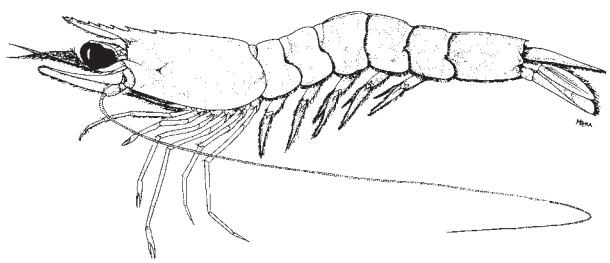
petasma (ventral view)

(after Crosnier, 1994)

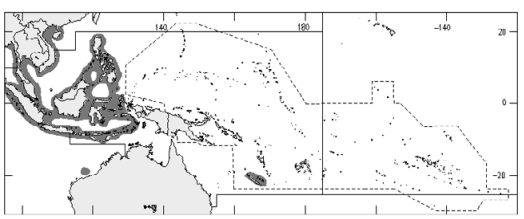
Metapenaeopsis toloensis Hall, 1962

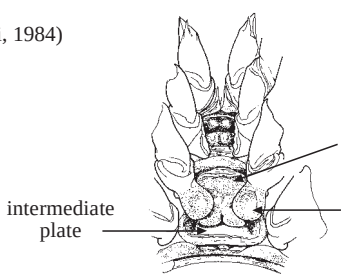
En - Tolo velvet shrimp; **Fr** - Crevette chamois tolo; **Sp** - Camarón gamuza tolo.

Maximum body length 10 cm (females) and 8 cm (males); commonly between 6 and 9 cm. On sandy or muddy bottoms, from depths of 8 to 73 m. Taken by trawls and artisanal gear. Not particularly common in the area and of minor or no commercial importance. Marketed mainly fresh for local consumption. Indo-West Pacific from the Maldives to Japan and New Caledonia.

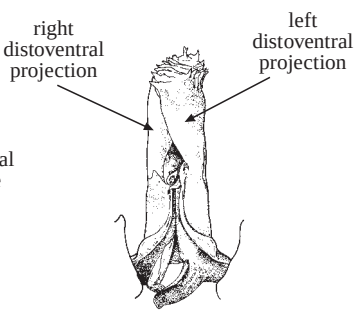


(after Motoh and Buri, 1984)





thelycum



petasma (ventral view)

(after Crosnier, 1994)

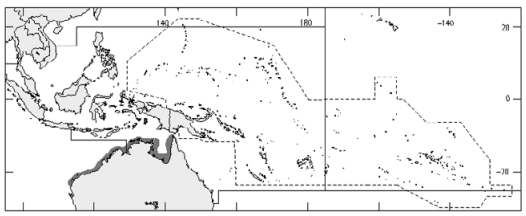
Metapenaeopsis wellsi Racek, 1967

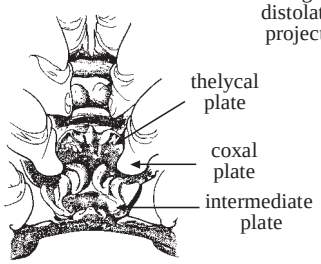
En - Velvet shrimp.

Maximum body length 11 cm (females) and 11.8 cm (males). At depths between 13 and 78 m. Restricted to northern Australia from Shark Bay (Western Australia) to Gulf of Carpentaria (Queensland). Of minor commercial importance, taken as bycatch in trawls. Marketed fresh or frozen for local consumption.

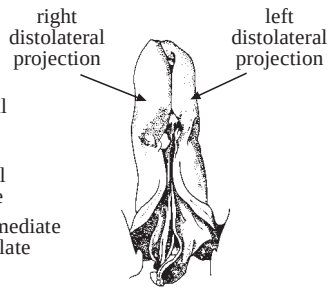


(from Crosnier, 1991)





thelycum



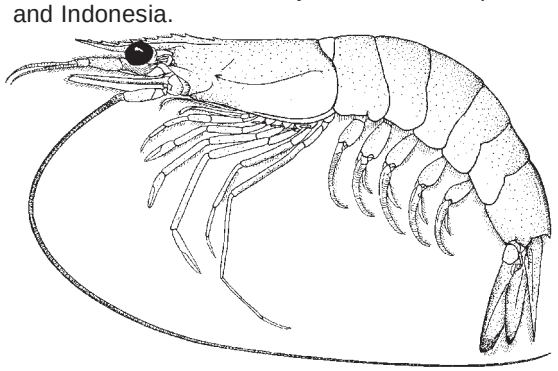
petasma (ventral view)

(after Crosnier, 1991)

Metapenaeus affinis (H. Milne Edwards, 1837)

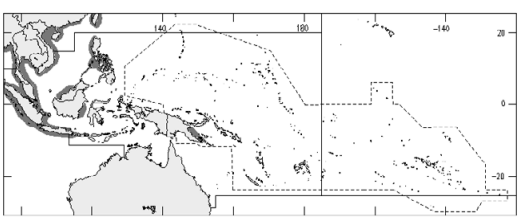
En - Jinga shrimp; **Fr** - Crevette jinga; **Sp** - Camarón jinga.

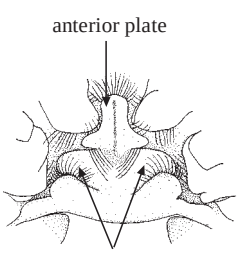
Maximum body length 18.6 cm for females (perhaps to 22.2 cm) and 14.6 cm for males; commonly between 10 and 14 cm. On mud or sandy-mud bottoms, from the coastline to depths of about 90 m, usually less than 55 m. Juveniles generally are found in estuaries and backwaters. Caught by trawlers, traps, seine nets, and artisanal gear. Marketed fresh or frozen, probably mainly for local consumption. Widespread in the Indo-West Pacific from the Persian Gulf to Taiwan Province of China, the Philippines, and Papua New Guinea. Can be easily confused with *Metapenaeus ensis* and seems to occur mainly in the western part of the area, from Viet Nam to Thailand, Malaysia, and Indonesia.



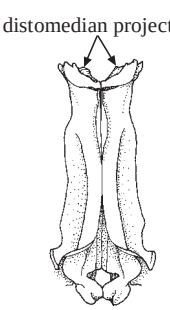


merus of fifth leg (male)





thelycum

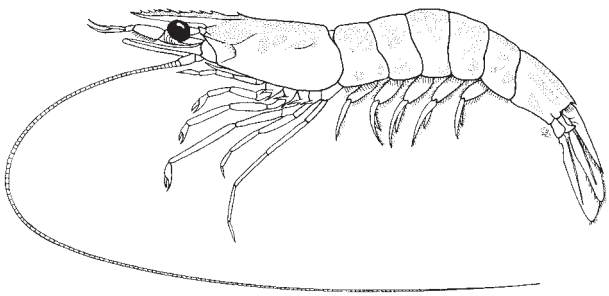


petasma (ventral view)

Metapenaeus benettae Racek and Dall, 1965

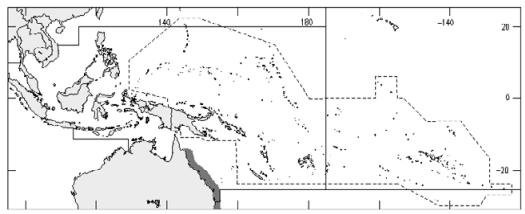
En - Greentail shrimp; **Fr** - Crevette queue verte; **Sp** - Camarón rabo verde.

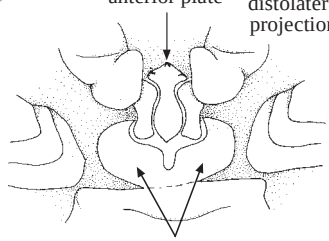
Maximum body length 13 cm (females) and 10.5 cm (males). Found mainly on soft mud bottoms in estuaries, coastal lakes, and rivers, to a depth of 22 m. Juveniles generally inhabit upstream waters, mangrove canals or intertidal seagrass areas of low salinity and abundant algal cover. Caught by beam trawls in rivers and otter trawl in coastal waters, sometimes also by cast nets. Of commercial importance in eastern Australia, above all in southeastern Queensland (about 650 t in the annual period of 1989/1990). Marketed mainly fresh and consumed locally, also used as bait. Restricted to eastern Australia, from Rockhampton (Queensland) to eastern Victoria.



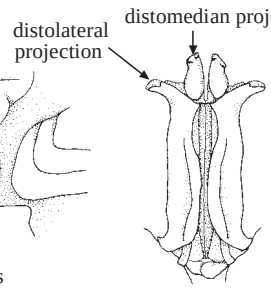


merus of fifth leg (male)





thelycum

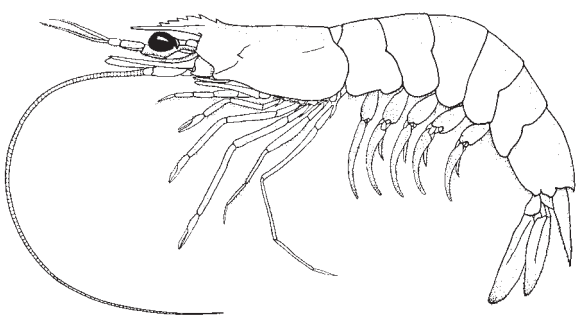


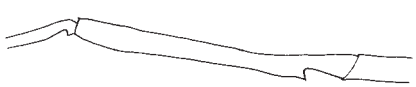
petasma (ventral view)

Metapenaeus brevicornis (H. Milne Edwards, 1837)

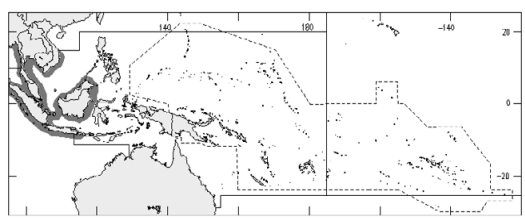
En - Yellow shrimp; **Fr** - Crevette jaune; **Sp** - Camarón amarillo.

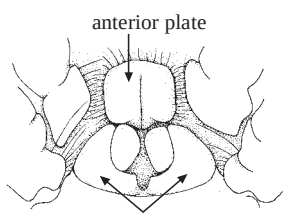
Maximum body length 13.2 cm (perhaps to 15.2 cm) for females and 9.8 cm for males. A marine to almost fresh-water species, found on sand or mud to depths of about 90 m, usually less than 30 m. Juveniles generally found in estuaries, backwaters, and deltas. A common species in the western part of the area. Mainly fished by set nets, traps, cast nets, scoop nets, drag nets, and artisanal gear, sometimes also by trawls. Often enters *Penaeus* culture ponds in Thailand, Singapore, Indonesia, and Viet Nam, and is harvested together with the cultured species. Marketed usually fresh or frozen, probably mainly for localconsumtion. Indo-West Pacific from Pakistan to Viet Nam, and Indonesia.



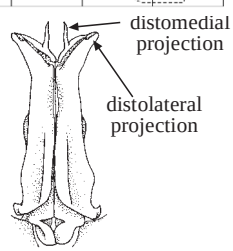


merus of fifth leg (male)





thelycum

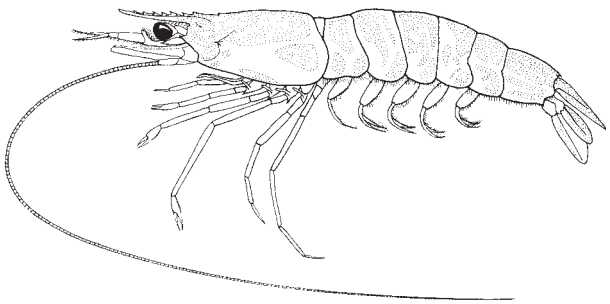


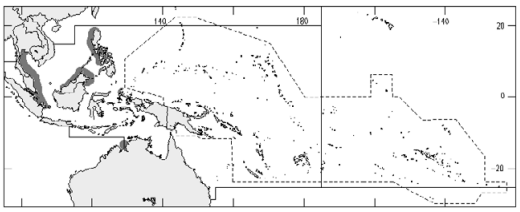
petasma (ventral view)

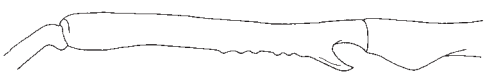
Metapenaeus conjunctus Racek and Dall, 1965

En - Wood shrimp; **Fr** - Crevette bois; **Sp** - Camarón leña.

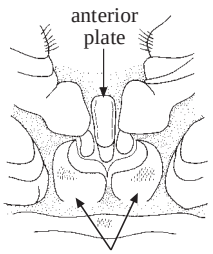
Maximum body length 14.3 cm (females) and 11.5 cm (males). Inhabits estuarine and brackish waters to depths less than 15 m. Taken by traps and seines. Generally not very common and of minor commercial importance. Found mainly mixed in the catches of *Metapenaeus ensis* or other species of the genus. Western Pacific from Thailand to Malaysia, Singapore, Indonesia, the Philippines, and northern Australia.



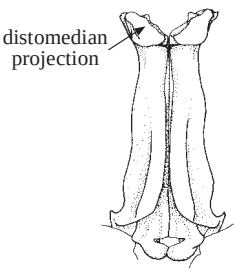




merus of fifth leg (male)



thelycum

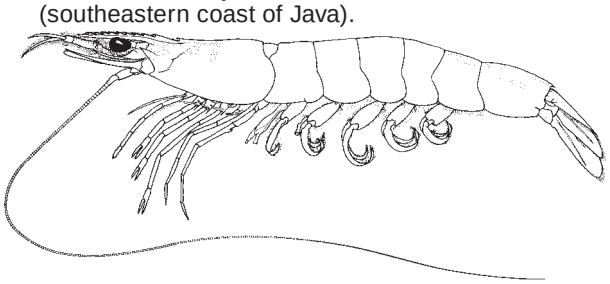


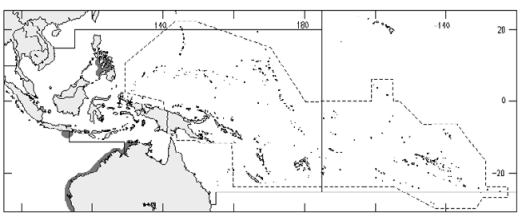
petasma (ventral view)

Metapenaeus dalli Racek, 1957

En - Western school shrimp; **Fr** - Crevette dali; **Sp** - Camarón dalí.

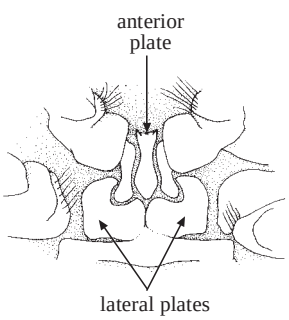
Maximum body length 9.8 cm (females) and 7.8 cm (males). On bottoms of mud and sand in estuarine and brackish waters, to a depth of about 33 m. Caught mainly with hand nets, also by seines and traps. Not common in the area and of very limited commercial importance, due to its small size. Mainly known from western Australia but also found in the Philippines and Indonesia (southeastern coast of Java).



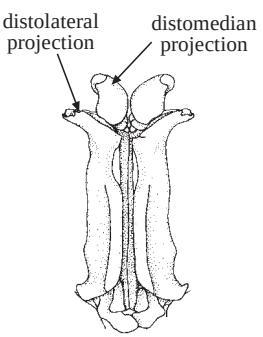




merus of fifth leg (male)



thelycum

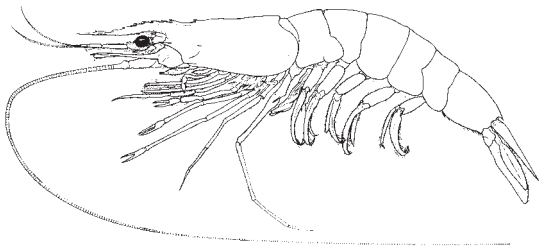


petasma (ventral view)

Metapenaeus demani (Roux, 1921)

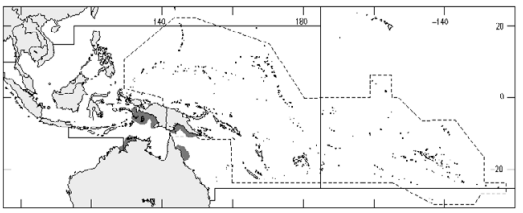
En - Demon shrimp; **Fr** - Crevette diable; **Sp** - Camarón diablo.

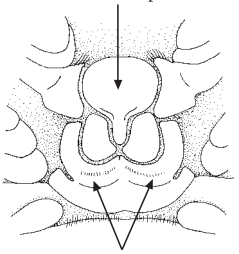
Maximum body length 12.2 cm (females) and 10.4 cm (males). Over muddy bottoms in estuarine and coastal waters, to a depth of 50 m, usually less than 30 m. Caught mainly by trawl nets and artisanal gear. Of some commercial importance in the Gulf of Papua prawn fishery where it constitutes about 50% of the shrimp catches. Probably mainly consumed locally. Restricted to the waters between New Guinea and Australia (sometimes divided into 2, eastern and western, subspecies).



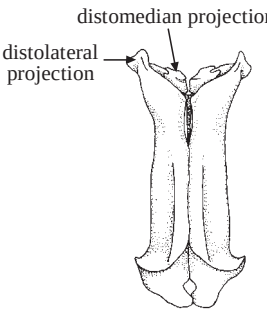


merus of fifth leg (male)





thelycum

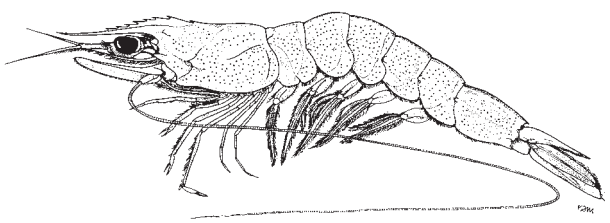


petasma (ventral view)

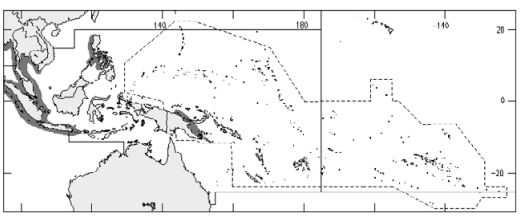
Metapenaeus dobsoni (Miers, 1878)

En - Kadal shrimp; **Fr** - Crevette kadal; **Sp** - Camarón kadal.

Maximum body length 13 cm (females) and 11.8 cm (males). Occurs mainly in low salinity lagoons and adjacent marine areas on muds to a depth of 37 m. Juveniles inhabit estuarine and backwaters. Caught mainly by trawls, seines, stake nets, and artisanal gear. Generally not very common in the area although reported to be quite abundant in New Guinea and appears in culture ponds in Thailand. Indo-West Pacific from India to the Philippines and New Guinea.

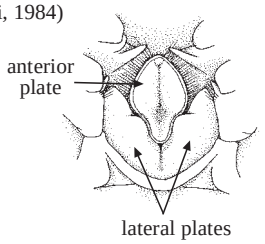


(after Motoh and Buri, 1984)

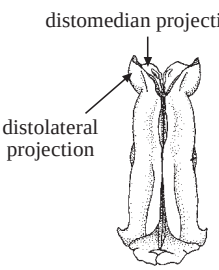




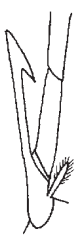
merus of fifth leg (male)



thelycum



petasma (ventral view)

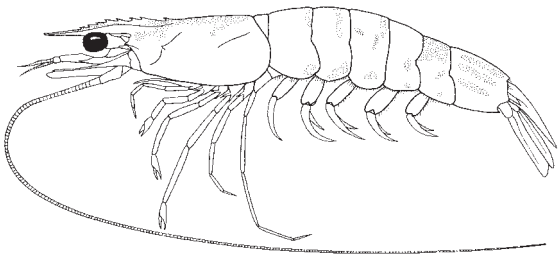


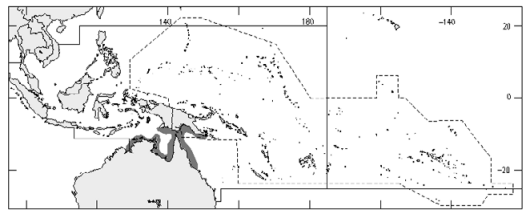
basial spine of third leg (male)

Metapenaeus eboracensis Dall, 1957

En - York shrimp; **Fr** - Crevette york; **Sp** - Camarón york.

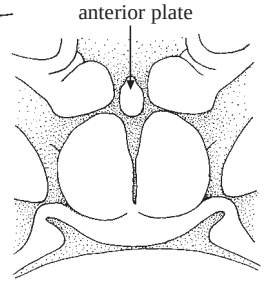
Maximum body length 11.6 cm (females) and 9.8 cm (males). On sandy or muddy bottoms in inshore waters, rivers and estuaries, to a depth of 45 m, usually between 10 and 20 m. Caught by trawls, seines, hand nets, and artisanal gear. Of minor commercial importance, due to its small size. Constitutes only about 5% of the prawn fishery catches in the Gulf of Papua and supports a small amateur fishery in northern Australia. Mainly consumed locally. Restricted to the waters between southern New Guinea and northern Australia.



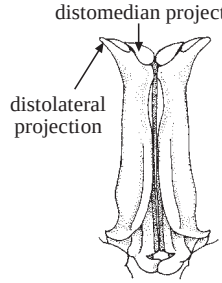




merus of fifth leg (male)



thelycum

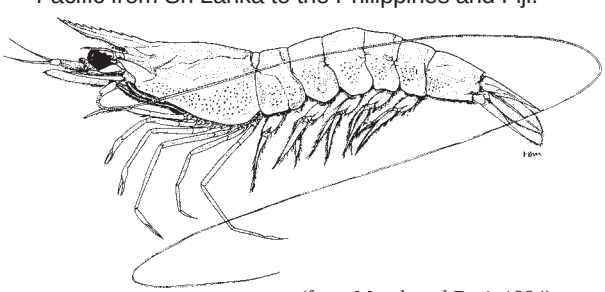


petasma (ventral view)

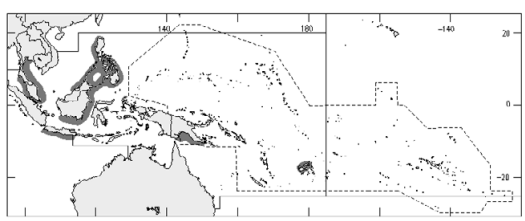
Metapenaeus elegans De Man, 1907

En - Fine shrimp; **Fr** - Crevette élégante; **Sp** - Camarón fino.

Maximum body length 11.8 cm (females) and 8.4 cm (males). Usually in estuaries, ponds, and inland lagoons with low salinity, but also found at sea to a depth of 55 m, on mud or sandy-mud bottoms. Caught mainly by traps, also by trawls, push nets, set nets, and artisanal gear. Reported to be of limited commercial importance in the area, but can be easily confused with the commercially important *Metapenaeus ensis*; seems to be rather common in markets of the Philippines and probably is more commonly marketed in other countries as well. Marketed mainly fresh for local consumption. Indo-West Pacific from Sri Lanka to the Philippines and Fiji.

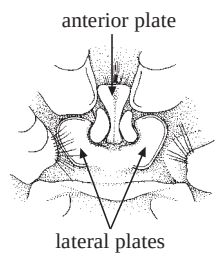


(from Motoh and Buri, 1984)

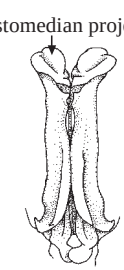




merus of fifth leg (male)



thelycum

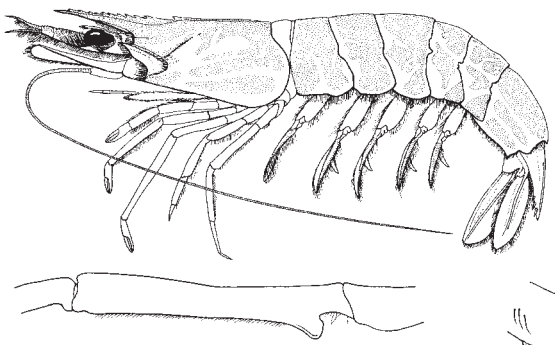


petasma (ventral view)

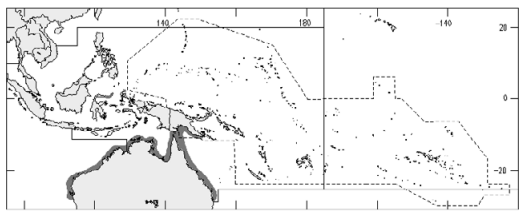
Metapenaeus endeavouri (Schmitt, 1926)

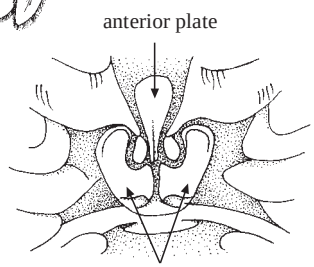
En - Endeavour shrimp; **Fr** - Crevette devo; **Sp** - Camarón devo.

Maximum body length 17.5 cm (females) and 14 cm (males). On sandy or sandy-mud bottoms, found from the coastline to depths of 50 or 60 m. Juveniles generally associated with seagrass areas in shallow estuaries. Caught mainly at night by demersal otter trawls, sometimes also by beam trawls. Caught commercially in northern Australia, with a catch of about 2 400 t (together with *Metapenaeus ensis*), catches from western Australia not included, in the annual period of 1989/1990. Marketed mainly frozen, cooked or salted, sometimes used as bait; consumed locally and also exported. In 1995, the reported aquaculture production of this species (probably a misidentification of *Metapenaeus anchistus*) in the Philippines amounted to 1 295 t (FAO Aquaculture Production Statistics). Restricted to northern Australia and the Gulf of Papua.

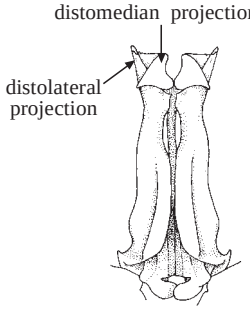


merus of fifth leg (male)





thelycum

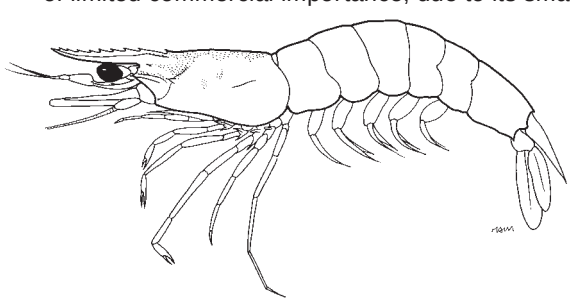


petasma (ventral view)

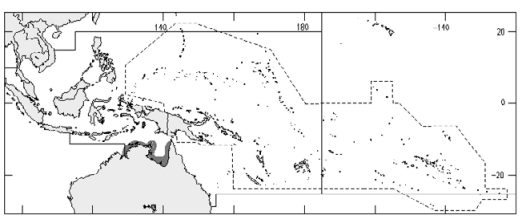
Metapenaeus insolitus Racek and Dall, 1965

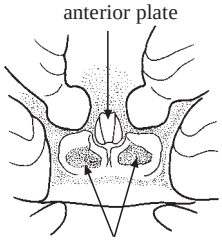
En - Emerald shrimp; **Fr** - Crevette émeraude; **Sp** - Camarón esmeralda.

Maximum body length 12 cm (females) and 8 cm (males). Over muddy or sandy bottoms in inshore waters, including creeks and estuaries, to a depth of 35 m, usually less than 8 m. Mainly caught by hand nets in amateur fisheries and consumed locally. Moderately abundant in inshore habitats, but of limited commercial importance, due to its small size. Restricted to northern Australia.

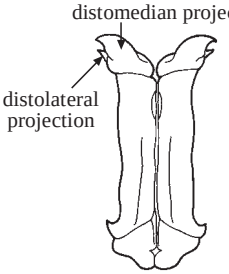


(after Racek and Dall, 1965)





thelycum

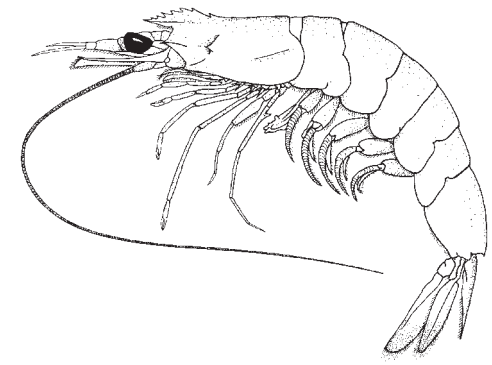


petasma (ventral view)

Metapenaeus lysianassa (De Man, 1888)

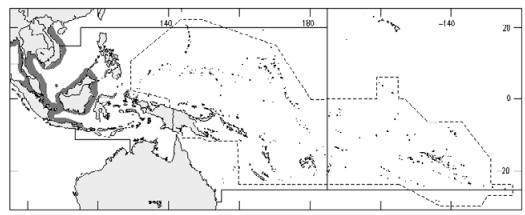
En - Bird shrimp; **Fr** - Crevette oiseau; **Sp** - Camarón parancero.

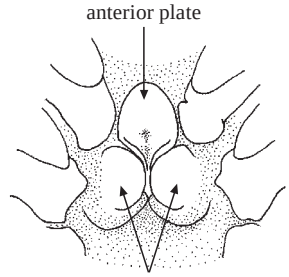
Maximum body length 9 cm (females) and 6.1 cm (males). On muddy bottom in inshore waters, to depths of about 28 m. Caught by stake nets, traps, set nets, push nets, seines, and trawls. Abundant in the western part of the area, but of secondary commercial importance, due to its small size. Marketed fresh, frozen, or dried and mainly for local consumption. Indo-West Pacific from India to Viet Nam, Malaysia, and Indonesia.



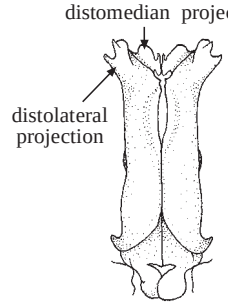


merus of fifth leg (male)





thelycum

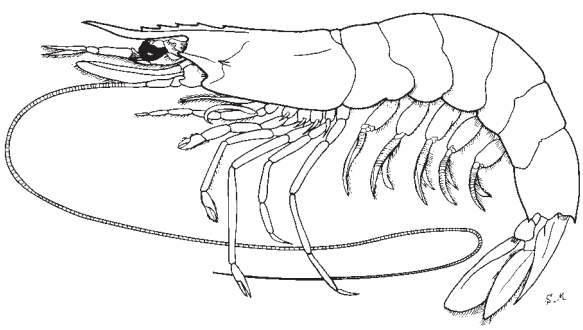


petasma (ventral view)

Metapenaeus macleayi (Haswell, 1879)

En - Eastern school shrimp; **Fr** - Crevette de maclay; **Sp** - Camarón maclayo.

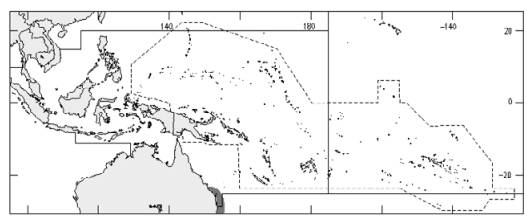
Maximum body length 17.5 cm (females) and 14.6 cm (males). In estuaries and inshore waters, to a depth of 55 m. Juveniles inhabit seagrass areas within estuaries. Caught by means of trawling (mainly), hauling, and seining; also obtained on the basis of small-scale aquaculture. Of commercial importance in eastern Australia, but its catch in Queensland was only about 100 t in the annual period of 1989/1990. Marketed cooked or uncooked ("green"), mainly for local consumption. Restricted to eastern Australia, from Tin Can Bay (Queensland) to Corner Inlet (Victoria).

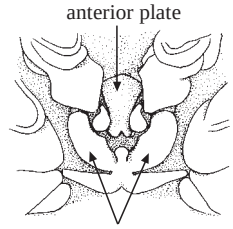


(after Miguel, 1982)

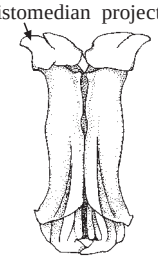


merus of fifth leg (male)





thelycum

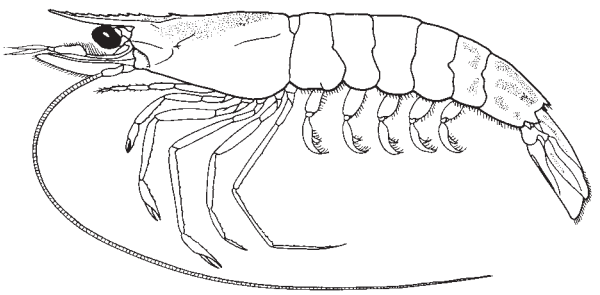


petasma (ventral view)

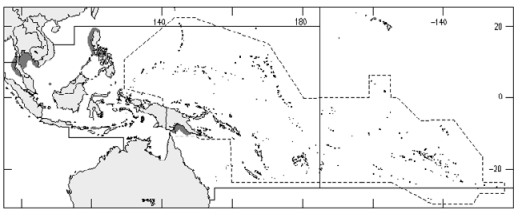
Metapenaeus papuensis Racek and Dall, 1965

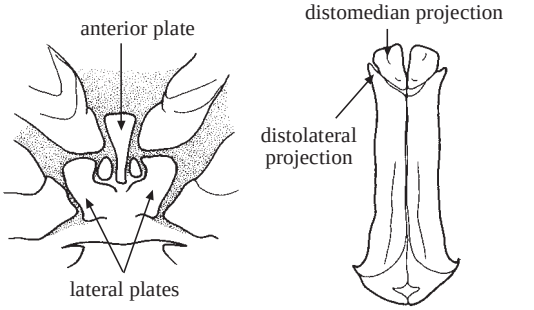
En - Papua shrimp; **Fr** - Crevette papou; **Sp** - Camarón papuense.

Maximum body length 11.8 cm (females) and 8.6 cm (males). Found in estuaries and inshore waters to depths of about 60 m. Probably not very common and without commercial importance. Very similar to *Metapenaeus elegans*. Indo-West Pacific, reported from the Philippines, Thailand, New Guinea, and probably also found in the Bay of Bangal.



(after Miguel, 1982)



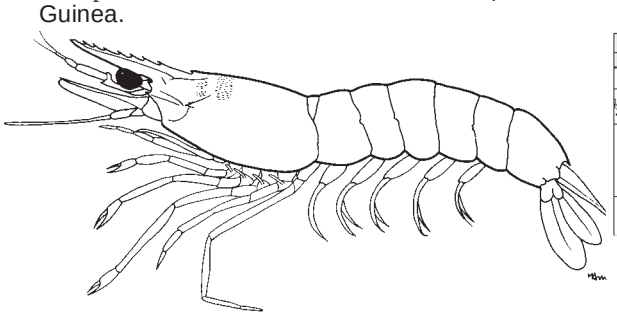


(after Miguel, 1982)

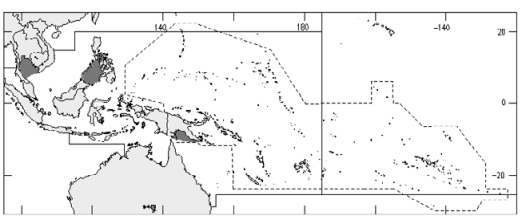
Metapenaeus suluensis Racek and Dall, 1965

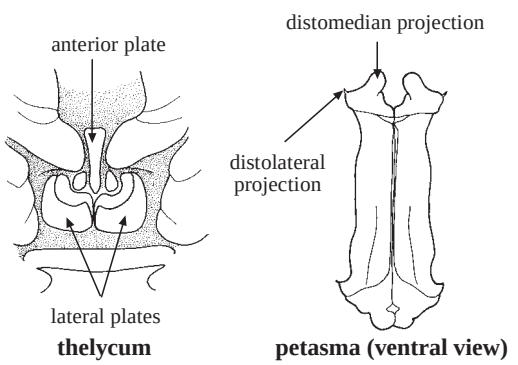
En - Sulu shrimp.

Maximum body length 12 cm (females) and 9.9 cm (males). Found from the coastline to depths of about 40 m. Probably not very common and without commercial importance. Very similar to *Metapenaeus ensis*. Indo-West Pacific, reported from the Philippines, Gulf of Thailand, and New Guinea.



(after Racek and Dall, 1965)





(after Miguel, 1982)

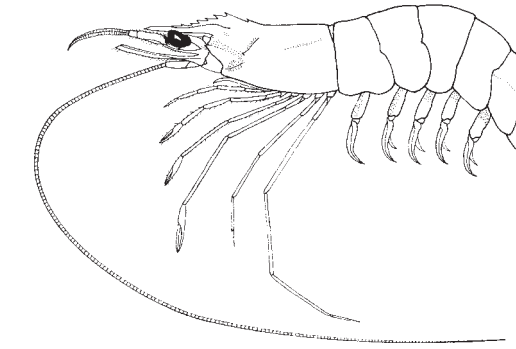
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Metapenaeus tenuipes Kubo, 1949

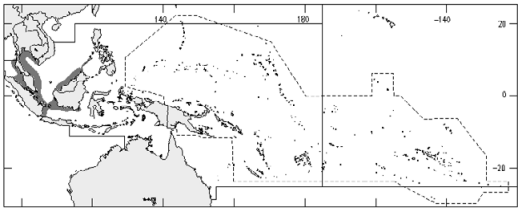
En - Stork shrimp; **Fr** - Crevette cigogne; **Sp** - Camarón cigueña.

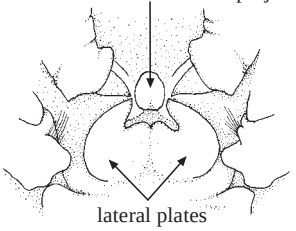
Maximum body length 9.5 cm (females) and 7.5 cm (males). Occurs from the coastline and brackish waters to a depth of 30 m. Caught by trawls, set nets, traps, seines, and artisanal gear. Commonly found in the western part of the area, but nowhere very abundant and mainly forms a bycatch in prawn fisheries. Marketed fresh or frozen, mainly consumed locally. Western Pacific from Thailand to Malaysia, Singapore, and Indonesia.



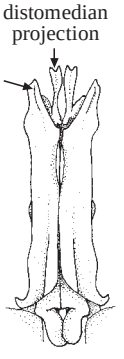


merus of fifth leg (male)





thelycum



ventral view



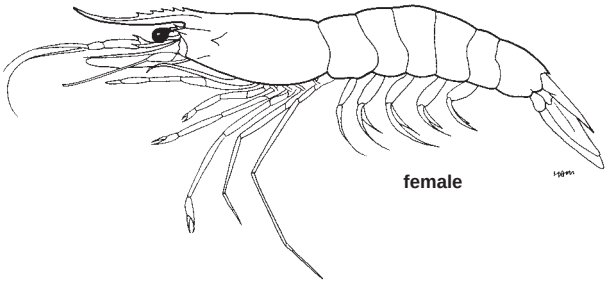
distal part in lateral view

petasma

Parapenaeopsis arafurica Racek and Dall, 1965

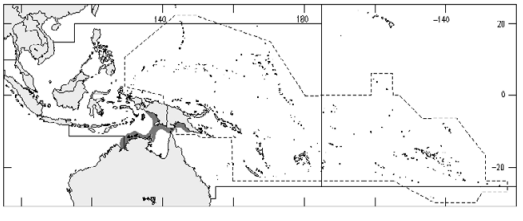
En - Arafura shrimp; **Fr** - Crevette arafura; **Sp** - Camarón arafura.

Maximum body length 14 cm (females) and 8 cm (males). Found over soft mud bottoms at depths from 5 to 30 m. Caught mainly as bycatch in trawls. Apparently not very common and of no commercial importance. Restricted to the area between New Guinea and northern Australia.



female

(after Racek and Dall, 1965)



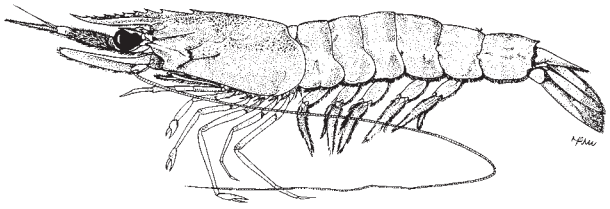


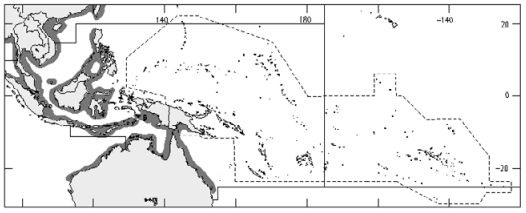
male

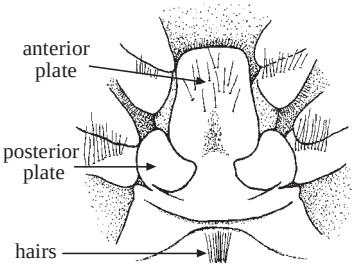
Parapenaeopsis cornuta (Kishinouye, 1900)

En - Coral shrimp; **Fr** - Crevette corail; **Sp** - Camarón coral.

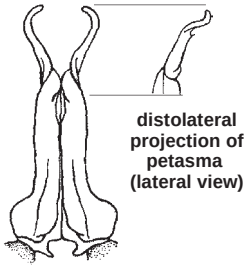
Maximum body length 10 cm (females) and 8.5 cm (males), commonly between 5 and 8 cm. Generally inhabits river mouths and estuaries, but sometimes found at sea to depths of about 40 m, on bottom of sandy-mud or mud. Caught by trawls, seines, stake nets, and artisanal gear. Reported to be found occasionally in large quantities in Thailand and the Philippines. However, as this species can be easily confused with *Parapenaeopsis maxillipedo*, its abundance in the area remains uncertain. Indo-West Pacific from the western coast of India to Japan and northern Australia.







thelycum



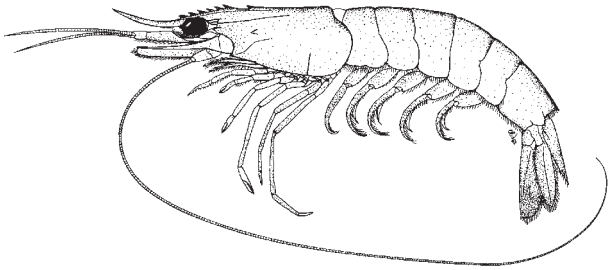
petasma (ventral view)

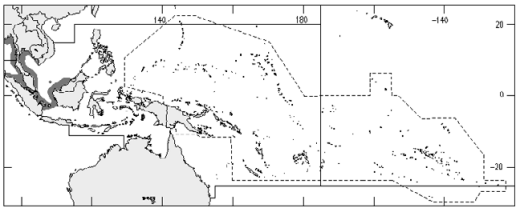
(after Motoh and Buri, 1984)

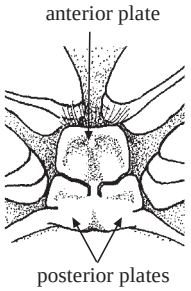
Parapenaeopsis coromandelica Alcock, 1906

En - Coromandel shrimp; **Fr** - Crevette coromandel; **Sp** - Camarón coromandel.

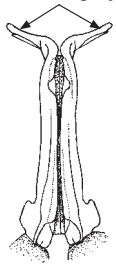
Maximum body length about 12 cm (males and females). Found in shallow waters to a depth of about 11 m, mainly on mud. Caught mainly by seine nets and shrimp gill nets, also by artisanal gear. Probably not very common in the Western Central Pacific, although reported to be moderately abundant at the northwestern coast of Malaysia and along the western coast of Thailand. Indo-West Pacific from southern India to the Gulf of Thailand, Indonesian Archipelago, and Borneo.







thelycum

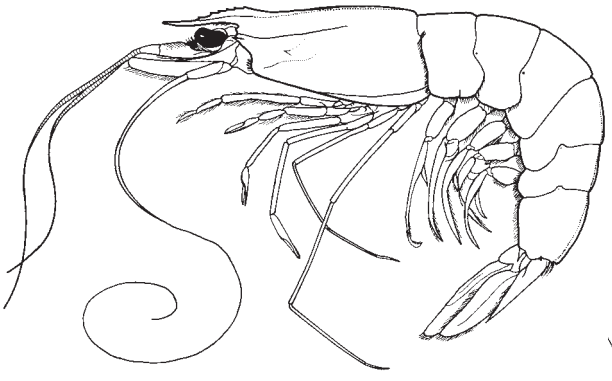


petasma (ventral view)

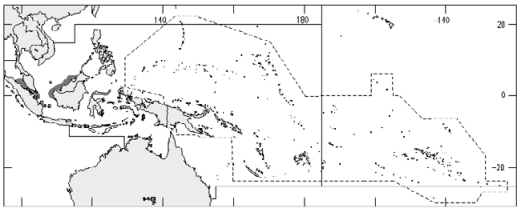
Parapenaeopsis gracillima Nobili, 1903

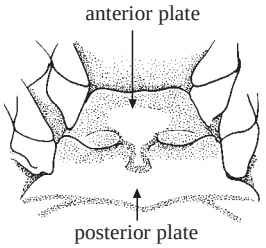
En - Thin shrimp.

Maximum body length about 7 cm for females, males smaller. Prefers sandy bottoms, occasionally also on mud, at depths from 30 to 60 m. Caught by trawlers. Probably not common and of no commercial importance. Only known from the Strait of Malacca and northern Borneo of Malaysia.

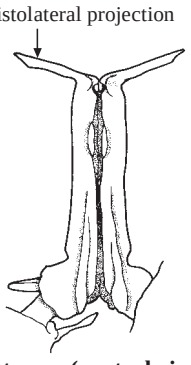


(after Hall, 1962)





thelycum

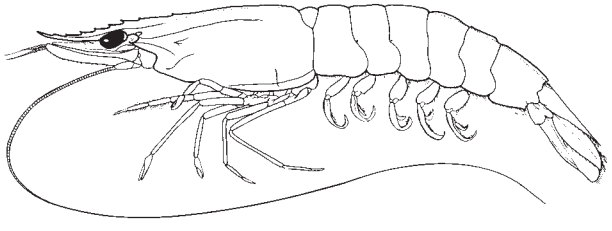


petasma (ventral view)

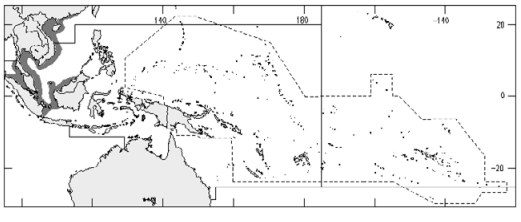
Parapenaeopsis hungerfordi Alcock, 1905

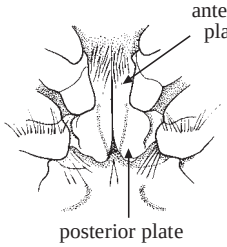
En - Dog shrimp; **Fr** - Crevette chien; **Sp** - Camarón perro.

Maximum body length 10.4 cm (females) and 7.8 cm (males), commonly between 4 and 9.5 cm. Found on mud or sandy mud bottoms, from depths of 5 to 45 m, usually less than 25 m. Taken mainly by trawls. Reported to be one of the dominant species in shrimp catches off northwestern Malaysia, the western coast of Thailand, and off the southern coast of China. Its abundance in the area is uncertain. Marketed fresh or frozen for local consumption. Indo-West Pacific from the western coast of Thailand to Malaysia, Indonesia, and along the southern coasts of China, including Hong Kong.



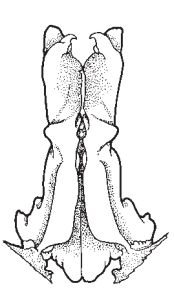
(after Hall, 1962)





thelycum

(after Hall, 1961)

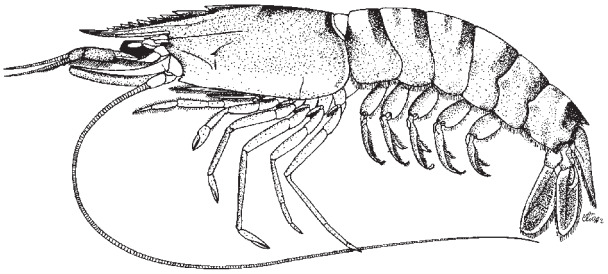


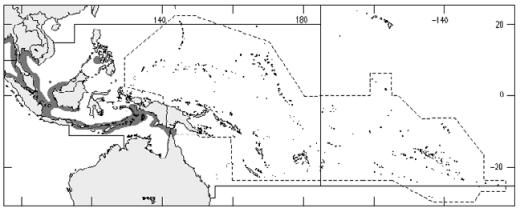
petasma (ventral view)

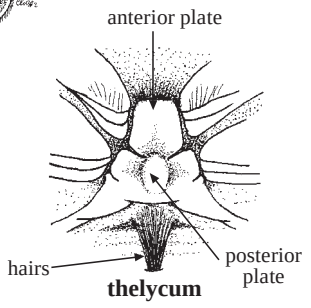
Parapenaeopsis maxillipedo Alcock, 1906

En - Torpedo shrimp; **Fr** - Crevette torpille; **Sp** - Camarón torpedo.

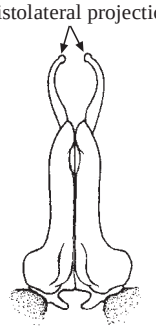
Maximum body length 12.5 cm (females; perhaps to 15 cm) and 10 cm (males). Found at sea in shallow depths of less than 30 m on mud-banks, sometimes also on sandy-mud bottom. Caught by trawls, bottom gill nets, push nets, and shore seines. Reported to be commonly found in commercial catches in Malayan waters. However, as this species is often confused with *Parapenaeopsis cornuta*, its abundance in the area remains uncertain. Indo-West Pacific from the western coast of India to the Philippines and northern Australia.







thelycum

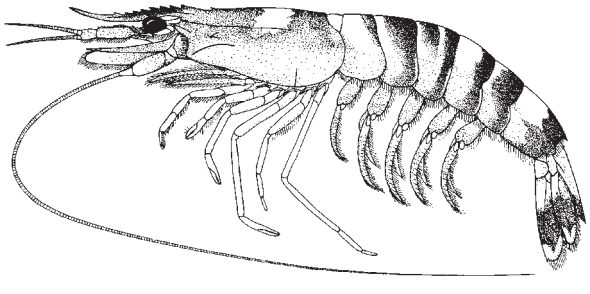


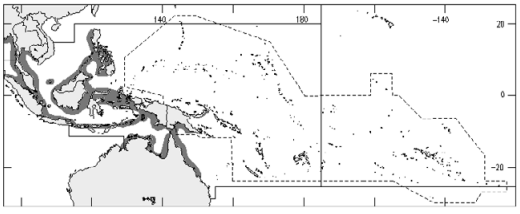
petasma (ventral view)

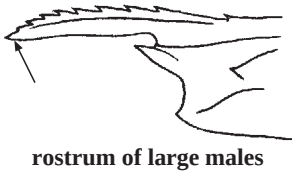
Parapenaeopsis sculptilis (Heller, 1862)

En - Rainbow shrimp; **Fr** - Crevette arc-en-ciel; **Sp** - Camarón arco iris.

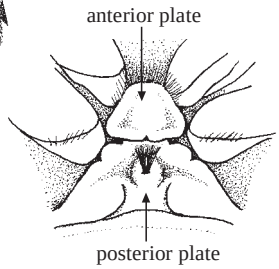
Maximum body length 17 cm (females) and 13 cm (males). Usually inhabits shallow waters from the coastline to depths of about 90 m, but mainly less than 40 m, on sand, mud, or mixed bottoms. Caught mainly by stake nets, seines, and trawls. Reported to be of some commercial importance in Malaysia and Singapore, but its abundance in these areas is uncertain. Relatively common in inshore commercial catches in northern Australia, but only of minor importance and mostly used as bait. Marketed mainly fresh or frozen for local consumption. Indo-West Pacific from Pakistan to the Philippines and northern Australia.



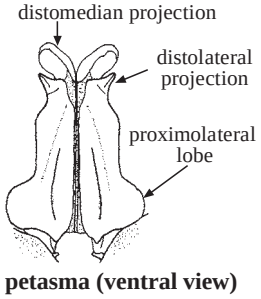




rostrum of large males



thelycum

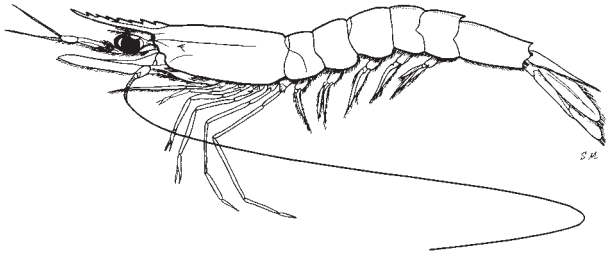


petasma (ventral view)

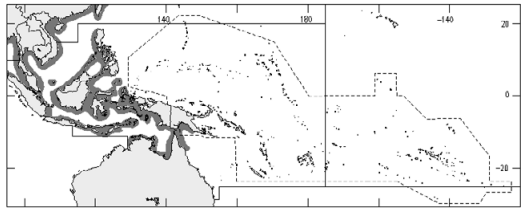
Parapenaeopsis tenella (Bate, 1888)

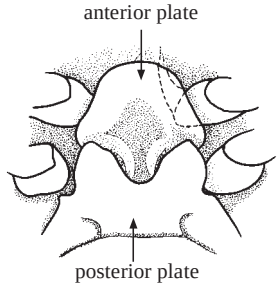
En - Smoothshell shrimp; **Fr** - Crevette glabre; **Sp** - Camarón liso.

Maximum body length 7 cm (females) and 5 cm (males), commonly between 4 and 6 cm. Found from depths of 5.5 to 50 m, but mostly around 10 m, on muddy or sandy mud bottoms. Taken mainly by trawls. Apparently common in the western part of the area, but of very limited commercial importance due to its small size. Marketed fresh for local consumption. Indo-West Pacific from Pakistan to Japan and northern Australia.

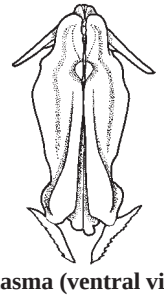


(after Motoh and Buri, 1984)





thelycum

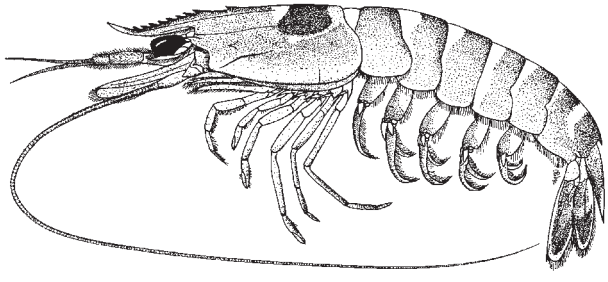


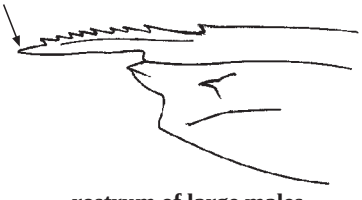
petasma (ventral view)

Parapenaeopsis uncta Alcock, 1905

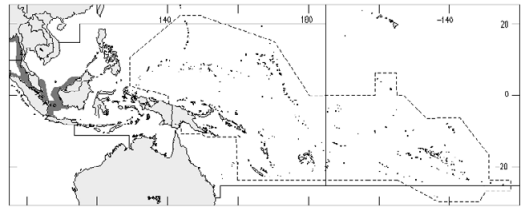
En - Uncta shrimp; **Fr** - Crevette uncta; **Sp** - Camarón uncta.

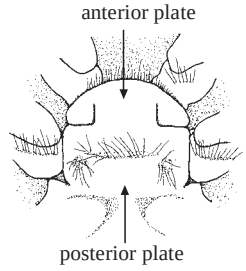
Maximum body length 13 cm (females) and 8.3 cm (males). Found from depths of 40 to 90 m on clean sand, sometimes mixed with shell fragments. Taken by trawls. One of the relatively larger representatives of the genus, but nowhere abundant and only sporadically found in shrimp catches. Marketed mainly fresh or frozen for local consumption. Indo-West Pacific from Kuwait to India, Malaysia, and Indonesia.



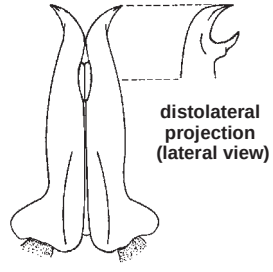


rostrum of large males





thelycum

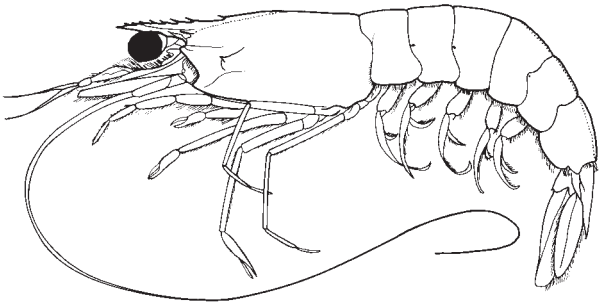


petasma (ventral view)

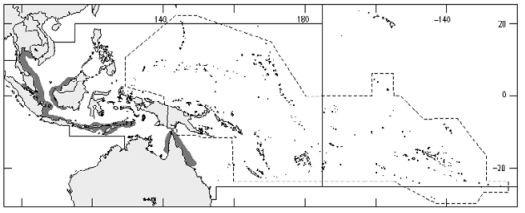
Parapenaeopsis venusta De Man, 1907

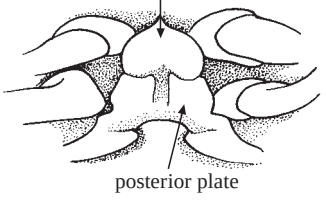
En - Adonis shrimp; **Fr** - Crevette adonis; **Sp** - Camarón adonis.

Maximum body length 4.5 cm. Found from depths of 11 to 44 m on bottoms of sand, shells, stones, and mud. Taken mainly by trawls. Probably not common and of no commercial importance, due to its small size. Western Pacific from the Gulf of Thailand to Malaysia, Indonesia, and Queensland (Australia).

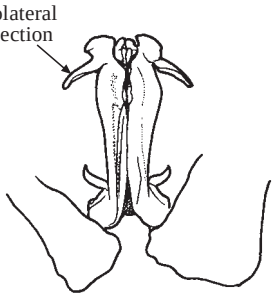


(after Hall, 1962)





thelycum



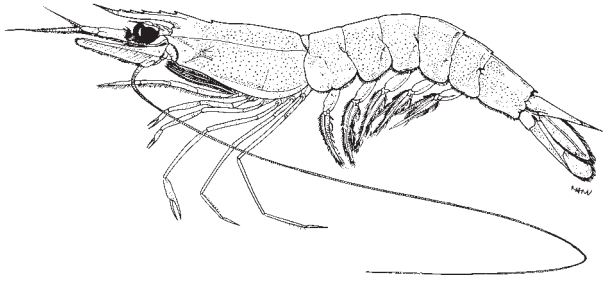
petasma (ventral view)

(after Hall, 1961)

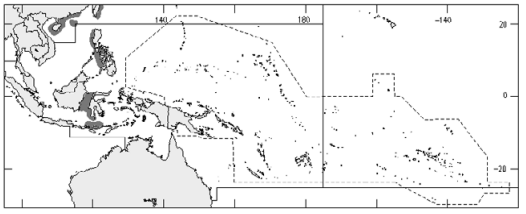
Parapenaeus fissuroides Crosnier, 1986

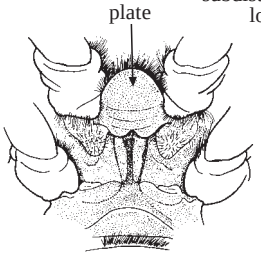
En - False rose shrimp.

Maximum body length 14 cm (females) and 11.7 cm (males), commonly between 7 and 11 cm. Found from depths of 65 to 908 m, mainly between 110 and 400 m, on bottoms of sand, mud, sandy mud, and soft mud. Taken by trawls. Of limited commercial importance and only sporadically taken as bycatch in deeper waters. It may have some economic potential with the development of a deep-sea fishery. Marketed mainly fresh for local consumption. Widely distributed from the eastern coast of Africa to Japan and Indonesia (populations in the Indian Ocean are sometimes considered to be 2 subspecies). Often confused with *Parapenaeus fissurus* and in the past mostly reported under this name.

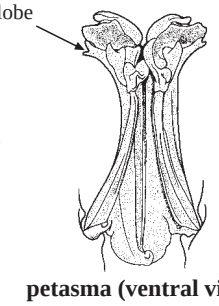


(after Motoh and Buri, 1984)





thelycum

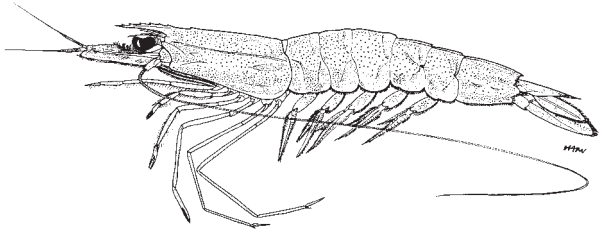


petasma (ventral view)

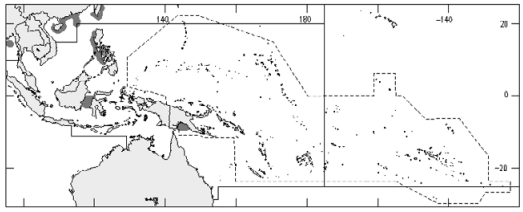
Parapenaeus longipes Alcock, 1905

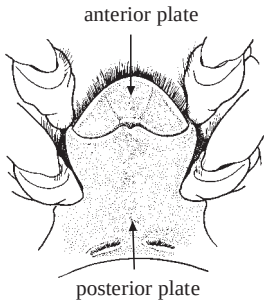
En - Flamingo shrimp; **Fr** - Crevette flamand; **Sp** - Camarón flamenco.

Maximum body length 11.5 cm (females) and 8.5 cm (males), commonly between 5 and 8 cm. Found usually between depths of 30 and 90 m, sometimes to a depth of 165 m. Taken mainly as bycatch in trawls. This species has the shallowest vertical distribution in the genus, but is nowhere abundant and of very limited commercial importance. Marketed mainly fresh for local consumption. Indo-West Pacific from eastern coast of Africa to Japan and New Guinea.

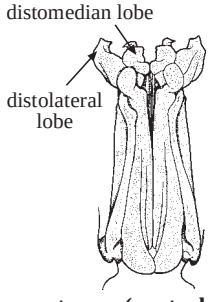


(after Motoh and Buri, 1984)





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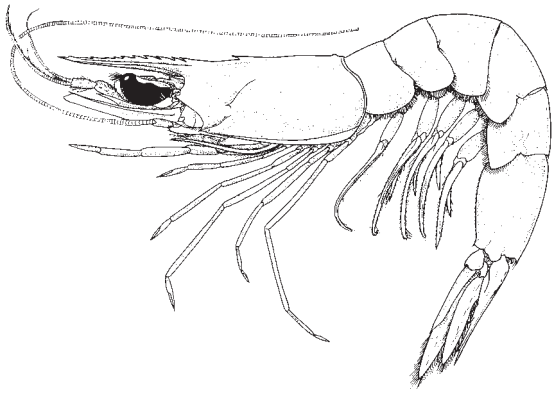


petasma (ventral view)

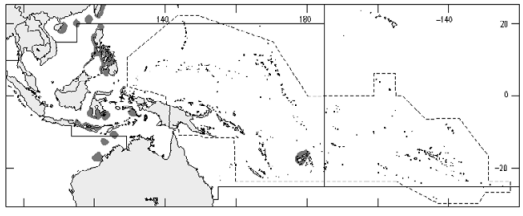
Penaeopsis eduardoi Pérez Farfante, 1977

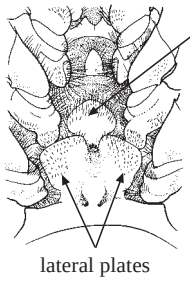
En - Four-spined needle shrimp.

Maximum body length 13 cm (females) and 12 cm (males), commonly between 8 and 11 cm. Found on sandy mud bottoms from depths of 289 to 570 m, usually deeper than 300 m. So far taken mainly during exploratory trawling operations, but sometimes found in large quantities and may therefore have some economic potential with the development of a deep-sea fishery. Western Pacific from Japan to the Timor Sea and Fiji. Can easily be confused with *Penaeopsis rectacuta*.

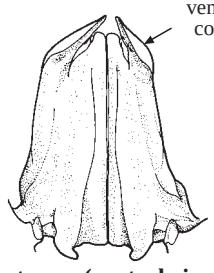


(after Pérez Farfante, 1977)





thelycum

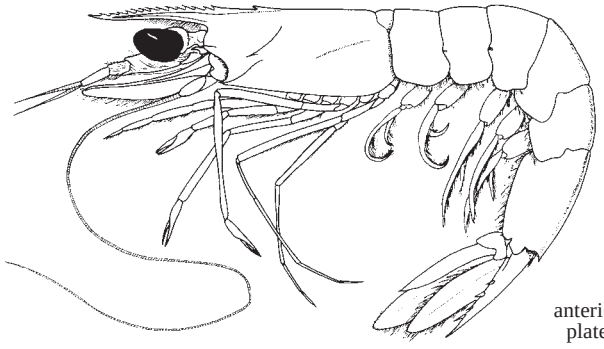


petasma (ventral view)

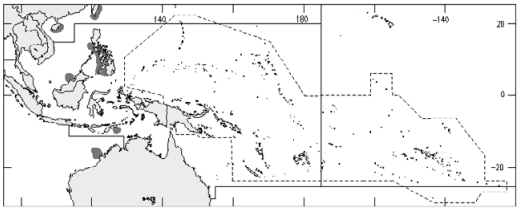
Penaeopsis rectacuta (Bate, 1881)

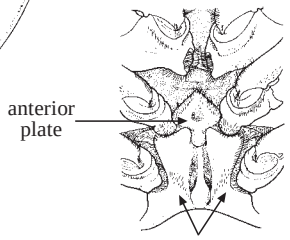
En - Needle shrimp; **Fr** - Crevette aiguille; **Sp** - Camarón aguji.

Maximum body length 13.5 cm (females) and 11 cm (males), commonly between 8 and 11 cm. Found on sandy mud bottom from depths of 174 to 410 m, usually deeper than 300 m. Mainly taken by experimental trawlers, but sometimes found in fair quantities and may therefore have some commercial potential once that a deep-sea fishery is developed in the area. Western Pacific from Taiwan Province of China to the Philippines, South China Sea, and Timor Sea. Often confused with *Penaeopsis eduardoi*.

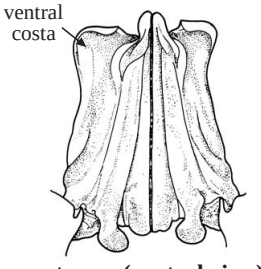


(after Hall, 1962)





thelycum



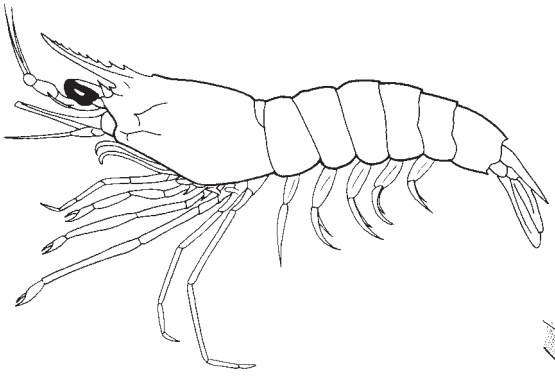
petasma (ventral view)

(after Pérez Farfante, 1979)

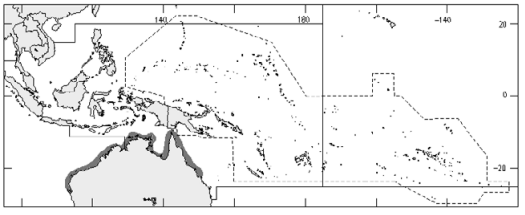
Trachypenaeus anchoralis (Bate, 1881)

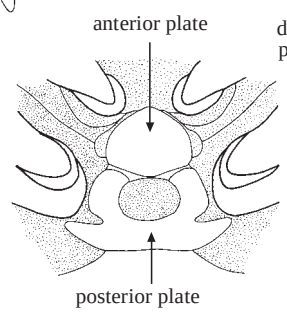
En - Hardback shrimp; **Fr** - Crevette os; **Sp** - Camarón huesudo.

Maximum body length 10.4 cm (females) and 7 cm (males). Found on bottoms of mud to coral debris, from depths of 12.5 to 60 m. Taken mainly by trawls. Caught incidentally in the northern prawn fishery of Australia, but without much economic importance, due to its relatively small size. Generally believed to be restricted to northern Australia from Shark Bay (western Australia) and Keppel Bay (Queensland), but probably also occurs in southern Taiwan Province of China.

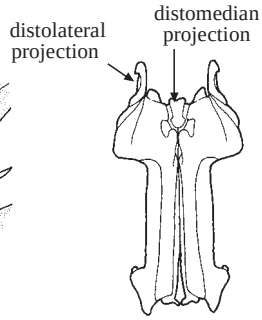


(after Dall, 1957)





thelycum

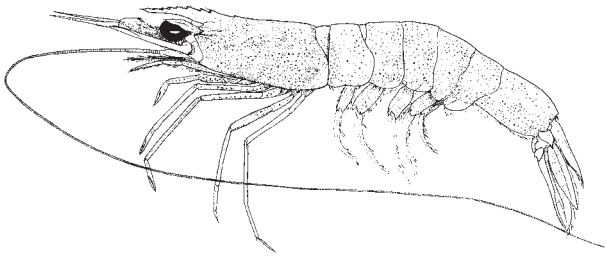


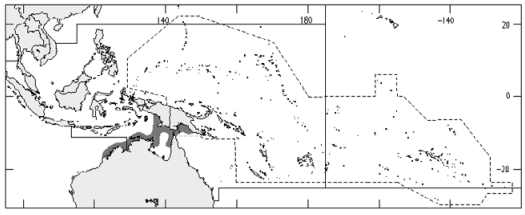
petasma (ventral view)

Trachypenaeus gonospinifer Racek and Dall, 1965

En - Northern rough shrimp; **Fr** - Crevette gambri nordique; **Sp** - Camarón fijador norteño.

Maximum body length 8 cm (females) and 5 cm (males). Found over muddy bottom from depths of 13 to 52 m. Taken as incidental catch by trawlers. Not particularly abundant and without commercial importance, due to its small size. Restricted to the waters between New Guinea and northern Australia.



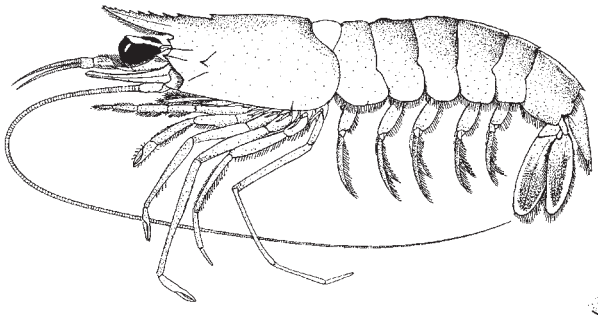


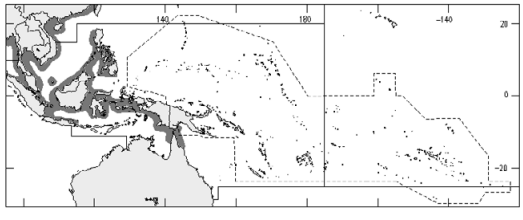
(after Grey, Dall, and Baker, 1983)

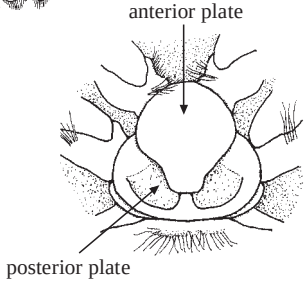
Trachypenaeus granulosus (Haswell, 1879)

En - Coarse shrimp; **Fr** - Crevette gambri grenue; **Sp** - Camarón fijador de granos.

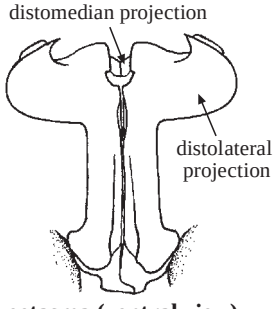
Maximum body length 9.5 cm (females) and 7.2 cm (males), commonly between 6 to 8 cm. Found over bottoms of mud, hard sand or rocks, from depths of 5 to 81 m. Taken as incidental catch, mainly at night by trawlers, also with artisanal gear. Of minor economic importance because of its small size and hard shell. Marketed mainly fresh for local consumption. Indo-West Pacific from Persian Gulf to Taiwan Province of China and northern Australia.







thelycum

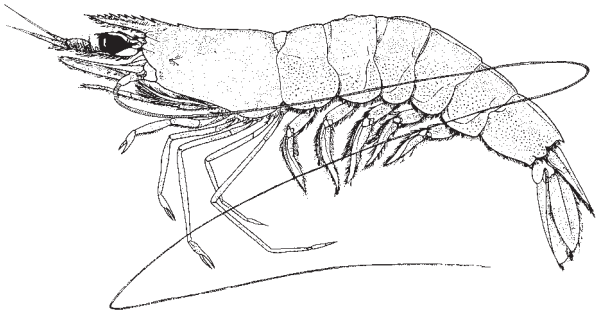


petasma (ventral view)

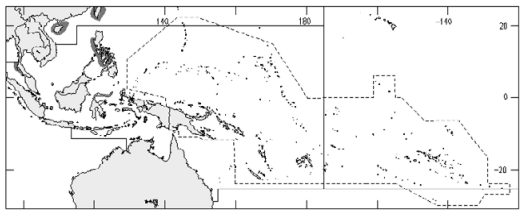
Trachypenaeus longipes (Paulson, 1875)

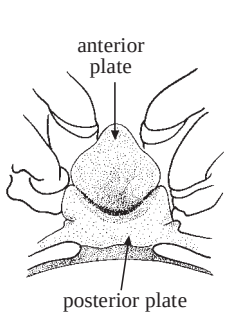
En - Longlegged rough shrimp.

Maximum body length 10.5 cm (females) and 8 cm (males). Found from nearshore waters to depths of about 220 m, usually between 40 and 60 m. Taken mainly by trawls. This species is often confused with *Trachypenaeus curvirostris* (sometimes under the name *T. asper*), and therefore its actual distribution and occurrence in the area is unclear. Probably not very common and of limited or no commercial importance. Indo-West Pacific from the Red Sea to Japan and the Philippines.

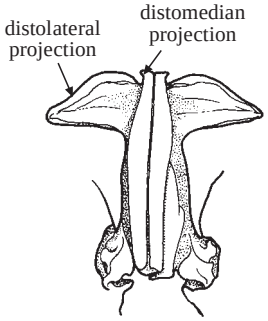


(after Motoh and Buri, 1984)





thelycum



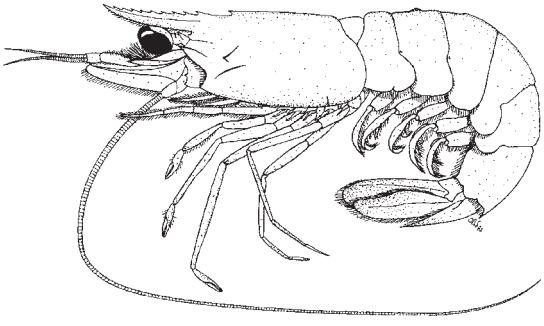
petasma (ventral view)

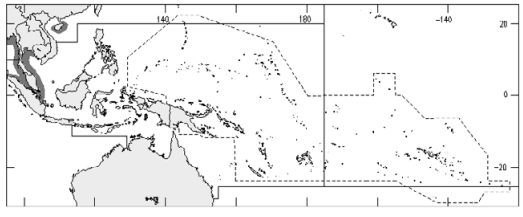
(after Hayashi, 1992)

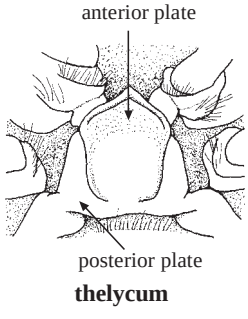
Trachypenaeus sedili Hall, 1961

En - Singapore rough shrimp. (the FAO names previously used for this species are now used for *Trachypenaeus malaiana*)

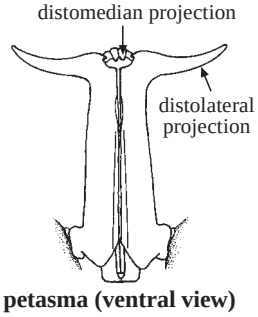
Maximum body length 8.8 cm (females) and 5.1 cm (males), commonly between 6 and 8 cm. Found on mud or sand bottom, from nearshore waters to depths of about 45 m. Taken by trawls and artisanal gear. Probably not a common species in the area and without commercial importance. Indo-West Pacific from India (perhaps Somalia) to the Malay Peninsula and South China Sea.







thelycum

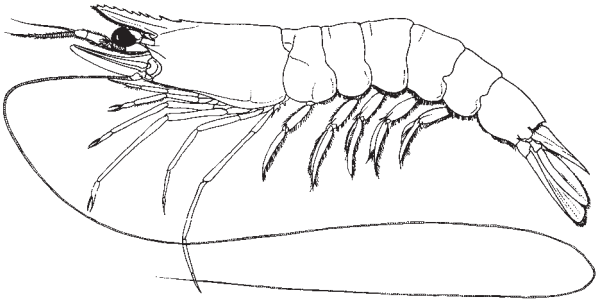


petasma (ventral view)

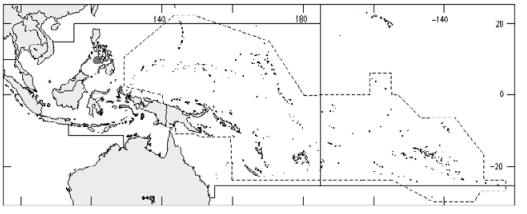
Trachypenaeus villaluzi Muthu and Motoh, 1979

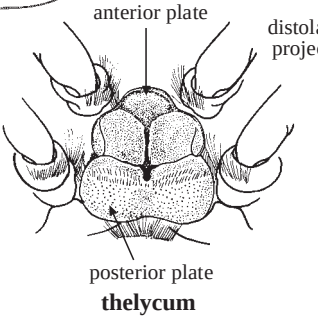
En - Philippines rough shrimp.

Maximum body length 7.3 cm (females) and 5.3 cm (males). Caught by otter trawls at a depth of about 7 m, on mud bottom. Probably not common and without commercial importance. So far only known from the Philippines.

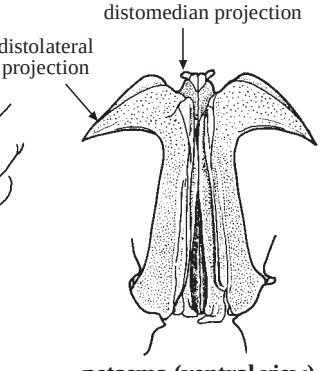


(after Motoh and Buri, 1984)





thelycum



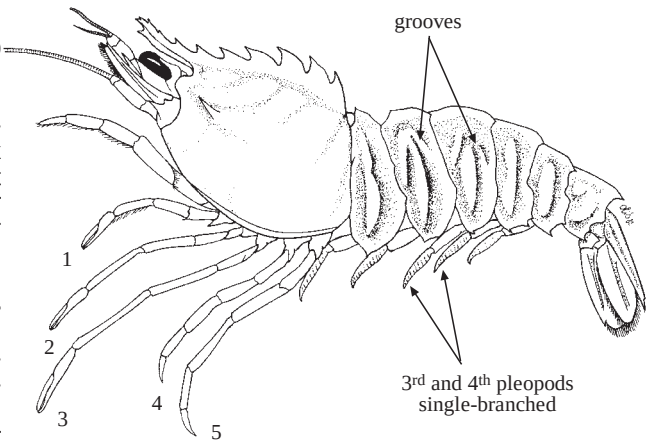
petasma (ventral view)

click for next page

click for previous page

SICYONIIDAE

Rock shrimps



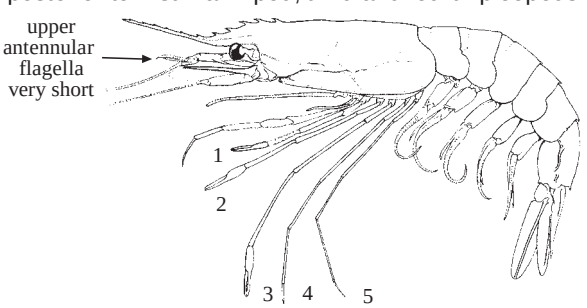
Diagnostic characters: Body generally robust, with shell very hard, of "stony" appearance; abdomen often with deep grooves and numerous tubercles. Rostrum well developed and extending beyond eyes, always bearing more than 3 upper teeth (including those on carapace); base of eyestalk with styliform projection on inner surface, but without tubercle on inner border. Both upper and lower antennular flagella of similar length, attached to tip of antennular peduncle. **Carapace lacks both postorbital and postantennal spines, cervical groove indistinct or absent. Exopod present only on first maxilliped**. All 5 pairs of legs well developed, fourth leg bearing a single well-developed arthrobranch (hidden beneath carapace). In males, endopod of second pair of pleopods (abdominal appendages) with appendix masculina only. **Third and fourth pleopods single-branched**. Telson generally armed with a pair of fixed lateral spines. **Colour:** body colour varies from dark brown to reddish; **often with distinct spots or colour markings on carapace and/or abdomen - such colour markings are specific and very useful in distinguishing the species**.

Habitat, biology, and fisheries: All members of this family are marine and can be found from shallow to deep waters (to depths of more than 400 m). They are all benthic and occur on both soft and hard bottoms. Their sizes are generally small, about 2 to 8 cm, but some species can reach a body length over 15 cm. The sexes are easily distinguished by the presence of a large copulatory organ (petasma) on the first pair of pleopods of males, while the females have the posterior thoracic sternites modified into a large sperm receptacle process (thelycum) which holds the spermatophores or sperm sacs (usually whitish or yellowish in colour) after mating. The shape of the petasma and thelycum is often specific and very useful for species identification. The eggs are small and numerous, and are released directly into the water and not retained on the female abdomen. The larvae are planktonic and have the nauplius stage. This family contains a single genus only and at present about 14 species are recorded from the Western Central Pacific. However, the taxonomic status and relationships of these species are generally unclear. Moreover, none of them are large enough or abundant enough to be of commercial importance in the area. Therefore, no identification key is provided here, and a species account is given for *Sicyonia lancifera* only, the most common representative of this family in the Western Central Pacific.

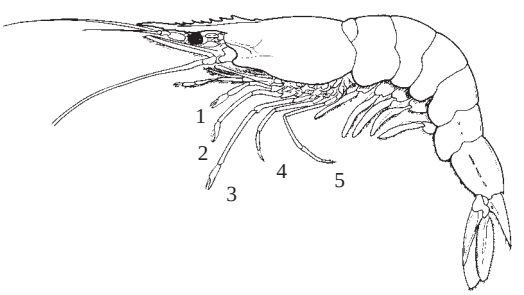
Similar families occurring in the area

Aristeidae: body not "stony" in appearance, abdomen without deep grooves or tubercles; either rostrum very short, armed with 1 or 2 upper teeth only, or upper antennular flagellum very short, not attached to tip of antennular peduncle; third and fourth pleopods divided into 2 branches; telson without fixed lateral spine.

Penaeidae: body not "stony" in appearance, abdomen without deep grooves or tubercles; exopod present posterior to first maxilliped; third and fourth pleopods divided into 2 branches.



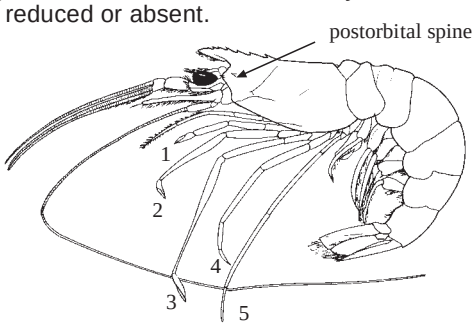
Aristeidae



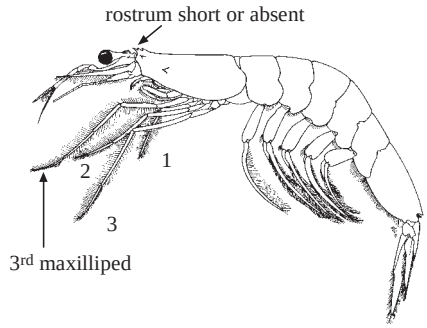
Penaeidae

Solenoceridae: body not “stony” in appearance, abdomen without deep grooves or tubercles; carapace either with postorbital or postantennal spine; cervical groove distinct, extending to about dorsal carapace; third and fourth pleopods divided into 2 branches.

Sergestidae: size small; rostrum very short; body strongly compressed laterally; shell soft; last 2 pairs of legs reduced or absent.



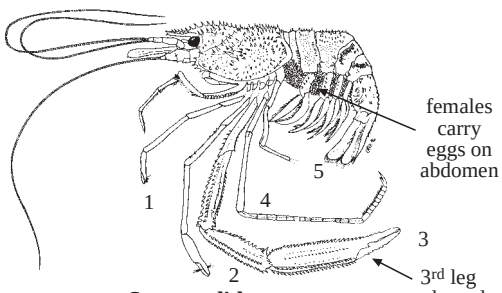
Solenoceridae



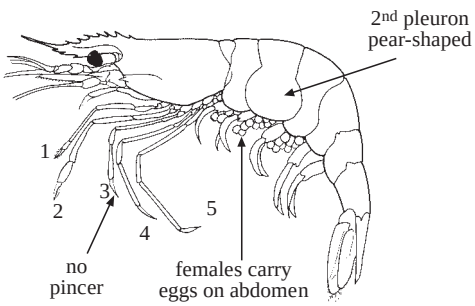
Sergestoidae

Stenopodidae: third pincer extraordinary large and massive; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.

Shrimps of the infraorder Caridea: third leg without pincer; second abdominal pleuron (lateral plate) greatly expanded, overlapping posterior part of first pleuron and anterior part of third pleuron; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.



Stenopodidae



Caridea

List of species occurring in the area

The symbol  is given when species accounts are included.

Sicyonia benthophila De Man, 1907
Sicyonia bispinosa (De Haan, 1844)
Sicyonia curvirostris Balss, 1914
Sicyonia fallax De Man, 1907
Sicyonia furcata Miers, 1878
Sicyonia inflexa (Kubo, 1949)
Sicyonia laevis Bate, 1881
 *Sicyonia lancifera* (Olivier, 1811)
Sicyonia nebulosa Kubo, 1949
Sicyonia ocellata Stimpson, 1860
Sicyonia ommanneyi Hall, 1961
Sicyonia parvula (De Haan, 1850)
Sicyonia rectirostris De Man, 1907
Sicyonia trispinosa De Man, 1907

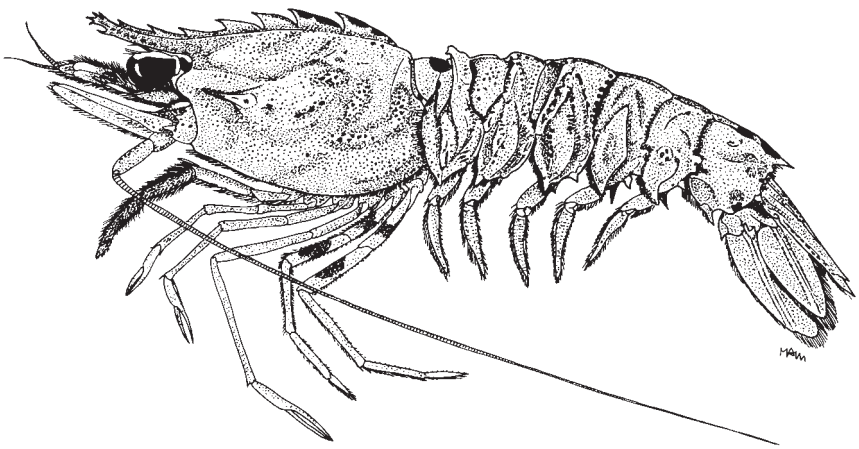
References

Chan, T.Y. and H.P. Yu. 1985. On the rock shrimps of the family Sicyoniidae (Crustacea: Decapoda) from Taiwan, with description of one new species. *Asian Mar. Biol.*, 2:93-106.

Sicyonia lancifera (Olivier, 1811)

Frequent synonyms / misidentifications: *Sicyonia cristata* (De Haan, 1844) / None.

FAO names: En - Knight rock shrimp; **Fr** - Boucot chevalier; **Sp** - Camarón de piedra lanzón.

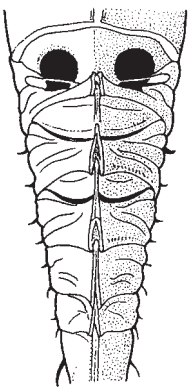


(after Motoh and Buri, 1984)

Diagnostic characters: Body robust, with **shell very hard, of "stony" appearance. Rostrum nearly straight,** with 3 to 6 upper teeth and 1 to 3 apical teeth, lower border usually bearing 1 tooth only. **Carapace armed with 3 to 5 large, crest-like postrostral teeth as well as a very strong hepatic spine. Abdomen heavily sculptured and with each pleura ending in 2 or 3 sharp spines. Pleopods with a single branch only. Colour:** body brownish, with a complicated pattern of white stripes and black dots; ventral surface somewhat reddish brown; **dorsal surface of first abdominal segment whitish, with a pair of large black spots;** eyes light brown; antennal flagella and thoracic appendages covered with white and brown bands; tail fan with a thick white band near base.

Size: Maximum body length 8 cm (females larger), commonly between 3 and 5 cm.

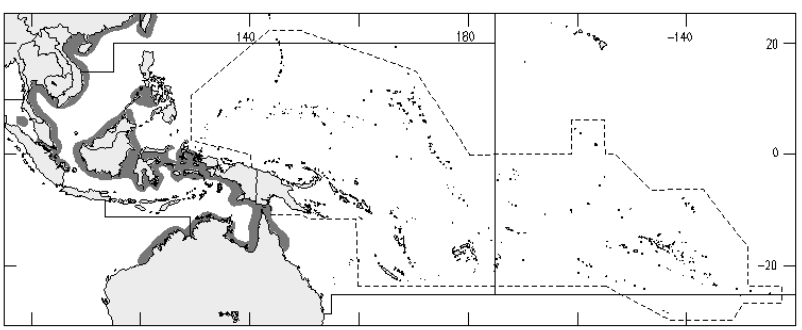
Habitat, biology, and fisheries: Found on sandy-mud bottoms, at depths from 25 to 350 m, usually less than 100 m. Probably burrows in sand during the daytime. When it comes out, often walks on the bottom with the abdomen strongly curved upward. Probably the most common species of the family in the area, but still few in numbers and only caught incidentally during prawn trawling operations. Without commercial value throughout its range because of its small size and low quantities.



abdomen (dorsal view)

(after Motoh and Buri, 1984)

Distribution: Widely distributed in the Indo-West Pacific from Mozambique to Japan and northern Australia.

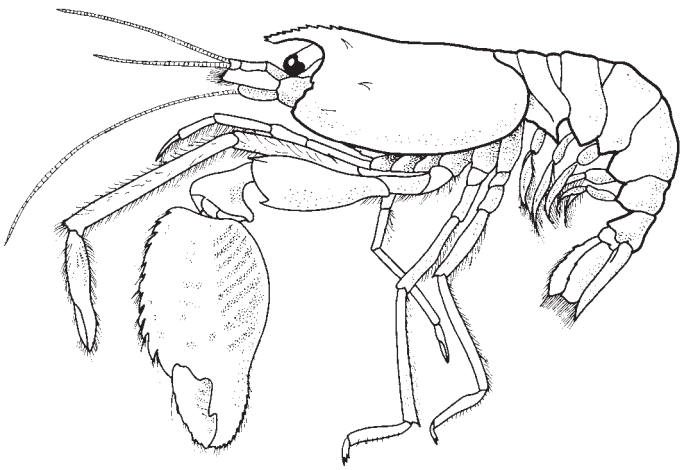


Infraorder STENOPODIDEA

Family STENOPODIDAE

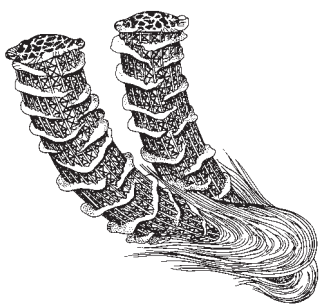
Stenopodid shrimps

Diagnostic characters: Usually small-sized, with a body length from 1 to 6 cm. All 5 pairs of legs well developed, **with first 3 pairs of legs forming a pincer, third pair huge and massive**. Abdomen with **posterior part of pleura covering anterior part of succeeding pleura. Males and females without large copulatory organ** on first pair of pleopods (abdominal appendages) or posterior thoracic sternites, respectively. **Females carry the eggs on the abdomen until hatching.**



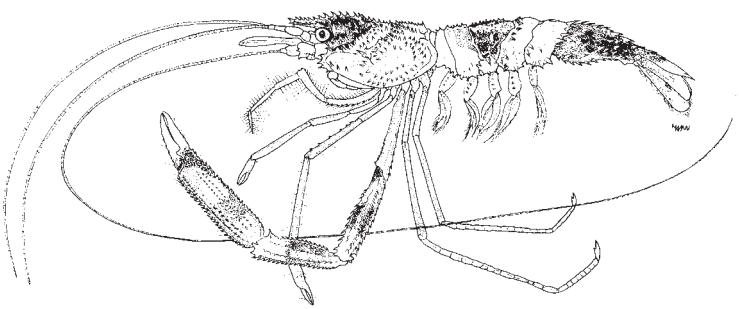
Spongicola venusta
(after Holthuis, 1993)

Habitat, biology, and fisheries: This infraorder contains a single family and about 60 species (divided into 2 families by some authors). Altogether, 7 genera and 19 species have been reported from the Western Central Pacific. All species are marine and benthic, and can be found from shallow coral reef areas to deep sea at depths of more than 800 m, with some species living in symbiosis with other invertebrates or fishes. Amongst these, the cleaner shrimps of the genus *Stenopus* and the venus shrimp *Spongicola venusta* are best known. *Stenopus* shrimps inhabit coral reefs and set up "cleaning stations" which are regularly visited by fishes which allow the shrimps to clean their wounds, skins, and mouths. *Spongicola venusta* lives in pairs inside the body of the deep-sea hextactinellid sponges (i.e. the Venus' flower basket). They enter the body of the sponges when they are in the postlarvae stage. As they grow, their size becomes too large and thus they cannot escape from the sponges where both the male and female spend the rest of their life.



Hextactinellid sponges (Venus' flower basket)
(after Tan et al., 1995)

Members of this infraorder are generally without any economic importance. Therefore, no species accounts are included here and no key is provided. For keys to the genera of this infraorder users can refer to L.B. Holthuis (1993), "The recent genera of the Caridean and Stenopodidean shrimps (Crustacea, Decapoda): with an appendix on the order Amphionidacea, C.H.J.M. Fransen and C. van Achterberg eds, Nationaal Natuurhistorisch Museum, Leiden." Only the cleaner shrimps of the genus *Stenopus* may sporadically enter the aquarium trade and have some commercial value. In the Western Central Pacific, the most commonly found species is *Stenopus hispidus* (Olivier, 1811). A key to species of *Stenopus* is given in J.W. Goy (1992, *J. Nat. Hist.*, 26:79-102), and good colour photos of this genus are included in H. Debelius and H.A. Baensch (1994, Marine Atlas: The joint aquarium care of invertebrates and tropical marine fishes, published by Mergus).



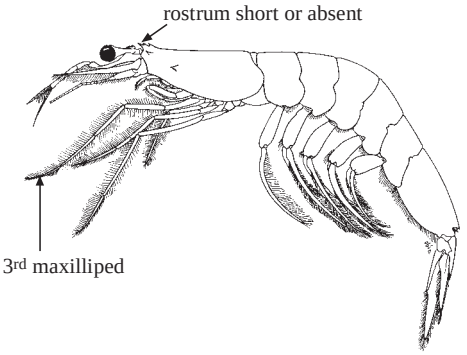
Stenopus hispidus

Other major groups of shrimps and prawns occurring in the area

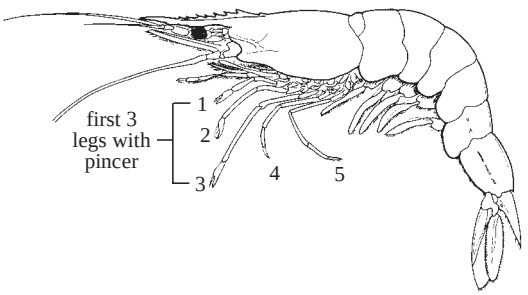
Sergestoidea: body strongly compressed laterally; shell soft; rostrum and last 2 pairs of legs reduced or absent; males with large copulatory organ on first abdominal appendage; eggs usually released directly into water, not retained by the female.

Penaeoidea: first 3 pairs of legs forming a pincer, none of them particularly large; with large copulatory organ, on first pair of pleopods in males, and on posterior thoracic sternites in females; eggs released directly into water, not retained by the female.

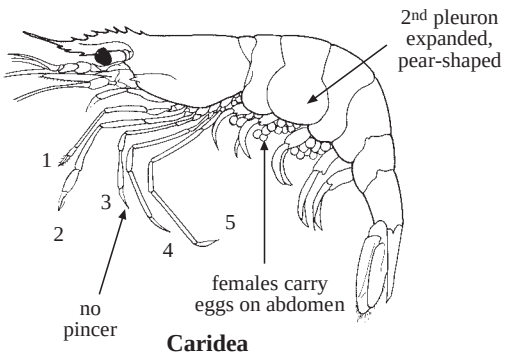
Caridea: third leg without pincer; pleuron of second abdominal segment greatly expanded and overlapping those of first and third segments.



Sergestoidea



Penaeoidea (after Liu, 1955)



Caridea

List of species occurring in the area

Engystenopus palmipes Alcock and Anderson, 1894
Engystenopus spinulatus Holthuis, 1946

Microprosthema scabricaudatum Richters, 1880
Microprosthema validum Stimpson, 1860

Odontozona ensifera (Danna, 1852)
Odontozona sculpticaudata Holthuis, 1946

Paraspongicola pusilla De Saint Laurent and Cleva, 1981

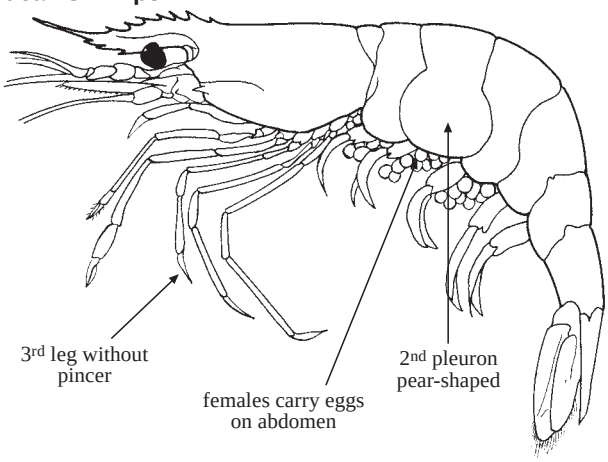
Spongicola henshawi Rathbun, 1906
Spongicola holthuisi De Saint Laurent and Cleva, 1981
Spongicola inflata De Saint Laurent and Cleva, 1981
Spongicola venusta De Haan, 1841

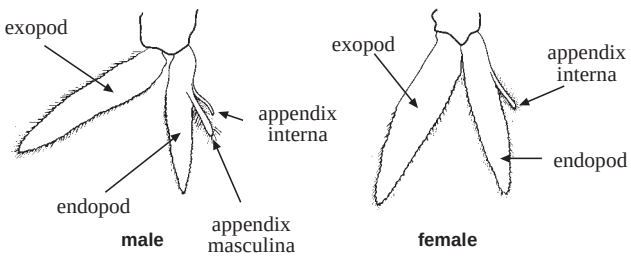
? *Spongicoloides japonica* (Kubo, 1942)

Stenopus chrysexanthus Goy, 1992
Stenopus cyanoscelis Goy, 1984
Stenopus devaneyi Goy and Randall, 1984
Stenopus hispidus (Olivier, 1811)
Stenopus pyronotus Goy and Davaney, 1980
Stenopus tenuirostris De Man, 1888
Stenopus zanzibaricus Bruce, 1976

Infraorder CARIDEA

Caridean shrimps





second abdominal leg (pleopod)

Diagnostic characters: Very small to large-sized, with a body length from 0.5 to 32 cm. All 5 pairs of legs well developed, the first 2 pairs with or without a pincer, **but third leg never bearing a pincer**. **Second abdominal pleuron (lateral plate) greatly expanded, pear-shaped and overlapping posterior part of first pleuron as well as anterior part of third pleuron. Males and females without large copulatory organ** on first pair of pleopods (abdominal appendages) or posterior thoracic sternites, respectively. **Females carry the eggs on the abdomen until hatching**.

Habitat, biology, and fisheries: This large infraorder contains at least 2 517 species in 28 families (the number of families in this infraorder is controversial among crustacean taxonomists). They can occur in all kinds of aquatic habitats such as high mountain streams (at altitudes of more than 2 500 m), lakes, caves, underground waters, rivers, estuaries, littoral zones, beaches, bays, coral reefs, continental shelves, and the deep sea (at depths of at least 6 364 m, perhaps even 10 912 m for a red "shrimp" sighted at a bathyscaphe at Challenger Deep, near Guam). A few species inhabit the upper littoral zone and are able to endure short periods of desiccation. Both benthic and/or pelagic (including epi- and bathypelagic) ways of life are found in members of this infraorder, and a large number of marine species live in symbiosis with other invertebrates or fishes. The sexes are generally separated, but certain species, such as some *Pandalus*, commonly first undergo a male phase and later transform into females. The gonopores are situated at the bases of fifth or third leg in males and females, respectively. However, as many caridean shrimps are of very small size, with the thoracic sternum being narrow, sexing caridean shrimps by observing the position of gonopores is often difficult. A more simple way to distinguish the sexes of caridean shrimps is to determine the presence or absence of the so-called appendix masculina on the second pleopods (or abdominal appendages; see figure above). In females, the endopod of the second pair of pleopods bears an appendix interna only. In males, the endopod of the second pleopods usually has an appendix interna as well, but additionally bears an appendix masculina, which, when observed under magnification, is distinct, even in juveniles. Besides, a remarkable sexual dimorphism (e.g. the size of the second pincer, the curvature of the rostrum, the shape of the abdominal pleura, etc.) is present in many species, but such a dimorphism is often specific and not necessarily the same in different species. The females of caridean shrimps carry the eggs on the abdomen. Their larvae leave the eggs in relatively advanced stages (i.e. lacking the nauplius stage) and some even directly as juveniles.

At present, 22 families of caridean shrimps are known to occur in the Western Central Pacific, but the exact number of species in the area is unclear. This is mainly due to fact that most of them are without any economic importance and therefore, have rarely been studied. However, recent extensive studies on carideans from the Philippines and adjacent areas have shown that 528 species are found in that region alone. Despite the large number of species, most caridean shrimps are small and do not occur in sufficient quantities to be actively fished, and/or live in very deep sea. Therefore, they are generally of no commercial importance in the Western Central Pacific. So far, only the giant river prawn *Macrobrachium rosenbergii* is both actively fished and extensively cultured in the area. It is mainly marketed live or fresh for local consumption, sometimes also exported. Several other fresh-water and coastal caridean shrimps in the area also have a relatively larger size or are easy to catch, and are likely to be used as food by natives in several countries. However, information on local use of caridean shrimps is mostly lacking and the exact identities of the species in question are often uncertain and/or confusing in literature. On the other hand, some deep-sea caridean shrimps, mostly belonging to the family Pandalidae

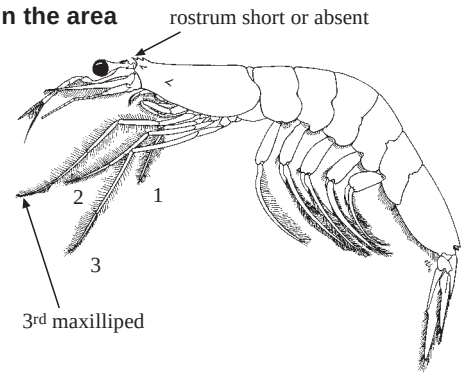
(particularly those of the genus *Heterocarpus*), are large in size and are often caught in great numbers during exploratory trawling operations. They are generally considered to have commercial potential with the development of a future deep-sea fishery in the area. Finally, it should be mentioned that some coral reef carideans (mainly members of the families Alpheidae, Gnathophyllidae, Hippolytidae, Hymenoceridae, Palaemonidae, and Rhynchocinetidae) have an attractive coloration and can be sporadically found in the aquarium trade, where those uncommon species often command a high price. Nevertheless, their supply are usually unstable and they are commercially much less important as marine coral fishes. Therefore, individual identification sheets are provided here for several selected species only, as representatives of the infraorder in the area. For keys to the families and genera of carideans, users may consult L.B. Holthuis (1993), "The recent genera of the Caridean and Stenopodidean shrimps (Crustacea, Decapoda): with an appendix on the order Amphionidacea, C.H.J.M. Fransen and C. van Achterberg (eds), Nationaal Natuurhistorisch Museum, Leiden." For the identification of species, users may refer to the keys published by F.A. Chace, Jr (1976-1997: *Smithson. Contrib. Zool.* 222, 277, 381, 384, 397, 411, 432, 466, 543, 587), or are encouraged to send the sample(s) to the author of the present contribution.

Other major groups of shrimps and prawns occurring in the area

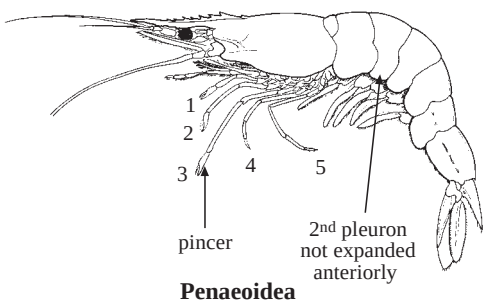
Sergestoidea: last 2 pairs of legs reduced or absent; anterior part of second abdominal pleuron not overlapping first abdominal pleuron; males with large copulatory organ on first pair of pleopods; eggs usually released directly into water, not retained by the female.

Penaeoidea: third leg with pincer; anterior part of second abdominal pleuron not overlapping first abdominal pleuron; with large copulatory organ, on first pair of pleopods in males, and on posterior thoracic sternites in females; eggs released directly into water, not retained by the female.

Stenopodidea: third leg bearing a very large pincer; anterior part of second abdominal pleuron not overlapping first abdominal pleuron.

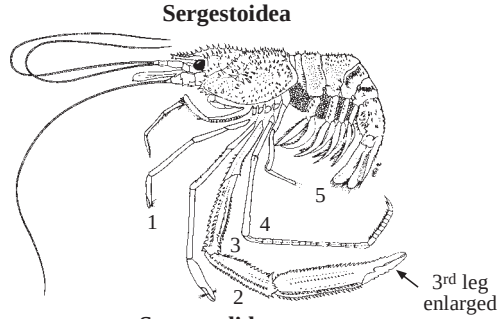


Sergestoidea



Penaeoidea

(after Liu, 1955)



Stenopodidea

List of families and species treated in this contribution

The symbol is given when species accounts are included.

Infraorder CARIDEA
Superfamily PASIPHAEOIDEA
PASIPHAEIDAE

Superfamily OPLOPHORIDEA
OPLOPHORIDAE

Superfamily ATYOIDEA
ATYIDAE
Atyopsis moluccensis (De Haan, 1849)
Atyopsis spinipes (Newport, 1847)

Caridina weberi De Man, 1892

Superfamily BRESILIOIDEA
BRESILIIDAE

Superfamily NEMATOCARCINOIDEA
EUGONATONOTIDAE
NEMATOCARCINIDAE
RHYNCHOCINETIDAE
Rhynchocinetes durbanensis Gordon, 1936

Superfamily PSALIDOPODOIDEA
PSALIDOPODIDAE

Superfamily STYLODACTYLOIDEA
STYLODACTYLIDAE

Superfamily CAMPYLONOTIDEA
BATHYPALAEMONELLIDAE

Superfamily PALAEMONOIDEA
ANCHISTIOIDIDAE
GNATHOPHYLLIDAE
HYMENOCERIDAE
Hymenocera picta Dana, 1852

PALAEMONIDAE
Exopalaemon styliferus (H. Milne Edwards, 1840)
Exopalaemon vietnamicus Nguyên, 1992

Leandrites indicus Holthuis, 1950

Leptocarpus potamiscus (Kemp, 1917)

Macrobrachium equidens (Dana, 1852)
Macrobrachium lar (Fabricius, 1798)
Macrobrachium mirabile (Kemp, 1917)
Macrobrachium rosenbergii (De Man, 1879)

Nematopalaemon tenuipes (Henderson, 1893)

Palaemon concinnus Dana, 1852

Superfamily ALPHEOIDEA
ALPHEIDAE
HIPPOLYTIDAE
Lysmata amboinensis (De Man, 1888)
Lysmata debelius Bruce, 1983

Saron neglectus De Man, 1902

OGYRIDIDAE

Superfamily PROCESSOIDEA
PROCESSIDAE

Superfamily PANDALOIDEA
PANDALIDAE
Heterocarpus hayashii Crosnier, 1988
Heterocarpus parvispina De Man, 1917
Heterocarpus sibogae De Man, 1917

THALASSOCARIDIDAE

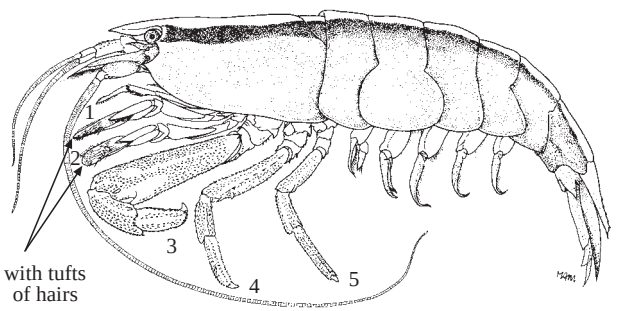
Superfamily CRANGONOIDEA
CRANGONIDAE
GLYPHOCRANGONIDAE

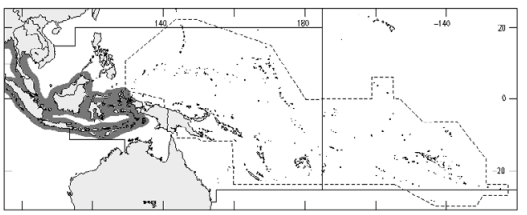
ATYIDAE

Atyopsis moluccensis (De Haan, 1849)

En - Moluccas brush shrimp.

Maximum total length 7.7 cm (occasionally 8.6 cm); males larger. Inhabits upper or middle parts of fast-flowing streams. Probably reproduce in brackish water and juveniles are tolerant of salt water. Abundance of this shrimp in the area is uncertain. Atyid shrimps are reported to be used as food or fertilizer in many parts of the area. Although the size of this species is large for atyids, its economic importance is probably still minor. Atyids are mainly marketed fresh or dry for local consumption. Recently, live specimens, probably originating from Indonesia, have been seen in the aquarium trade, for which this shrimp is a suitable candidate, due to the attractive bandings on the body and since it can easily be kept in captivity. Indo-West Pacific, and known with certainty from Sri Lanka to Thailand, Malaysia, Indonesia, and perhaps the Philippines. Often confused with *Atyopsis spinipes*.



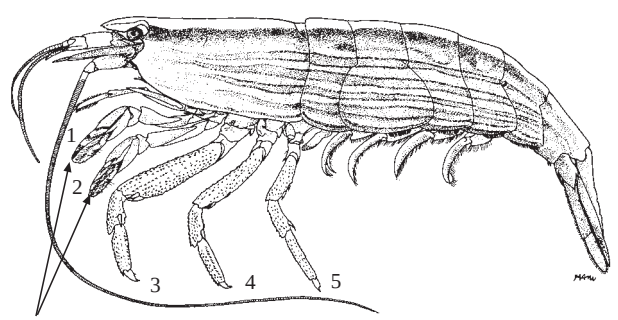


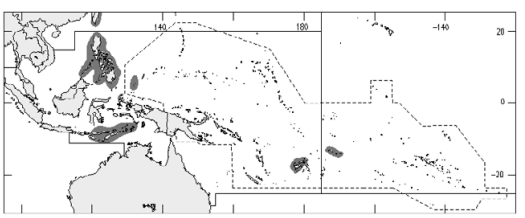
(adapted from Chace, 1983)

Atyopsis spinipes (Newport, 1847)

En - Soldier brush shrimp; **Fr** - Saltarelle soldat; **Sp** - Camarón soldado.

Maximum total length 7.1 cm, commonly between 4 and 5 cm (females larger). Adults mainly occcur in fresh water, in upper or middle parts of fast-flowing streams. Reproduce in brackish water. Abundance of this shrimp in the area is uncertain. Although atyid shrimps are reported to be used as food or fertilizer in many parts of the area and this species is relatively large amongst the atyids, its economic importance is probably only minor. Atyids are mainly marketed fresh or dry for local consumption. This shrimp has recently been introduced to the aquarium trade (place of origin probably Indonesia), because of the attractive bandings on the body and as it can easily be kept in captivity. Western Pacific, and known with certainty from Ryukyus, Taiwan Province of China, the Philippines, Lesser Sunda Islands, Palau, Fiji, and Samoa.



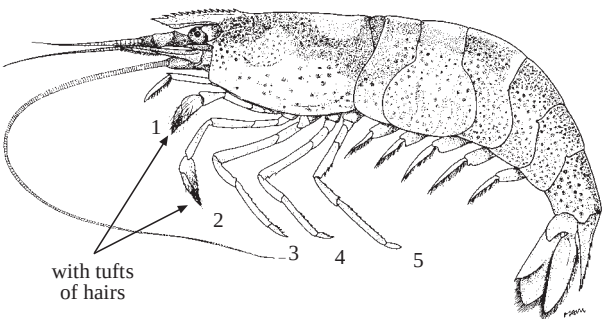


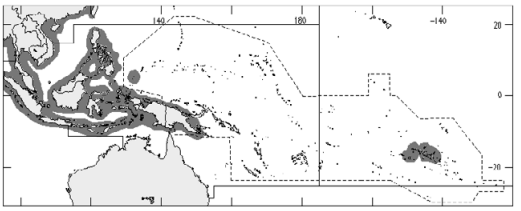
(adapted from Chace, 1983)

Caridina weberi De Man, 1892

En - Pugnose caridina; **Fr** - Saltarelle nez-camus; **Sp** - Camarón ñata.

Maximum total length about 3 cm, commonly between 1.5 and 2 cm (females usually larger). Inhabits mainly in middle or lower parts of rivers, often around heavy vegetation. Reproduce in brackish water and juveniles are tolerant of salt water. Abundance of this shrimp in the area is uncertain although it has been reported to be of some economic value in Indonesia. Considering their very small size, all species of Caridina probably have very limited, if any, commercial importance. Indo-West Pacific from India to Japan and Polynesia.





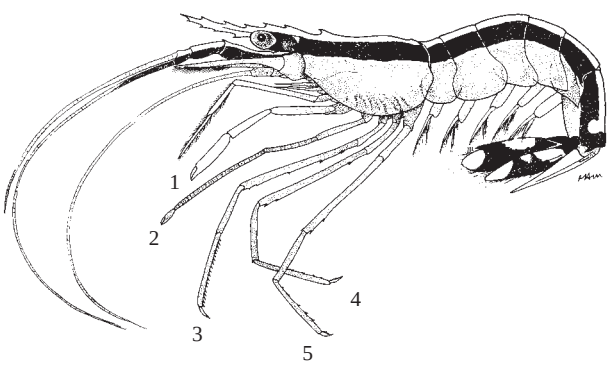
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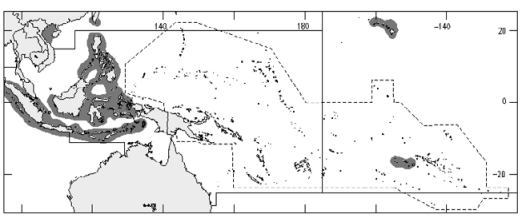
HIPPOLYTIDAE

Lysmata amboinensis (De Man, 1888)

En - Common cleaner shrimp.

Body length around 5 cm. Shallow marine reef areas. Well known for its fish cleaning behaviour and sometimes encountered in large groups. Popular and often seen in the marine aquarium trade where it is sold at moderate prices. Nevertheless, its unstable supply suggests that this shrimp is not abundant in its natural habitats. Widely distributed in the Indo-West Pacific from Kenya to Japan, French Polynesia, and Hawaii.



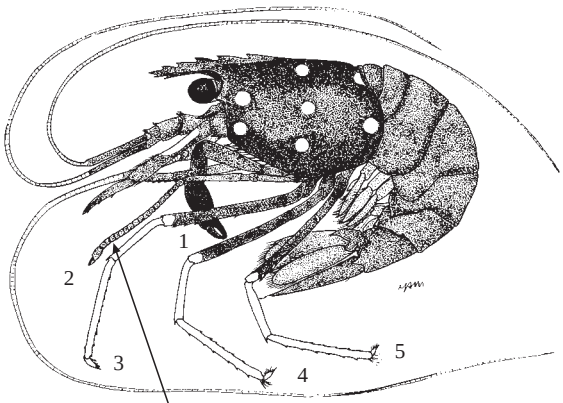


(adapted from Holthuis, 1947)

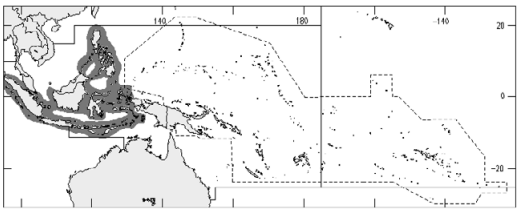
Lysmata debelius Bruce, 1983

En - Cardinal shrimp.

Body length around 4 to 5 cm. Marine reef areas in depths from 10 to 28 m. Normally found in pairs and behave as fish cleaners. A popular shrimp in the marine aquarium trade and sold at somewhat higher prices than most of the other marine aquarium shrimps. However, its supply is not large and unstable, indicating that this shrimp is not abundant in its natural habitats. Known with certainty from the Philippines, Indonesia, and Sri Lanka.



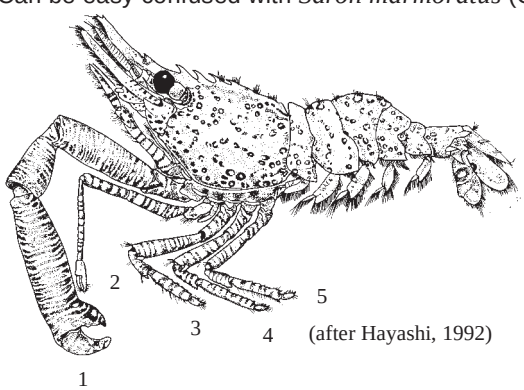
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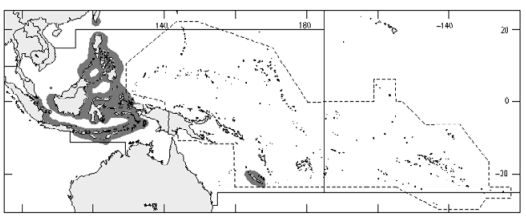
Saron neglectus De Man, 1902

En - Spotted marbled shrimp.

Body length around 2 to 4 cm. Shallow marine reef areas. Nocturnal and usually hiding under rocks and caves, no fish cleaning behaviour reported. Males with first leg greatly enlarged. Probably the most common species of the genus seen in the marine aquarium trade (live specimens originated probably mainly from Indonesia). Sold at moderate prices, due to its unstable supply. Widely distributed in the Indo-West Pacific from Madagascar to the Red Sea, Japan, and New Caledonia. Can be easy confused with *Saron marmoratus* (Olivier, 1811).



(after Hayashi, 1992)

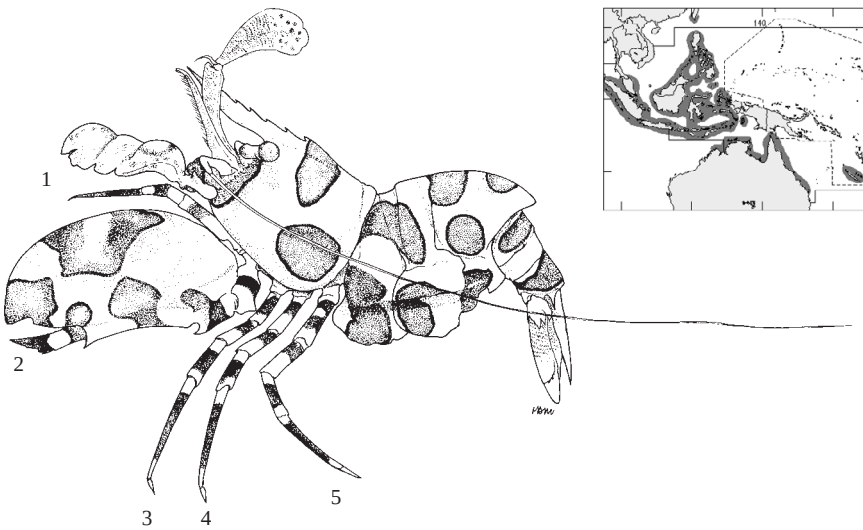


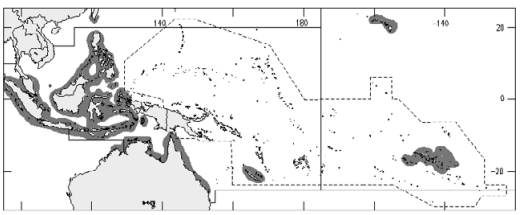
HYMENOCERIDAE

Hymenocera picta Dana, 1852

En - Painted harlequin shrimp.

Body length around 2 to 5 cm. Shallow marine reef areas in depths from 1 to 20 m. Usually live in pairs and reported to be strongly territorial. No fish cleaning behavior observed but reported to kill and feed on starfishes, at least under aquarium conditions. A popular shrimp in the aquarium trade because of its bizarre looking and amazing coloration. Sold at moderately high prices due to its rare supply, indicating that this shrimp is not commonly found in its natural habitats. Widely distributed in the Indo-West Pacific from eastern Africa to Japan, Hawaii, and French Polynesia.



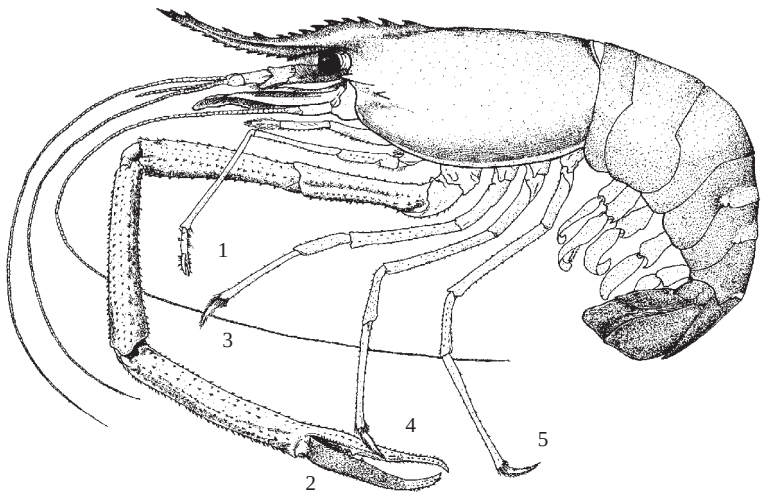


PALAEMONIDAE

Macrobrachium rosenbergii (De Man, 1879) PRF

Frequent synonyms / misidentifications: *Macrobrachium rosenbergii dacqueti* (Sunier, 1925) / *Macrobrachium carcinus* (Linnaeus, 1758).

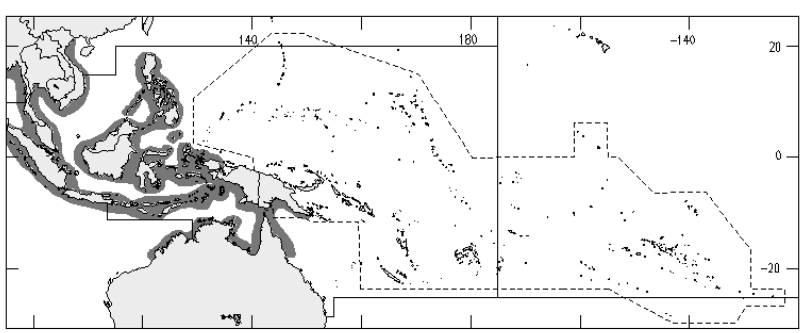
FAO names: En - Giant river prawn; **Fr** - Bouqet géant; **Sp** - Camarón gigante.



Diagnostic characters: Rostrum long, well extending beyond antennal scale; **forming a high basal crest above the eye**; armed with 11 to 14 upper teeth (including those on carapace and with distal teeth more widely spaced) and 8 to 14 lower teeth. **Hepatic spine situated distinctly below antennal spine. Second legs very large, robust and of same size, with carpus longer than merus; in adult males, entire second leg densely covered with spines and sharp tubercles, cutting edges of fingers bearing only 1 or 2 large basal teeth and without rows of tubercles on either side, movable finger very hairy except at tip, carpus shorter than pincer.** Telson tapering posteriorly, with tip exceeding posterolateral spines. **Colour:** body generally dark green to greyish blue, with longitudinal or irregular streaks of darker and lighter colour, **hinges of abdominal segments often orange**; eyes dark brown; antennal flagella dark blue to greyish; large pincer bluish to dark blue; eggs yellowish; youngs and berried females often with some longitudinal golden strips on the sides of body.

Size: The largest known caridean shrimp, maximum body length 34 cm (females) and 26 cm (males), commonly between 10 and 20 cm.

Habitat, biology, and fisheries: Inhabits mainly estuarine areas and rivers but sometimes also found at sea; requires brackish water for spawning and nursing up to postlarval stage, while juveniles are mainly found in fresh-water zones. An omnivorous, very large and common fresh-water shrimp that is extensively caught in the area. Taken by bamboo barriers, fish corrals, traps, set nets, cast nets, hook-and-line, and artisanal gear. Big catches are often linked to heavy rains. Also an important candidate for fresh-water aquaculture in many countries. In 1995, the harvest of this species reported from the area amounted to 9 732 t from capture fishery in Indonesia and Thailand, and 5 040 t from aquaculture in Thailand. Marketed live, fresh or frozen, mainly for local consumption but sometimes also for export.

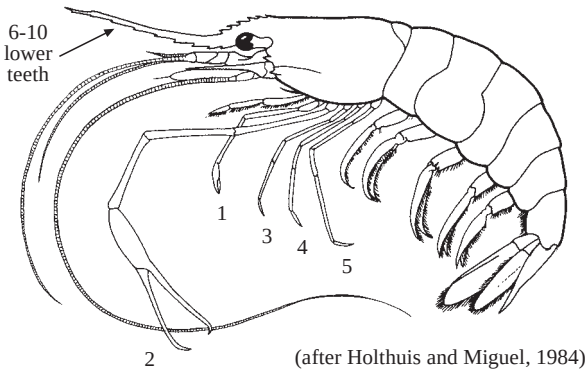


Distribution: Indo-West Pacific from Pakistan to Viet Nam, the Philippines, New Guinea, and northern Australia (the western form from India to Malaysia is sometimes treated as a different subspecies). This shrimp has been introduced to many parts of the world for use in aquaculture.

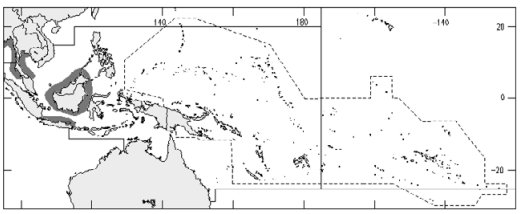
Exopalaemon styliferus (H. Milne Edwards, 1840)

En - Roshna prawn; **Fr** - Bouqet rosna; **Sp** - Camarón rosna.

Maximum total length for males 9 cm; egg-bearing females 6.8 to 8.6 cm. Inhabits shallow coastal waters, brackish or marine, occasionally also in fresh water. A small species, abundance in the area uncertain, probably without commercial importance and only caught incidentally in fisheries for other shrimps. Indo-West Pacific from Pakistan to Thailand and Borneo.



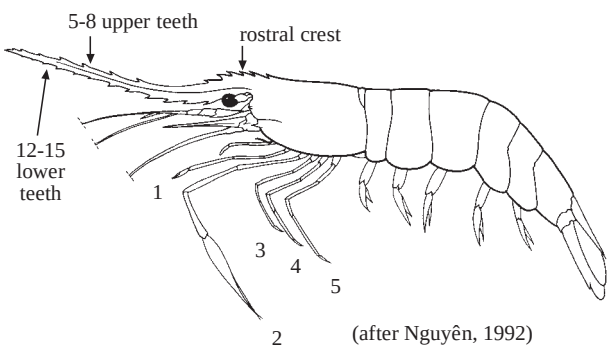
(after Holthuis and Miguel, 1984)



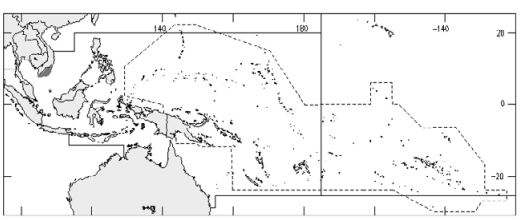
Exopalaemon vietnamicus Nguyên, 1992

En - Vietnamese crest prawn.

Maximum body length 7.7 cm; egg-bearing females more than 4 cm body length. Inhabits estuaries and shallow coastal mud flat areas near river mouths. Caught by conical set nets and push nets. Often occurs in large quantities in coastal rice shrimp farming areas and semi-extensive shrimp culture ponds. Sometimes too abundant, becoming a food competitor of cultured penaeid prawns. In certain areas it constitutes 40 to 50% of the total shrimp harvest at the end of the rainy season. Marketed dried or fresh and usually mixed with other small penaeids; an important food source for local consumption. Restricted to southeastern Viet Nam near Ho Chi Min City.



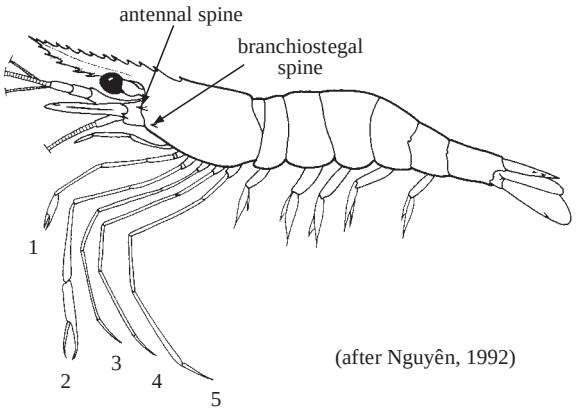
(after Nguyên, 1992)



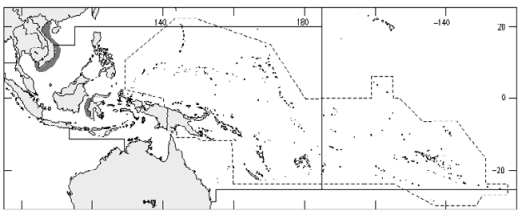
Leandrites indicus Holthuis, 1950

En - Indian small prawn.

Maximum total length about 3 cm. Inhabits brackish water in mangrove areas. A bycatch of fisheries for *Acetes* species, caught by conical set nets and push nets. In certain parts of Viet Nam, this small species is very abundant and constitutes a good food source for local consumption. Sometimes also enters penaeid culture ponds. Marketed fresh and mixed with *Acetes* species, also used in the processing of native shrimp paste. Western Pacific, and so far only recorded from Makasar (Celebes) and Viet Nam.



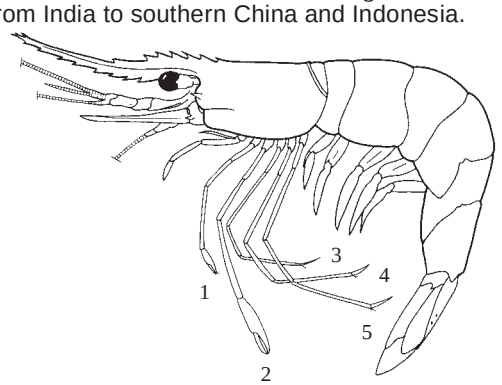
(after Nguyên, 1992)



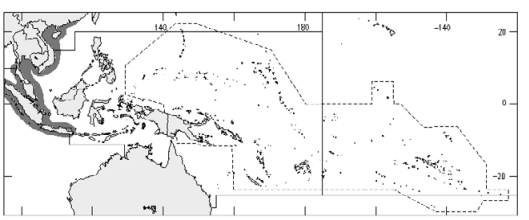
Leptocarpus potamiscus (Kemp, 1917)

En - Bombay prawn; **Fr** - Bouqet bombay; **Sp** - Camarón de Bombay.

Maximum total length about 6 cm (females) and 4.5 cm (males). Inhabits fresh to brackish water. In Viet Nam, this shrimp is reported to occur in great quantities in the irrigation ditches designed for culture of *Macrobrachium rosenbergii* and is a valuable species for local fisheries. Indo-West Pacific from India to southern China and Indonesia.



(after Nguyên, 1992)



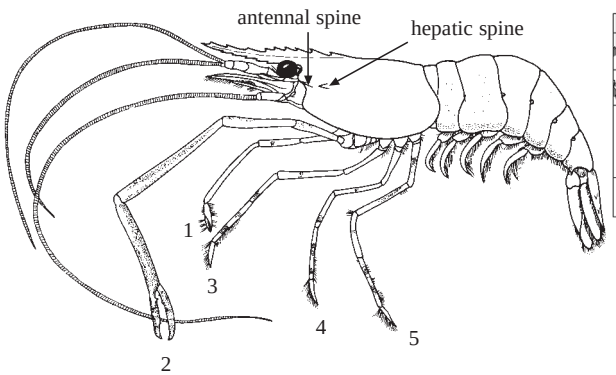
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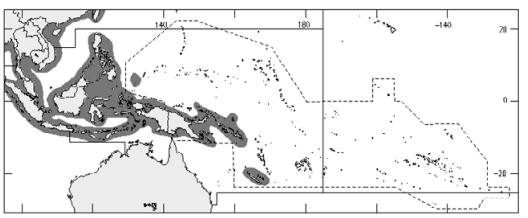
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Macrobrachium equidens (Dana, 1852)

En - Rough river prawn; **Fr** - Bouqet chagrin; **Sp** - Camarón lija.

Maximum total length 9.8 cm (males usually larger). Inhabits lower parts of streams, river mouths, estuaries, and brackish waters of high salinity; rarely found in pure fresh water but often in sea water (near river mouths) to a depth of at least 30 m. Reproduce in brackish and sea water, larvae have about 11 stages and transform into postlarvae in 43 days. A common species in the area but nowhere abundant. Similarly to other small to medium-sized species of the genus, it is frequently found in mixed catches of fresh-water shrimps. Since this shrimp also occurs in pure sea water, it is often caught incidentally in penaeid fisheries. Marketed mainly live or fresh, generally sold at low prices and consumed locally. Widely distributed in the Indo-West Pacific from eastern Africa to the Ryukyu Islands, New Caledonia, and Solomon Islands, also introduced to Nigeria.



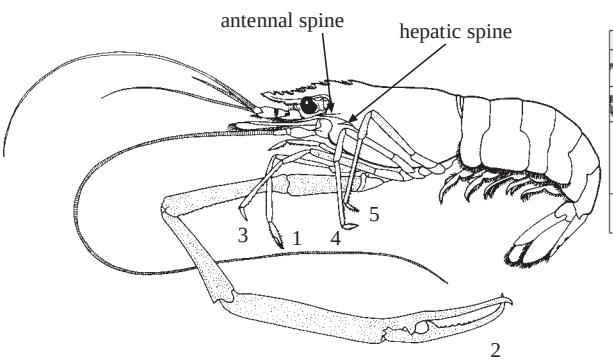


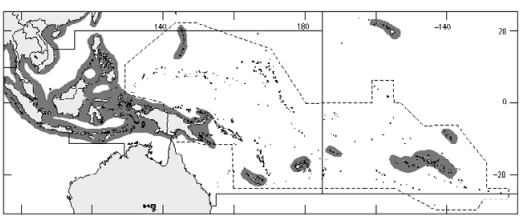
(after Holthuis and Miguel, 1984)

Macrobrachium lar (Fabricius, 1798)

En - Monkey river prawn; **Fr** - Bouqet singe; **Sp** - Camarón mono.

Maximum total length 18.1 cm (males usually much larger). Adults occur in fresh water, mainly in upper and middle parts of rivers; able to endure short time of desiccation and occasionally observed to crawl on land during heavy rainfall. Migrate to the river mouth or estuary for reproduction, with juvenile stages in brackish and sometimes also in salt water. Fished throughout its range. Caught by traps and artisanal gear. A large species, but nowhere very abundant and marketed mainly locally, live or fresh. In the Philippines, this shrimp is not always available in the fish markets, sold at about half the price of *Macrobrachium rosenbergii*. Aquaculture experiments have been carried out by many countries but were so far unsuccessful, due to the very long larval stage in this species (at least 100 days). Widely distributed in the Indo-West Pacific, from eastern Africa to Ryukyu Islands and the Marquesas Islands; probably not indigenous (i.e. introduced) in Hawaii.



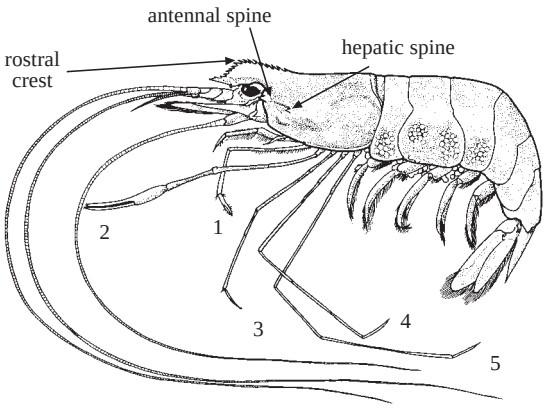


(after Holthuis, 1993)

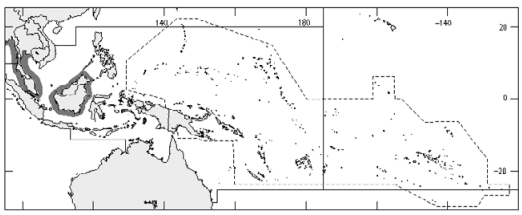
Macrobrachium mirabile (Kemp, 1917)

En - Shortleg river prawn; **Fr** - Bouqet tipattes; **Sp** - Camarón patojo.

Maximum total length 6 cm (females) and 4 cm (males). Inhabits fresh and brackish water. Similarly to the other small species of the genus, its fishery in the area is unclear, probably caught incidentally with other fresh-water shrimps and used as food whenever available. Indo-West Pacific, and recorded from eastern India, Bangladesh, Myanmar, Thailand, Malaysia, and Borneo.



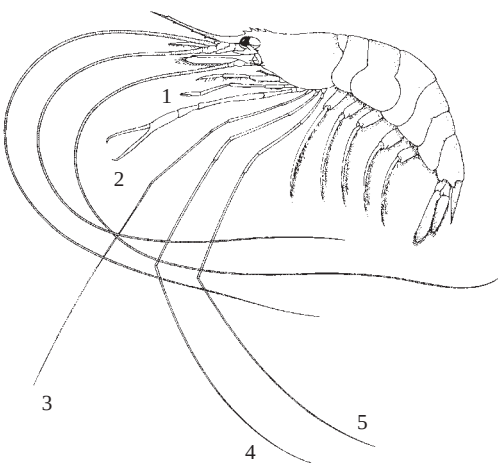
(after Kemp, 1917)

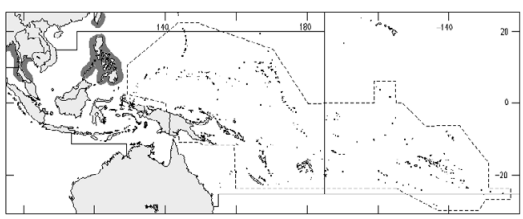


Nematopalaemon tenuipes (Henderson, 1893)

En - Spider prawn; **Fr** - Bouqet araignée; **Sp** - Camarón araña.

Maximum total length 8 cm. Inhabits shallow coastal waters to depths of about 20 m, and also found in estuarine and brackish waters. Abundance of this species in the area is unclear, but it has been reported to be used as food in the Philippines. Marketed dried or salted for local consumption. Widely distributed in the Indo-West Pacific from eastern Africa to Taiwan Province of China and the Philippines, probably also from New Zealand.

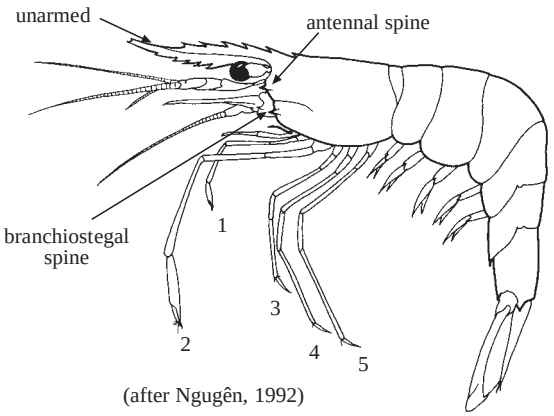




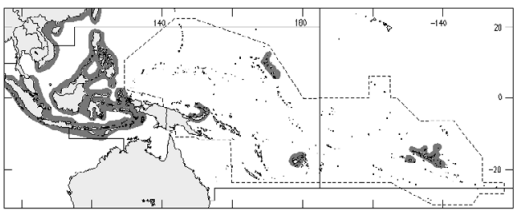
Palaemon concinnus Dana, 1852

En - Mangrove prawn; **Fr** - Bouqet mangrove; **Sp** - Camarón de manglar.

Maximum total length 7 cm (females), smallest egg-bearing females 4.9 cm. Restricted to brackish water in the lower part of rivers, rarely found in pure fresh or sea water. In Viet Nam, this shrimp forms a bycatch of fisheries for *Macrobrachium* species and is offered for sale in local markets. Probably also used as food in the Philippines. Widely distributed in the Indo-West Pacific, from eastern Africa to Taiwan Province of China and Polynesia.



(after Ngugên, 1992)

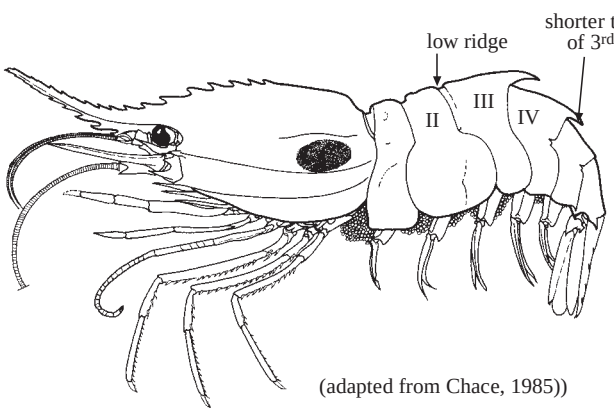


PANDALIDAE

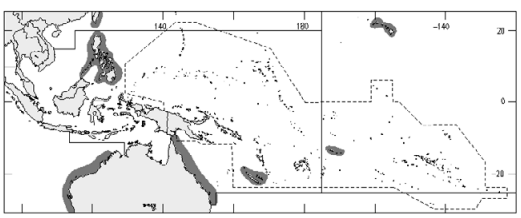
Heterocarpus hayashii Crosnier, 1988

En - Japanese nylon shrimp.

Maximum body length about 11 cm (females larger), commonly between 6 and 10 cm. Found on bottoms of sand and mud, at depths from 150 to 625 m, usually around 200 m, or deeper. So far not fished commercially but sometimes caught in large quantities on the basis of exploratory deep-water trawling. The moderate size of this shrimp and the fact it is found in not very deep water suggests that it may have commercial potential with the development of a deep-sea fishery in the area. Western Pacific, reported from Japan, Taiwan Province of China, the Philippines, Australia, New Caledonia, Chesterfield Islands, and Hawaii. Often confused with *Heterocarpus ensifer* A. Milne Edwards, 1881, *H. parvispina*, and *H. sibogae*.



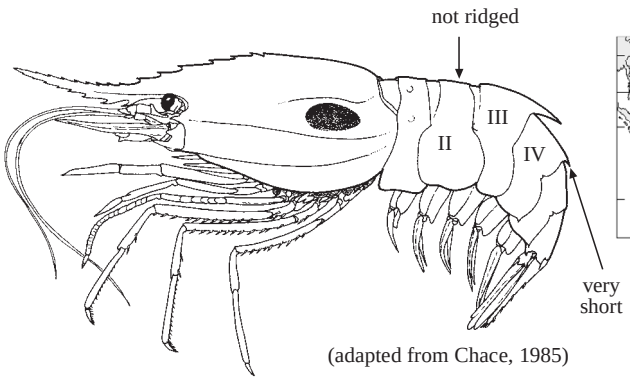
(adapted from Chace, 1985))

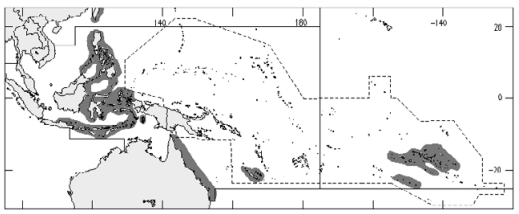


Heterocarpus parvispina De Man, 1917

En - Short-spined nylon shrimp.

Maximum body length about 9 cm (females larger), commonly between 6 and 8 cm. Found on sandy-mud bottoms, at depths from 230 to 815 m, mostly less than 600 m. Not fished commercially at present. Occasionally caught in large quantities on the basis of exploratory deep-water trawling (more abundant from 350 m depth downward) and may have commercial potential with the development of deep-sea fisheries in the area. Western and southern Pacific from Taiwan Province of China to Indonesia, Australia, and French Polynesia. Often confused with *Heterocarpus ensifer* A. Milne Edwards, 1881, *H. hayashii*, and *H. sibogae*.



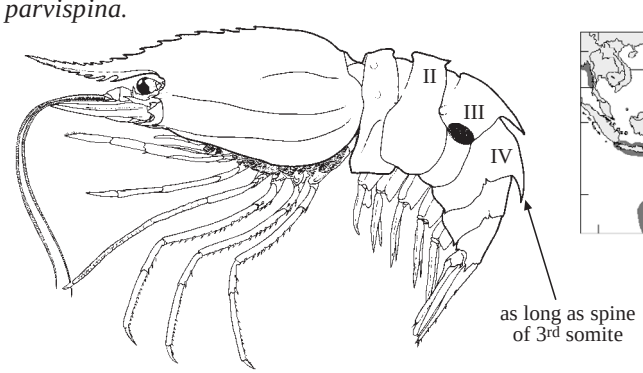


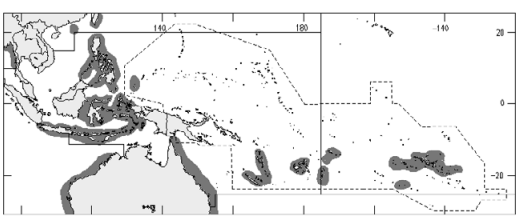
(adapted from Chace, 1985)

Heterocarpus sibogae De Man, 1917

En - Mino nylon shrimp; **Fr** - Crevette nylon mino; **Sp** - Camarón nailón mino.

Maximum body length about 11 cm (females larger), commonly between 6 and 10 cm. Found on bottoms of sand and mud from depths of about 150 to 950 m. Although at present not commercially fished, it is the most common caridean shrimp caught during exploratory deep-water trawling operations in the area. Often caught in large quantities from moderate depths (about 200 m downward) in the area (e.g. the Philippines, Indonesia, Australia, New Caledonia, Fiji, Vanuatu, Samoa, Tonga, French Polynesia, and probably also Palau) and therefore has a very high commercial potential. Widely distributed in the Indo-West Pacific from Madagascar to Japan and French Polynesia. Often confused with *Heterocarpus ensifer* A. Milne Edwards, 1881, *H. hayashii*, and *H. parvispina.*





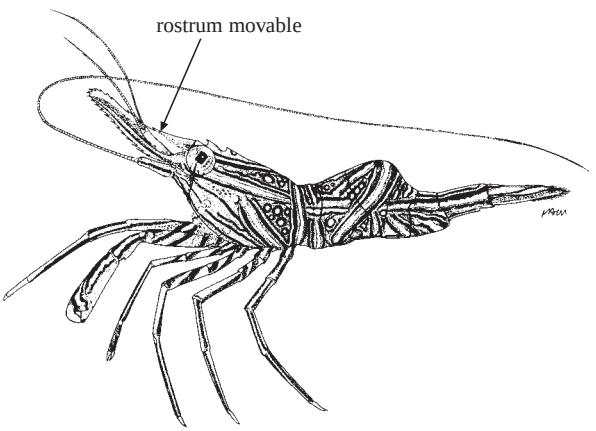
(adapted from Chace, 1984)

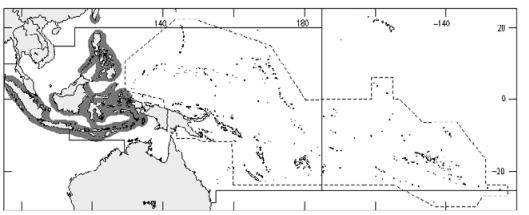
RHYNCHOCINETIDAE

Rhynchocinetes durbanensis Gordon, 1936

En - Striped hinge-beak shrimp.

Body length around 3 to 4 cm. Shallow marine reef areas. Gregarious and usually hiding under rocks and caves, also active during the daytime (afternoon); no fish cleaning behavior reported. Probably the most common shrimp in the area seen in the marine aquarium trade (with live specimens originating from Sri Lanka, the Philippines, and Indonesia), where it is regularly offered for sale. Very popular for its attractive coloration and as it easily adapts to captivity; sold at inexpensive prices. Widely distributed in the Indo-West Pacific from the eastern coast of South Africa to the Ryukyu Islands and Indonesia. Previously often confused with *Rhynchocinetes uritai* Kubo, 1942.





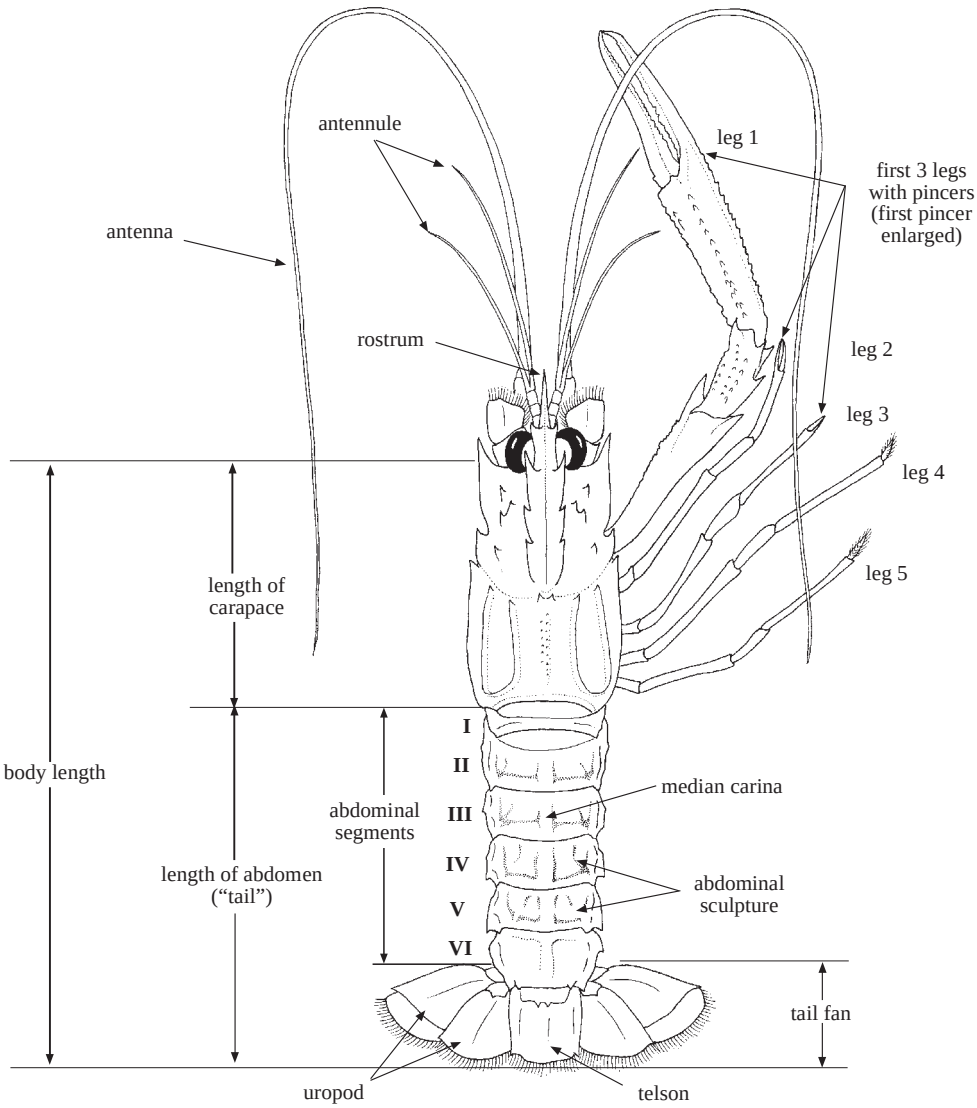
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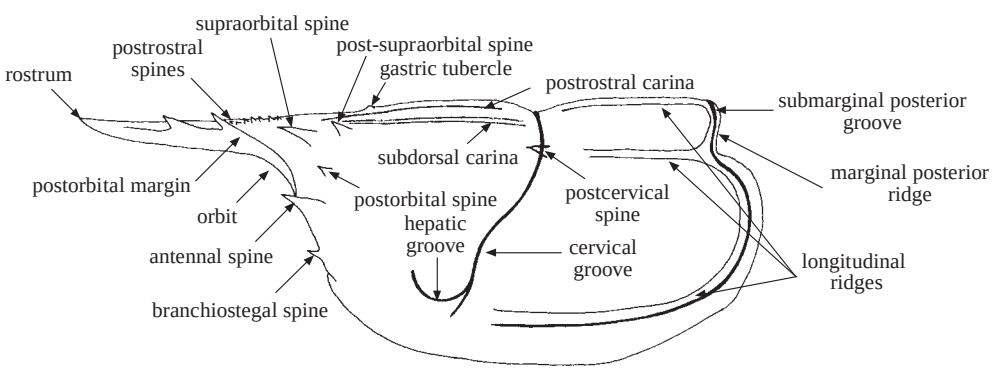
LOBSTERS

by T.Y. Chan

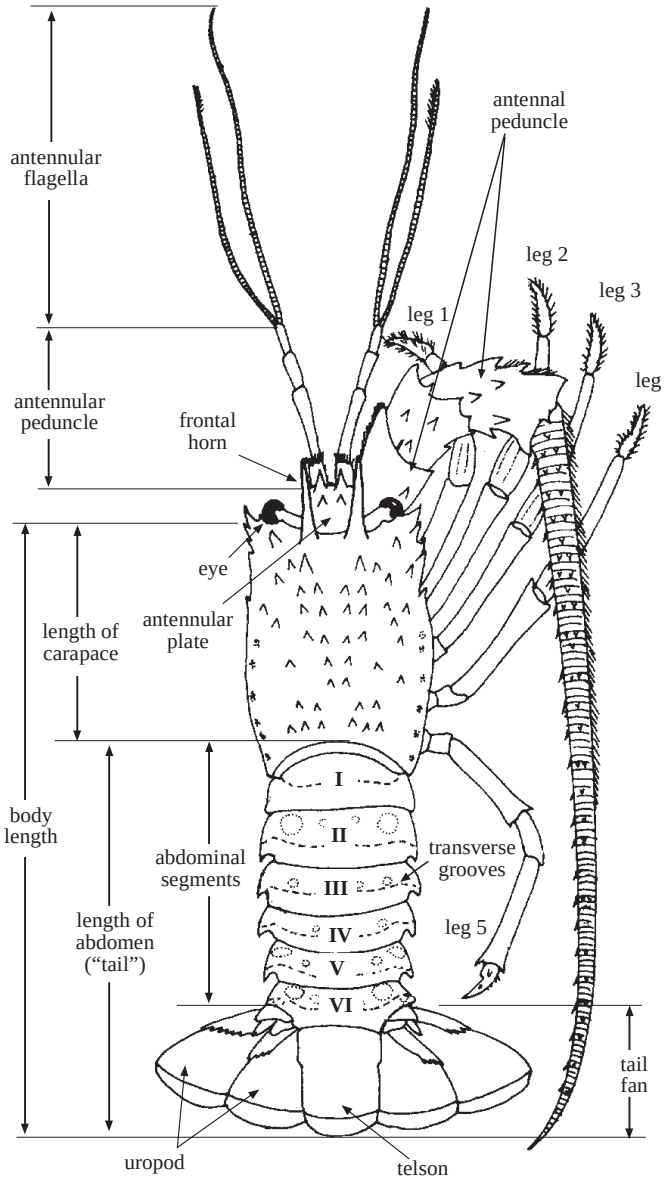
TECHNICAL TERMS AND MEASUREMENTS



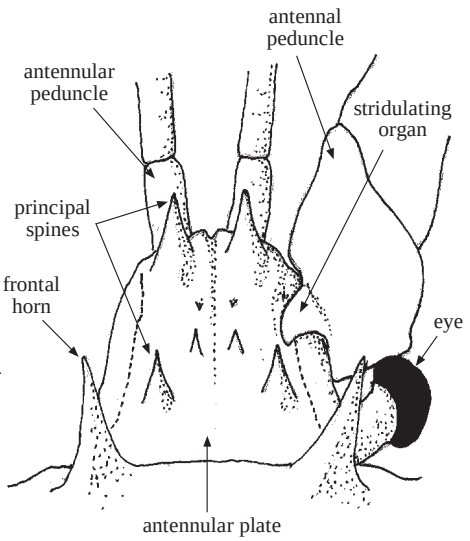
general shape (dorsal view) of a true lobster (*Metanephros* spp.)



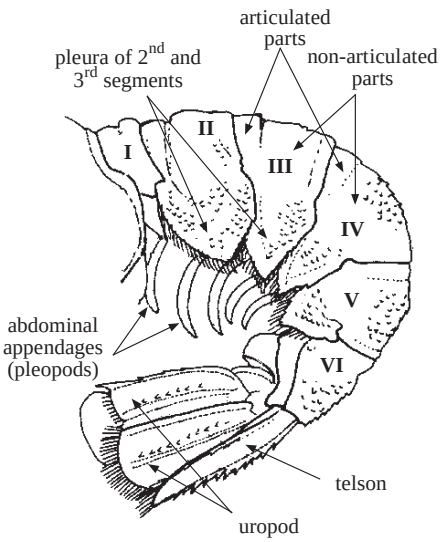
carapace of a true lobster (lateral view)



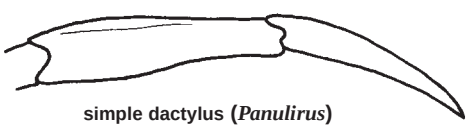
general shape (dorsal view) of a spiny lobster (*Panulirus* spp.: no rostrum, no pincers)



antennular somite of a spiny lobster (left antenna and eye omitted)



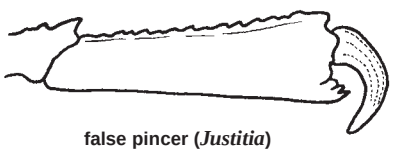
tail (abdomen) in lateral view



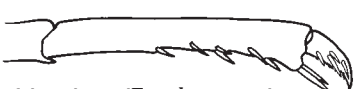
simple dactylus (*Panulirus*)



true pincer (*Metanephrops*)



false pincer (*Justitia*)

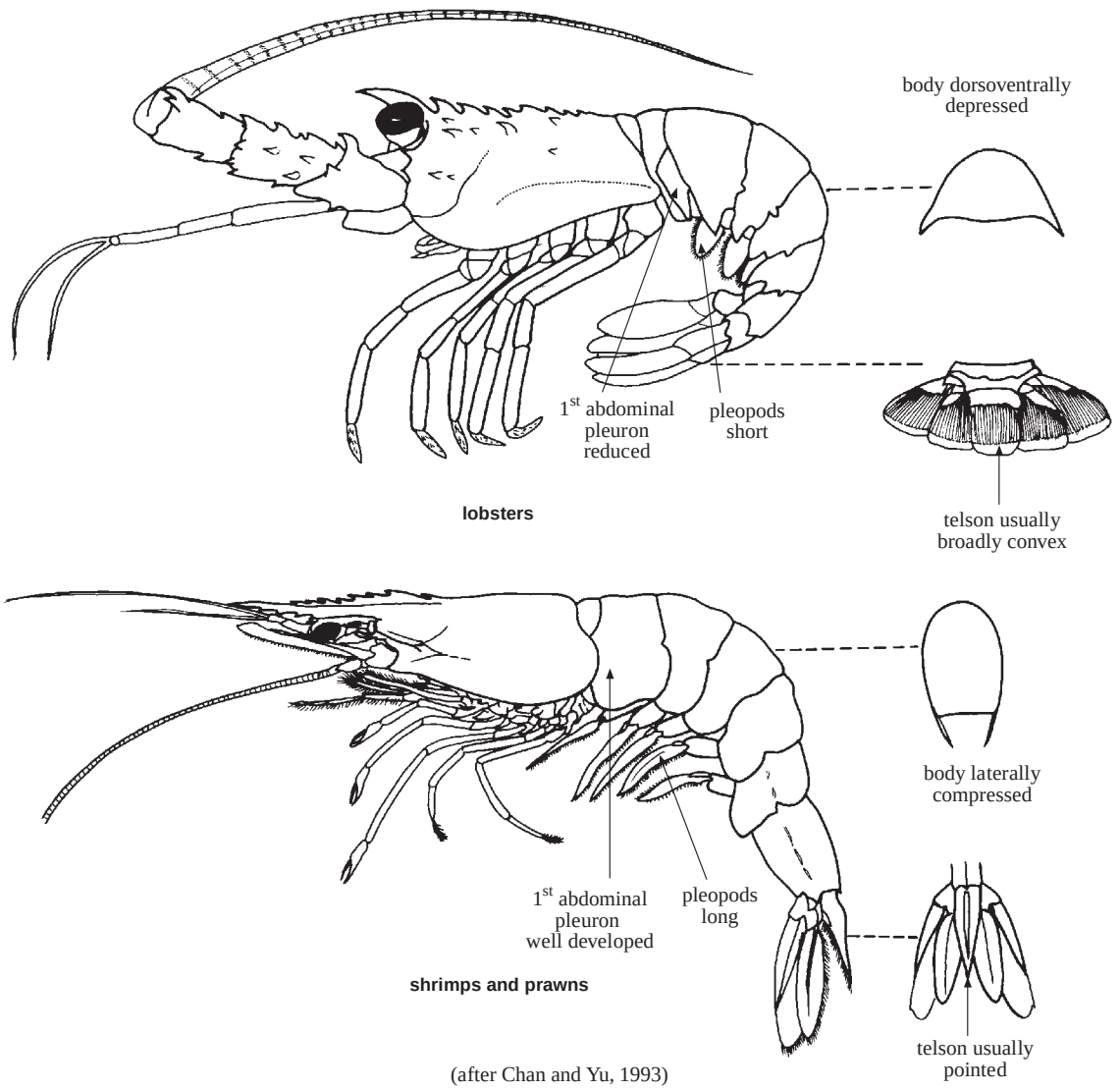


false pincer (*Enoplometopus*)

types of terminal segments of legs

GENERAL REMARKS

Lobsters are generally large-sized crustaceans with a body length (measured dorsally from the orbital margin to the end of the tail, excluding the rostrum and any of the appendages) from a few to more than 60 cm. Like shrimps and prawns, lobsters have a well-developed and extended abdomen or "tail". In addition to their usually thicker shell, lobsters generally differ from shrimps and prawns by having the body more dorsoventrally depressed (particularly at posterior abdominal segments), the pleopods (i.e. legs of the abdomen) less developed, the thoracic sternum wide and distinct, the first abdominal pleuron considerably more reduced than the posterior pleura, and the posterior margin of the telson usually broadly convex or truncate. Certain other lobster-like crustaceans, such as the "squat lobsters" (Galatheoidea), "mud lobsters" (Thalassinidea: Thalassinidae), "mud shrimps" (Thalassinidea: Upogebiidae), and "ghost shrimps" (Thalassinidea: Callianassidae) are taxonomically not "true" lobsters. These groups are of no or only very minor importance to fisheries in the Western Central Pacific and therefore not included in this field guide.



(after Chan and Yu, 1993)

conspicuous morphological differences between lobsters and shrimps

In the Western Central Pacific, the lobsters are represented by 8 families, 22 genera and about 89 species. Although the production of most of the species is not very large, many of them are of moderate importance to fisheries because of their large size and high market value.

Most spiny and slipper lobsters (Palinuridae and Scyllaridae, respectively), and the families Synaxidae and Enoplometopidae, inhabit shallow waters of rocky and reef bottoms or bottoms with coarse sediments. Among these, the genera *Panulirus*, *Scyllarides* and *Parribacus* are actively fished throughout the area because of their large size. On the other hand, juveniles of *Panulirus* species and the rare Enoplometopidae and Synaxidae are often highly valued in the aquarium trade. These shallow-water lobsters are mainly taken by hand while diving or by spears during night fishing, but sometimes also taken by tangle nets, lobster pots, or traps.

Most Nephropidae, Thaumastochelidae, Glypheidae, Polychelidae, a few Palinuridae, and Scyllaridae are found in deeper waters on soft bottoms with sand and/or mud. They are usually caught by trawlers. At present, only the two shallow-water genera *Ibacus* and *Thenus* (both belonging to the family Scyllaridae) are landed in larger amounts and are of moderate commercial importance. However, exploratory fishing indicates that several deep-water species of the genera *Metanephrops*, *Nephropsis*, *Acanthacaris*, *Linuparus* and *Puerulus* (the first 3 genera belonging to the family Nephropidae, while the latter 2 belong to the family Palinuridae) are large and occasionally abundant and may eventually be of commercial interest. Species of the other 3 families (Thaumastochelidae, Glypheidae, and Polychelidae) are generally rare and of no interest to fisheries in the area, and are not treated here in separate family or species accounts.

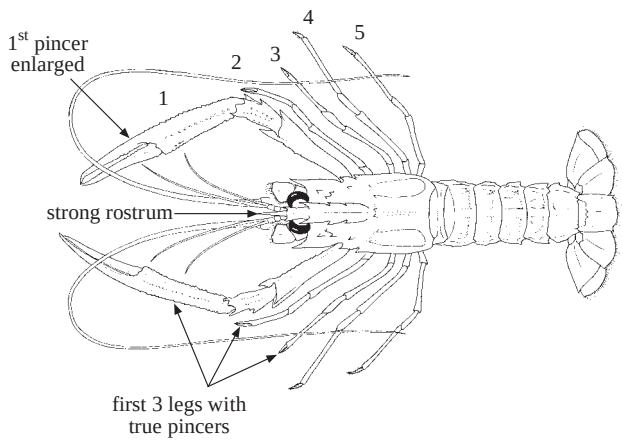
Lobsters in the Western Central Pacific are generally locally consumed and marketed fresh or live. In certain countries, such as the Philippines and Indonesia, a fair amount of lobsters are exported (live, fresh, cooked whole, or tailed).

GUIDE TO FAMILIES OCCURRING IN THE AREA

NEPHROPIDAE **Page 982**

True lobsters and lobsterettes

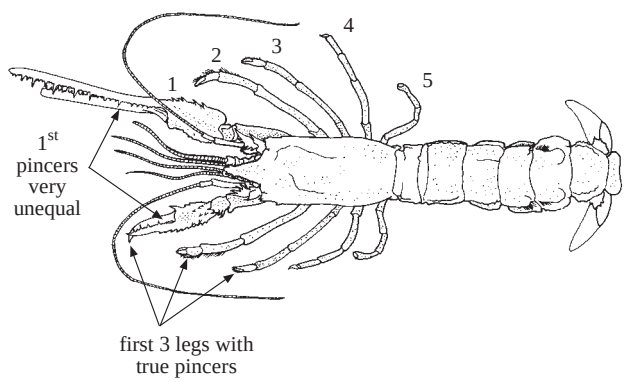
Body tubular, surfaces almost naked or covered with thick fur; rostrum well developed; antennae long and thread-like; antennal scale, if present, with inner margin unarmed and curved; first 3 pairs of legs with true pincers, first pair much larger than others; abdominal pleura ending in acute ventral tooth; tail fan entirely hardened, telson armed with fixed spines and with posterior margin broadly convex.



THAUMASTOCHELIDAE

Pincer lobsters

Body slightly depressed dorsoventrally; eyes strongly reduced, cornea lacking pigmentation; rostrum well developed; antennae long and thread-like, antennal scale bearing several large teeth along inner margin; first 3 pairs of legs (occasionally also fifth legs) with true pincers, first pair large but very unequal; abdominal pleura short, quadrangular and without large ventral tooth; tail fan entirely hardened, telson quadrangular and unarmed. Only 2 deep-water species known from the area, very rare and of no interest to fisheries.

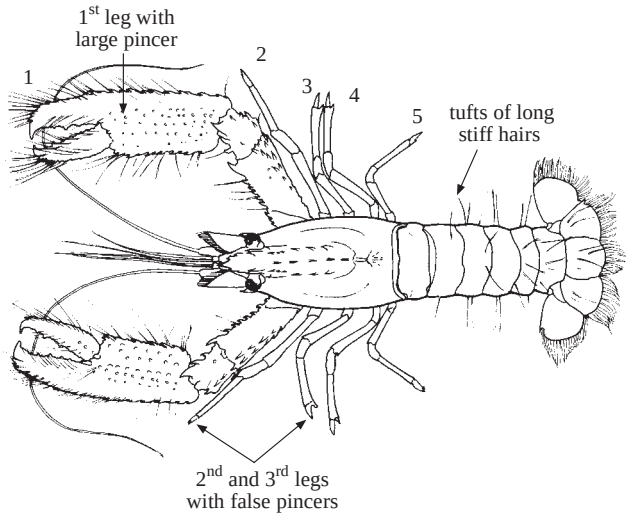


ENOPLOMETOPIDAE

Page 995

Reef lobsters

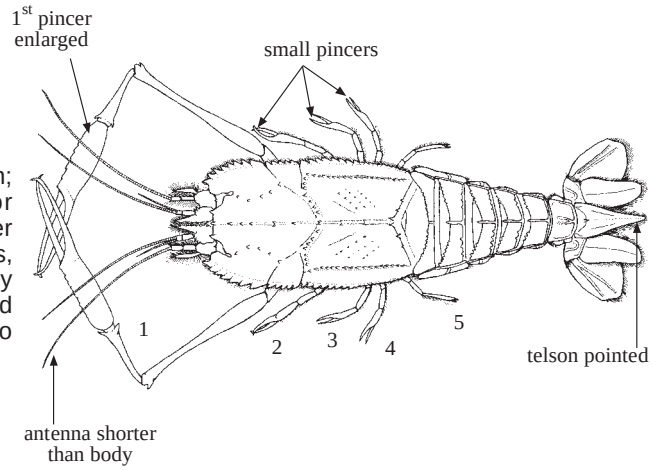
Body tubular and distributed with tufts of long stiff hairs; carapace with a well-developed rostrum; antennae long and thread-like, antennal scale with inner margin unarmed and curved; first pair of legs as large pincer, second and third legs slender and forming false pincers; abdominal pleura more or less rounded and sometimes ending in a strong ventral tooth; tail fan entirely hardened, telson bearing movable spines and with posterior margin broadly convex.



POLYCHELIDAE

Blind lobsters

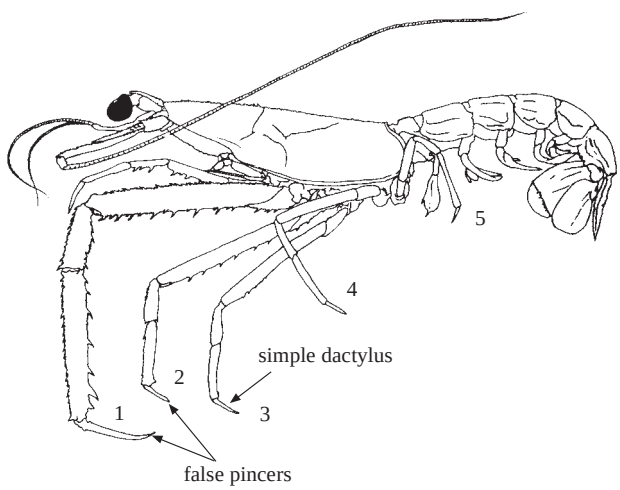
Eyes small, cornea lacking pigmentation; carapace box-like, rostrum absent or rudimentary; antennae thread-like, shorter than body; first 4 or all legs with true pincers, first pair long and slender; tail fan entirely hardened, telson pointed. All species found in very deep waters and of no interest to fisheries in the area.



GLYPHEIDAE

Fenix lobsters

Body somewhat flattened dorsoventrally; eyes large and black, inserted on a median elevation of cephalon; carapace with a well-developed rostrum; antennae long and thread-like; first 2 legs forming false pincers, first pair very strong; uropods of tail fan entirely hardened. A single deep-water species, rare and of no commercial importance.

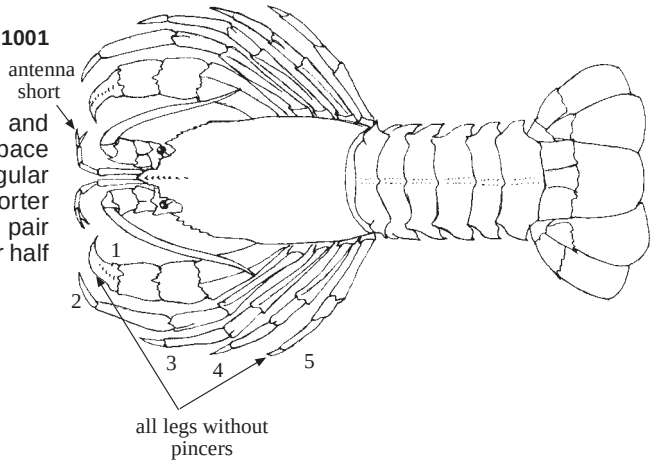


SYNAXIDAE

Page 1001

Furry lobsters

Body somewhat flattened dorsoventrally and very hairy, without enlarged spines; carapace laterally angular, with a broad and flat triangular or rounded rostrum; antennae whip-like, shorter than carapace; legs without pincers, first pair much more robust than the others; posterior half of tail fan soft and flexible.

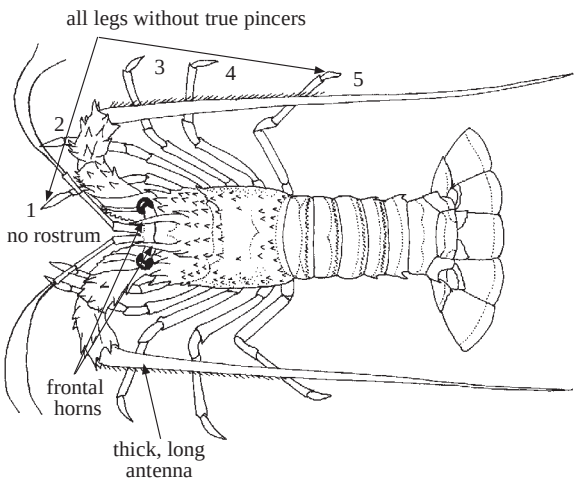


PALINURIDAE

Page 1005

Spiny lobsters, langoustes

Body tubular or slightly flattened dorsoventrally; hairs, if present, few and scattered; rostrum absent or reduced to a small spine; carapace subcylindrical or prismatic, laterally rounded or straight, surface spiny and with a pair of large frontal horns above eyes; antennae very long and rather thick, whip-like or spear-like; legs without true pincers and first pair (except in *Justitia*) not or only slightly longer than the following legs, but often somewhat more robust; posterior half of tail fan soft and flexible.

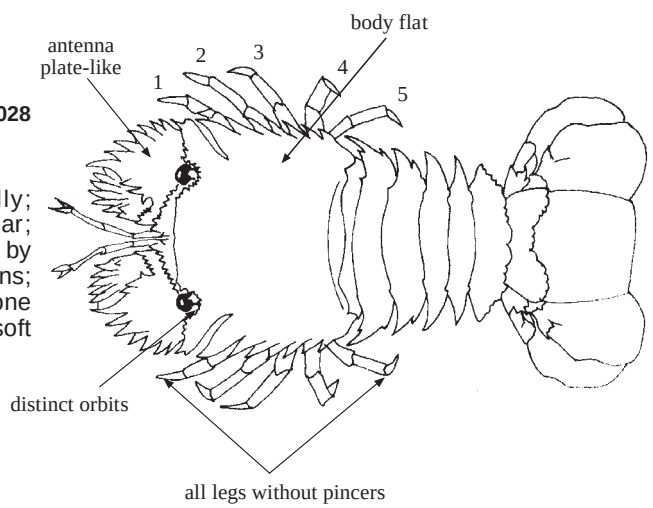


SCYLLARIDAE

Page 1028

Slipper lobsters

Body strongly flattened dorsoventrally; carapace depressed and laterally angular; rostrum absent or minute; eyes enclosed by distinct orbits and without large frontal horns; antennae plate-like; legs without pincers, none of them enlarged; posterior half of tail fan soft and flexible.



LIST OF FAMILIES AND SPECIES OCCURRING IN THE AREA

The symbol 🦐 is given when species accounts are included.

NEPHROPIDAE

🦐 *Acanthacaris tenuimana* Bate, 1888

🦐 *Metanephrops andamanicus* (Wood-Mason, 1891)
🦐 *Metanephrops arafurensis* ((De Man, 1905)
🦐 *Metanephrops australiensis* (Bruce, 1966)
🦐 *Metanephrops neptunus* (Bruce, 1965)
🦐 *Metanephrops sibogae* (De Man, 1916)
🦐 *Metanephrops sinensis* (Bruce, 1966)
🦐 *Metanephrops thomsoni* (Bate, 1888)
🦐 *Metanephrops velutinus* Chan and Yu, 1991

Nephropsis acanthura Macpherson, 1990
Nephropsis ensirostris Alcock, 1901
Nephropsis holthuisi Macpherson, 1993
Nephropsis serrata Macpherson, 1993
🦐 *Nephropsis stewarti* Wood-Mason, 1873
Nephropsis suhmi Bate, 1888
Nephropsis sulcata Macpherson, 1990

THAUMASTOCHELIDAE

Thaumastocheles japonicus Calman, 1913

Thaumastochelopsis wardi Bruce, 1988

ENOPLOMETOPIDAE

Enoplometopus chacei Kensley and Child, 1986
🦐 *Enoplometopus daumi* Holthuis, 1983
🦐 *Enoplometopus debelius* Holthuis, 1983
Enoplometopus gracilipes (De Saint Laurent, 1988)
🦐 *Enoplometopus holthuisi* Gordon, 1968
🦐 *Enoplometopus occidentalis* (Randall, 1840)

POLYCHELIDAE

Polycheles baccatus Bate, 1878
Polycheles carpenteri (Alcock, 1894)
Polycheles enthrix (Bate, 1878)
Polycheles gracilis (Bate, 1888)
Polycheles laevis (Bate, 1878)
Polycheles obscurus (Bate, 1878)
Polycheles typhlops Heller, 1862

Stereomastis andamanensis (Alcock, 1894)
Stereomastis auriculata (Bate, 1878)
Stereomastis helleri (Bate, 1878)
Stereomastis phosphoreus (Alcock, 1894)
Stereomastis sculpta (S.I. Smith, 1880)
Stereomastis trispinosa (De Man, 1905)

GLYPHEIDAE

Neoglyphea inopinata Forest and De Saint Laurent, 1975

SYNAXIDAE

🦐 *Palibythus magnificus* Davie, 1990

🦐 *Palinurellus wieneckii* (De Man, 1881)

PALINURIDAE
- *Justitia chani* Poupin, 1994
- *Justitia japonica* (Kubo, 1955)
- *Justitia longimanus* (H. Milne Edwards, 1837)
- *Justitia vericeli* Poupin, 1994

- *Linuparus sordidus* Bruce, 1965
- *Linuparus trigonus* (Von Siebold, 1824)

- *Palinustus unicornutus* Berry, 1963
- *Palinustus waguensis* Kubo, 1963

- *Panulirus albiflagellum* Chan and Chu, 1996
- *Panulirus homarus* (Linnaeus, 1758)
- *Panulirus longipes* (A. Milne Edwards, 1868)
- *Panulirus ornatus* (Fabricius, 1798)
- *Panulirus pascuensis* Reed, 1954
- *Panulirus penicillatus* (Olivier, 1791)
- *Panulirus polyphagus* ((Herbst, 1793)
- *Panulirus stimpsoni* Holthuis, 1963
- *Panulirus versicolor* (Latreille, 1804)

- *Puerulus angulatus* (Bate, 1888)
- *Puerulus velutinus* Holthuis, 1963

SCYLLARIDAE
- *Arctides regalis* Holthuis, 1963

Ibacus brevipes Bate, 1888
Ibacus brucei Holthuis, 1977
- *Ibacus ciliatus* (Von Siebold, 1824)
- *Ibacus novemdentatus* Gibbes, 1850

Ibacus peronii Leach, 1815
- *Ibacus pubescens* Holthuis, 1960

- *Parribacus antarcticus* (Lund, 1793)
- *Parribacus caledonicus* Holthuis, 1960
- *Parribacus holthuisi* Forest, 1954
- *Parribacus scarlatinus* Holthuis, 1960

- *Scyllarides haanii* (De Haan, 1841)
- *Scyllarides squammosus* (H. Milne Edwards, 1837)

Scyllarus aesopius Holthuis, 1960
Scyllarus aureus Holthuis, 1963
Scyllarus aurora Holthuis, 1982
Scyllarus batei Holthuis, 1946
- *Scyllarus bertholdii* Paulson, 1875

Scyllarus bicuspidatus (De Man, 1905)
Scyllarus cultrifer (Ortmann, 1897)
Scyllarus demani Holthuis, 1946
Scyllarus gibberosus (De Man, 1905)
Scyllarus martensii Pfeffer, 1881
Scyllarus rapanus Holthuis, 1993
- *Scyllarus rugosus* H. Milne Edwards, 1837

Scyllarus sordidus (Stimpson, 1860)
Scyllarus timidus Holthuis, 1960
Scyllarus umbilicatus Holthuis, 1963
Scyllarus vitiensis (Dana, 1852)

- *Thenus orientalis* (Lund, 1793)

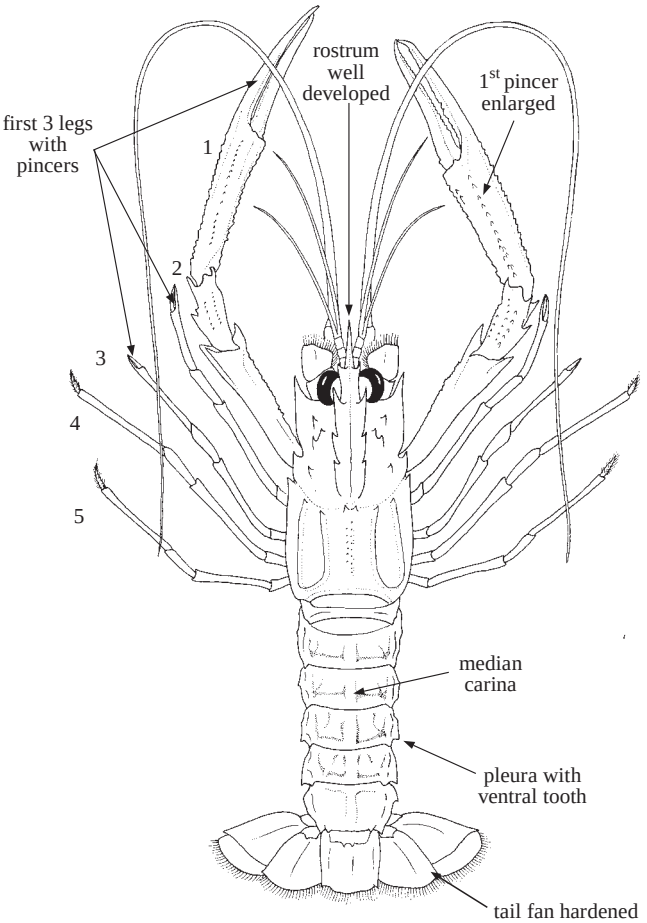
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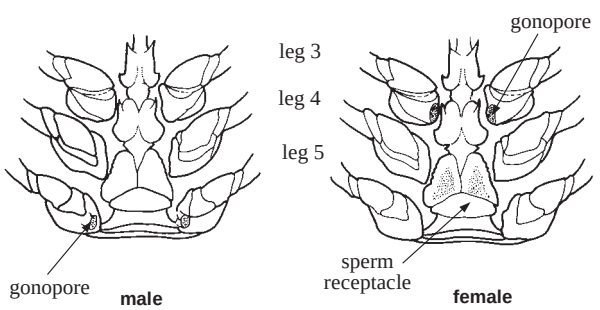
NEPHROPIDAE

True lobsters and lobsterettes

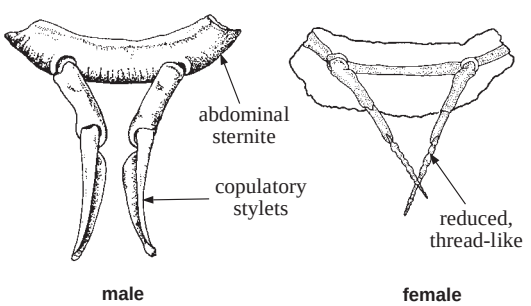
Diagnostic characters: Moderate to large-sized crustaceans. Body tubular, surface almost naked or covered with thick fur. Carapace (or "head") **with a well-developed rostrum**, ornamented with spines or nodules, occasionally smooth. Eyes usually well developed and black, or small and lacking pigmentation, or even absent. Antennae very long and thread-like; **antennal scale, if present, with inner margin unarmed and curved. First 3 pairs of legs forming true pincers, with the first pair greatly enlarged and long.** Both abdomen and tail fan well developed and powerful. Abdomen smooth or variously sculptured, **pleura ending in acute ventral tooth. Tail fan entirely hardened, telson with fixed spines and posterior margin broadly convex. Colour:** with the typical coloration of deep-sea crustaceans - from white to pink or red, some species with special markings (usually red and/or white) on body; setae or hairs, if present, are light brown.



Habitat, biology, and fisheries: All species are deep-sea forms and found at depths from 150 to more than 1 893 m. Their adult sizes are ranging from 5 cm to over 40 cm. They are bottom-dwellers with a preference for soft substrate. Some species are known to live in self-made burrows. The sexes are easily distinguished by the position of the gonopores, which are situated at the bases of the third and fifth legs in the females and males, respectively. In addition, the first pleopods ("legs" of the abdomen) of males are transformed into a strong and rigid pen-like copulatory organ while they are reduced and thread-like in females. The females bear large and colourful eggs (white, blue or red, and other colours) on the ventral side of the abdomen. They seem to have a long incubation period, but a short larval development. At present, none of the species of this family is of significant commercial importance in the Western Central Pacific. However, the large size of several species and the fact that some of them are commonly caught on the basis of exploratory trawling suggest that they may have some commercial potential with the development of deep-sea fisheries. This is especially the case with members of the genus *Metanephrops*, which are treated here in separate species accounts.



bases of last 3 legs in nephropids



first pleopods of nephropids

Similar families occurring in the area

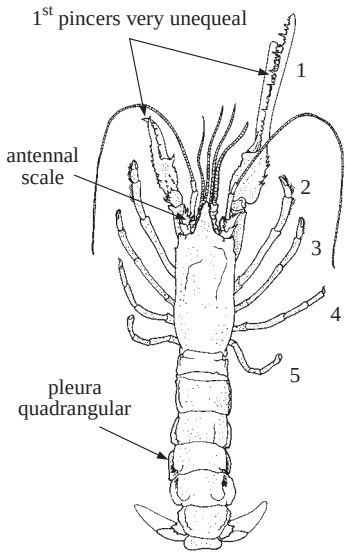
Thaumastochelidae: body somewhat flattened dorsoventrally; antennal scale with several large teeth along inner margin; first pair of pincers very unequal; abdominal pleura short, quadrangular and not ending in a point; telson unarmed.

Enoplometopidae: body distributed with tufts of long stiff hairs; second and third legs forming false pincers; telson bearing movable spines.

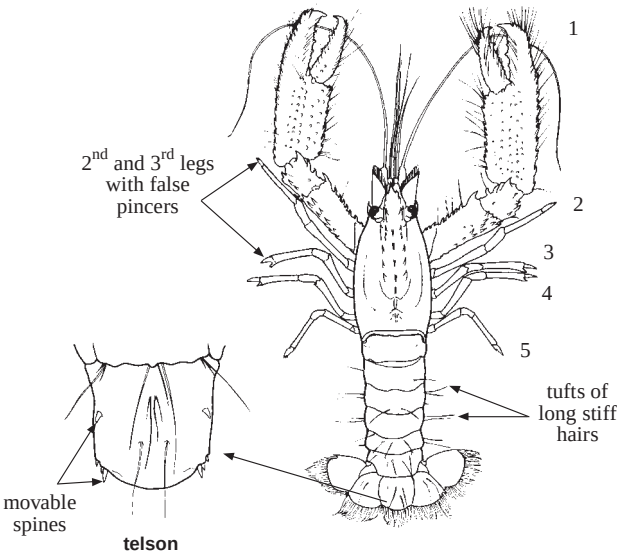
Polychelidae: carapace box-like, rostrum absent or rudimentary; first 4 or all legs with pincers, first pair long but slender; telson pointed.

Glypheidae: body somewhat flattened dorsoventrally; eyes inserted on a median elevation of cephalon; first 2 legs forming false pincers.

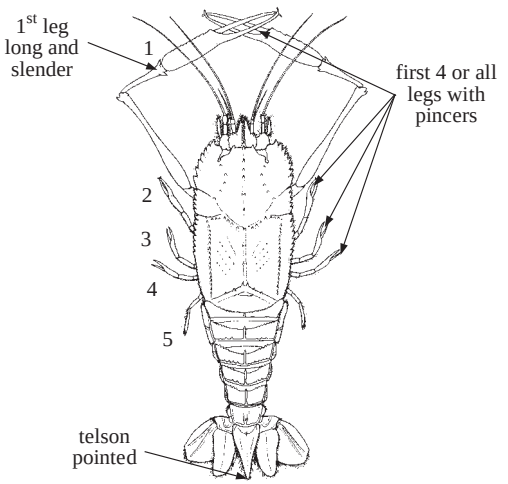
Synaxidae: body somewhat flattened dorsoventrally and hairy; all legs simple and without pincers, the first pair heavier than the others; antennae whip-like and shorter than carapace; posterior half of tail fan soft and flexible.



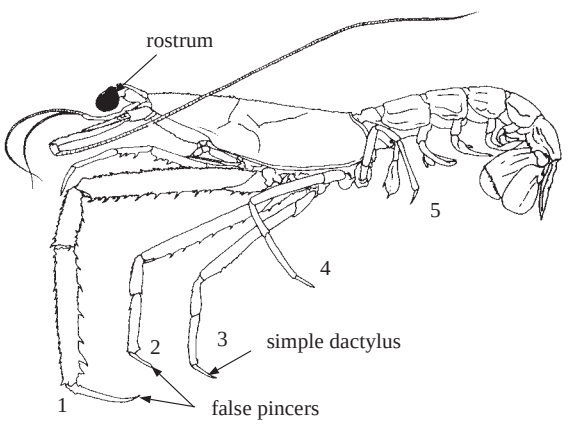
Thaumastochelidae



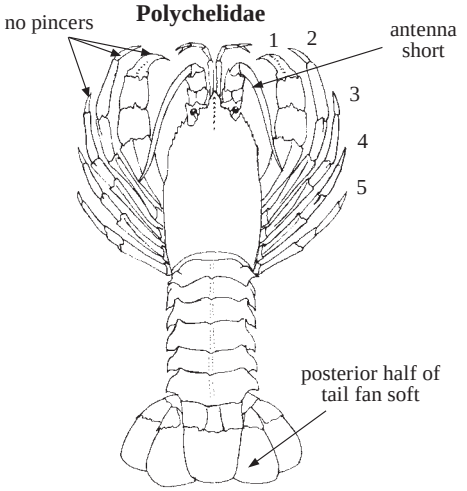
Enoplometopidae



Polychelidae



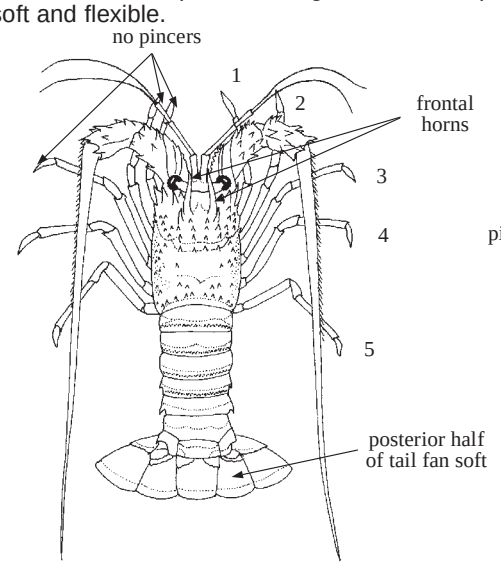
Glypheidae



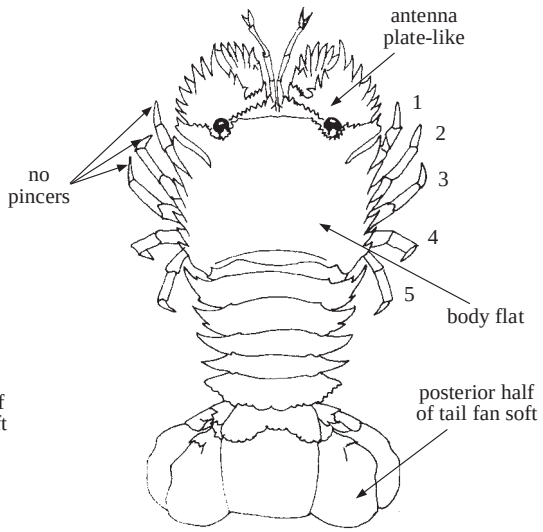
Synaxidae

Palinuridae: carapace without rostrum or with rostrum reduced to a small spine, but with a pair of large frontal horns over the eyes; antennae very long and thick, whip-like or spear-like; legs without true pincers and first pair generally not enlarged (except in *Justitia*); posterior half of tail fan soft and flexible.

Scyllaridae: body strongly flattened dorsoventrally; rostrum absent or rudimentary; eyes enclosed by distinct orbits; antennae plate-like; legs without true pincers and none of them enlarged; posterior half of tail fan soft and flexible.



Palinuridae



Scyllaridae

Key to the genera of Nephropidae occurring in the area

1a. Eyes large and black; antennal scale present; body provided with some spines but never uniformly spinulose (Fig. 1) . . . . . ***Metanephrops***

1b. Eyes minute, cornea lacking pigmentation . . . . . → ***2***

2a. Antennal scale present; body more or less uniformly spinulose and not covered with soft pubescence (Fig. 2) . . . . . ***Acanthacaris***
(a single species, *A. tenuimana*, in the area)

2b. Antennal scale absent; body not uniformly spinulose but covered with thick pubescence (Fig. 3) . . . . . ***Nephropsis***

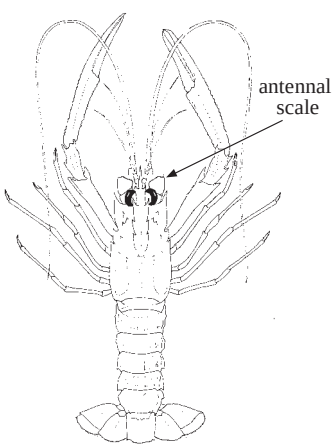


Fig. 1 ***Metanephrops***

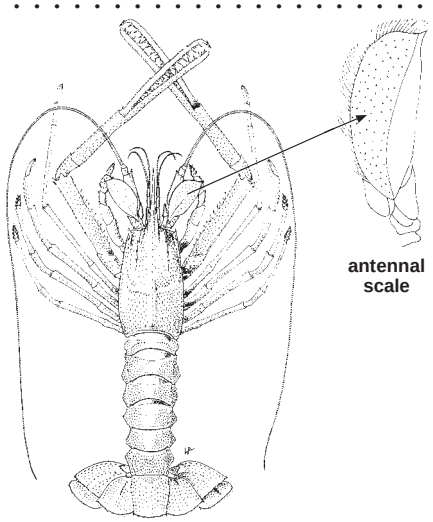


Fig. 2 ***Acanthacaris***

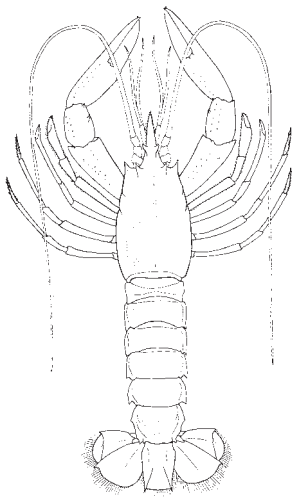
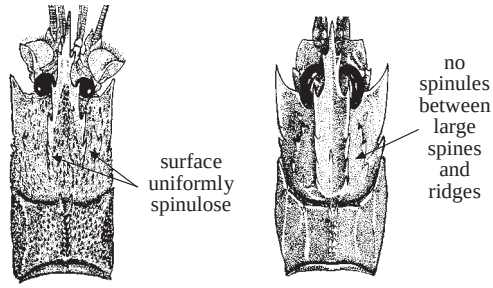


Fig. 3 ***Nephropsis***

Key to the species of *Metanephrops* occurring in the area

1a. Carapace rather uniformly spinulose (Fig. 4a); dorsal surface of uropods covered with spinules . . . . . → ***2***

1b. Carapace smooth between the ridges and large spines (Fig. 4b); uropods unarmed dorsally . . . . . → ***4***



a) ***Metanephrops neptunus*** b) ***Metanephrops sibogae***

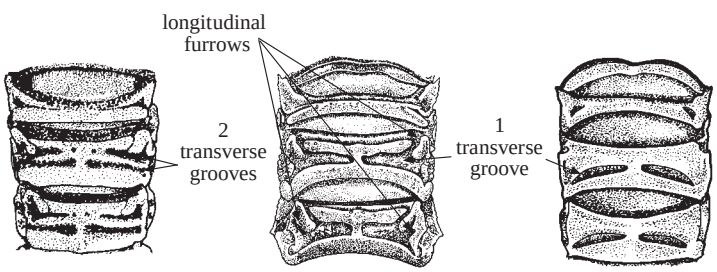
Fig. 4 carapace (dorsal view)

2a. Abdominal segments each with 2 transverse grooves (Fig. 5a); large pincer with finger distinctly longer than palm (Fig. 6a) . . . . . ***Metanephrops neptunus***

2b. Abdominal segments each with 1 transverse groove only (Fig. 5b, c); large pincer with finger shorter than palm (Fig. 6b) . . . . . → ***3***

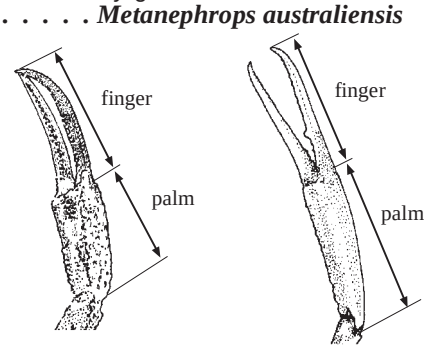
3a. Abdomen with deep longitudinal furrows (Fig. 5b); large pincer covered with sharp tubercles . . . . . ***Metanephrops arafurensis***

3b. Abdomen without distinct longitudinal furrows (Fig. 5c); large pincer finely granular to nearly smooth . . . . . ***Metanephrops australiensis***



a) ***Metanephrops neptunus*** b) ***Metanephrops arafurensis*** c) ***Metanephrops australiensis***

Fig. 5 first 3 abdominal segments (dorsal view)



a) ***Metanephrops neptunus*** b) ***Metanephrops australiensis***

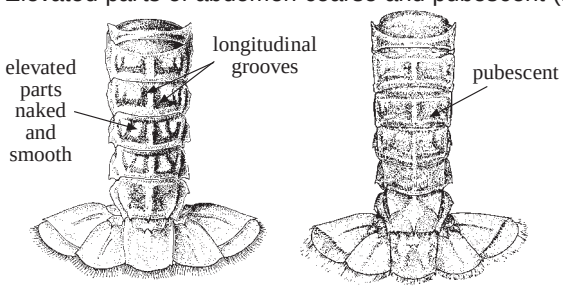
Fig. 6 large pincer

4a. Abdomen with distinct transverse and longitudinal grooves (Fig. 7); large pincers distinctly ridged (Fig. 8a), with outer border flat . . . . . → ***5***

4b. Abdomen smooth or with only narrow transverse grooves; large pincer smooth or weakly ridged (Fig. 8b), with outer border always angular. . . . . → ***6***

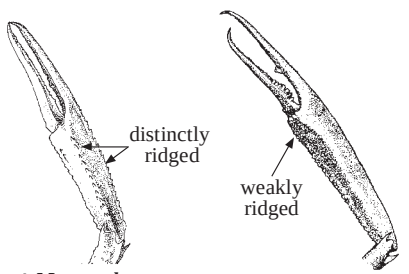
5a. Elevated parts of abdomen naked and smooth (Fig. 7a) . . . . . ***Metanephrops andamanicus***

5b. Elevated parts of abdomen coarse and pubescent (Fig. 7b) . . . . . ***Metanephrops velutinus***



a) ***Metanephrops andamanicus*** b) ***Metanephrops velutinus***

Fig. 7 abdomen (dorsal view)

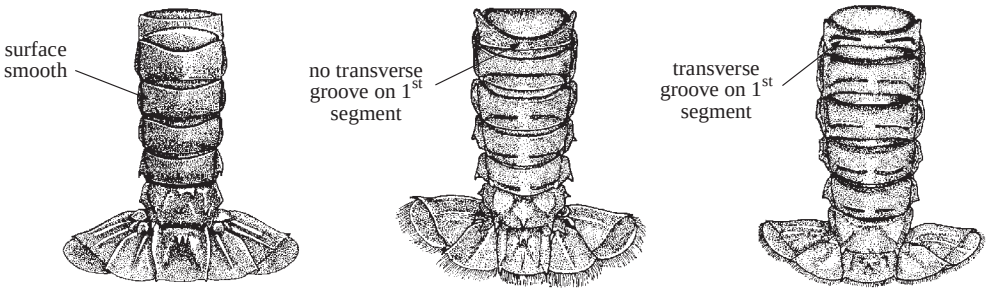


a) ***Metanephrops andamanicus*** b) ***Metanephrops sibogae***

Fig. 8 large pincer

6a. Abdomen smooth, without grooves (Fig. 9a) . . . . . ***Metanephrops sibogae***

6b. Abdomen with narrow transverse grooves (Fig. 9b, c) . . . . . → ***7***

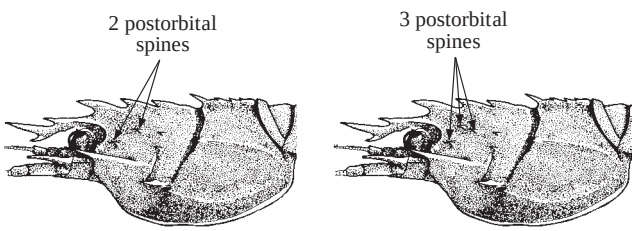


a) ***Metanephrops sibogae*** **b)** ***Metanephrops thomsoni*** **c)** ***Metanephrops sinensis***

Fig. 9 abdomen (dorsal view)

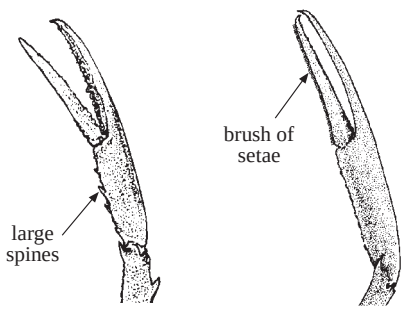
7a. Two postorbital spines present (Fig. 10a); large pincers with inner margin naked but often bearing some large spines (Fig. 11a); first abdominal segment generally without distinct transverse grooves (Fig. 9b) . . . . . ***Metanephrops thomsoni***

7b. Three postorbital spines present (Fig. 10b); large pincers without large spines along inner margin, lateral margin of movable fingers bearing a brush of setae (Fig. 11b); first abdominal segment usually with short, lateral, transverse grooves (Fig. 9c) . . . . . ***Metanephrops sinensis***



a) ***Metanephrops thomsoni*** **b)** ***Metanephrops sinensis***

Fig. 10 carapace (lateral view)



a) ***Metanephrops thomsoni*** **b)** ***Metanephrops sinensis***

Fig. 11 large pincer

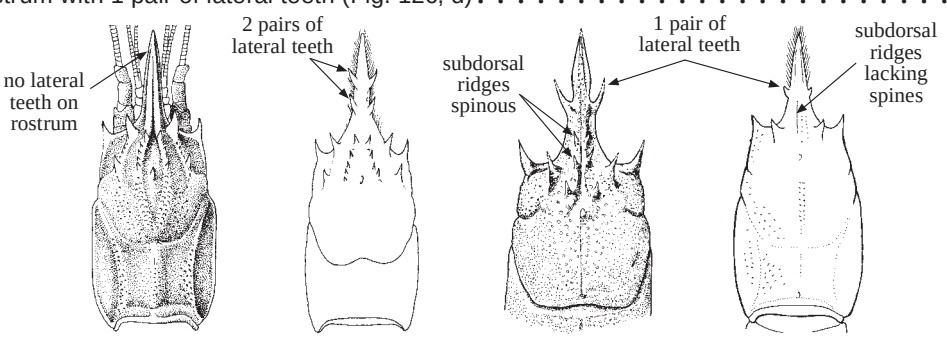
Key to the species of *Nephropsis* occurring in the area

1a. Rostrum without lateral teeth (Fig. 12a) . . . . . ***Nephropsis ensirostris***

1b. Rostrum with lateral teeth (Fig. 12b-d) . . . . . → ***2***

2a. Rostrum with 2 pairs of lateral teeth (Fig. 12b) . . . . . → ***3***

2b. Rostrum with 1 pair of lateral teeth (Fig. 12c, d) . . . . . → ***4***



a) ***Nephropsis ensirostris*** **b)** ***Nephropsis sulcata*** **c)** ***Nephropsis serrata*** **d)** ***Nephropsis stewarti***

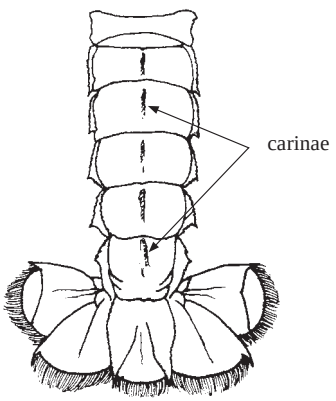
Fig. 12 carapace (dorsal view)

3a. Abdomen with a median longitudinal carina (Fig. 13) . . . . . ***Nephropsis sulcata***
3b. Abdomen without a median longitudinal carina . . . . . ***Nephropsis suhmi***

4a. Basal part of telson with an erect dorsal spine (Fig. 14a) . . . . . ***Nephropsis acanthura***
4b. Basal part of telson without an erect dorsal spine (Fig. 14b) . . . . . → ***5***

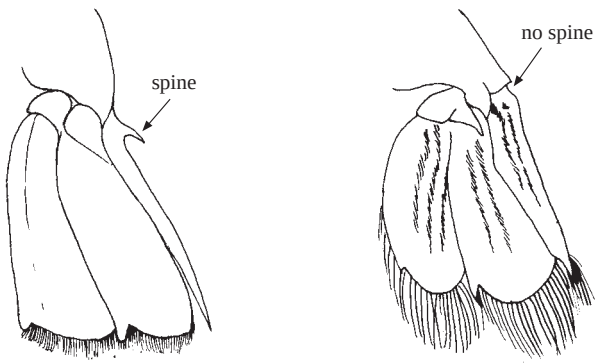
5a. Abdomen with a median longitudinal carina . . . . . ***Nephropsis holthuisi***
5b. Abdomen without a median longitudinal carina . . . . . → ***6***

6a. Subdorsal ridges of carapace spinose (Fig. 12c) . . . . . ***Nephropsis serrata***
6b. Subdorsal ridges of carapace lacking spines (Fig. 12d) . . . . . ***Nephropsis stewarti***



abdomen (dorsal view)

Fig. 13 ***Nephropsis sulcata***



a) ***Nephropsis acanthura***

b) ***Nephropsis holthuisi, N. serrata, N. stewarti***

Fig. 14 tail fan (lateral view)

List of species occurring in the area

The symbol 🦐 is given when species accounts are included.

🦐 *Acanthacaris tenuimana* Bate, 1888

🦐 *Metanephrops andamanicus* (Wood-Mason, 1891)
Metanephrops arafurensis (De Man, 1905)
🦐 *Metanephrops australiensis* (Bruce, 1966)
🦐 *Metanephrops neptunus* (Bruce, 1965)
🦐 *Metanephrops sibogae* (De Man, 1916)
🦐 *Metanephrops sinensis* (Bruce, 1966)
🦐 *Metanephrops thomsoni* (Bate, 1888)
🦐 *Metanephrops velutinus* Chan and Yu, 1991

Nephropsis acanthura Macpherson, 1990
Nephropsis ensirostris Alcock, 1901
Nephropsis holthuisi Macpherson, 1993
Nephropsis serrata Macpherson, 1993
🦐 *Nephropsis stewarti* Wood-Mason, 1873
Nephropsis suhmi Bate, 1888
Nephropsis sulcata Macpherson, 1990

References

Chan, T.Y. and H.P. Yu. 1993. *The Illustrated lobsters of Taiwan*. Taipei, SMC Publishing Inc., 248 p.

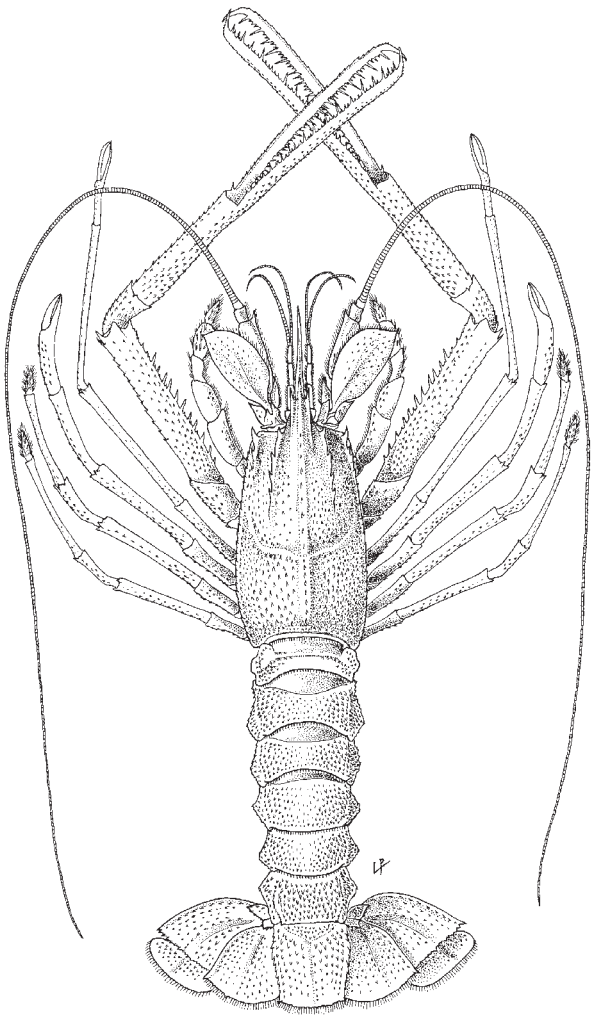
Holthuis, L.B. 1991. FAO species catalogue. Vol. 13. Marine lobsters of the world. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fish. Synop*., 125(13):1-292.

Acanthacaris tenuimana Bate, 1888

Frequent synonyms / misidentifications: *Phoberus tenuimanus* Bate, 1888; *P. caecus sublevis* Wood-Mason and Alcock, 1891; *Acanthacaris opipara* Burukovsky and Musy, 1976; *Phoberus brevirostris* Thung and Wang, 1985 / None.

FAO names: En - Prickly deep-sea lobster; **Fr** - Langoustine spinuleuse; **Sp** - Cigala raspa.

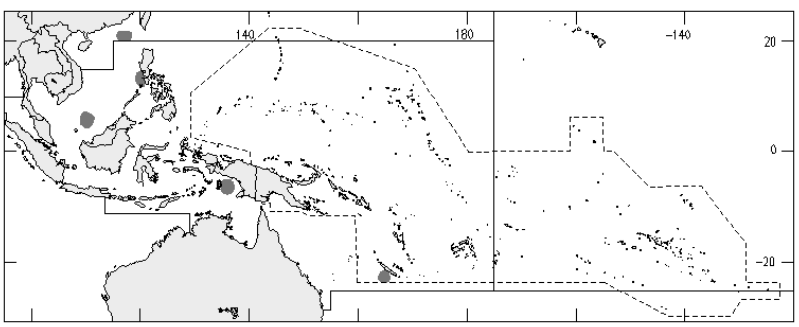
Diagnostic characters: A large lobster. Body tubular, **entirely covered with small spines and sharp tubercles, but not covered with soft pubescence**. Carapace with a well-developed rostrum. **Eyes minute, cornea lacking pigmentation**. Antennae long and thread-like, **antennal scale well developed. First 3 pairs of legs ending in pincers; first pair equal-sized, very slender and longer than body, with pincers bearing long teeth along cutting edges**; second pair of legs much longer but less spiny than third pair. Tail fan entirely hardened; posterior margin of telson truncate. **Colour:** uniform delicate pink.



Size: Maximum carapace length 21 cm (total length to 40 cm), ovigerous females between 11 and 19 cm carapace length.

Habitat, biology, and fisheries: Found in deep water at depths from 600 to 1 670 m on muddy bottoms where it lives in burrows. This species is occasionally taken during exploratory trawling operations in deep water, but only in very small quantities. Due to its large size it may have some fishery potential once suitable fishing grounds are found.

Distribution: Indo-West Pacific from the eastern coast of Africa to Japan, the East and South China Sea, Indonesia, and New Caledonia.



Metanephrops sibogae (De Man, 1916)

Frequent synonyms / misidentifications: *Nephrops sibogae* De Man, 1916 / None.

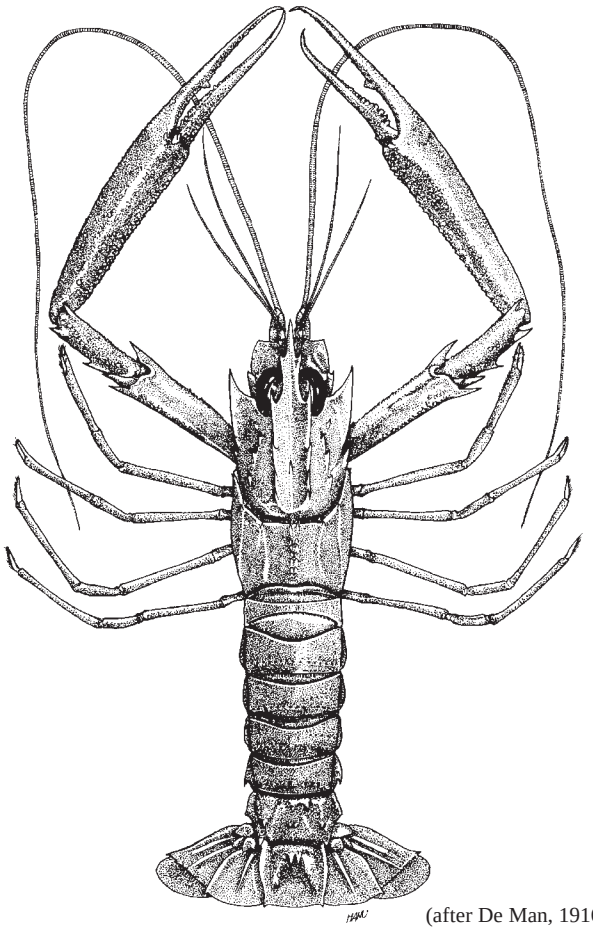
FAO names: En - Siboga lobster.

Diagnostic characters: A small to medium-sized lobster. Body cylindrical and naked. **Carapace spiny, but not uniformly so**; rostrum well developed, armed with lateral and ventral teeth only; **4 pairs of postrostral teeth and 3 postorbital spines present. Eyes large and pigmented**. Antennae long and thread-like, **antennal scale present**. First 3 pairs of legs ending in pincers; **first pair enlarged and long; pincers feebly ridged and finely granular, their inner margin without pubescence but occasionally bearing a few large spines. Abdomen naked and smooth, without distinct sculptures**. Tail fan entirely hardened; posterior margin of telson broadly convex. **Colour: body uniformly orange-pink**.

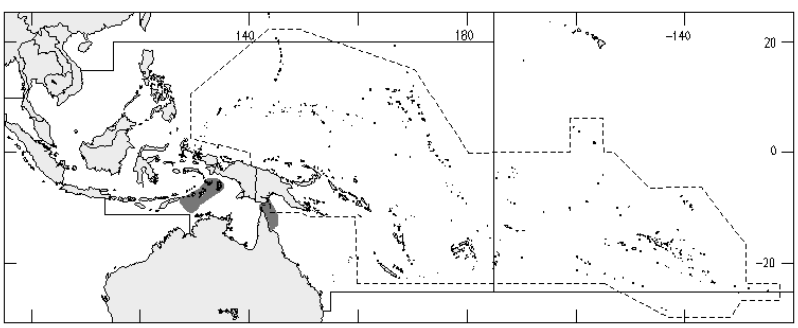
Size: Maximum body length 18 cm, commonly to about 13 cm.

Habitat, biology, and fisheries: At depths from 246 to 320 m on soft sandy sediment; probably lives in burrows. Of minor importance to fisheries in northern Australia, where it is trawled commercially during the northern prawn fishery closed seasons. Also taken in a fair amount during experimental trawling operations in southern Indonesia.

Distribution: Only known from southern Indonesia and northern Australia.



(after De Man, 1916)



Metanephrops thomsoni (Bate, 1888)

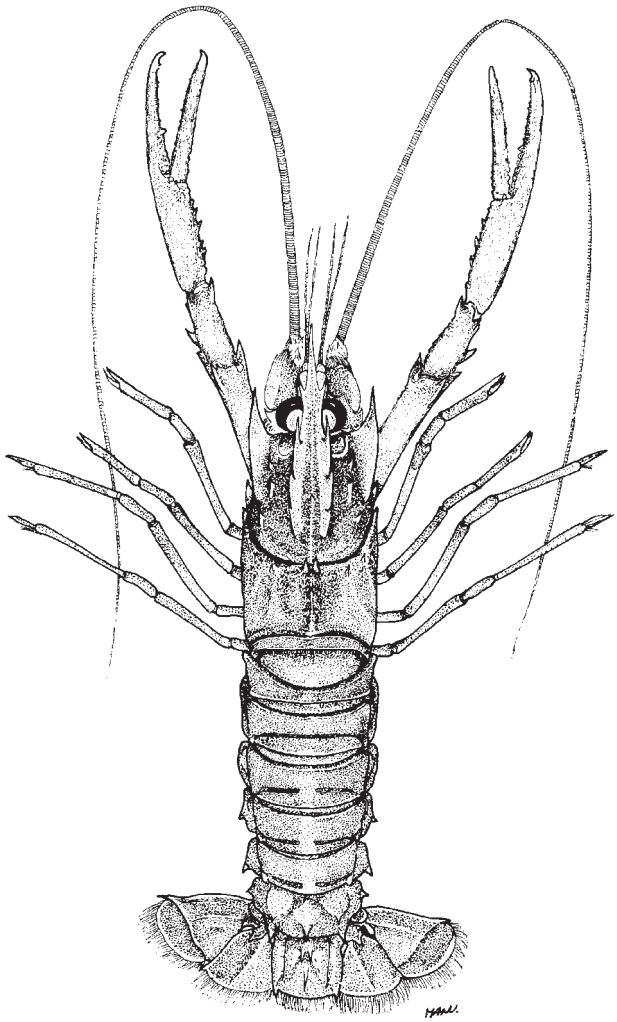
Frequent synonyms / misidentifications: *Nephrops thomsoni* Bate, 1888 / None.

FAO names: En - Red-banded lobster.

Diagnostic characters: A small to medium-sized lobster. Body cylindrical and naked. **Carapace spiny, but not uniformly so**; rostrum well developed, armed with lateral and ventral teeth only; **3 pairs of postrostral teeth and only 2 postorbital spines present. Eyes large and pigmented**. Antennae long and thread-like, **antennal scale present**. First 3 pairs of legs ending in pincers; **first pair enlarged and long; pincers feebly ridged and finely granular, inner margin without pubescence but often bearing some large spines. Abdomen without median longitudinal carina and weakly sculptured; transverse grooves very shallow (nearly absent on first segment) and broadly interrupted medially, longitudinal grooves absent**. Tail fan entirely hardened; posterior margin of telson broadly convex. **Colour: body almost uniformly orange-pink**; post-orbital margin, tips of fingers of large pincers, margins of abdominal pleura, and posterior margin of tail fan whitish. Eyes dark brown. **Eggs blue**, becoming dirty white when eye spots appear.

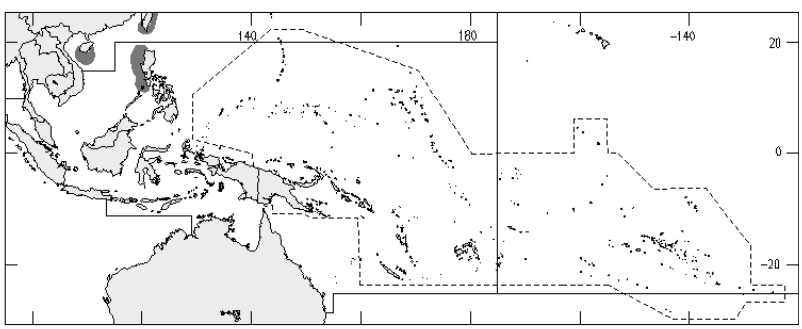
Size: Maximum body length 15 cm, commonly between 9 and 12 cm.

Habitat, biology, and fisheries: On sandy mud bottoms at depths from 50 to 509 m. Caught in the Philippines by lobster cages called “Panak”, but not in large quantities and only occasionally sold in local fish markets. Often taken on the basis of exploratory deep-water trawling around the northwest coasts of the Philippines and may therefore have more fishery potential in the area.



(after Chan and Yu, 1988)

Distribution: Western Pacific from Japan, the Ryukyu Islands, the East and South China Sea, Taiwan Province of China, and the Philippines.



Remarks: The common name “Red-banded lobster” refers to the presence of red bands on the first pair of legs. However, specimens known from the area (i.e. the Philippines) differ from those found elsewhere in its range by the lack of these red bands.

Nephropsis stewarti Wood-Mason, 1873

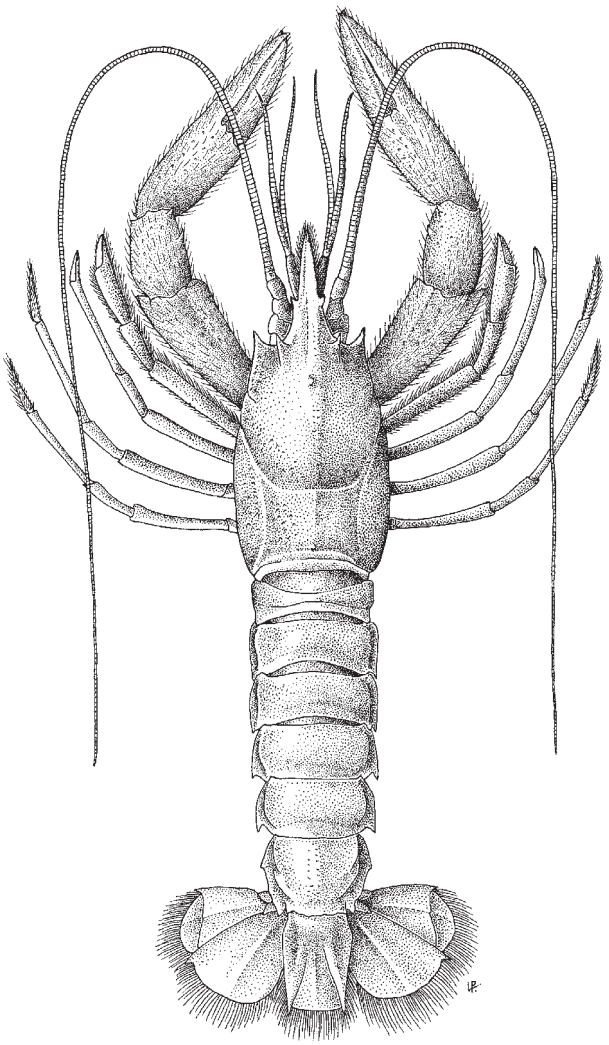
Frequent synonyms / misidentifications: None / None.

FAO names: En - Indian Ocean lobsterette; **Fr** - Langoustine indienne; **Sp** - Cigala del Oceano Indico.

Diagnostic characters: A small to medium-sized lobster. Body cylindrical, **covered with thick fur**. Carapace with a well-developed **rostrum armed with 1 pair of lateral spines; anterior carapace bearing only supraorbital and antennal spines; subdorsal ridges without spines. Eyes minute, cornea lacking pigmentation**. Antennae long and thread-like; **antennal scale absent**. First 3 pairs of legs ending in pincers; **first pair rather stout and very hairy. Abdomen without median longitudinal carina**, all pleura sharply pointed ventrally but **lacking spines on front edges**. Tail fan entirely hardened; **outer blade showing a transverse fissure; telson with a pair of fixed posterolateral spines but unarmed dorsally**. **Colour: body whitish and covered with thick grey fur**. Anterior carapace including rostrum, ventral surface, mouth parts and tail fan pink-red. Antennal and antennular flagella orange. Legs orange-pink, with distal segments reddish; large pincers sometimes slightly orange. Eggs white.

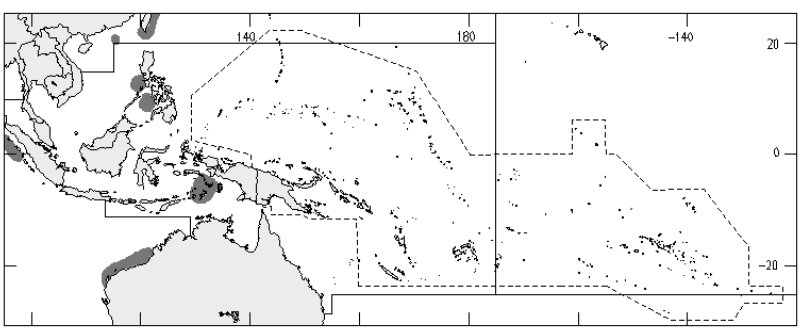
Size: Maximum known body length about 20 cm, commonly between 10 and 15 cm.

Habitat, biology, and fisheries: Deep sea at depths from 170 to 1 060 m, mostly between 500 and 750 m on soft muddy substrate. A common bycatch of deep-water trawling operations throughout its range. Although it is probably the largest and most common species of the genus, its quantities are at present too small for significant interest to fisheries.



(after Alcock and Anderson, 1896)

Distribution: Widely distributed in the Indo-West Pacific, from eastern Africa to Japan, the Philippines, Indonesia, and northwestern Australia.

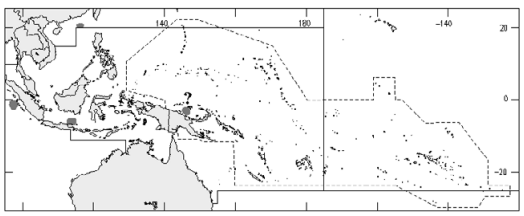


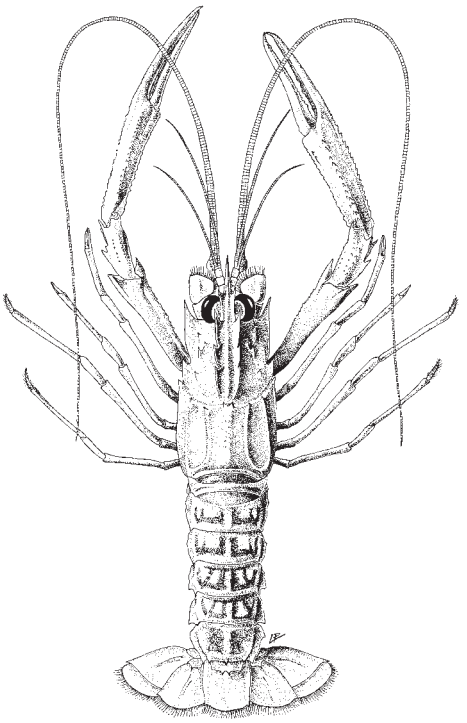
Metanephrops andamanicus (Wood-Mason, 1891)

NEA

En - Andaman lobster; **Fr** - Langoustine andamane; **Sp** - Cigala de Andamán.

Maximum total body length 20 cm, commonly between 15 and 18 cm. On hard mud in depths from 250 to 750 m, but mostly from 300 to 450 m; probably lives in burrows. In the Western Central Pacific, so far only taken in very small numbers during experimental deep-water trawling operations, but its high abundance just north of the Philippines in the South China Sea may indicate that it has some fishery potential in the area. Indo-West Pacific from eastern Africa to the Andaman Sea, the South China Sea, Indonesia, and perhaps also Papua New Guinea.



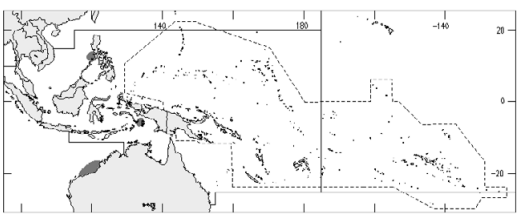


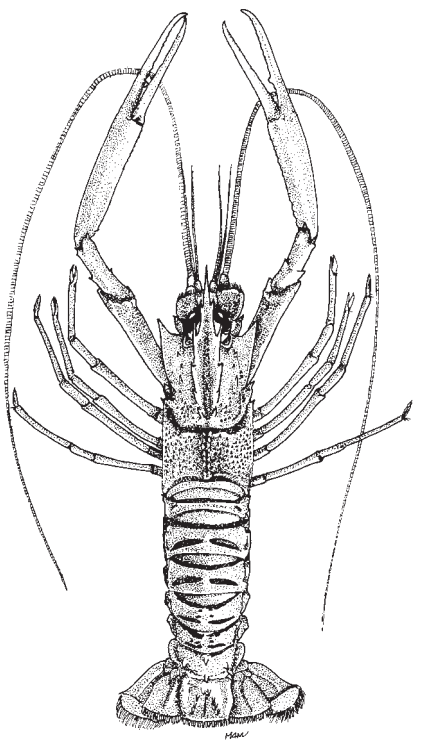
(after Alcock, 1894)

Metanephrops australiensis (Bruce, 1966)

En - Northwest lobster.

Maximum total body length 18 cm. At depths from 418 to 500 m, on firm sediments such as *Globigerina* ooze; probably lives in burrows. In the area, so far only taken in few numbers during experimental deep-water trawling operations. However, as this lobster is the main component of the commercial *Metanephrops* fishery in northwestern Australia, more knowledge of its fishing grounds may reveal that it has also some fishery potential elsewhere in the Western Central Pacific. Known from the Philippines, Indonesia, and northwestern Australia.



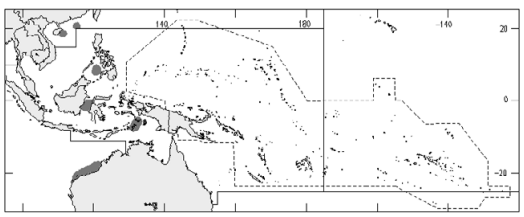


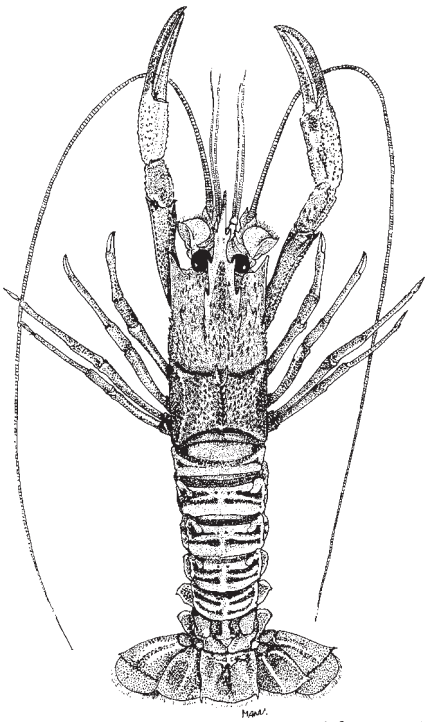
(after Bruce, 1966)

Metanephrops neptunus (Bruce, 1965)

En - Neptune lobster.

Maximum total body length 25 cm; probably the largest species of the genus. On soft bottoms at depths to 940 m, mostly more than 500 m; probably lives in burrows. Occasionally caught in rather small quantities during deep-water trawling operations. With the development of deep-sea fishing gear this lobster is potentially very attractive for fisheries, due to its large size. Western Pacific from the South China Sea to the Philippines, Indonesia, and northwestern Australia.



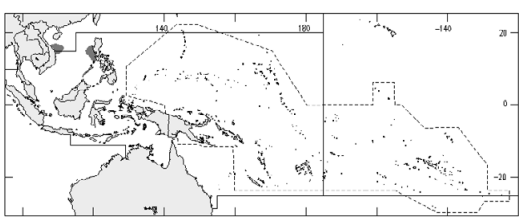


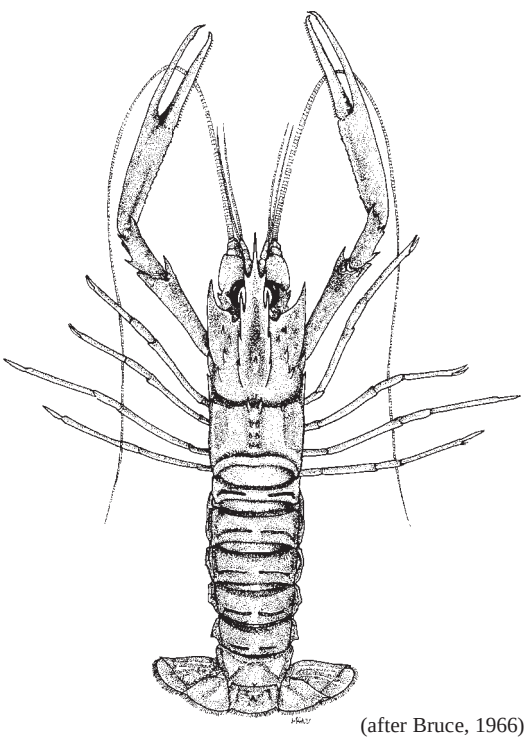
(after Bruce, 1965)

Metanephrops sinensis (Bruce, 1966)

En - China lobster.

Maximum total body length 15 cm. Found on muddy bottoms in deep water at depths from 203 to 407 m, sometimes with shells. Not fished commercially at present, but often caught in large numbers during experimental deep-water trawling operations around the Philippines and may therefore have some fishery potential in the area. So far only known from the South China Sea and the northwestern coast of the Philippines.



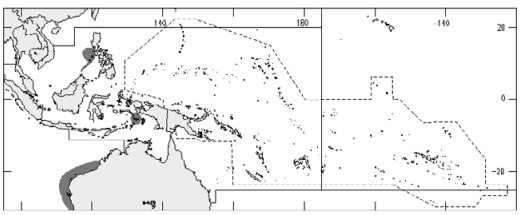


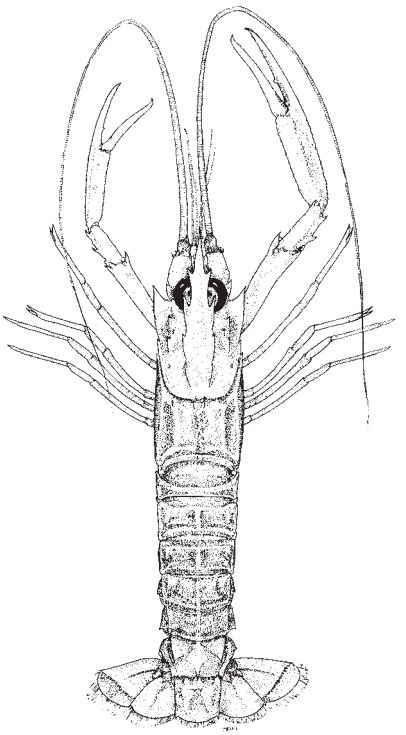
(after Bruce, 1966)

Metanephrops velutinus Chan and Yu, 1991

En - Velvet lobster.

Maximum carapace length 8.6 cm. In deep water at depths of 238 to 702 m, mostly between 350 and 450 m on hard muddy substrate. A commercial species in northwestern Australia, but not yet fished in the area. Often caught on the basis of exploratory deep-water trawling operations around the Philippines and Indonesia and may therefore also have some fishery potential in area. So far only found in the Philippines, Indonesia, and Western Australia.





(after Chan and Yu, 1991)

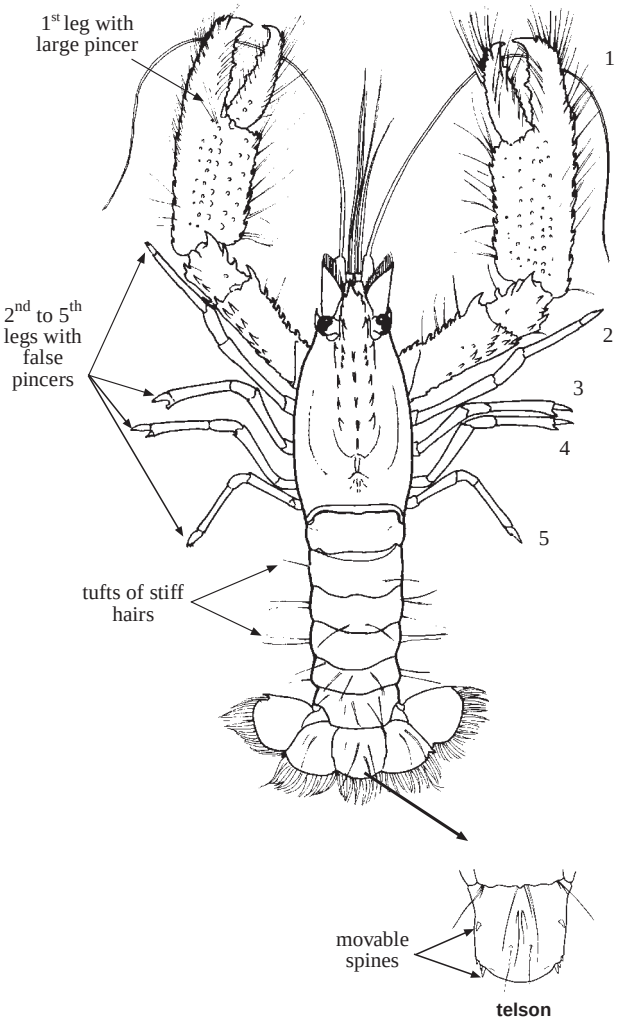
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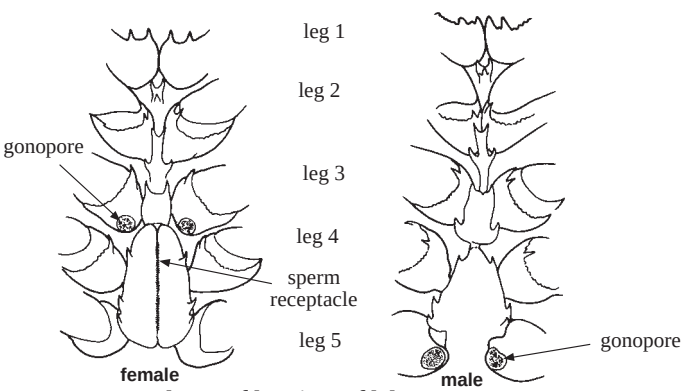
ENOPLOMETOPIDAE

Reef lobsters

Diagnostic characters: Moderate- to small-sized crustaceans. Body cylindrical, **distributed with tufts of long stiff hairs**. Carapace (or "head") with a well-developed rostrum. **Eyes well developed and black**. Antennae long and thread-like, **antennal scale with inner margin unarmed and curved. First pair of legs greatly enlarged and forming true pincers; second to fifth legs slender and ending in false pincers** (less distanct in posterior legs). Abdomen well developed and powerful, **pleura more or less rounded and sometimes bearing strong spines**. Tail fan entirely hardened; **telson bearing movable spines**, its posterior margin broadly convex. **Colour: brilliant and attractive** - orange-red, red, purple and/or white, **with conspicuous spots on body, sometimes also with stripes**.



Habitat, biology, and fisheries: Reef lobsters usually live in coral and rocky reefs or in deeper parts of reef slopes at depths of 30 cm to 300 m. As in nephropids, the sexes can be determined by the position of the gonopores at the bases of legs. In addition, the first pleopods ("legs" of the abdomen) of males are large and leaf-like (thin but rigid), while they are small and thread-like in females. A large sperm receptacle process is present on the thoracic sternum between the last 3 legs in females. The eggs are small (about 0.5 mm in diameter) and numerous. They hatch within a short time (about 6 days for *Enoplometopus debelius*) but the larvae are very difficult to rear. Since reef lobsters are nocturnal and shy, they are very difficult to catch. However, they are often highly valued in the aquarium trade for their attractive coloration. Reef lobsters presumably originating from Indonesia or the Philippines can be found in aquarium shops of other Asian countries, Europe, and the USA. Therefore, species accounts are provided here for the more common species.



bases of legs in reef lobsters



first pleopod of male (*Enoplometopus*)

Similar families occurring in the area

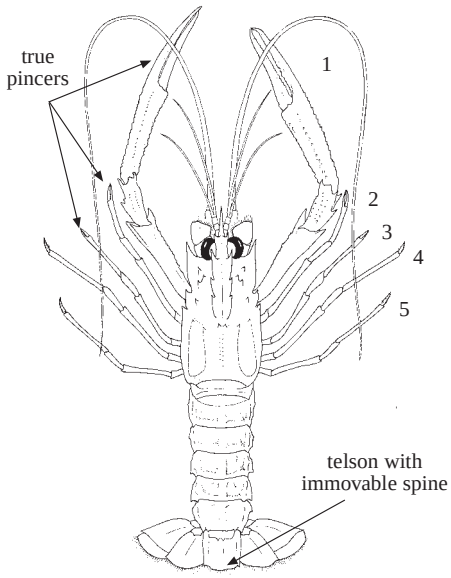
Nephropidae: body almost naked or covered with thick fur; first 3 pairs of legs ending in true pincers, with the first pair much larger than the others; telson only bearing immovable spines.

Thaumastochelidae: body slightly depressed dorsoventrally; eyes strongly reduced, cornea lacking pigmentation; antennal scale bearing several large teeth along inner margin; first 3 pairs of legs (occasionally also fifth legs) ending in true pincers, first pair large but very unequal; abdominal pleura short, quadrangular and without large ventral tooth; telson unarmed.

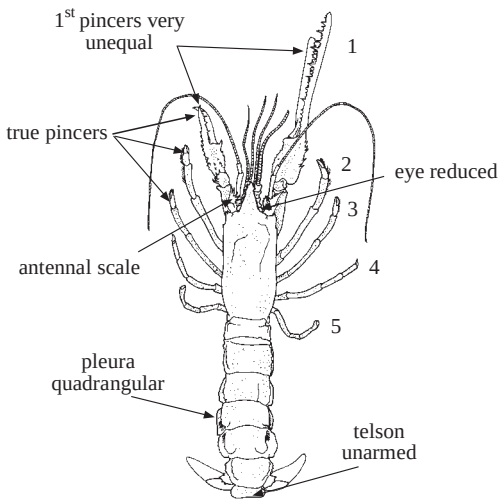
Polychelidae: eyes small, cornea lacking pigmentation; carapace box-like, rostrum absent or rudimentary; first 4 or all legs ending in true pincers, first pair long and slender; telson pointed.

Glypheidae: body somewhat flattened dorsoventrally; eyes inserted on a median elevation of cephalon; first 2 legs forming false pincers with first pair very strong, third leg simple.

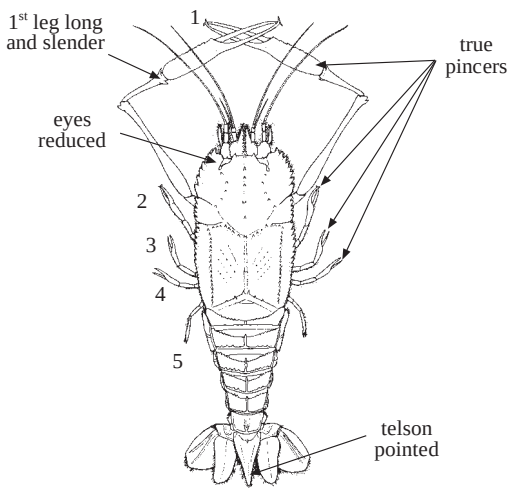
Synaxidae: body somewhat flattened dorsoventrally and uniformly hairy; legs simple and without pincers, first pair much more robust than others; antennae rather thick and whip-like, shorter than carapace; posterior half of tail fan soft and flexible.



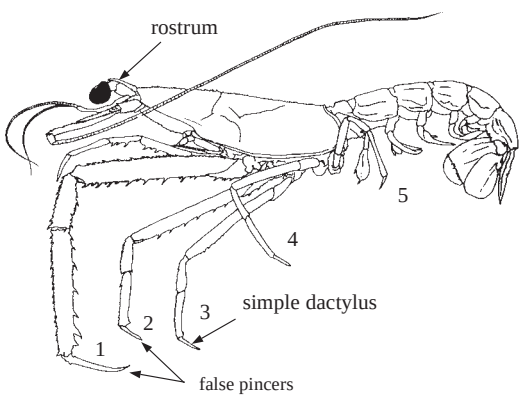
Nephropidae



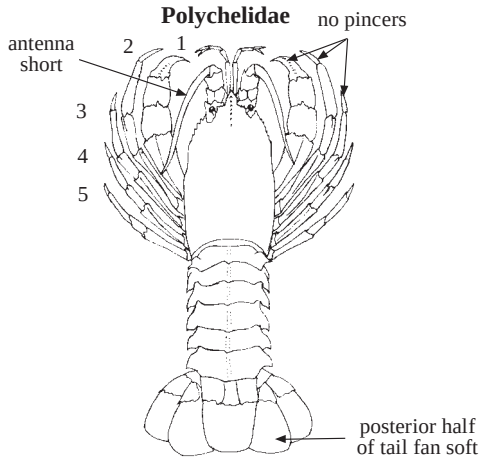
Thaumastochelidae



Polychelidae



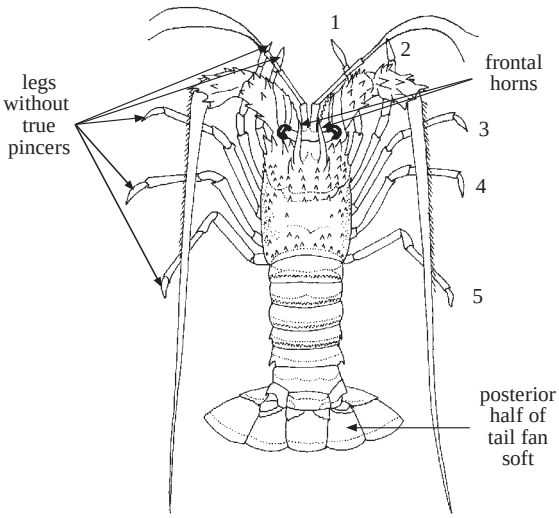
Glypheidae



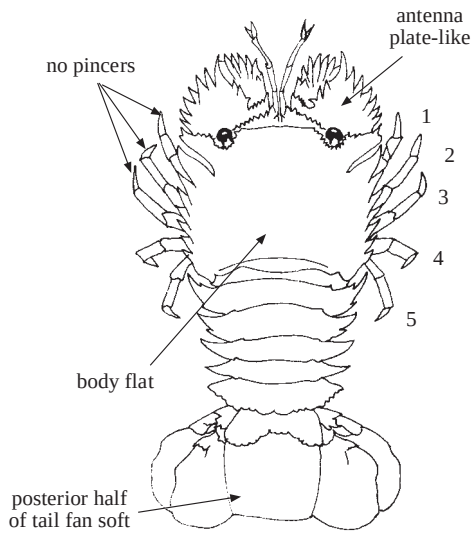
Synaxidae

Palinuridae: body tubular or slightly flattened dorsoventrally; rostrum absent or reduced to a small spine; carapace spiny and with a pair of large frontal horns above eyes; antennal flagella rather thick and very long, whip-like or spear-like; legs without true pincers and first pair generally not enlarged (except in *Justitia*); posterior half of tail fan soft and flexible.

Scyllaridae: body strongly flattened dorsoventrally; rostrum absent or minute; eyes enclosed by distinct orbits; legs without true pincers and none of them enlarged; antennae plate-like; posterior half of tail fan soft and flexible.



Palinuridae



Scyllaridae

Key to the species of Enoplometopidae occurring in the area

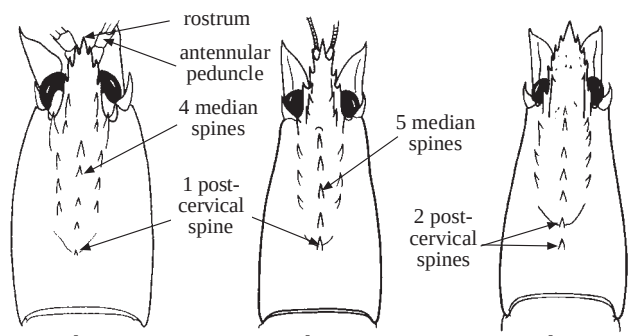
Note: since reef lobsters generally have particular colour patterns, live specimens of the various species are easily distinguished by their coloration.

1a. Carapace with or without 1 postcervical spine (Fig. 1a, b); abdominal pleura broadly convex, with a blunt posterolateral angle (Fig. 2a); lateral margins of telson armed with 1 pair of median spines (Fig. 3a) . . . . . → ***2***

1b. Carapace with 2 postcervical spines (Fig. 1c); abdominal pleura bearing a strong tooth (Fig. 2b); lateral margins of telson armed with 2 pairs of median spines (Fig. 3b) . . . . . → ***5***

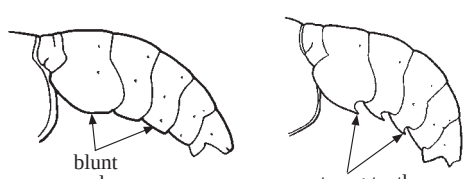
2a. Rostrum bearing 2 pairs of lateral teeth; body orange-red and with colour markings mainly limited to lower carapace and posterior margins of abdominal segments . . . . . ***Enoplometopus chacei***

2b. Rostrum bearing 3 or more pairs of lateral teeth; colour spots and/or stripes present on whole body . . . . . → ***3***



a) *Enoplometopus daumi* **b) *Enoplometopus occidentalis*** **c) *Enoplometopus holthuisi***

Fig. 1 carapace (dorsal view)

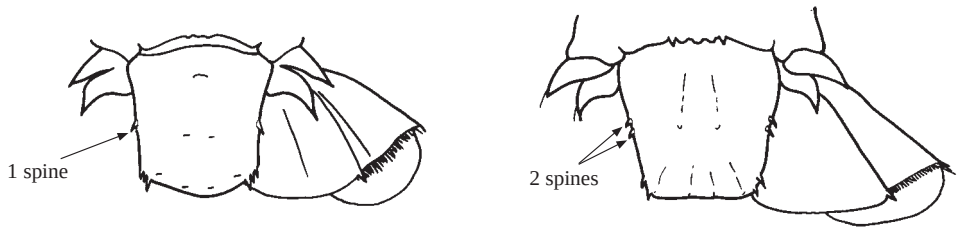


a) *Enoplometopus occidentalis* **b) *Enoplometopus holthuisi***

Fig. 2 abdomen (lateral view)

3a. Carapace with 5 median spines; rostrum reaching to or beyond antennular peduncle (Fig. 1b); colour orange-red with some conspicuous white spots on abdomen, fewer on carapace . . . . . ***Enoplometopus occidentalis***

3b. Carapace with 4 median spines; rostrum reaching to about middle of distal segment of antennular peduncle (Fig. 1a); colour mainly purplish . . . . . → ***4***



a) ***Enoplometopus occidentalis*** **b)** ***Enoplometopus holthuisi***

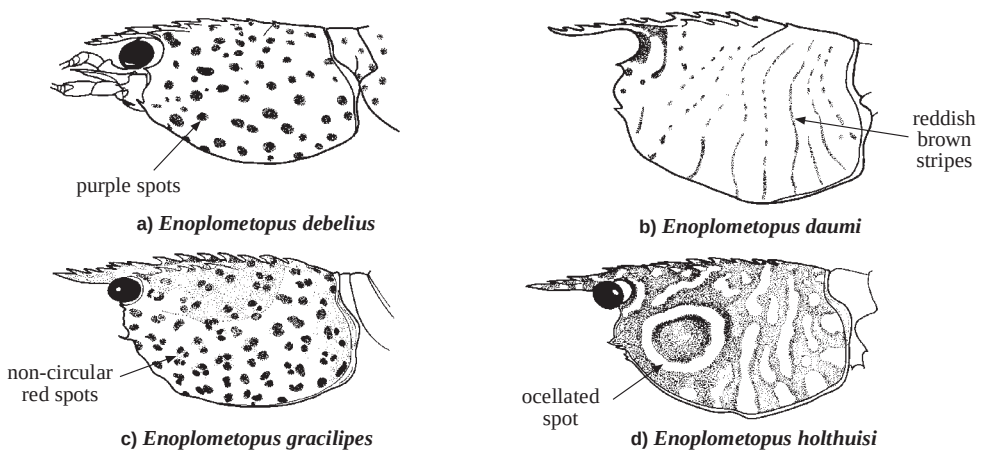
Fig. 3 tail fan (dorsal view)

4a. Postcervical tooth distinct; body whitish, almost uniformly covered with small purple dots (Fig. 4a) . . . . . ***Enoplometopus debelius***

4b. Postcervical tooth rather indistinct; carapace with vertical reddish brown stripes; abdomen provided with many white spots (Fig. 4b). . . . . ***Enoplometopus daumi***

5a. Body pale pink and almost uniformly covered with small non-circular red spots (Fig. 4c) . . . . . ***Enoplometopus gracilipes***

5b. Body reddish; lateral carapace with a large ocellated spot and some vertical white stripes (Fig. 4d); abdomen provided with many white spots . . . . . ***Enoplometopus holthuisi***



a) ***Enoplometopus debelius*** **b)** ***Enoplometopus daumi***

c) ***Enoplometopus gracilipes*** **d)** ***Enoplometopus holthuisi***

Fig. 4 carapace (lateral view)

List of species occurring in the area

The symbol 🦐 is given when species accounts are included.

Enoplometopus chacei Kensley and Child, 1986
🦐 *Enoplometopus daumi* Holthuis, 1983
🦐 *Enoplometopus debelius* Holthuis, 1983
Enoplometopus gracilipes (De Saint Laurent, 1988)
🦐 *Enoplometopus holthuisi* Gordon, 1968
🦐 *Enoplometopus occidentalis* (Randall, 1840)

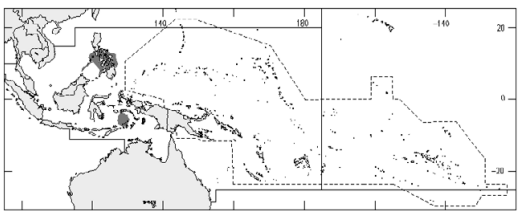
Reference

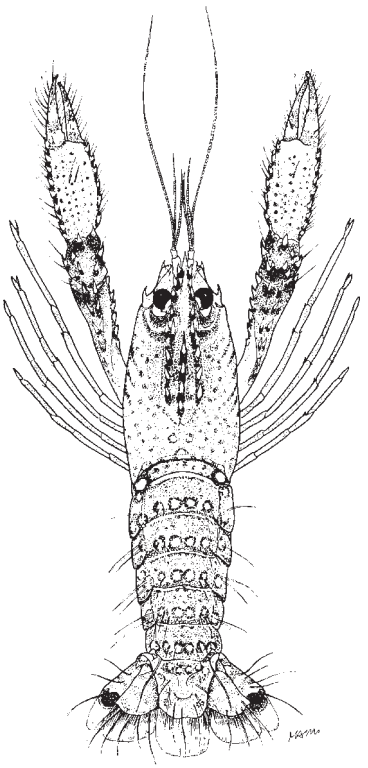
Holthuis, L.B. 1983. Notes on the genus *Enoplometopus*, with descriptions of a new subgenus and two new species (Crustacea Decapoda, Axiidae). *Zool. Med. Leiden*, 56(22):281-298.

Enoplometopus daumi Holthuis, 1983

En - Striped reef lobster.

Carapace length of adults between 1.3 and 2.6 cm, body length between 4 and 6 cm. Shallow coral reef areas. Shy, generally hide in rock cavities, often with only the pincers visible. Territorial and extremely aggressive against members of the same species except during mating. Collected by rotenone and probably also by divers. Not common, but a favourite for the aquarium trade because of its small size and special coloration. Live specimens are probably regularly exported from the Philippines and Indonesia. With certainty only known from Indonesia and the Philippines.

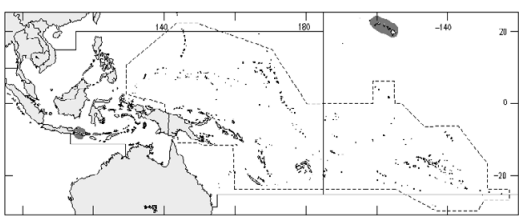


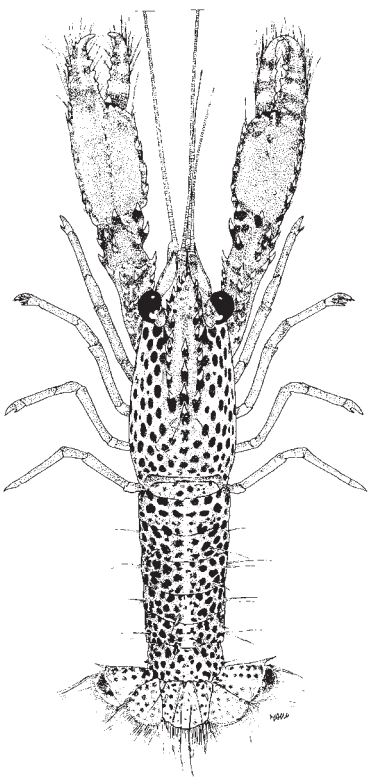


Enoplometopus debelius Holthuis, 1983

En - Violet-spotted reef lobster.

Carapace length of adults between 2.2 and 2.4 cm, body length reaching 5 cm or more. On reef slopes in depths from 15 to 25 m. Collected by hand net during night diving. Appears to be slightly less aggressive than other species of the genus. An uncommon species that is sold at high prices in the aquarium trade for its attractive coloration. Specimens are mostly exported from Indonesia. Western Pacific from Indonesia to Hawaii and possibly Japan.

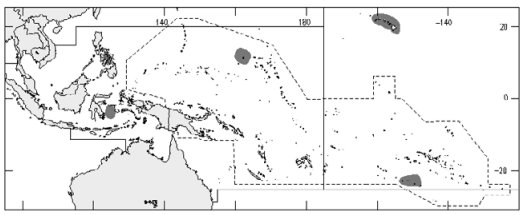


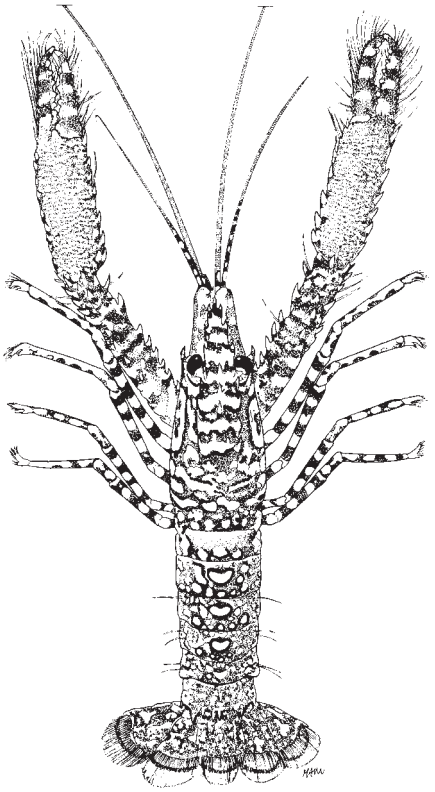


Enoplometopus holthuisi Gordon, 1968

En - Bullseye reef lobster.

Maximum body length about 12 cm. Lives on rocky reef slopes and deeper parts of reefs at depths of about 20 m to 80 m. Less shy and more aggressive than other species of the genus. Occasionally found in the aquarium trade and sold at a high price. Probably caught by night diving. Western Pacific from the Philippines, Indonesia, Eniwetok Atoll (Marshall Islands), Austral Islands, and Hawaii.

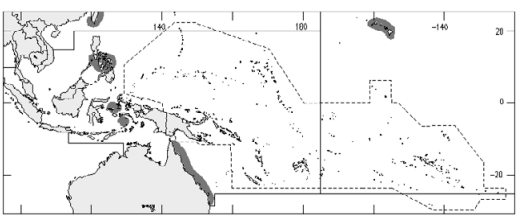


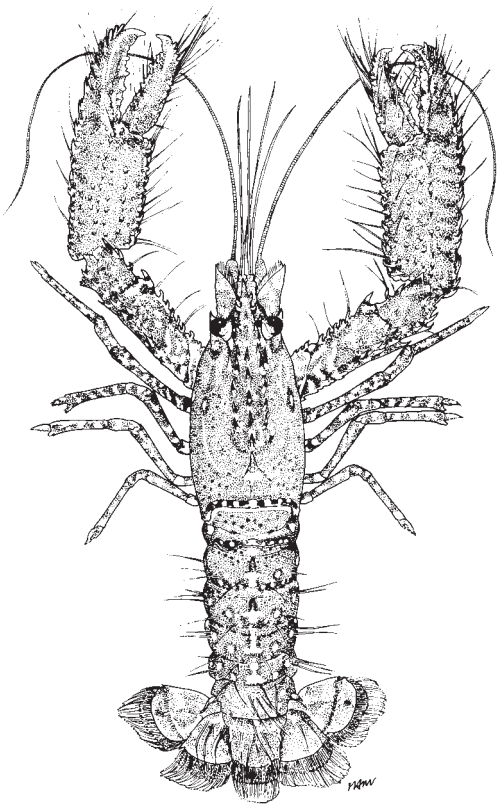


Enoplometopus occidentalis (Randall, 1840)

En - Red reef lobster.

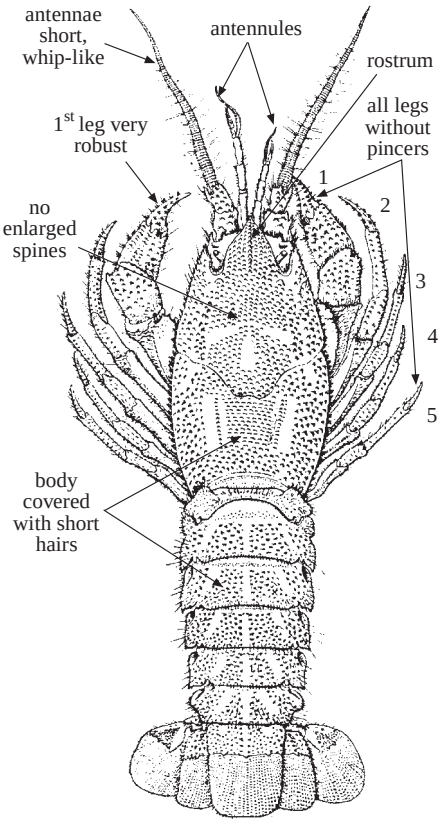
Body length between 4 and 14 cm. Inhabits coral or rocky reefs and often found in deeper areas at the fringe of reefs, at depths of a few meters to about 100 m. Nocturnal and shy, usually found hiding in crevices and rocks. Very aggressive against members of the same species except during mating. Probably the most common species of the genus but still rather rare and only occasionally caught by divers collecting spiny lobsters or aquarium fishes. Small specimens are occasionally found in the aquarium trade and sold at a high price. Indo-West Pacific from eastern Africa to Japan, eastern Australia, and Hawaii.





SYNAXIDAE

Furry lobsters



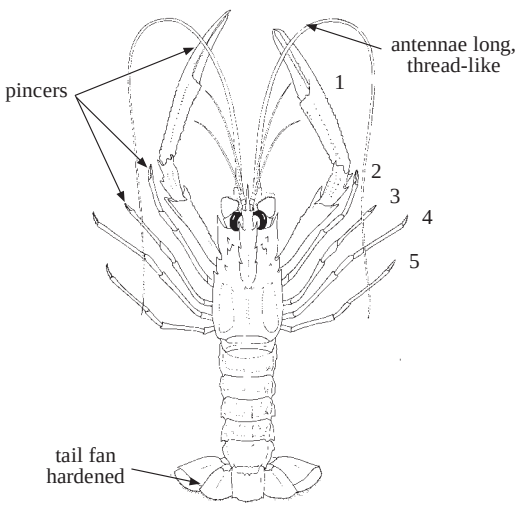
Diagnostic characters: Moderate- to small-sized crustaceans. Body somewhat flattened dorsoventrally and **covered with a dense fur of short hair. Carapace long and laterally angular**, covered with small rounded granules only, **without enlarged spines; rostrum broad and flat triangular or rounded. Eyes small but distinct. Antennae rather thick and whip-like, but shorter than carapace; antennulae with flagella shorter than peduncle**; stridulating organ sometimes present between bases of antennae and antennular plate. **Legs without pincers but first pair much heavier than others.** Both abdomen and tail fan well developed and powerful, **posterior half of tail fan soft and flexible; abdomen hairy, with a low smooth keel along dorsal midline, but without transverse grooves. Colour:** uniformly orange to bright orange or orange-red. Eyes black.

Habitat, biology, and fisheries: This family contains only 2 genera and a total of 2 species in the Western Central Pacific. The shallow water genus *Palinurellus* is smaller (maximum total length about 20 cm) than the slightly larger deep-water genus *Palibythus* (maximum total length 27 cm). Both genera live on hard bottom and are difficult to catch. Furry lobsters generally occur in few numbers and have therefore a very limited commercial potential. However, the "exotic" appearence and bright coloration of *Palinurellus* species has caught the attention of the tropical marine aquarium trade. Specimens presumably originating from the Philippines and Indonesia are occasionally sold for high prices in aquarium shops of other Asian countries, Europe, and the USA. The sexes of furry lobsters can be determined by the position of the gonopores as in the other families of lobsters. Furthermore, the first pair of pleopods ("legs" of the abdomen) is absent in males but present in females.

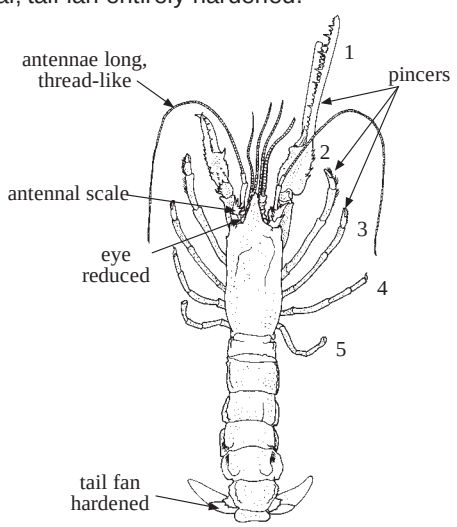
Similar families occurring in the area

Nephropidae: body tubular, almost naked or covered with thick fur; antennae very long and thread-like; first 3 pairs of legs ending in pincers, first pair greatly enlarged; tail fan entirely hardened.

Thaumastochelidae: eyes strongly reduced, cornea lacking pigmentation; antennae very long and thread-like, scale with several large teeth along inner margin; first 3 pairs of legs (occasionally also fifth legs) ending in pincers, first pair large but very unequal; tail fan entirely hardened.



Nephropidae



Thaumastochelidae

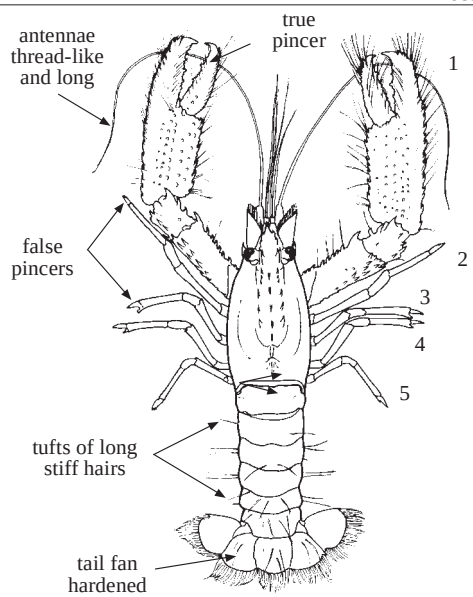
Enoplometopidae: body tubular, distributed with tufts of long stiff hairs; antennae very long and thread-like; first pair of legs enlarged and forming true pincer, second and third legs slender and ending in false pincers; tail fan entirely hardened.

Polychelidae: eyes small, cornea lacking pigmentation; rostrum absent or rudimentary; antennae thread-like and shorter than body; first 4 or all legs with pincers, first pair long and slender; tail fan entirely hardened, with telson pointed.

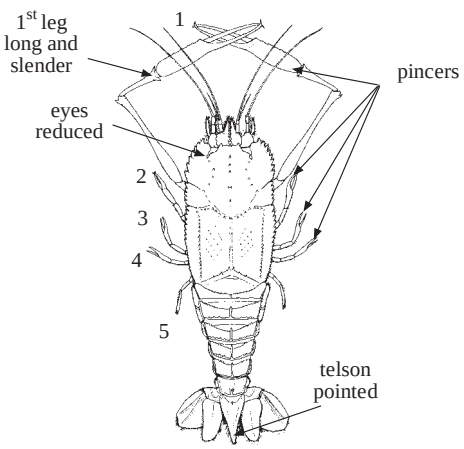
Glypheidae: eyes inserted on a median elevation of cephalon; antennae very long and thread-like; first 2 legs forming false pincers, with first pair very strong, third legs simple; uropods of tail fan entirely hardened.

Palinuridae: body naked or with few and scattered hairs; carapace spiny and with a pair of large frontal horns over eyes, but lacking a median rostrum or with rostrum greatly reduced; antennae very long and whip-like or spear-like; legs without pincers and first pair generally not enlarged (except in one species of *Justitia*).

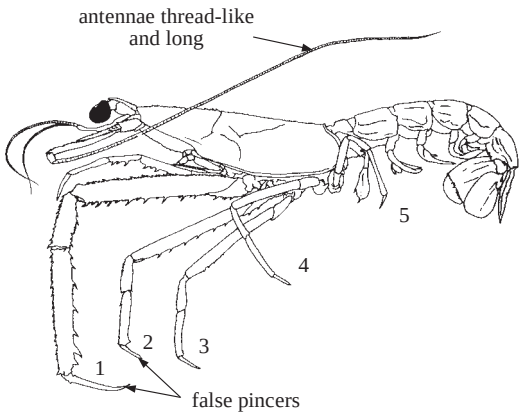
Scyllaridae: body strongly flattened dorsoventrally; rostrum absent or minute; antennae plate-like; legs without pincers and none of them enlarged.



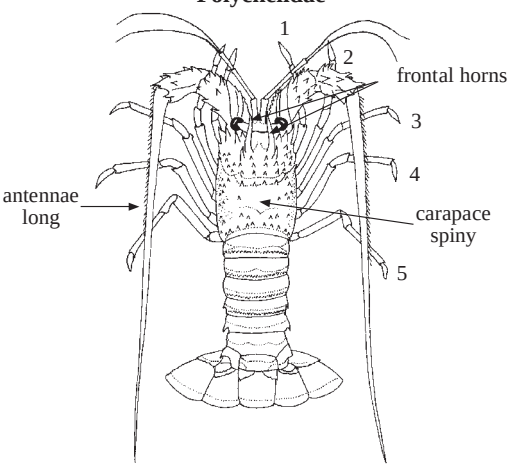
Enoplometopidae



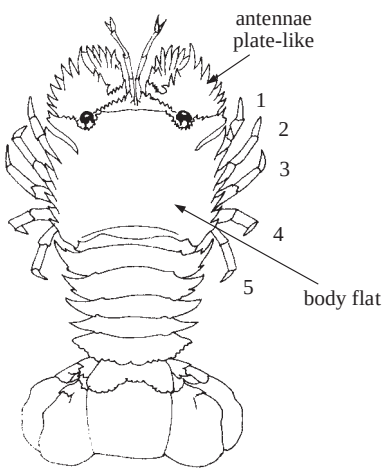
Polychelidae



Glypheidae



Palinuridae

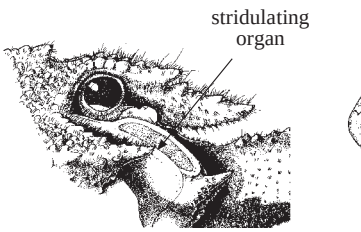


Scyllaridae

Key to the species of Synaxidae occurring in the area

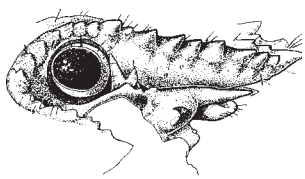
1a. Antennular plate with stridulating organ (Fig. 1a); rostrum transversely oval, wider than long; lateral margin of carapace with distinct teeth behind anterolateral tooth (Fig. 2a) . . . . . ***Palibythus magnificus***

1b. Antennular plate without stridulating organ (Fig. 1b); rostrum triangular, longer than wide; lateral margin of carapace without teeth behind anterolateral tooth (Fig. 2b) . . . . . ***Palinurellus wieneckii***



(from Davie, 1990)

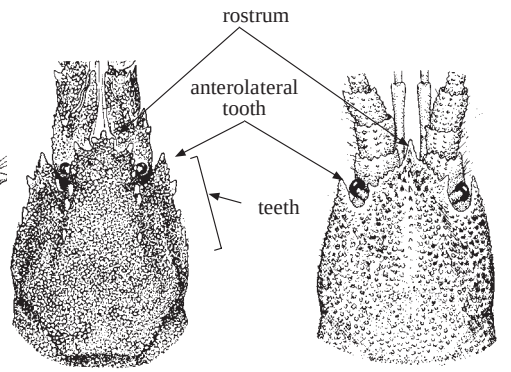
a) *Palibythus magnificus*



(from Davie, 1990)

b) *Palinurellus wieneckii*

Fig. 1 lateral part of orbital region and antennular plate



(after Davie, 1990)

a) *Palibythus magnificus* **b) *Palinurellus wieneckii***

Fig. 2 anterior part of carapace

List of species occurring in the area

The symbol 🦐 is given when species accounts are included.

🦐 *Palibythus magnificus* Davie, 1990

🦐 *Palinurellus wieneckii* (De Man, 1881)

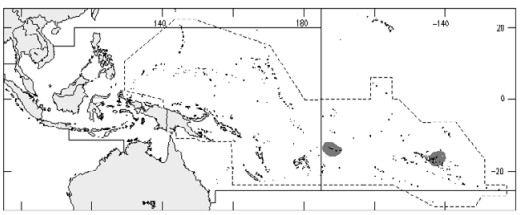
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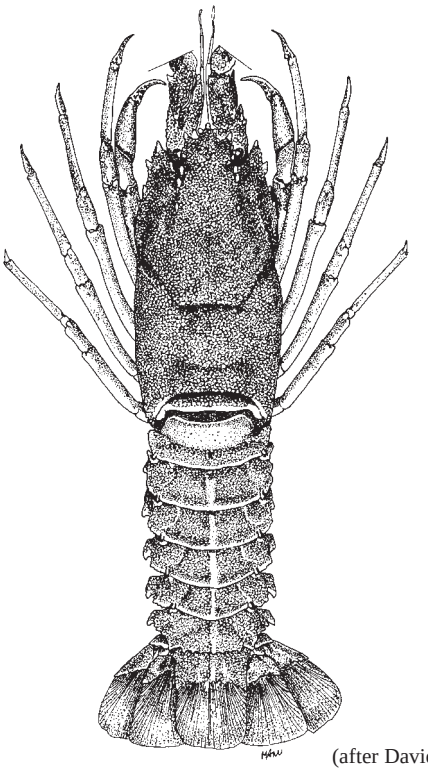
Holthuis, L.B. 1991. FAO species catalogue. Vol. 13. Marine lobsters of the world. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fish. Synop*., 125(13):1-292.

Palibythus magnificus Davie, 1990

En - Musical furry lobster.

Maximum body length about 27 cm. On rocky bottoms at depths between 90 and 300 m. Although this furry lobster is of a fair size, it is rare and so far only caught by experimental trapping. Only known from Western Samoa and Tuamotu Archipelago.



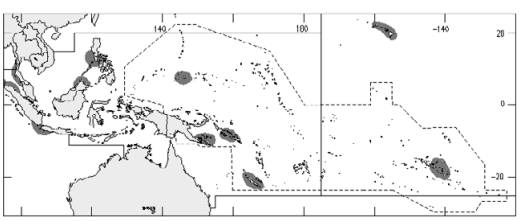


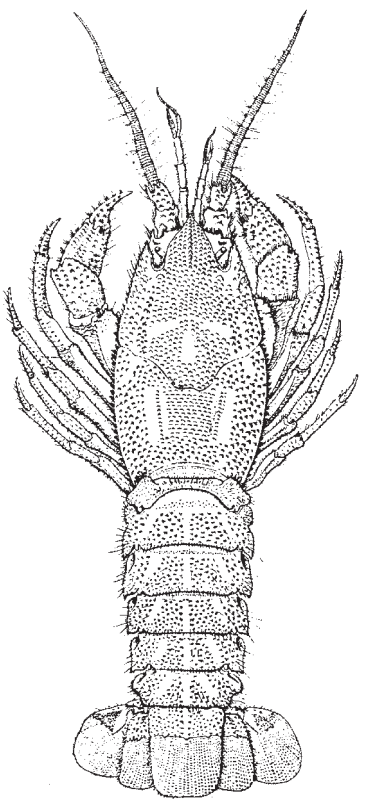
(after Davie, 1990)

Palinurellus wieneckii (De Man, 1881)

En - Indo-Pacific furry lobster; **Fr** - Cacahouète indopacifique; **Sp** - Langosta del Indo-Pacifico.

Maximum body length about 20 cm, commonly between 7 and 14 cm. In shallow waters on coral reefs at depths from 9 to 27 m. Probably nocturnal and often found in deep caves. Occasionally caught by divers (using hand) or gill nets. Too rare and small to be of significant importance as food, but highly valued in the aquarium trade for its bright colour and rarity. Specimens in the aquarium trade are presumably originated from the Philippines and Indonesia. Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Red Sea, southern Japan, New Caledonia, French Polynesia, and Hawaii.





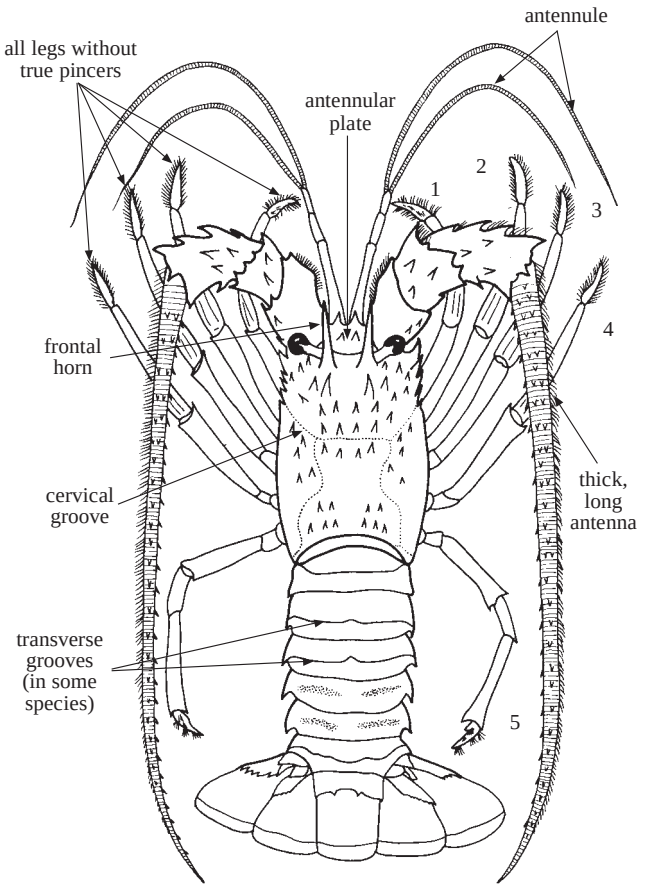
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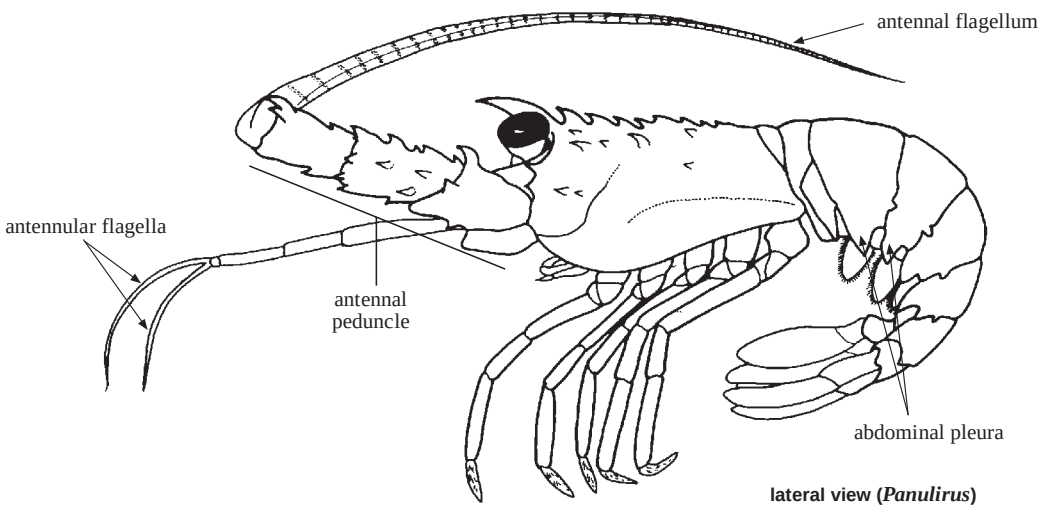
PALINURIDAE

Spiny lobsters, langoustes

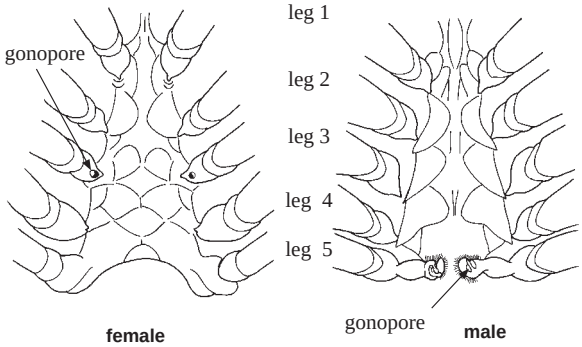
Diagnostic characters: Moderate- to large-sized crustaceans. Body tubular or slightly flattened dorsoventrally; hairs, if present, few and scattered. Carapace (or "head") subcylindrical or box-like, laterally rounded or straight, **without a well-developed rostrum, ornamented with spines and granules of various sizes, sometimes with scale-like sculpture (*Justitia*). Eyes well developed, each protected by a strong, spiny frontal projection of the carapace (frontal horns). Antennae rather thick and very long, whip-like or spear-like**; antennal scale absent; antennulae slender and each with 2 long or short flagella. **Bases of antennae often separated by a broad antennular plate usually bearing some spines**. In some genera a projection from the base of antenna is developed and forms with the rim of the antennal plate a stridulating organ which can produce a grating sound by movement of the antenna. **Legs generally simple, without true pincers; the first pair not or only slightly longer than the following legs (except in male of *Justitia longimanus*), but often somewhat more robust**. Both abdomen and tail fan well developed and powerful, **posterior half of tail fan soft and flexible**. Abdominal segments either smooth or each provided with 1 or more transverse grooves. **Colour:** mostly brightly coloured and provided with special markings, bands or spots, or uniformly coloured.



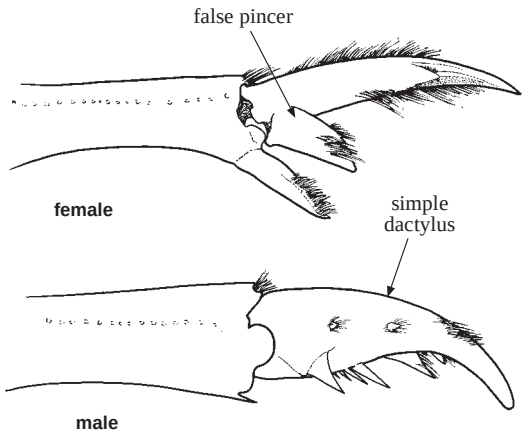
dorsal view (*Panulirus*)



lateral view (*Panulirus*)

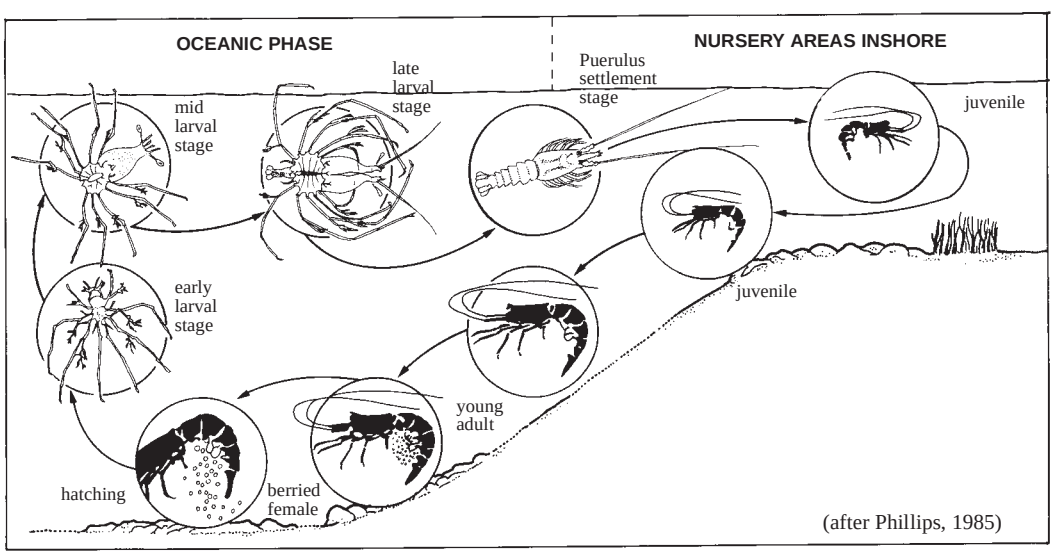


bases of legs in spiny lobsters



terminal segments of 5th leg in spiny lobsters

Habitat, biology, and fisheries: The maximum body length of species in the area ranges from about 14 cm to over 60 cm. The sexes are easily distinguished by the position of the gonopores which are situated at the bases of the third and fifth legs in females and males, respectively. Furthermore, the last leg forms a false (mostly) or true pincer in mature females, but is simple in mature males. Members of this family are characterized by the eggs (usually orange in colour) being very small and numerous, and by having a relatively shorter carrying time and very long planktonic larval stages (i.e. the phyllosoma). Spiny lobsters are all bottom-dwelling and can be found from very shallow water to a depth of 683 m. The shallow-water genus *Panulirus* comprises most of the species which are mainly nocturnal and live in coral or rocky reefs in depths less than 40 m. These are traditionally considered as excellent seafood and have a high economic value in the area. Juveniles are sometimes also seen in the aquarium trade. All species of *Panulirus* are actively fished throughout the area by divers (taken both by hand and spears), tangle nets, traps, or sometimes even by trawls, although they are not landed anywhere in large quantities. From 1990 to 1995, FAO's Yearbook of Fishery Statistics reports a range of yearly catch of *Panulirus* of 2 450 to 4126 t from the Western Central Pacific. The other 4 genera occurring in the area are more commonly found in deeper water, some of them living in rocky areas (e.g. *Justitia* and *Palinustus*) and others on soft substrate (e.g. *Linuparus* and *Puerulus*). All these deep-water species are not very abundant, some even rare, and so far only taken as bycatch. Nevertheless, the rarer species are also used for human consumption. Due to their rather large size, some species may have more commercial potential with the development of deep-sea fisheries. Therefore, all spiny lobsters occurring in the area are treated here in separate species accounts.



life cycle of spiny lobsters of the genus *Panulirus*

Similar families occurring in the area

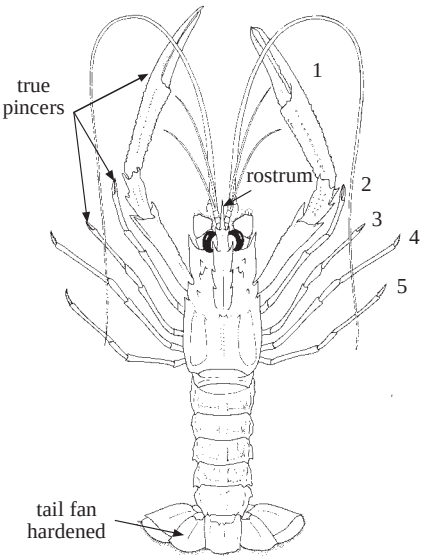
Nephropidae: body almost naked or covered with thick fur; rostrum well developed; antennae thin and thread-like; first 3 pairs of legs ending in pincers, first pair greatly enlarged; tail fan entirely hardened.

Thaumastochelidae: eyes strongly reduced, cornea lacking pigmentation; rostrum well developed; antennae thin and thread-like, scale with several large teeth along inner margin; first 3 pairs of legs (occasionally also fifth legs) forming pincers, first pair large but very unequal; tail fan entirely hardened.

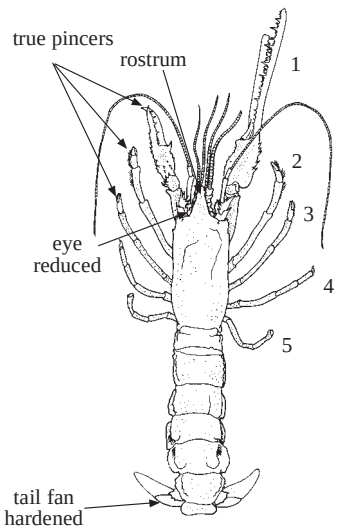
Enoplometopidae: body distributed with tufts of long stiff hairs; carapace with a well-developed rostrum; antennae thin and thread-like, antennal scale present; first pair of legs enlarged and forming true pincers, second and third legs ending in false pincers; tail fan entirely hardened.

Polychelidae: eyes small, cornea lacking pigmentation; antennae thin and thread-like, shorter than body; first 4 or all legs ending in pincers, with first pair long and slender; telson entirely hardened and with telson pointed.

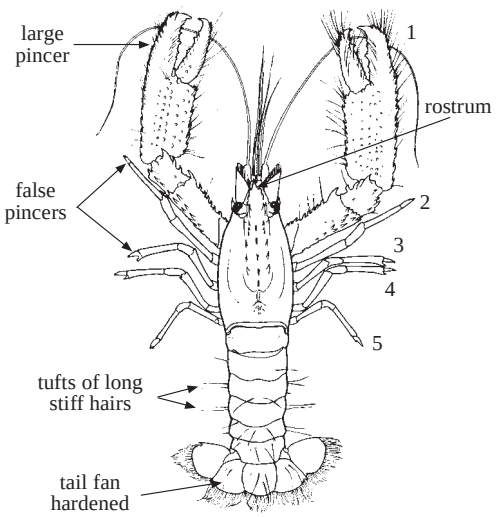
Glypheidae: eyes inserted on a median elevation of cephalon; carapace with a well-developed rostrum; antennae thin and thread-like; first 2 legs forming false pincers, the first pair very strong, third legs simple; uropods of tail fan entirely hardened.



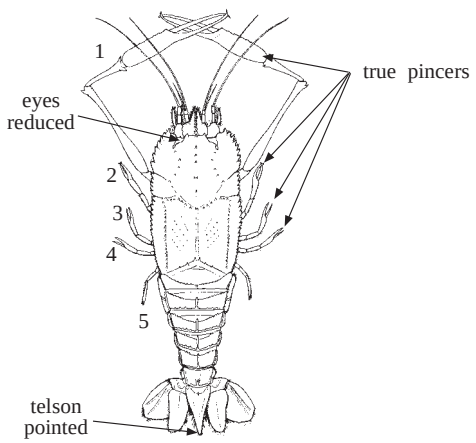
Nephropidae



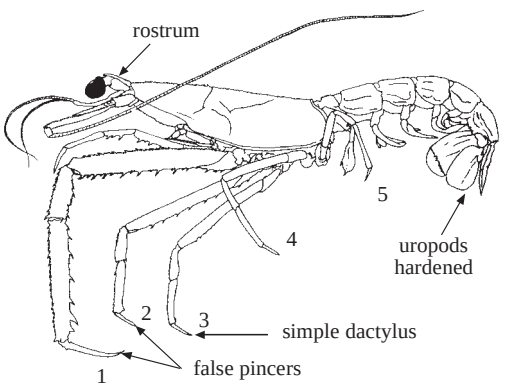
Thaumastochelidae



Enoplometopidae



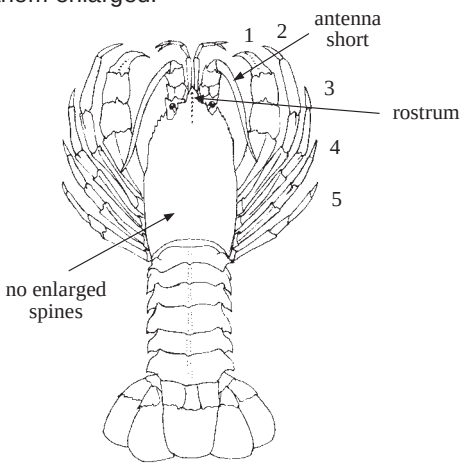
Polychelidae



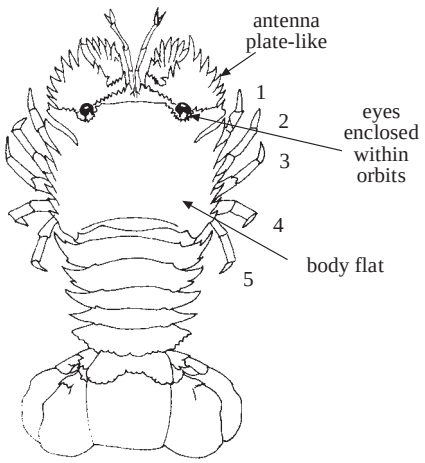
Glypheidae

Synaxidae: body very hairy; carapace laterally angular, with a broad and flat triangular or rounded rostrum, covered with small rounded granules but without enlarged spines; antennae whip-like but shorter than carapace; legs without pincers but first pair much heavier than others.

Scyllaridae: body strongly flattened dorsoventrally; carapace depressed and laterally angular; eyes enclosed by distinct orbits and lacking large frontal horns; antennae plate-like; legs without pincers and none of them enlarged.



Synaxidae



Scyllaridae

Key to the genera of Palinuridae occurring in the area

Note: members of this family, particularly those of the genus *Panulirus*, generally have distinctive colour markings on the body and live and fresh specimens of the various species are often easily distinguished by their coloration.

1a. Carapace covered with scale-like sculpture; each abdominal segments with 4 or more transverse grooves; first pair of legs sometimes enlarged and forming false pincers in males (Fig. 1) . . . . . ***Justitia***

1b. Carapace without scale-like sculpture; abdomen smooth or each segment at most with 2 transverse grooves; first pair of legs simple and never enlarged . . . . . → ***2***

2a. Frontal horns truncated; proximal segment of antennular peduncle longer than antennal peduncle; legs very spinous (Fig. 2) . . . . . ***Palinustus***

2b. Frontal horns pointed; proximal segment of antennular peduncle distinctly shorter than antennal peduncle; legs sparsely covered with spines . . . . . → ***3***

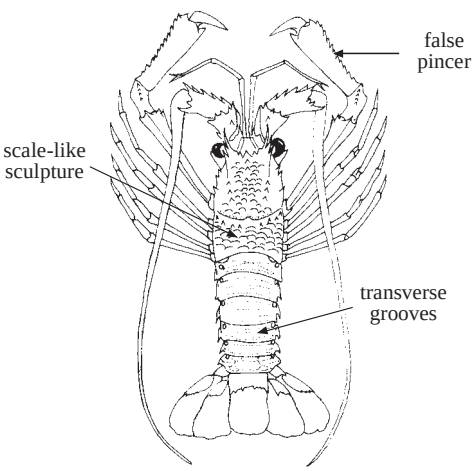


Fig. 1 ***Justitia***

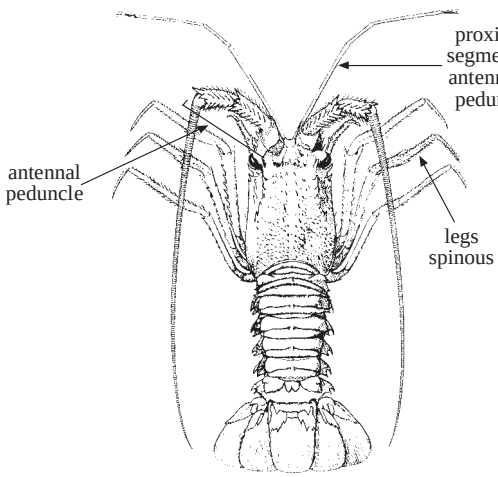


Fig. 2 ***Palinustus***

3a. Carapace subcylindrical, without median keel (Fig. 3); antennule with flagellum longer than peduncle (Fig. 4a); abdominal pleura ending in 1 strong tooth only (Fig. 5a) . . . . . ***Panulirus***

3b. Carapace box-like, with a median keel; antennule with flagellum much shorter than peduncle (Fig. 4b); abdominal pleura ending in 2 or more strong teeth . . . . . →***4***

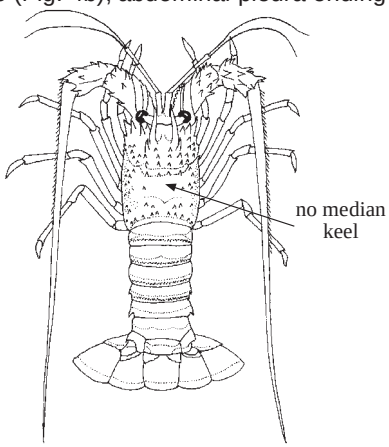


Fig. 3 ***Panulirus***

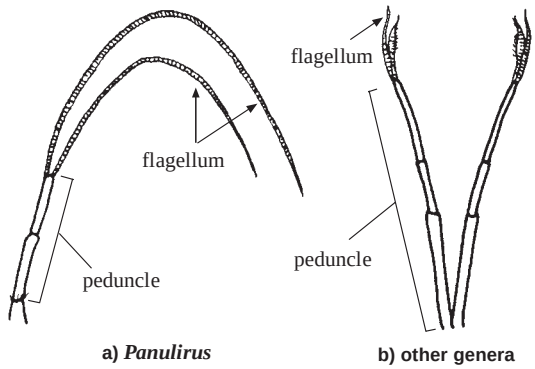


Fig. 4 antennule of spiny lobsters

4a. Frontal horns small and fused at the middle of anterior carapace (Fig. 6a); abdominal pleura ending in short teeth (Fig. 5b); antennae thick, inflexible and shorter than body length (Fig. 7) . . . . . ***Linuparus***

4b. Frontal horns large and widely separated (Fig. 6b); abdominal pleura ending in 2 long teeth (Fig. 5c); antennae slender and much longer than body length (Fig. 8) . . . . . ***Puerulus***

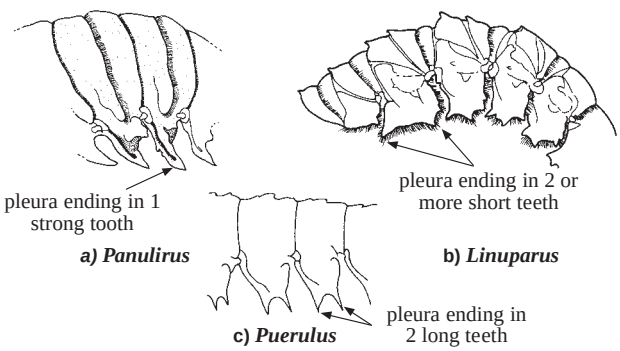


Fig. 5 abdomen (lateral view)

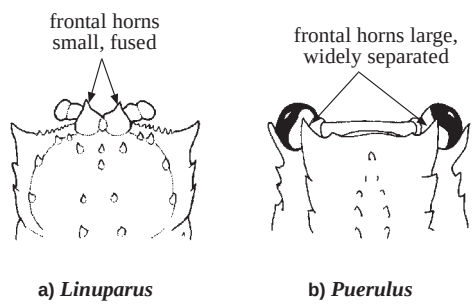


Fig. 6 anterior part of carapace (dorsal view)

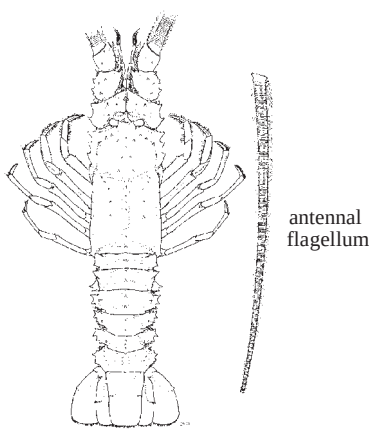


Fig. 7 ***Linuparus***

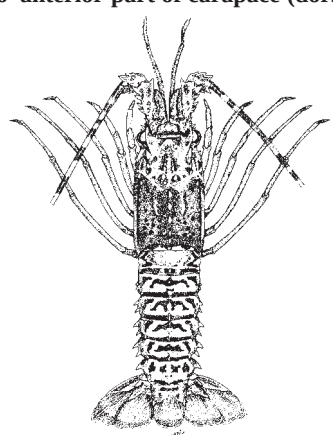


Fig. 8 ***Puerulus***

Key to the species of *Justitia* occurring in the area

1a. Median spine on anterior margin of carapace flanked by 2 to 3 pairs of spines (Fig. 9a); antennular peduncle distinctly exceeding antennal peduncle; first pair of legs of males extremely long and forming false pincers (Fig. 10); abdomen not banded . . . . ***Justitia longimanus***

1b. A single median spine present on anterior margin of carapace (Fig. 9b); antennular peduncle reaching as far as antennal peduncle; first pair of legs short and simple in both sexes; abdomen covered with red bands . . . . . → ***2***

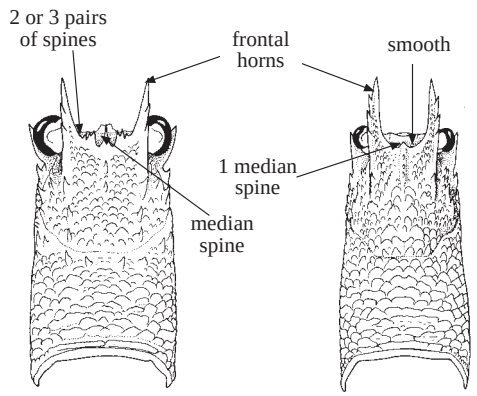


Fig. 9 carapace (dorsal view)

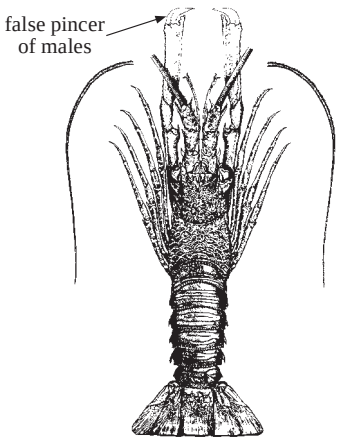


Fig. 10 *Justitia longimanus*

2a. Distal antennal segment with dorsal spine (Fig. 11a); frontal horns usually with 2 dorsal teeth; abdomen with intermediate grooves, usually interrupted and poorly defined, present between main grooves (Fig. 12a); red bands on abdomen located at posterior margin of each segment . . . . . ***Justitia chani***

2b. Distal antennal segment without dorsal spine; frontal horns usually with 3 dorsal teeth; abdominal grooves simple, without intermediate grooves; red bands on abdomen located at anterior margin of each segment . . . . . → ***3***

3a. Antennal peduncle with disto-outer spine much larger than disto-inner spine (Fig. 11b); third to fifth abdominal segments each with 7 transverse grooves (Fig. 12b); lateral carapace without special coloured patches . . . . . ***Justitia japonica***

3b. Disto-outer and disto-inner spines of antennal peduncle similar in length (Fig. 11c); third to fifth abdominal segments each with 5 transverse grooves (Fig. 12c); lateral carapace with 2 red patches . . . . . ***Justitia vericeli***

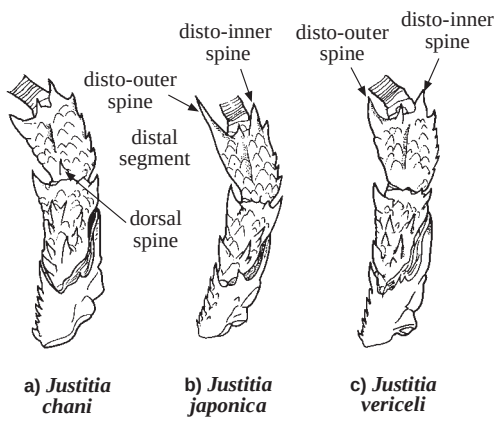


Fig. 11 right antennal peduncle (dorsal view)

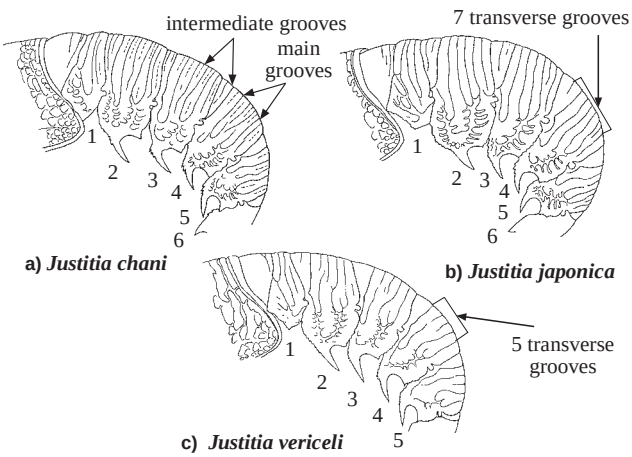
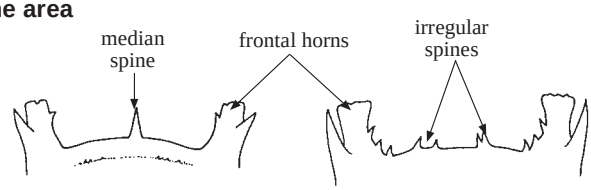


Fig. 12 abdomen (lateral view)
(from Poupin, 1994)

Key to the species of *Palinustus* occurring in the area

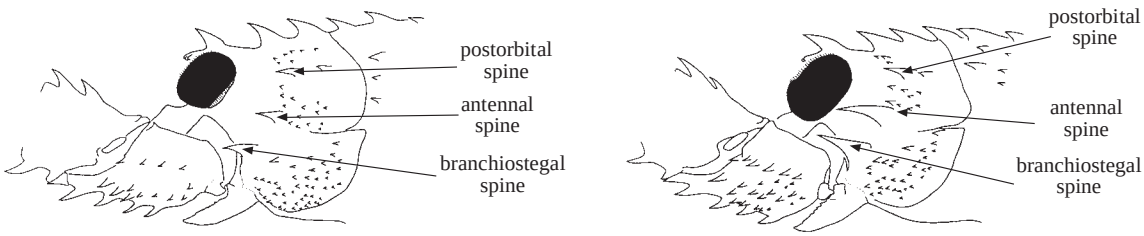
1a. Elevated parts of abdomen almost naked; anterior margin of carapace between frontal horns generally with a single median spine (Fig. 13a); postorbital, antennal and branchiostegal spines moderately long and similar in size (Fig. 14a); antennules uniformly orange-red and legs covered with broad pale bands . . . ***Palinustus unicornutus***



a) *Palinustus unicornutus* b) *Palinustus waguensis*

Fig. 13 anterior part of carapace (dorsal view)

1b. Elevated parts of abdomen distinctly pubescent; anterior margin of carapace between frontal horns provided with 1 to 8 irregularly arranged spines, or spines absent (Fig. 13b); postorbital spine distinctly shorter than antennal spine and branchiostegal spines (Fig. 14b); antennules banded and legs covered with dense narrow red rings . . . . . ***Palinustus waguensis***



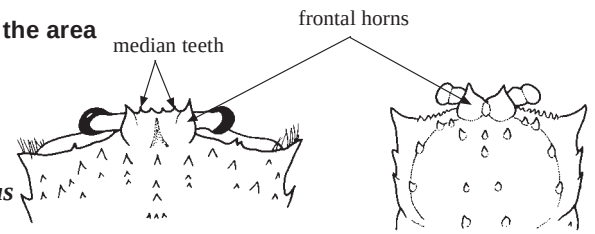
a) *Palinustus unicornutus* b) *Palinustus waguensis*

Fig. 14 anterior part of carapace (lateral view)

Key to the species of *Linuparus* occurring in the area

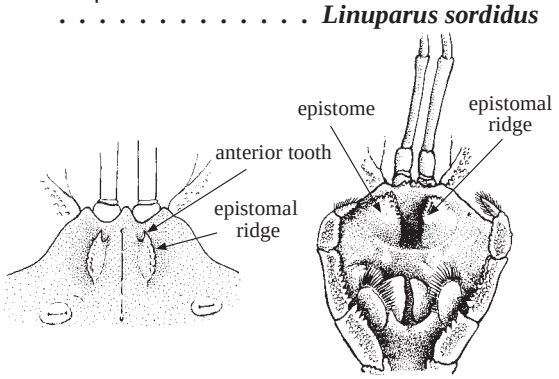
1a. Strong median teeth present between frontal horns (Fig. 15a); epistome ridges with strong anterior teeth (Fig. 16a); second and third abdominal pleura bearing basal teeth (Fig. 17) . . . . . ***Linuparus trigonus***

1b. No strong median teeth between frontal horns (Fig. 15b); epistome ridges without strong anterior teeth (Fig. 16b); second and third abdominal pleura without basal teeth . . . . . ***Linuparus sordidus***



a) *Linuparus trigonus* b) *Linuparus sordidus*

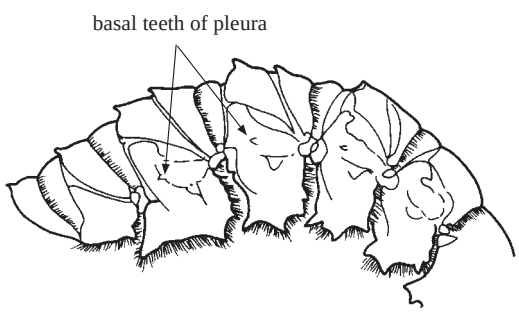
Fig. 15 anterior part of carapace (dorsal view)



a) *Linuparus trigonus*: epistome

b) *Linuparus sordidus*: anterior part of body (ventral view)

Fig. 16



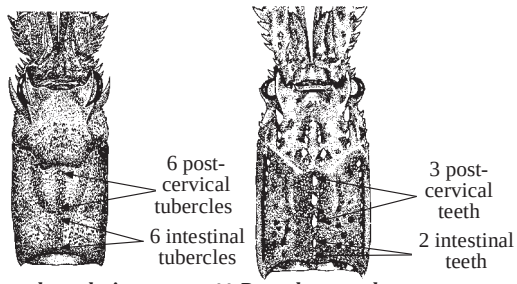
abdomen (lateral view)

Fig. 17 ***Linuparus trigonus***

Key to the species of *Puerulus* occurring in the area

1a. Body heavily pubescent; postorbital spine present; median keel of carapace with 6 postcervical and 6 intestinal tubercles; eyes large, much broader than long (Fig. 18a) . . . . . ***Puerulus velutinus***

1b. Body only slightly pubescent; postorbital spine absent; median keel of carapace with 3 postcervical and 2 intestinal teeth; eyes smaller, longer than broad (Fig. 18b) . . . . . ***Puerulus angulatus***



a) *Puerulus velutinus* b) *Puerulus angulatus*

Fig. 18 carapace (dorsal view)

Key to the species of *Panulirus* occurring in the area

1a. Abdomen provided with transverse grooves . . . . . → ***2***

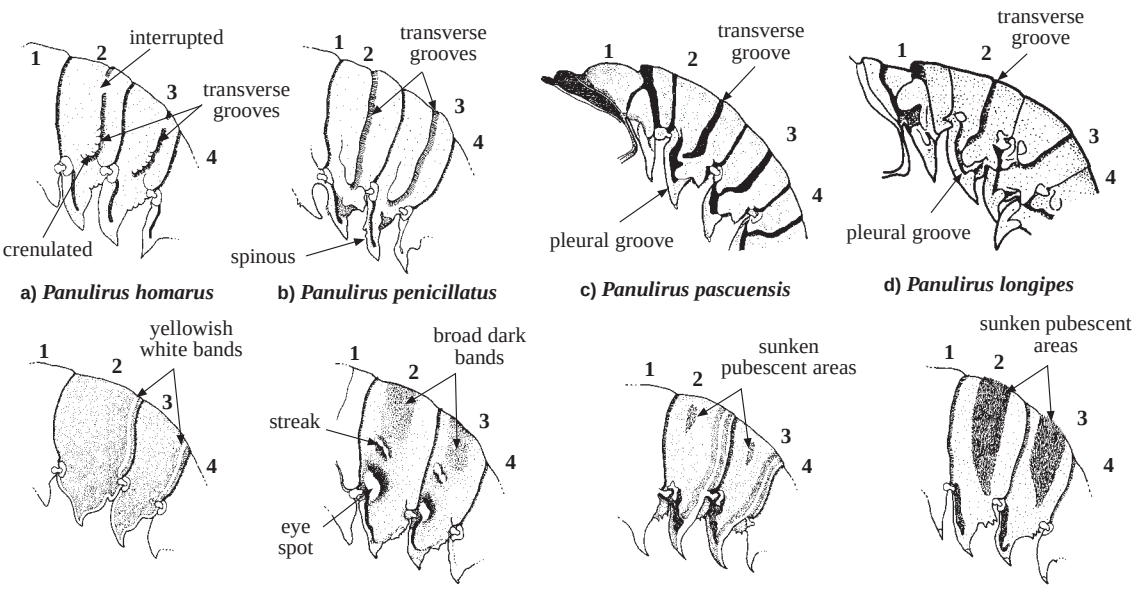
1b. Abdomen without transverse grooves or only with broad sunken pubescent areas . . . . . → ***6***

2a. Anterior margins of transverse grooves on abdomen crenulated, grooves incomplete or interrupted in the middle (Fig. 19a); antennular plate bearing 4 well-separated principal spines and some small spinules (Fig. 20a); body greenish to brown, regions between eyestalks with bright orange and blue markings; legs blotched . . . . . ***Panulirus homarus***

2b. Transverse grooves on abdomen with straight anterior margins, not crenulated . . . . . → ***3***

3a. Antennular plate armed with 4 close-set principal spines (Fig. 20b); anterior margin of third abdominal pleuron spinous (Fig. 19b); body dark blue and brown, membranes at outer bases of antennae light blue; legs striped . . . . . ***Panulirus penicillatus***

3b. Antennular plate with 2 principal spines (Fig. 20c); anterior margin of third abdominal pleuron not spinous . . . . . → ***4***



a) *Panulirus homarus* b) *Panulirus penicillatus* c) *Panulirus pascuensis* d) *Panulirus longipes*

e) *Panulirus polyphagus* f) *Panulirus ornatus* g) *Panulirus versicolor* h) *Panulirus stimpsoni*

Fig. 19 abdominal segments (lateral view)

4a. Transverse groove of second abdominal segment not joining corresponding pleural groove (Fig. 19c); body dark purple with some greenish, not speckled; irregular pale bands along posterior margin of abdominal segments, sometimes with whitish spots mixed in with them; spots on basis of tail fan; antennules not banded; legs striped . . . . . ***Panulirus pascuensis***

4b. Transverse groove of second abdominal segment joining corresponding pleural groove (Fig. 19d) . . . . → ***5***

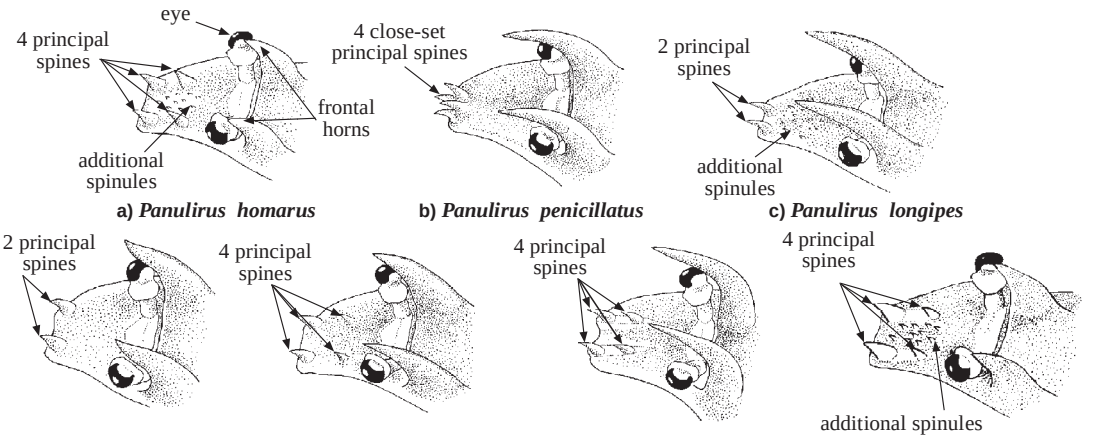


Fig. 20 antennular plate

5a. Median area at anterior carapace behind frontal horns usually bearing a longitudinal row of 3 spines only (Fig. 21a); ventral surfaces of distal 2 antennal segments each with 2 large spines only (Fig. 22a); thoracic sternum with 2 strong submedian protrusions (Fig. 23a); antennules with outer flagella dark brown and inner flagella entirely whitish; antennal peduncle including stridulating pad pinkish; lateral carapace with 2 complete longitudinal white strips extending along the entire carapace; legs striped . . . . . ***Panulirus albiflagellum***

5b. Median area at anterior carapace behind frontal horns always bearing some smaller, irregular spines in addition to the regular row of 3 spines (Fig. 21b); ventral surfaces of distal 2 antennal segments each with 1 large spine (sometimes also with several other scattered spinules, Fig. 22b); thoracic sternum without strong submedian protrusions (Fig. 23b); antennules alternated with dark brown and white bands; antennular peduncle brown to purple and with stridulating pad bright blue; lateral carapace with 1 short (upper) and 1 long (lower) longitudinal white stripes; legs striped or spotted . . . . . ***Panulirus longipes***

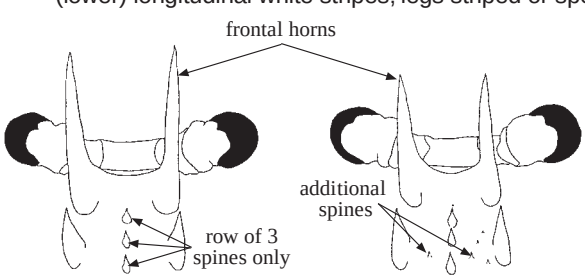


Fig. 21 anterior part of carapace

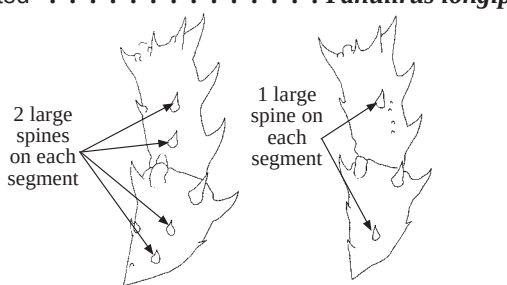


Fig. 22 distal 2 segments of antenna (ventral view)

6a. Abdomen naked and smooth (Fig. 19e, f); legs blotched . . . . . → ***7***

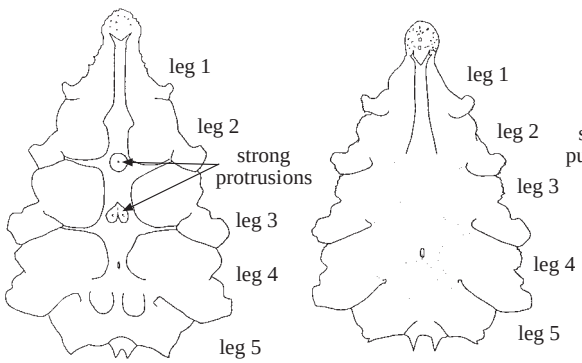
6b. At least second and third abdominal segments with broad sunken pubescent areas (Fig. 19g, h); legs striped . . . . . → ***8***

7a. Antennular plate armed with 1 pair of principal spines (Fig. 20d); body pale green and abdomen with narrow transverse yellowish white bands (Fig. 19e) . . . . . ***Panulirus polyphagus***

7b. Antennular plate armed with 2 pairs of principal spines (Fig. 20e); body greenish and abdomen with broad transverse dark bands (Fig. 19f), legs and antennules conspicuously ringed with light yellow and black . . . . . ***Panulirus ornatus***

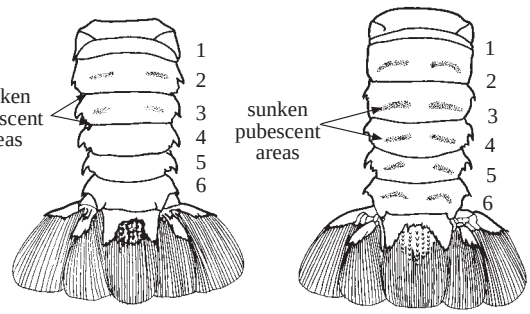
8a. Antennular plate armed with 2 pairs of principal spines only (Fig. 20f); fourth to sixth abdominal segments smooth (Fig. 24a); body deep blue and green, abdomen with narrow transverse white bands, antennal and antennular flagella whitish . . . . ***Panulirus versicolor***

8b. Antennular plate with many small spinules in additional to the 2 pairs of principal spines (Fig. 20g); sunken pubescent areas present on all abdominal segments (Fig. 24b); body greenish, region between eyestalks not brightly marked and abdomen not banded . . . . . ***Panulirus stimpsoni***



a) *Panulirus albiflagellum* **b) *Panulirus longipes***

Fig. 23 thoracic sternum (ventral view)



a) *Panulirus versicolor* **b) *PanulIrus stimpsoni***

Fig. 24 abdomen (dorsal view)

List of species occurring in the area

The symbol ➽ is given when species accounts are included.

➽ *Justitia chani* Poupin, 1994
➽ *Justitia japonica* (Kubo, 1955)
➽ *Justitia longimanus* (H. Milne Edwards, 1837)
➽ *Justitia vericeli* Poupin, 1994

➽ *Linuparus sordidus* Bruce, 1965
➽ *Linuparus trigonus* (Von Siebold, 1824)

➽ *Palinustus unicornutus* Berry, 1963
➽ *Palinustus waguensis* Kubo, 1963

➽ *Panulirus albiflagellum* Chan and Chu, 1996
➽ *Panulirus homarus* (Linnaeus, 1758)
➽ *Panulirus longipes* (A. Milne Edwards, 1868)
➽ *Panulirus ornatus* (Fabricius, 1798)
➽ *Panulirus pascuensis* Reed, 1954
➽ *Panulirus penicillatus* (Olivier, 1791)
➽ *Panulirus polyphagus* (Herbst, 1793)
➽ *Panulirus stimpsoni* Holthuis, 1963
➽ *Panulirus versicolor* (Latreille, 1804)

➽ *Puerulus angulatus* (Bate, 1888)
➽ *Puerulus velutinus* Holthuis, 1963

References

Chan, T.Y. and K.H. Chu. 1996. On the different forms of *Panulirus longipes femoristriga* (von Martens, 1872) (Crustacea: Decapoda: Palinuridae), with description of a new species. *J. Nat. Hist*., 30:367-387.

Chan, T.Y. and H.P. Yu. 1993. *The illustrated lobsters of Taiwan*. Taipei, SMC Publishing Inc., 248 p.

Chan, T.Y. and H.P. Yu. 1995. The rare lobster genus *Palinustus* A. Milne Edwards, 1880 (Decapoda: Palinuridae), with description of a new species. *J. Crust. Biol*., 15(2):376-394.

Holthuis, L.B. 1991. Marine lobsters of the world. FAO species catalogue. Vol. 13. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fish. Synop*., 125(13):1-292.

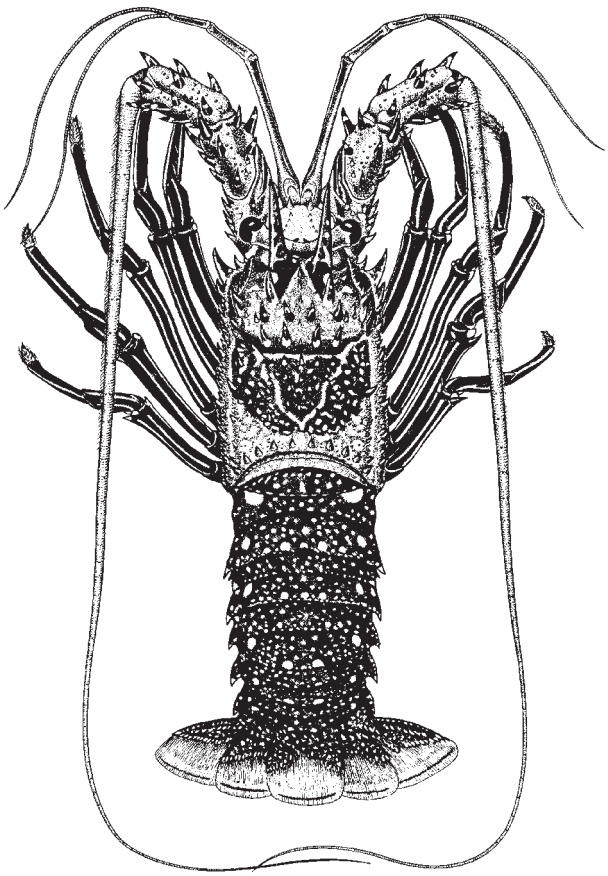
Poupin, J. 1994. The genus *Justitia* Holthuis, 1946, with the description of *J. chani* and *J. vericeli* spp. nov. (Crustacea, Decapoda, Palinuridae). *J. Taiwan Mus.*, 47(1):37-56.

Panulirus albiflagellum Chan and Chu, 1996

Frequent synonyms / misidentifications: None / *Panulirus longipes* (A. Milne Edwards, 1868); *P. longipes femoristriga* (Von Martens, 1872).

FAO names: En - White whisker spiny lobster.

Diagnostic characters: Carapace rounded and spiny; rostrum absent; anterior margin armed with irregular-sized spines; **height of frontal horn about 2.5 times the eye height; median area behind frontal horns generally with a longitudinal row of 3 spines only; cervical groove distinctly wider than posterior marginal groove**. Antennules with flagella longer than peduncle; **antennular plate at bases of antennae bearing 1 pair of well-separated principal spines and some scattered spinules; ventral surfaces of distal 2 antennal segments each with a row of 2 equal-sized large spines only**. First 4 pairs of legs without pincers. **Thoracic sternum with 2 strong submedian protrusions. Abdominal segments with a complete transverse groove joining the pleural groove; abdominal pleura only with that of second segment sometimes bearing spinules**. Posterior half of tail fan soft and flexible. **Colour:** body dark brown to indigo, covered with numerous white spots and markings. Eyes black-brown. **Lateral carapace with 2 longitudinal white stripes running along the entire carapace. Inner surface of antennal peduncle (including stridulating pad) and antennular plate pink**; antennal flagella dorsally brown, ventrally whitish to pink; antennules with peduncle dark brown but laterally white, **outer flagella dark brown and inner flagella entirely whitish. Legs striped with conspicuous white lines. Abdomen covered with numerous medium-sized white spots**. Soft part of tail fan orange-brown with distal margin whitish. Pleopods somewhat greenish with white margins. Eggs orange.

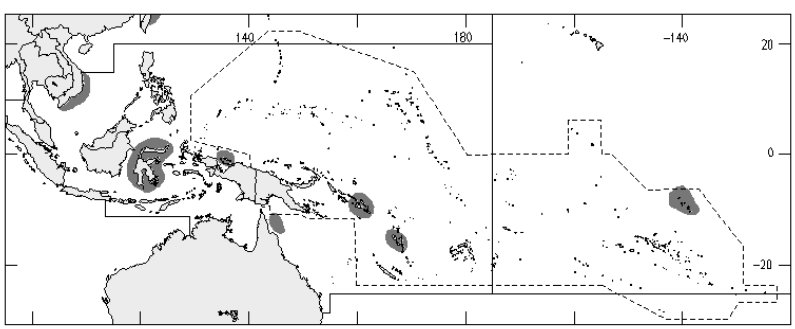


(after George and Holthuis, 1965)

Size: Maximum body length about 25 cm, commonly between 18 and 21 cm.

Habitat, biology, and fisheries: In shallow reef areas to a depth of about 20 m. Caught throughout its range, but apparently nowhere abundant. Nevertheless, in Indonesia this lobster can periodically be found in markets (live and fresh) and is sometimes even exported (live). No separate statistics are reported for this species because of former confusion with *Panulirus longipes*.

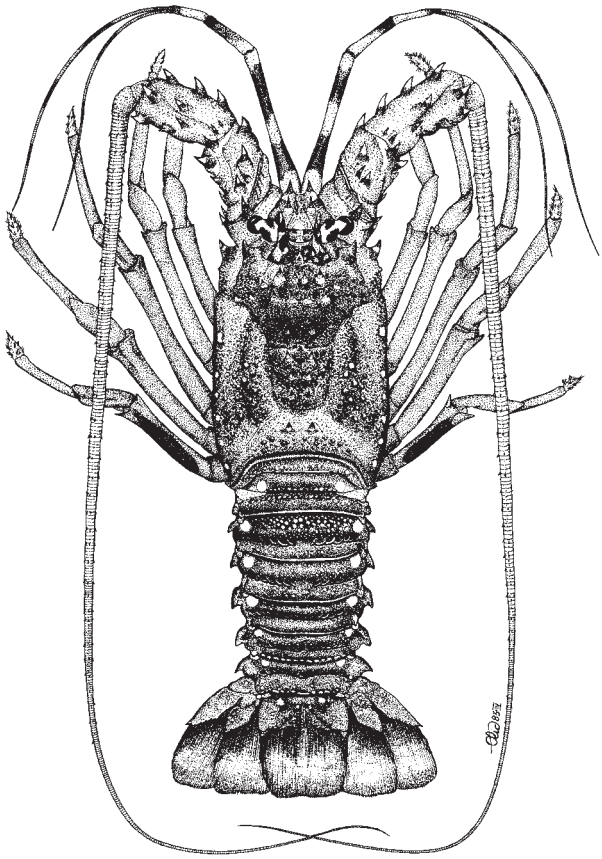
Distribution: Indo-West Pacific from the Maldive Islands, Viet Nam, Indonesia, Great Barrier Reef (Australia), Taiwan Province of China, and Japan; probably also occurs in the Solomon Islands, New Hebrides, and French Polynesia.



Panulirus homarus (Linnaeus, 1758)

Frequent synonyms / misidentifications: *Panulirus dasypus* (H. Milne Edwards, 1837); *P. burgeri* (De Haan, 1841) / None.

FAO names: En - Scalloped spiny lobster; **Fr** - Langouste festonée; **Sp** - Langosta festoneada.

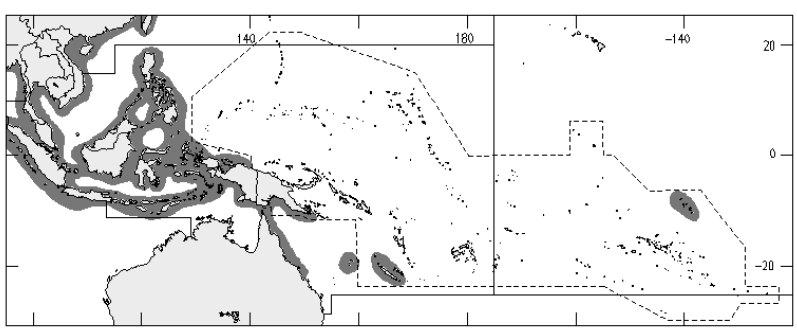


Diagnostic characters: Carapace rounded and spiny, sometimes with branchiostegal areas slightly inflated; rostrum absent; anterior margin armed with 4 regularly spaced large spines other than frontal horns; **height of frontal horns about 2 times the eye height**, **without spinules in between**. Antennules with flagella longer than peduncle, **antennular plate at bases of antennae bearing 2 pairs of well-separated principal spines (anterior pair slightly larger) and some spinules**. First 4 pairs of legs without pincers. **Abdominal segments with a slightly crenate transverse groove, sometimes interrupted at the middle**. Posterior half of tail fan soft and flexible. **Colour:** body greenish to brownish. Eyes dark brown. **Anterior carapace and region between eyestalks with bright orange and blue markings. Frontal horns banded with black and white. Antennular flagella alternated with brown and white bands. Legs blotched.** Abdomen covered with tiny white spots. Pleopods red-brown. Eggs orange.

Size: Maximum body length 31 cm, commonly between 16 and 25 cm.

Habitat, biology, and fisheries: In reef areas with sand in the surf zone and sometimes also in turbid waters at depths from 1 to 5 m, but can be found down to a depth of 90 m. Gregarious and nocturnal. The females produce 100 000 to 900 000 eggs per brood and hatching occurs after 25 to 59 days. The phyllosoma larvae last 4 to 7 months and have 9 stages. The juveniles molt every few weeks and become sexually mature after 2 to 3 years (carapace length 5 to 6 cm) after larval settlement. In the fourth year the reproductive potential is highest (carapace length 7 to 7.9 cm). The adults molt about 4 times a year and the life span of this lobster is estimated to be 8 to 10 years. Actively fished throughout its range by hand, with traps, gill nets, cast nets, and baited lines. Big catches are often possible after typhoons or heavy rains. The fishery of this lobster is mostly local though it is exported in some areas such as the Philippines and Indonesia (sometimes live) together with other species of the genus.

Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan, Australia, and the Marquesas Archipelago.

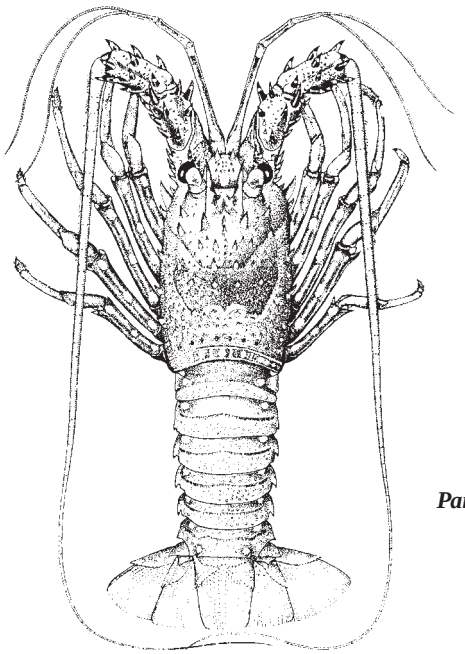


Panulirus longipes (A. Milne Edwards, 1868) LOJ

Frequent synonyms / misidentifications: *Panulirus longipes femoristriga* (Von Martens, 1872) / *Panulirus japonicus* (Von Siebold, 1824); *P. albiflagellum* Chan and Chu, 1996.

FAO names: En - Longlegged spiny lobster; **Fr** - Langouste diablotin; **Sp** - Langosta duende.

Diagnostic characters: Carapace rounded and spiny; rostrum absent; anterior margin armed with irregular-sized spines; **height of frontal horns about 2.5 times the eye height; median area behind frontal horns always bearing some additional spinules other than the regular longitudinal row of 3 spines; cervical groove about as wide as posterior marginal groove.** Antennules with flagella longer than peduncle; **antennular plate at bases of antennae bearing 1 pair of well-separated principal spines and some scattered spinules; ventral surfaces of distal 2 antennal segments each with 1 large spine, often flanked by some scattered spinules.** First 4 pairs of legs without pincers. **Thoracic sternum without strong sub-median protrusions. Abdominal segments with a complete transverse groove joining the pleural groove; abdominal pleura only with that of second segment sometimes** bearing spinules. Posterior half of tail fan soft and flexible. **Colour:** body dark brown to indigo and covered with numerous white spots and markings. Eyes black-brown. **Lateral carapace with 1 short (upper) and 1 long (lower) longitudinal white stripe. Inner surfaces of antennae and antennular plate brown to purple and with stridulating pad bright blue;** antennal flagella brownish with ventral surface lighter in colour; **antennules dark brown and alternated with conspicuous white bands.** Legs covered with prominent white spots connected by orange lines, or only striped with white or pale lines. **Abdomen covered with numerous small to medium-sized white spots.** Soft part of tail fan orange-brown with posterior margin whitish. Pleopods somewhat greenish with white margins. Eggs orange.



Panulirus longipes longipes

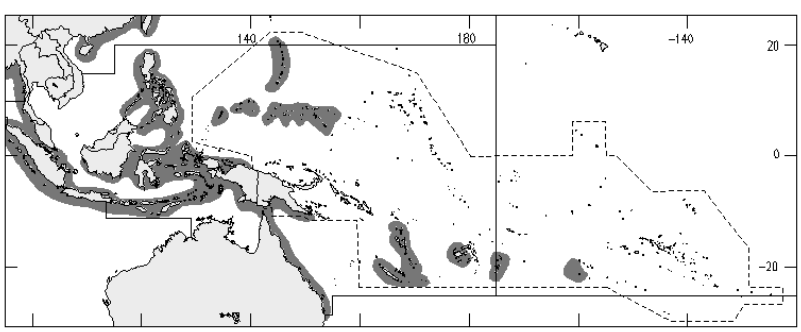


Panulirus longipes femoristriga

Size: Maximum body length 35 cm, commonly between 18 and 25 cm.

Habitat, biology, and fisheries: Found in shallow coral or rocky reefs (but can be found down to a depth of 130 m), usually in clear waters with moderate currents, sometimes in slightly turbid waters. Nocturnal and not gregarious; females produce an average of 132 000 eggs per brood. Actively fished throughout its range, but apparently nowhere very abundant. Taken by hand during night diving or with spears, also with traps, tangle nets and lobster pots. The fishery of this lobster is mostly of local interest. In some regions, such as the Philippines and Indonesia, occasionally exported live, together with other species of this genus.

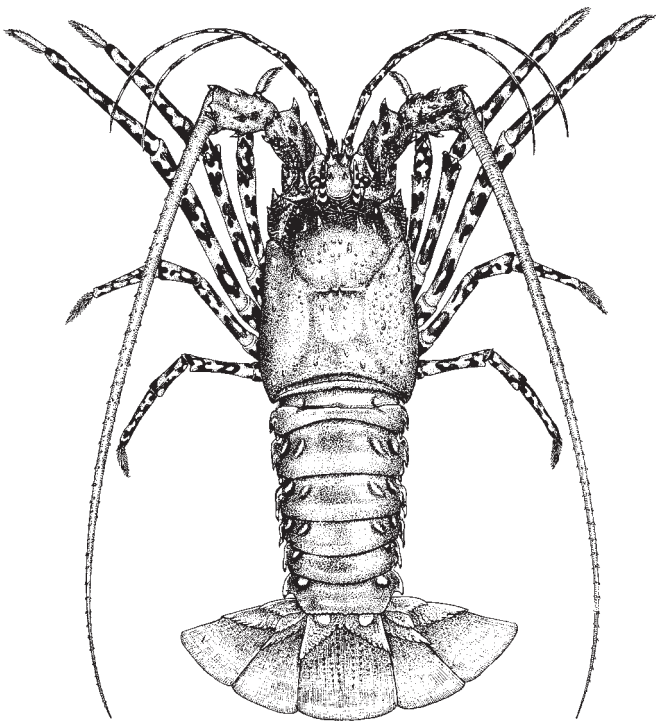
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan and Fiji. Two subspecies are recognized: the western or the spotted-legged form *Panulirus longipes longipes* occurring from eastern Africa to Thailand, Taiwan Province of China, the Philippines, and Indonesia; the eastern or the striped-legged form *P. longipes femoristriga* is known from Japan to the Bonin Islands, Taiwan Province of China, the Philippines, Indonesia, Australia, New Caledonia, the Loyalty Islands, New Hebrides, and Fiji; probably also in Micronesia, Papua New Guinea, Tonga, and the Cook Islands.



Panulirus ornatus (Fabricius, 1798)

Frequent synonyms / misidentifications: None / None.

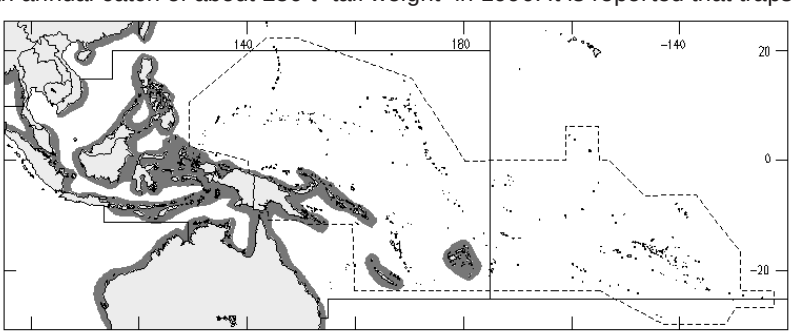
FAO names: En - Ornate spiny lobster; **Fr** - Langouste ornée; **Sp** - Langosta ornamentada.



Diagnostic characters: Carapace rounded and spiny; rostrum absent; anterior margin bearing irregular-sized spines other than frontal horns; **height of frontal horns about 2 times the eye height, without spinules in between**. Antennules with flagella longer than peduncle; **antennular plate at bases of antennae bearing 2 pairs of well-separated principal spines (anterior pair considerably larger), sometimes also with several spinules**. First 4 pairs of legs without pincers. **Abdomen naked and smooth, without transverse grooves or sunken pubescent areas.** Posterior half of tail fan soft and flexible. **Colour:** body greenish with carapace slightly bluish. Eyes black-brown. **Frontal horns intricately banded with yellowish white and brown markings.** Antennal peduncle bluish with stridulating pad somewhat pinkish. **Antennules and legs conspicuously ringed with pale yellow and black. Abdomen covered with broad transverse dark bands over middle of each segment and bearing large pale yellowish spots near hinges.** Pleopods yellowish. Eggs orange.

Size: Maximum body length about 60 cm, commonly between 20 and 35 cm. Maximum weight over 6 kg. Probably the largest species of the genus.

Habitat, biology, and fisheries: Usually occurs at depths from 1 to 10 m, but can be found to a depth of 200 m. In calm areas of coral and rocky reefs or reef slopes, sometimes also found on muddy substrate in river mouths with fairly turbid water. Lives solitary or in pairs; seasonal mass migrations have been observed in Torres Strait populations. Actively fished throughout its range, mostly by divers (using hand and spear), sometimes by hand nets and trawls (formerly a main fishing method in Torres Strait, but now banned). Sold mostly fresh or frozen in local markets, sometimes exported (as from the Philippines and Australia, live or tailed). In most parts of the area the catches are not very large but a commercial fishery for this species has been developed in Papua New Guinea (off the Gulf of Papua) and Australia (off Torres Strait and N.E. Queensland) since 1966, with an annual catch of about 250 t "tail weight" in 1990. It is reported that traps are not effective to catch this species and mass mortality may occur in breeding lobsters.



Distribution: Widely distributed in the Indo-West Pacific from East Africa to Japan, Australia, and Fiji. Recently also reported to enter the Mediterranean from the Red Sea.

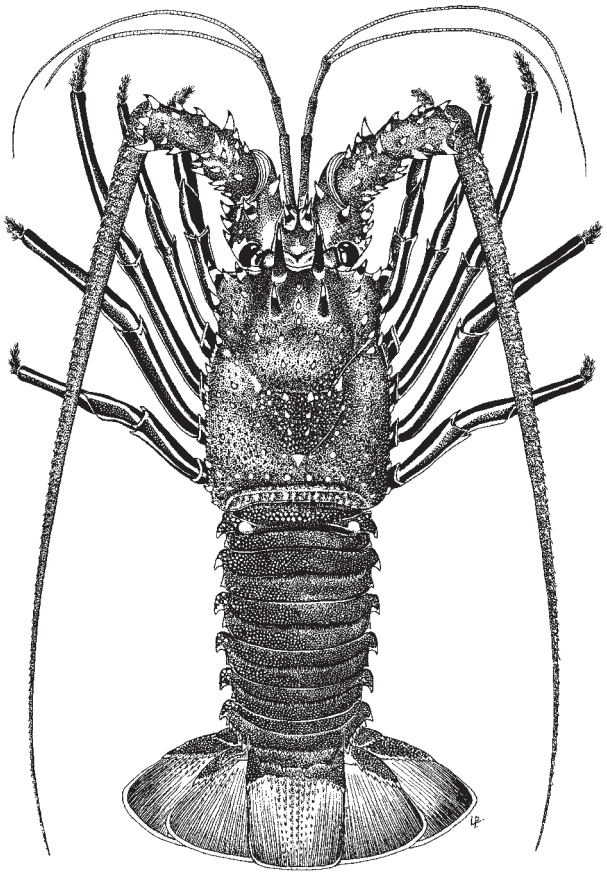
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Panulirus penicillatus (Olivier, 1791)

Frequent synonyms / misidentifications: None / None.

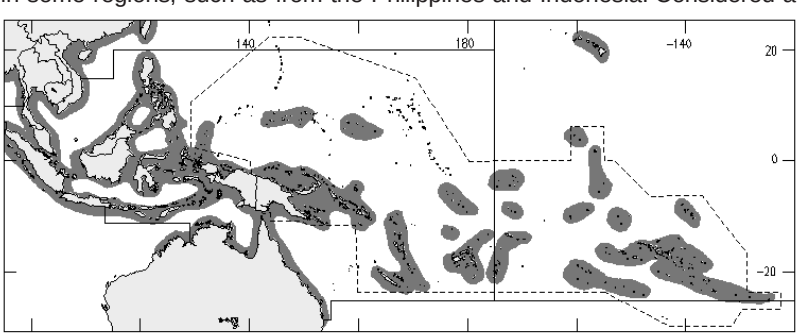
FAO names: En - Pronghorn spiny lobster; **Fr** - Langouste fourchette; **Sp** - Langosta horquilla.



Diagnostic characters: Carapace rounded and spiny, with branchiostegal areas slightly inflated; rostrum absent; anterior margin armed with 4 large and regularly spaced large spines other than frontal horns; **height of frontal horns about 2 times the eye height; median area behind frontal horns with a longitudinal row of spinules.** Antennules with flagella longer than peduncle; **antennular plate at bases of antennae armed with 4 close-set principal spines (posterior pair larger)**. First 4 pairs of legs without pincers. **Abdominal segments with a transverse groove, not continuous with pleural groove; anterior margins of pleura spinous.** Posterior half of tail fan soft and flexible. **Colour:** body dark blue and brown; males usually darker than females. Eyes black. Tips of large spines on carapace yellowish. Antennular peduncle striped with white lines, flagella uniformly brownish; **membranous areas at outer base of antenna light blue. Legs conspicuously striped with white lines.** Abdomen with tiny pale dots. Pleopods and soft part of tail fan black.

Size: Maximum body length 40 cm, commonly between 20 and 30 cm (males usually larger).

Habitat, biology, and fisheries: Found in shallow waters, usually at depths from 1 to 4 m (maximum depth 16 m) at seaward edges of reefs, in clear waters not influenced by rivers. Nocturnal and usually not gregarious, but sometimes occurs in a “harem” of mixed sexes; often found in deep caves during the daytime and strongly clinging to rocks at surf zones or areas with strong currents such as surge channels. Good catches are often possible during dark nights, particularly after the full moon. The phyllosoma larval stage of this species probably lasts 7 to 8 months and has 10 substages. The females seem to be reproductive all year around in the south western Pacific. Requires silt-free clear waters and is therefore found in optimal conditions around oceanic islands; it is the predominant spiny lobster in the South Pacific Islands. Fished throughout its range and mostly taken during day and night diving by hand and spear, sometimes also by trammel nets and traps, but less effectively so. However, the catches are generally not very abundant and it is mostly sold fresh, live, cooked whole or tailed for local consumption, but also exported in some regions, such as from the Philippines and Indonesia. Considered a commercially threatened species by the World Conservation Union (IUCN).

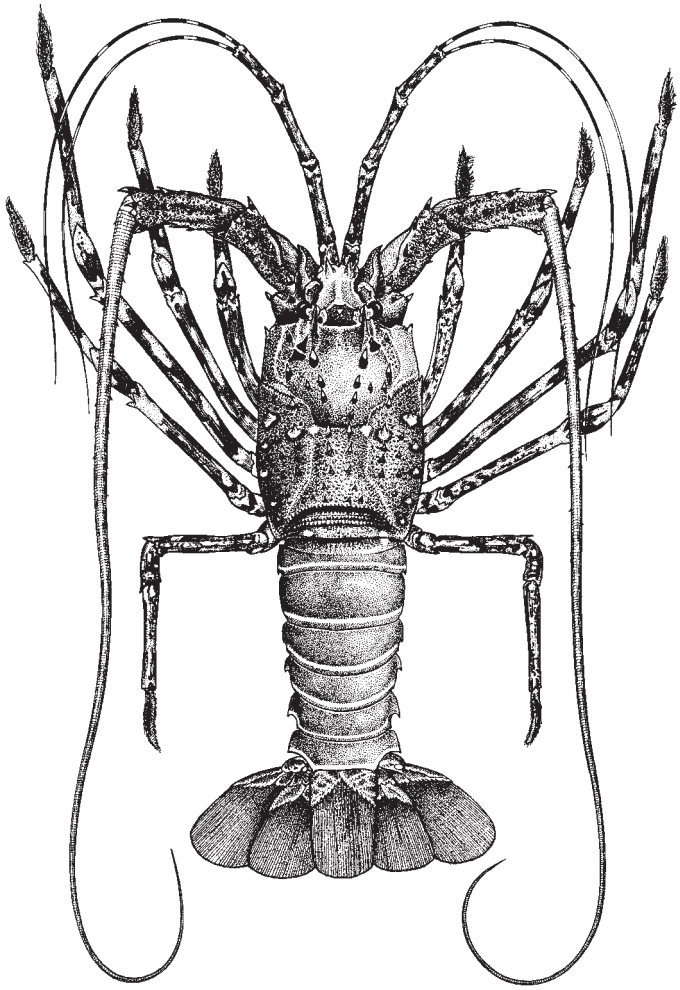


Distribution: Probably the most widely distributed species of the genus and can be found in the Indo-Pacific from the eastern coast of Africa to the Red Sea, Japan, Australia, French Polynesia, Hawaii, and the offshore islands near the western coasts of America (e.g. the Galapagos Archipelago).

Panulirus polyphagus (Herbst, 1793)

Frequent synonyms / misidentifications: *Panulirus fasciatus* (Fabricius, 1798) / None.

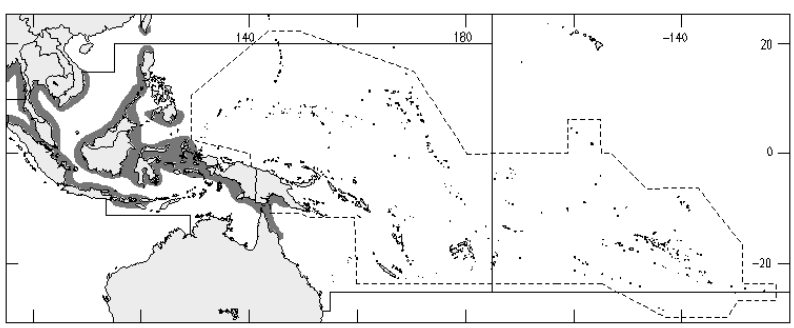
FAO names: En - Mud spiny lobster; **Fr** - Langouste de vase; **Sp** - Langosta fanguera.



Diagnostic characters: Carapace rounded and spiny; rostrum absent; anterior margin with irregular-sized spines other than frontal horns; **height of frontal horns less than 2 times the eye height, without spinules in between**. Antennules with flagella longer than peduncle; **antennular plate at bases of antennae armed with 1 pair of well-separated principal spines only.** First 4 pairs of legs without pincers. **Abdomen naked and smooth; without transverse grooves or sunken pubescent areas.** Posterior half of tail fan soft and flexible. **Colour:** body dull green. Eyes black-brown. Spines on carapace with yellowish brown tips, **orbital margin and posterior marginal groove yellowish white**. Antennular plate with a medial longitudinal yellowish white line; **antennular peduncle alternated with yellowish white and pale green bands, flagella banded with yellowish white and dark brown. Legs light brown with yellowish white blotches. Abdomen with tiny pale dots; a yellowish white band with brown margins near posterior border of each segment**. Pleopods and soft part of tail fan orange-brown with yellowish white margins.

Size: Maximum body length about 40 cm, commonly between 20 and 25 cm.

Habitat, biology, and fisheries: Mainly found on muddy bottoms (sometimes also on rocky bottoms) in turbid waters near river mouths at depths from 3 to 90 m, but usually less than 40 m deep. Unlike other spiny lobsters, this species is mainly taken by trawling, sometimes also by set nets, and seines, but rarely enters traps. Uncommon or absent in most parts of the area because of its preference for muddy substrate. Commercially and economically important mostly from the Gulf of Thailand. Sold fresh or frozen in local markets, and mounted dry specimens are sold as souvenirs to tourists.

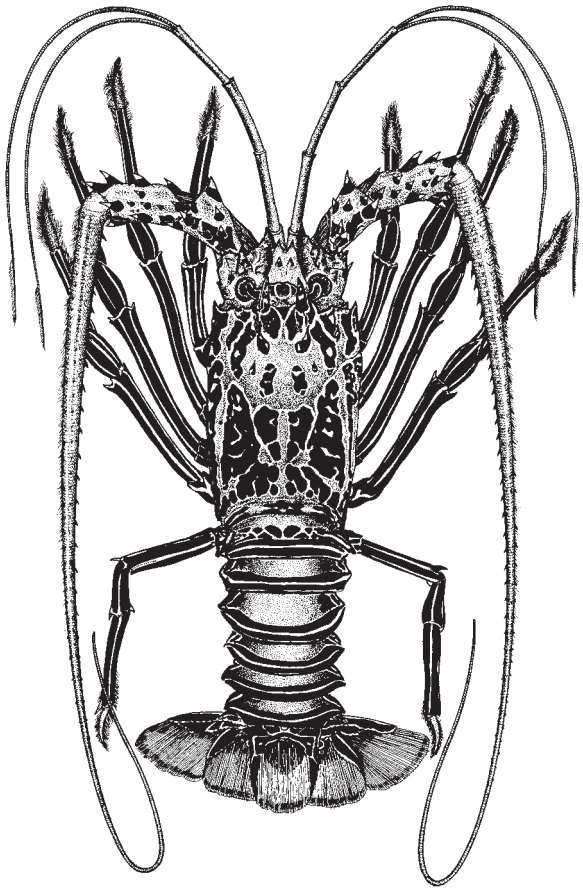


Distribution: Indo-West Pacific from Pakistan to India, Thailand, Viet Nam, Taiwan Province of China, the Philippines, Indonesia, Papua New Guinea, and northern Australia.

Panulirus versicolor (Latreille, 1804)

Frequent synonyms / misidentifications: None / *Panulirus fasciatus* (Fabricius, 1798) (= *P. polyphagus* (Herbst, 1793)).

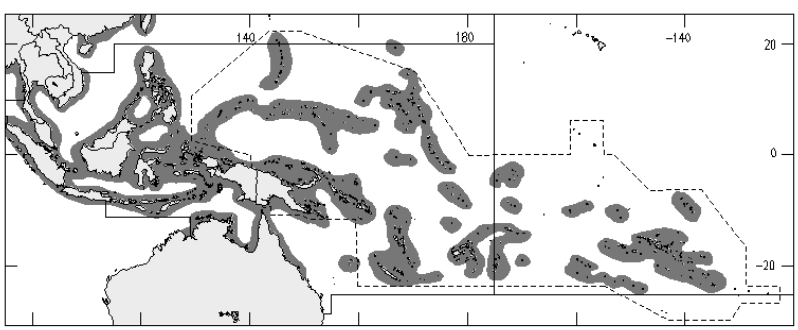
FAO names: En - Painted spiny lobster;
Fr - Langouste barriolée; **Sp** - Langosta colorete.



Diagnostic characters: Carapace rounded and spiny; rostrum absent; anterior margin bearing 4 regularly spaced large spines other than frontal horns; **height of frontal horns more than 3 times the eye height, without spinules in between.** Antennules with flagella longer than peduncle; **antennular plate at bases of antennae armed with 2 pairs of well-separated principal spines only (anterior pair larger)**. First 4 pairs of legs without pincers. **Abdomen more or less smooth, with broad but shallow sunken pubescent areas only present at each half of second and third segments.** Posterior half of tail fan soft and flexible. **Colour:** body of adults generally blue and green; more greenish in large individuals. Carapace, including frontal horns, with a mosaic pattern of green, white and blue. Eyes black-brown. **Antenna with inner surface pink and outer surface blue; inner surface of antennular peduncle white, outer surface blue; flagella whitish. Legs blue, distinctly striped with white lines. Abdomen greenish, having white lines with blue margins along posterior margin of each segment.** Soft part of tail fan green and blue or orange-brown (large individuals). Pleopods blue, with white margins and a conspicuous medial white line. **Coloration of juveniles somewhat different**: body bluish to dark blue with conspicuous longitudinal white lines on lateral carapace; antennae and antennular plate almost entirely whitish; antennules bluish and distally whitish; legs with dark blue stripes; pleopods without medial white line.

Size: Maximum body length about 40 cm, commonly between 20 to 30 cm.

Habitat, biology, and fisheries: Found in reef areas at depths of usually less than 16 m (mostly between 4 and 12 m) in clear or sometimes turbid water with strong currents, often on seaward edges of the reef plateau. Nocturnal and not gregarious; hides in crevices during the daytime with only the white antennae visible. Actively fished throughout its range by divers (using hand or spear), but apparently rarely enters traps or pots. The catches of this lobster are nowhere very large and it is mainly locally consumed live, fresh, cooked whole, or tailed, but in some regions, such as from the Philippines, exported live or tailed. The attractive coloration of the juveniles has caught the attention of the tropical marine aquarium trade and specimens presumably originating from the Philippines and Indonesia are sometimes sold in the aquarium shops of other Asian countries as well as in Europe and the USA (juveniles of other *Panulirus* species are occasionally also found in the aquarium trade, but usually sold at lower prices).

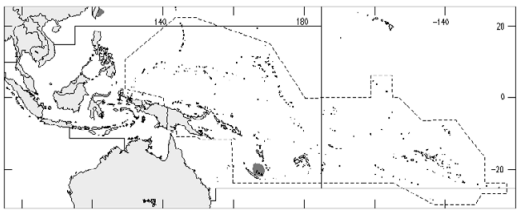


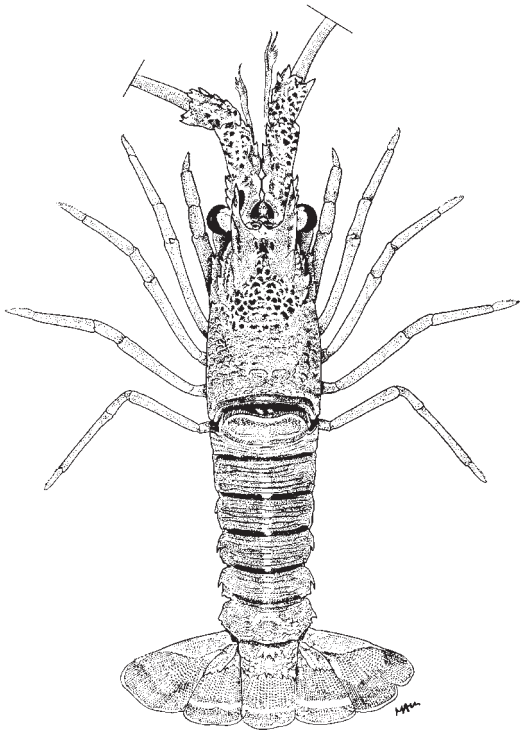
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Red Sea, Japan, Micronesia, Melanesia, northern Australia, and French Polynesia.

Justitia chani Poupin, 1994

En - Small furrow lobster.

Body length between 11 and 15.5 cm; probably the smallest species of the genus. On rocky substrate in depths from 150 to 340 m. Caught by tangle nets and dredges. Rare and of very limited interest to fisheries. Known from the western Pacific and so far only recorded from Japan, Taiwan Province of China, and New Caledonia.



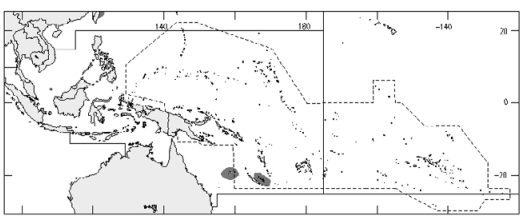


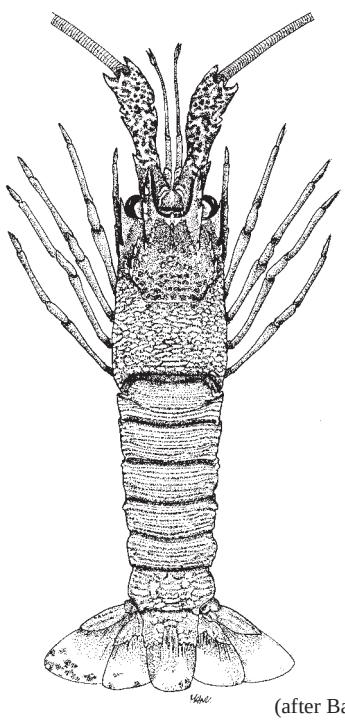
(after Poupin, 1994)

Justitia japonica (Kubo, 1955)

En - Japanese furrow lobster.

Maximum body length about 27 cm, commonly between 15 and 25 cm; probably the largest species of the genus. On rocky bottoms at depths from 90 to 340 m. A limited fishery potential because of its deep, untrawlable habitat; seldom caught by lobster pots and trap nets. Indo-West Pacific from Madagascar to Taiwan Province of China, Japan, New Caledonia, and the Chesterfields Islands.



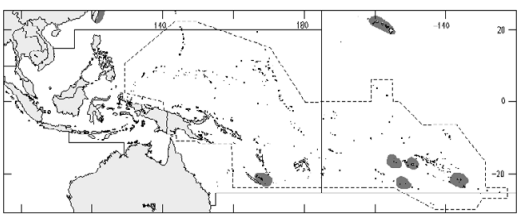


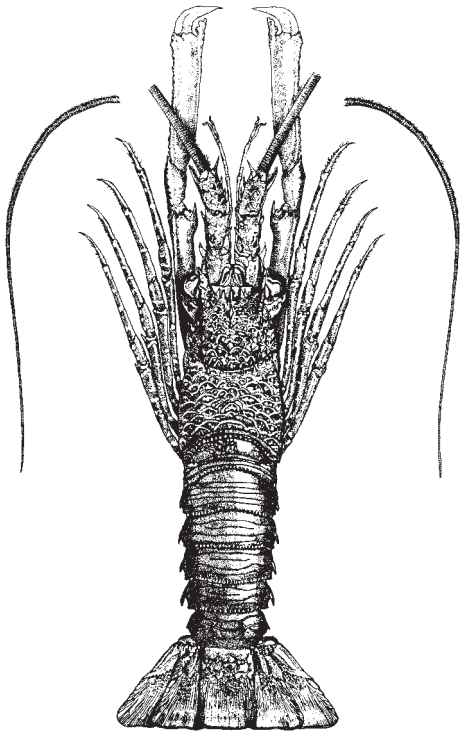
(after Baba et al., 1986)

Justitia longimanus (H. Milne Edwards, 1837)

En - Longarm furrow lobster; **Fr** - Langouste gibbon; **Sp** - Langosta de muelas. (The old FAO name of this species is re-used because recent research showed that *J. longimanus* and *J. mauritiana* represent the same species).

Maximum body length 18.5 cm, commonly between 11 and 16 cm. At depths from 23 to 454 m, usually between 50 and 150 m. Inhabits the outer parts of coral or rocky reef slopes. Although perhaps the most common species of the genus, it is only occasionally caught by traps, tangle nets, or divers. Of limited interest to fisheries because of its rocky habitat and usual occurrence in deeper waters. Worldwide distribution in tropical and subtropical seas; recorded in the western Atlantic from Bermuda to Brazil and in the Indo-Pacific from Madagascar to Taiwan Province of China, Japan, Hawaii, and French Polynesia.



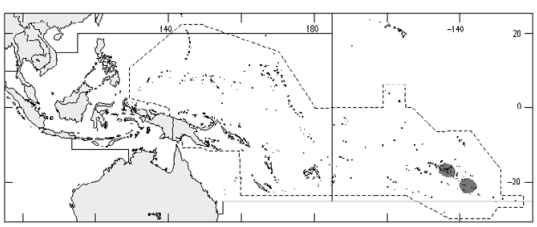


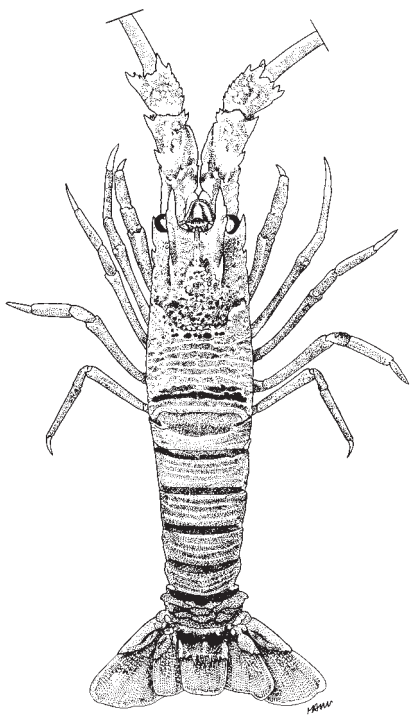
(after Miers, 1882)

Justitia vericeli Poupin, 1994

En - Polynesian furrow lobster.

Body length about 18 cm. On hard coral bottoms at depths from 160 to 320 m. Apparently very rare and only caught during experimental trapping operations. So far only known from the Tuamotu Archipelago (French Polynesia).



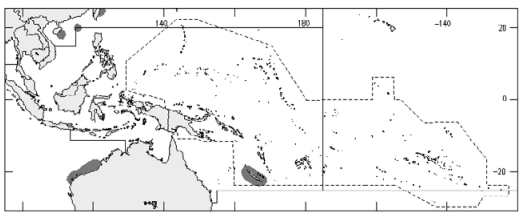


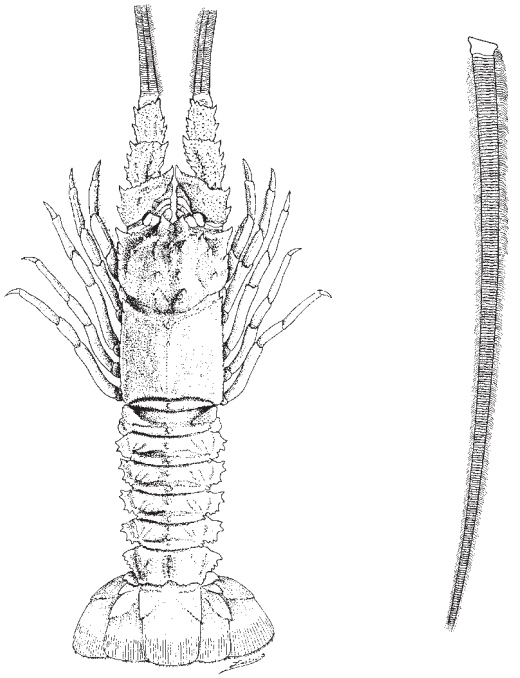
(after Poupin, 1994)

Linuparus sordidus Bruce, 1965

En - Oriental spear lobster.

Body length between 17 and 27 cm. On sandy mud and limestone rocks in depths from 200 to 500 m. A rare species, occasionally caught by trawls or traps. However, because of its large size and occurence in only moderately deep water, this lobster is potentially attractive for fisheries. Reported in the Indo-West Pacific from Taiwan Province of China, the South China Sea, northwestern Australia, and New Caledonia.



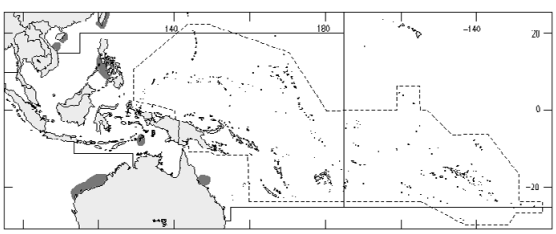


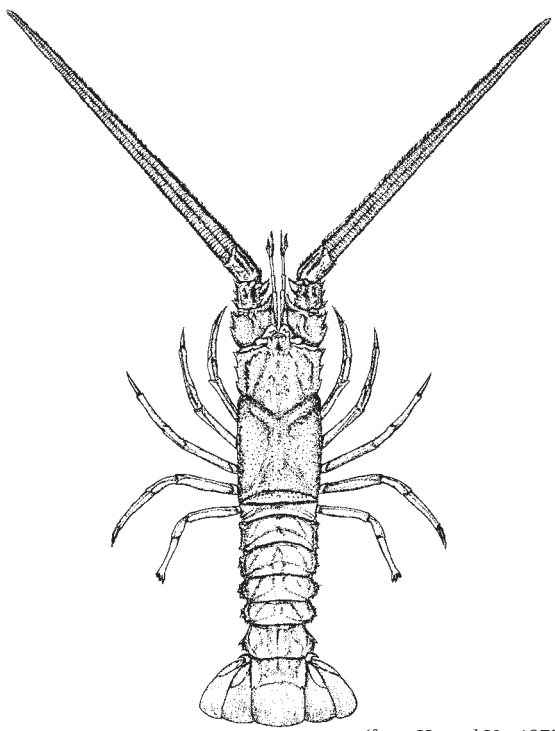
(after Bruce, 1965)

Linuparus trigonus (Von Siebold, 1824)

En - Japanese spear lobster.

Maximum body length 47 cm, commonly between 20 and 35 cm. On sand or mud bottoms in depths from 30 to 318 m. Occasionally taken by trawls, but apparently nowhere very abundant. Rarely sold in fish markets in the Philippines. Caught commercially on a small scale off northern Australia and Queensland during the northern prawn fishery closed seasons. The lobsters are tailed because their rigid antennae make them difficult to pack up. Indo-West Pacific from Japan to Taiwan Province of China, Viet Nam, the Philippines, Indonesia, and Australia.



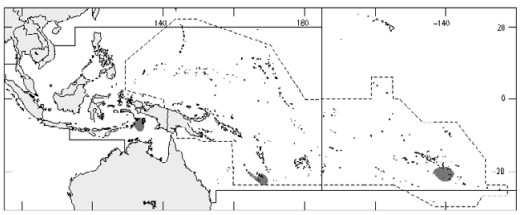


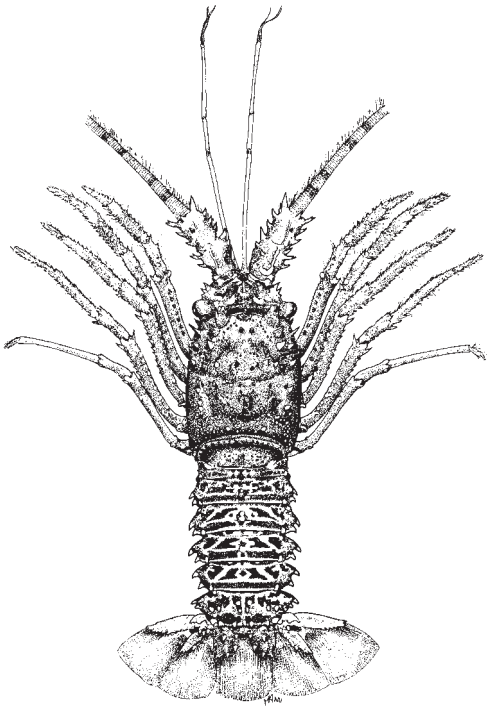
(from Ho and Yu, 1979)

Palinustus unicornutus Berry, 1979

En - Unicorn blunthorn lobster.

Maximum body length about 14 cm. On hard bottoms at depths from 205 to 670 m. Rare and mainly taken during experimental trawling and trapping operations. Indo-West Pacific from the eastern coast of South Africa to La Réuion, Comoro Islands, Japan, Indonesia, New Caledonia, and French Polynesia.



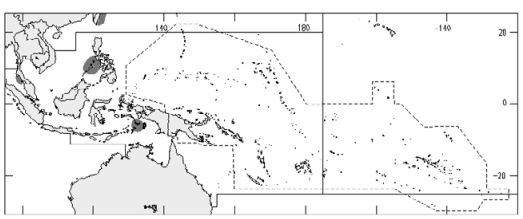


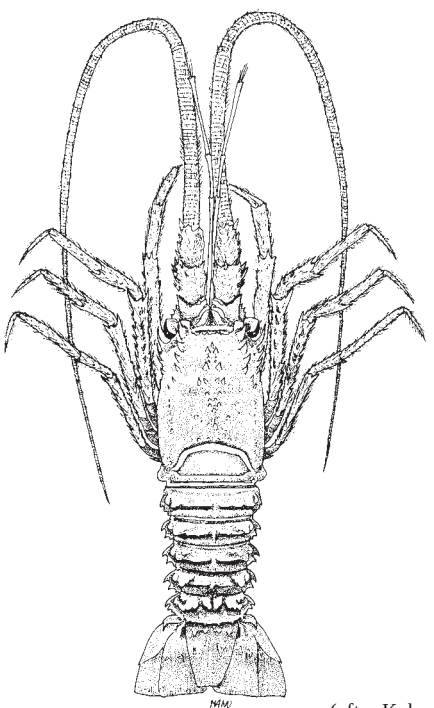
(after Berry, 1979)

Palinustus waguensis Kubo, 1963

En - Japanese blunthorn lobster.

Maximum body length about 14 cm, commonly to 10 cm. Inhabits the outer parts of coral and rocky reef slopes at depths from 72 to 180 m. The most common species of the genus although still moderately rare and only occasionally caught by tangle nets and trawls. A small species of very limited interest to fisheries. In Thailand, dried specimens are occasionally sold as souvenirs to tourists. Indo-West Pacific from Japan to Taiwan Province of China, the Philippines, Indonesia, Thailand, India, and Madagascar.



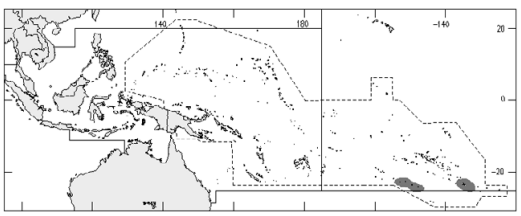


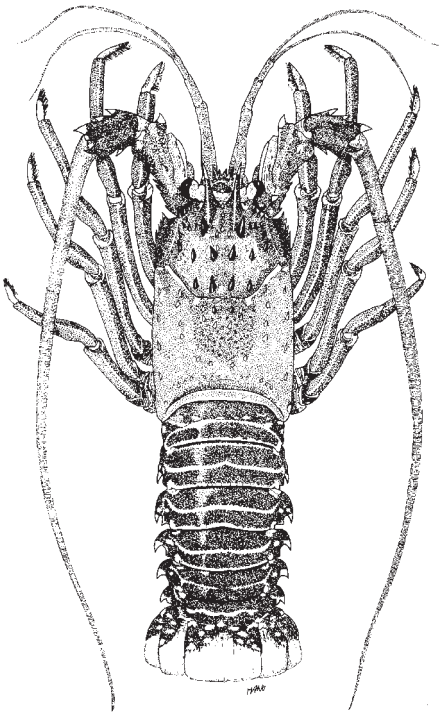
(after Kubo, 1963)

Panulirus pascuensis Reed, 1954

En - Easter Island spiny lobster.

Total body length of adults between 15 and 25 cm. Lives on rocky substrate in shallow waters to a depth of 50 m; breeding season around December. Caught by divers during both day and night by hand and spears, also by gill nets and lobster pots. Sold fresh and consumed locally. Only known from Easter Island, Pitcairn Islands and Austral Islands of French Polynesia.



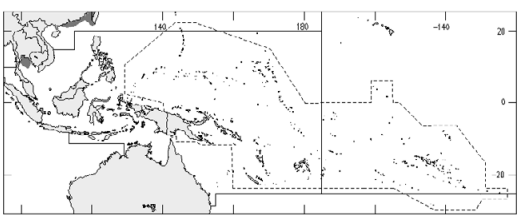


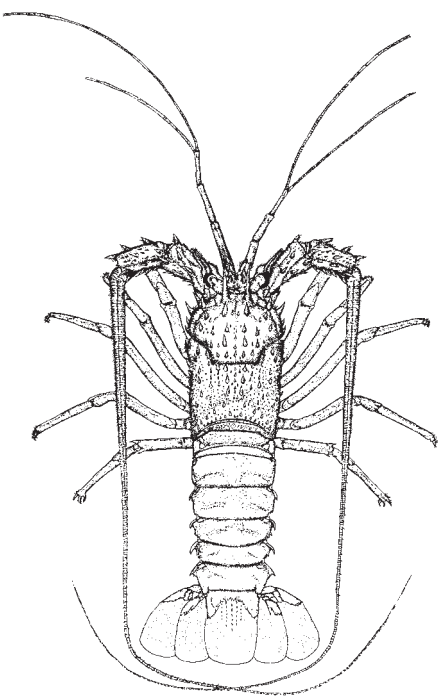
(after George and Holthuis, 1965)

Panulirus stimpsoni Holthuis, 1963

En - Chinese spiny lobster.

Maximum body length 35 cm, commonly between 16 and 23 cm; maximum weight about 3 kg. Found in reef areas at depths of less than 40 m. Mainly distributed along the southern coast of China, including Hong Kong, and the western coast of Taiwan Province of China. In the Western Central Pacific, only recently found in the Gulf of Thailand where it is apparently rare.



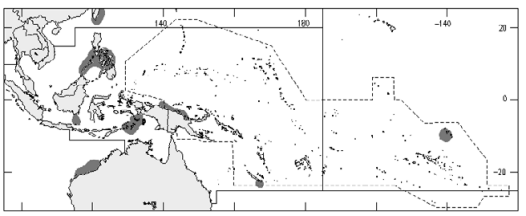


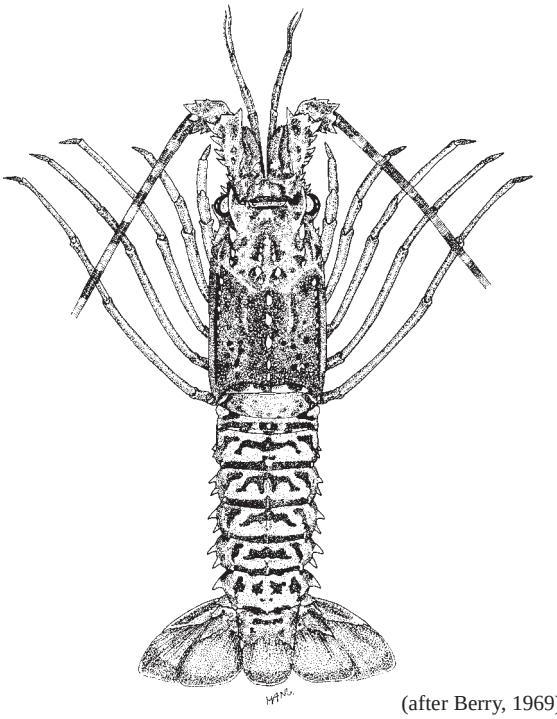
(from Ho and Yu, 1979)

Puerulus angulatus (Bate, 1888)

En - Banded whip lobster.

Maximum body length about 21 cm, commonly between 11 and 17 cm. On soft substrate at depths from 180 to 536 m. Often taken as bycatch during deep-sea trawling operations, but usually not in large numbers. Of potential interest to fisheries. Indo-West Pacific from the eastern coast of Africa to Japan, Taiwan Province of China, the Philippines, Indonesia, New Guinea, northwestern Australia, New Caledonia, and Marquesas Islands.



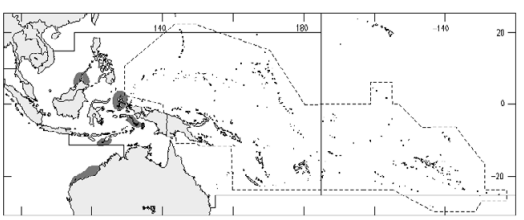


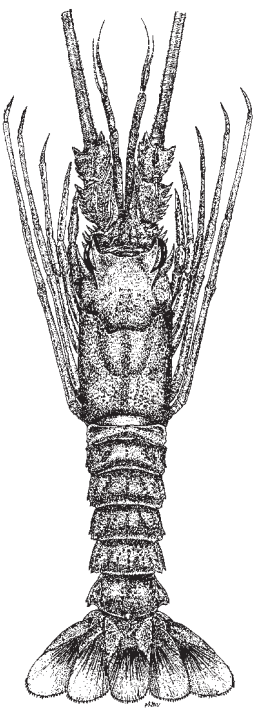
(after Berry, 1969)

Puerulus velutinus Holthuis, 1963

En - Velvet whip lobster.

Maximum body length about 19 cm. On sand or mud bottoms at depths from 485 to 683 m. So far only taken during experimental trawling operations, but sometimes collected in relatively great numbers and may therefore be of potential interest to fisheries. Only known from the Philippines, Indonesia, and northwestern Australia.





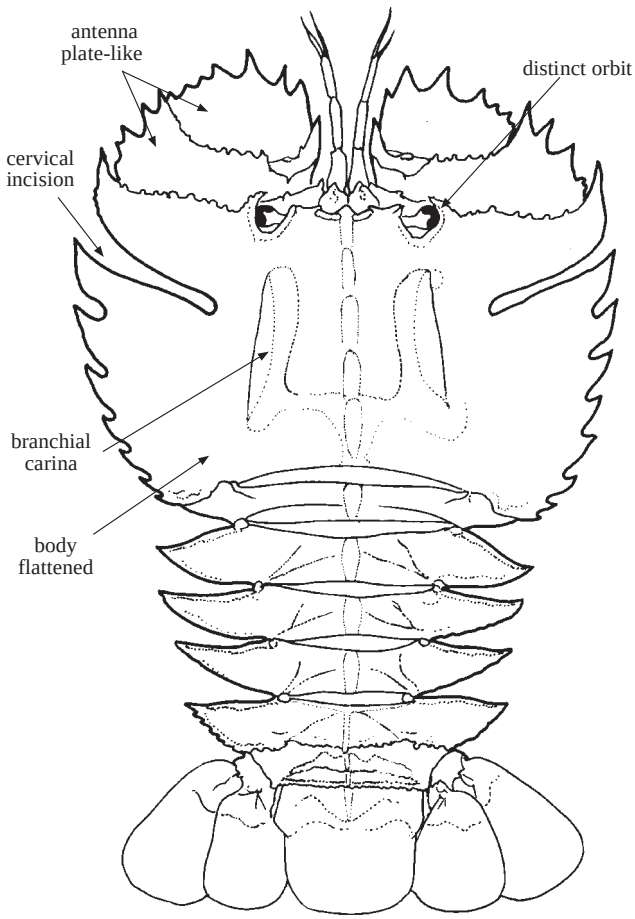
(after De Man, 1916)

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SCYLLARIDAE

Slipper lobsters

Diagnostic characters: Small to large crustaceans. **Body strongly depressed. Carapace laterally angular, rostrum absent or minute; eyes small but distinct and pigmented, enclosed within distinct orbits; no large frontal horns. Antennae short, broad, extremely flattened and plate- or scale-like**; antennules short and slender, with short flagella. **All legs similar in size and generally without pincers** (except in *Scyllarus cultrifer*, third and fourth legs ending in false pincers). Both abdomen and tail fan well developed and powerful, **posterior half of tail fan soft and flexible. Colour:** usually drab, somewhat brownish in various shadings; **dorsal surface of first abdominal segment often with a characteristic pattern of brightly coloured large spot(s).**



Habitat, biology, and fisheries: Six genera and about 30 species of slipper lobsters are currently known from the Western Central Pacific. Their adult sizes are ranging from 2 to 50.5 cm body length. All species are bottom dwelling and are found from very shallow water to a depth of more than 484 m. As in spiny lobsters, the sexes can easily be distinguished by the position of the gonopores at the bases of the third or fifth legs. Mature female slipper lobsters also have the tip of the fifth leg transformed into a small false or true pincer (except in *Thenus*). The eggs are generally very small and numerous and orange or yellowish in colour. Slipper lobsters have a long planktonic phyllosoma larval stage similar to that of spiny lobsters. Members of the genera *Arctides*, *Parribacus,* and *Scyllarides* live in shallow coral and rocky reefs. *Arctides* species are rare but species of the latter 2 genera often form the bycatches of fisheries for spiny lobsters and are of moderate commercial value. The genera *Ibacus* and *Thenus* mainly occur on soft bottoms (the former one in deeper waters) and can be taken by commercial trawlers. They reach a high production in some regions and may be used for export as well as for local consumption. Yearly production of all slipper lobsters in the Western Central Pacific from 1990 to 1995 ranged from 1641 to 3115 t (FAO Yearbook of Fishery Statistics). About 1/3 to 1/2 of this production originated in the Gulf of Thailand. The genus *Scyllarus* has the most numerous species in the family which occur in both soft and hard bottoms from shallow to deep waters. However, they are usually small in size and few in numbers and are therefore without economic value. Since the taxonomic status of many species of the genus *Scyllarus* is still unclear, a key to the species of this genus is not presented here, and only abbreviated species accounts are provided for 2 of the common species in the Western Central Pacific to give an idea of their general appearances.

Similar families occurring in the area

None. No other family of lobsters has such a strongly flattened body or plate-like antennae.

Key to the genera of Scyllaridae occurring in the area

1a. Carapace with deep cervical incisions and lateral margins cut into large teeth; abdominal pleura directed laterally (Figs 1, 2) . . . . . → ***2***

1b. Carapace with very shallow cervical incisions and lateral margins not cut into large teeth; abdominal pleura directed downwards (Figs 3 to 6) . . . . . → ***3***

2a. Dorsal surface of body rather smooth and provided with distinct branchial carinae; fifth abdominal segment bearing a posteromedian spine; body colour plain (Fig. 1) . . . . . ***Ibacus***

2b. Dorsal surface of body entirely covered with scale-like tubercles; branchial carina absent; fifth abdominal segment without posteromedian spine; body coloration mottled (Fig. 2) . . . . . ***Parribacus***

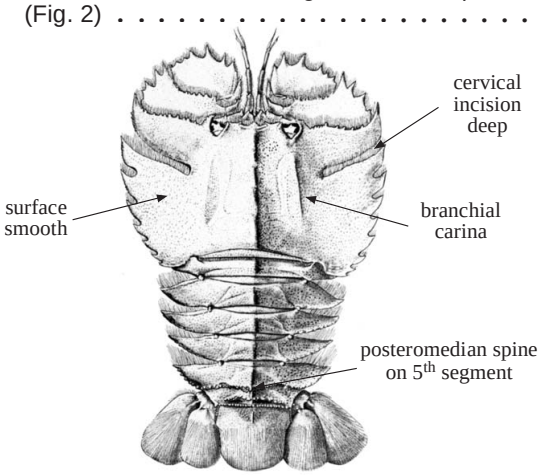


Fig. 1 ***Ibacus***

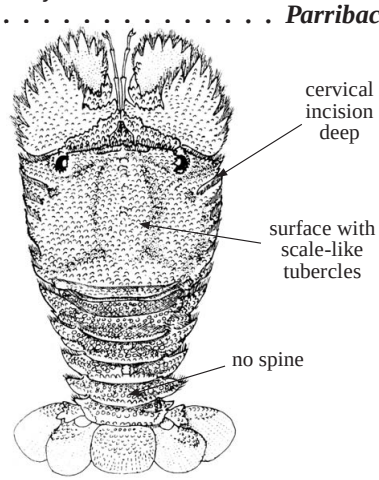


Fig. 2 ***Parribacus***

3a. Body strongly depressed; carapace trapezoid and narrowing posteriorly; orbits located at anterolateral angles of carapace (Fig. 3) . . . . . ***Thenus***
(a single species, *T. orientalis*, in this genus)

3b. Body not strongly depressed, sometimes slightly vaulted; carapace more or less rectangular; orbits situated on anterior margin . . . . . → ***4***

4a. Size large (up to 50.5 cm body length); distal margin of antenna finely crenate; abdomen uniformly granulate and not particularly sculptured (Fig. 4) . . . . . ***Scyllarides***

4b. Size medium or small (body length less than 17 cm); distal margin of antenna cut into distinct teeth; abdomen with transverse grooves or arborescent sculpture . . . . . → ***5***

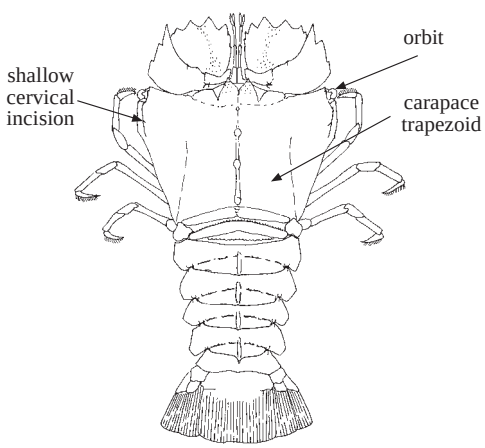


Fig. 3 ***Thenus orientalis***

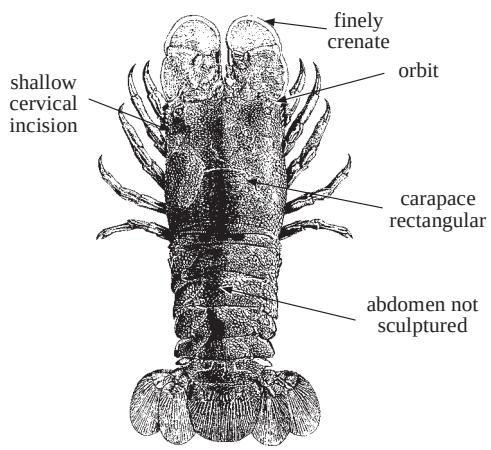


Fig. 4 ***Scyllarides***

5a. Medium size (adults more than 12 cm body length); distal margin of antenna with more than 20 small teeth; exopods of maxillipeds with multiarticulate flagella (Fig. 5) . . . . . ***Arctides***
(a single species, *Arctides regalis*, in the area)

5b. Small size (usually less than 10 cm body length); distal margin of antenna with less than 10 large teeth; exopods of maxillipeds without flagellum or with flagellum transformed to a single laminate segment (Fig. 6) . . . . . ***Scyllarus***
(generally, the species of *Scyllarus* can be separated into 2 groups: 1 has arborescent sculpture on the abdomen while the other group has broad transverse grooves on the abdomen and lacks an arborescent sculpture)

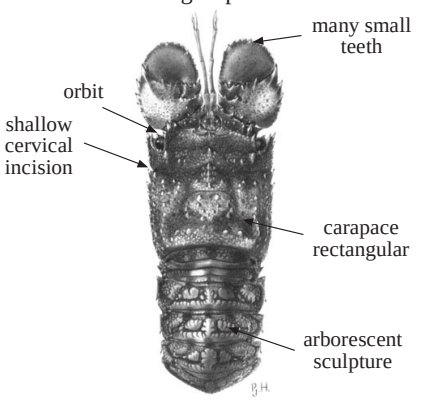


Fig. 5 ***Arctides regalis***

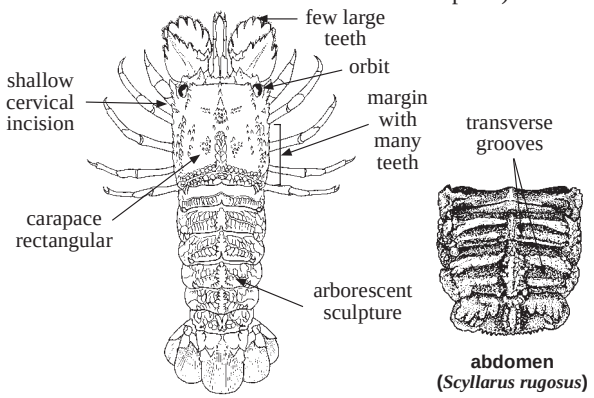


Fig. 6 ***Scyllarus***

Key to the species of *Ibacus* occurring in the area

1a. Carapace with 6 to 9 posterolateral teeth (Fig. 7a-c) . . . . . → ***2***

1b. Carapace with more than 9 posterolateral teeth (Fig. 7d-f) . . . . . → ***4***

2a. Merus of third maxilliped concave on ventral surface and without deep incisions on inner margin (Fig. 8a); cervical incision very wide (Fig. 7a) . . . . . ***Ibacus brucei***

2b. Merus of third maxilliped convex on ventral surface and provided with deep incisions on inner margin (Fig. 8b, c); cervical incision narrow (Fig. 7b, c) . . . . . → ***3***

3a. Branchial carina nearly straight (Fig. 7b); posterior incision of orbit without tubercle. . . . . ***Ibacus novemdentatus***

3b. Branchial carina strongly convex (Fig. 7c); posterior incision of orbit with a distinct tubercle . . . . . ***Ibacus peronii***

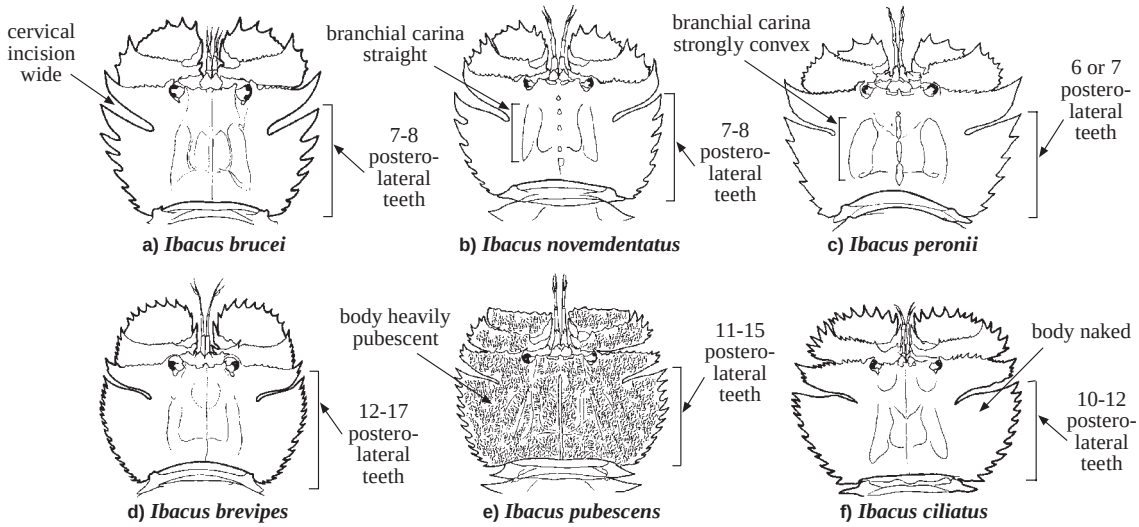


Fig. 7 carapace (dorsal view)

4a. Merus of third maxilliped convex on ventral surface and provided with deep incisions on inner margins (Fig. 8d) . . . . . ***Ibacus brevipes***

4b. Merus of third maxilliped concave on ventral surface and without deep incisions on inner margin (Fig. 8e) . . . . . → ***5***

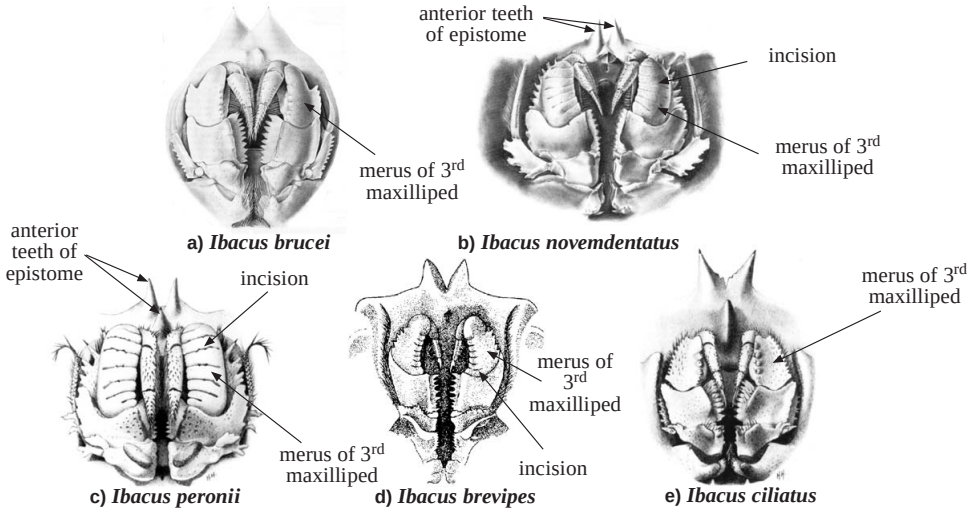


Fig. 8 mouth field (ventral view)

5a. Body heavily pubescent (Fig. 7e); posterior margin of fifth abdominal segment evenly serrated (Fig. 9a) . . . . . ***Ibacus pubescens***

5b. Body except distal segment of antenna naked (Fig. 7f); posterior margin of fifth abdominal segment only with a median spine and 3 to 4 lateral tubercles (Fig. 9b) . . . ***Ibacus ciliatus***

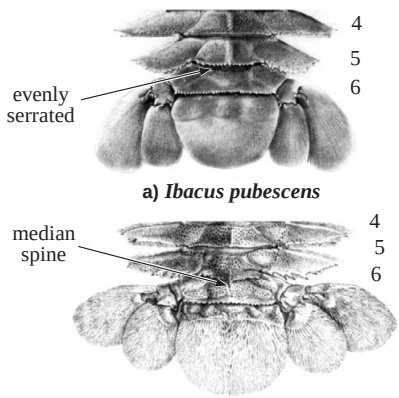


Fig. 9 posterior part of abdomen (dorsal view)

Key to the species of *Parribacus* occurring in the area

1a Median carina on second and third abdominal segments markedly elevated; transverse grooves separating articulated and non-articulated parts of abdominal segments wide and almost naked (Fig. 10a) . . . ***Parribacus antarcticus***

1b Median carina on second and third abdominal segments low; transverse grooves separating articulated and non-articulated parts of abdominal segments narrow and hairy (Fig. 10b) . . . . . → ***2***

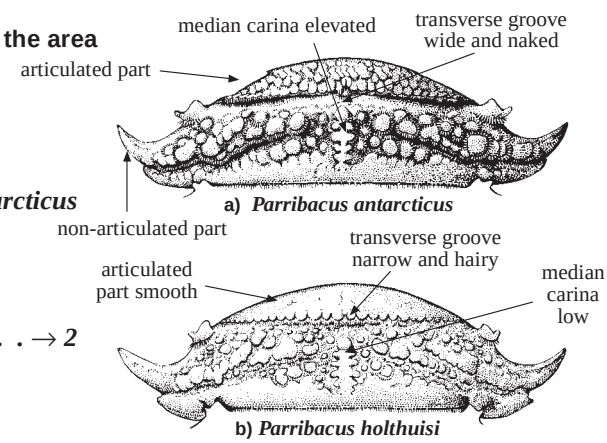


Fig. 10 third abdominal segment (dorsal view)

2a. Articulated parts of abdominal segments bearing distinct tubercles (Fig. 11a); fourth segment of antenna with 7 outer teeth (apical tooth not included) . . . . . ***Parribacus caledonicus***

2b. Articulated parts of abdominal segments more or less smooth (Fig. 10b); fourth segment of antenna with 5 to 6 outer teeth (apical tooth not included) . . . . . →***3***

3a. Fourth segment of antenna bearing 5 outer teeth (apical tooth not included); the posterior of the 2 lateral teeth of carapace before cervical incision much smaller than the first (Fig. 11b) . . . . . ***Parribacus holthuisi***

3b. Fourth segment of antenna bearing 6 outer teeth (apical tooth not included); the 2 lateral teeth of the carapace before cervical incision only slightly unequal in size (Fig. 11c) . . . . . ***Parribacus scarlatinus***

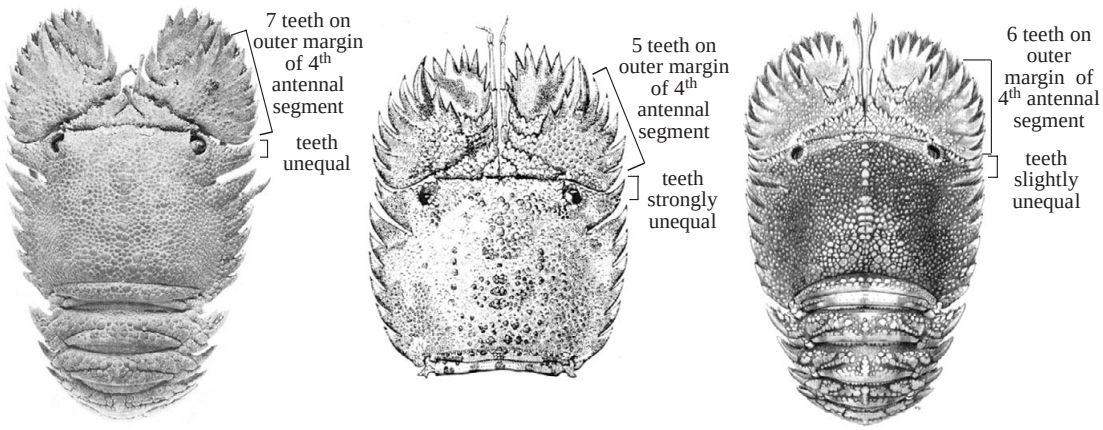


Fig. 11 carapace and anterior abdominal segments (dorsal view)

Key to the species of *Scyllarides* occurring in the area

1a. Carapace with a deep cervical groove and with posterior part distinctly wider than anterior half (Fig. 12a); fourth abdominal segment always produced into a remarkable hump medially; posterior margin of second abdominal pleuron somewhat concave (Fig. 13a); only diffuse spots present on first abdominal segment . . . . . ***Scyllarides haanii***

1b. Carapace with a shallow cervical groove and with anterior part more or less as wide as posterior half (Fig. 12b); middle of fourth abdominal segment never with a hump, only moderately ridged; posterior margin of second abdominal pleuron somewhat convex (Fig. 13b); first abdominal segment with large distinct spots . . . . . ***Scyllarides squammosus***

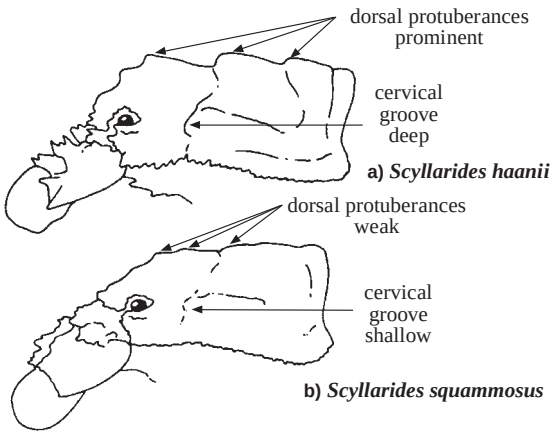


Fig. 12 carapax (lateral view)

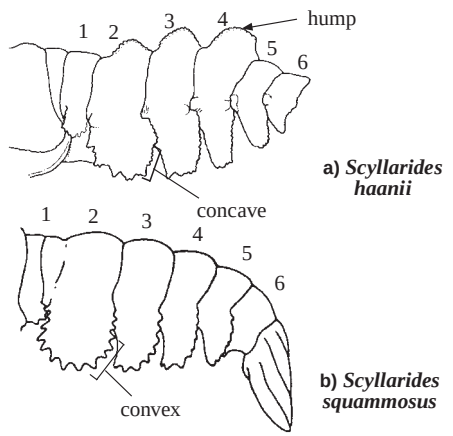


Fig. 13 abdomen (lateral view)

List of species occurring in the area

The symbol 🦐 is given when species accounts are included.

🦐 *Arctides regalis* Holthuis, 1963

Ibacus brevipes Bate, 1888
Ibacus brucei Holthuis, 1977
🦐 *Ibacus ciliatus* (Von Siebold, 1824)
🦐 *Ibacus novemdentatus* Gibbes, 1850
Ibacus peronii Leach, 1815
🦐 *Ibacus pubescens* Holthuis, 1960

🦐 *Parribacus antarcticus* (Lund, 1793)
🦐 *Parribacus caledonicus* Holthuis, 1960
🦐 *Parribacus holthuisi* Forest, 1954
🦐 *Parribacus scarlatinus* Holthuis, 1960

🦐 *Scyllarides haanii* (De Haan, 1841)
🦐 *Scyllarides squammosus* (H. Milne Edwards, 1837)

Scyllarus aesopius Holthuis, 1960
Scyllarus aureus Holthuis, 1963
Scyllarus aurora Holthuis, 1982
Scyllarus batei Holthuis, 1946
🦐 *Scyllarus bertholdii* Paulson, 1875
Scyllarus bicuspidatus (De Man, 1905)
Scyllarus cultrifer (Ortmann, 1897)
Scyllarus demani Holthuis, 1946
Scyllarus gibberosus (De Man, 1905)
Scyllarus martensii Pfeffer, 1881
Scyllarus rapanus Holthuis, 1993
🦐 *Scyllarus rugosus* H. Milne Edwards, 1837
Scyllarus sordidus (Stimpson, 1860)
Scyllarus timidus Holthuis, 1960
*Scyllarus umblica*tus Holthuis, 1963
Scyllarus vitiensis (Dana, 1852)

🦐 *Thenus orientalis* (Lund, 1793)

References

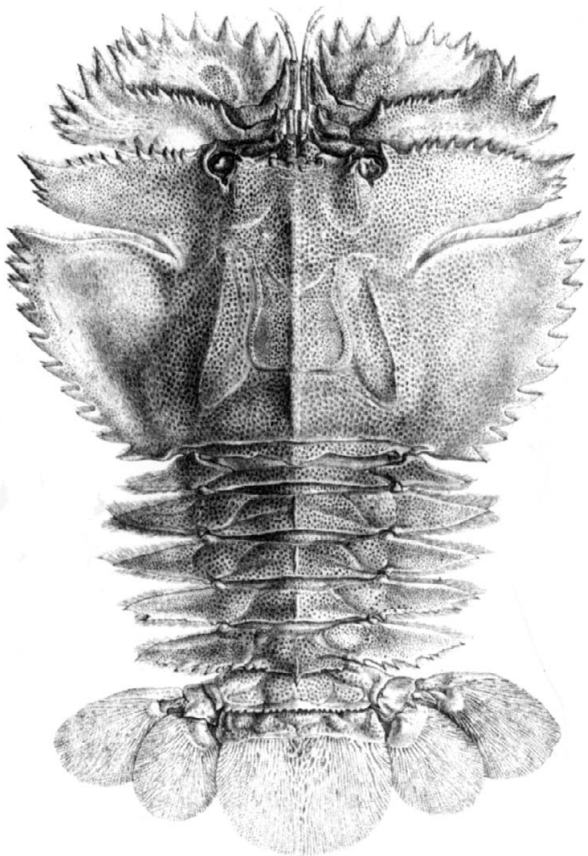
Chan, T.Y. and H.P. Yu. 1993. *The illustrated lobsters of Taiwan*. Taipei, SMC Publishing Inc., 248 p.

Holthuis, L.B. 1991. FAO species catalogue. Marine lobsters of the world. Vol. 13. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fish. Synop.*, 125(13):1-292.

Ibacus ciliatus (Von Siebold, 1824)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Japanese fan lobster.



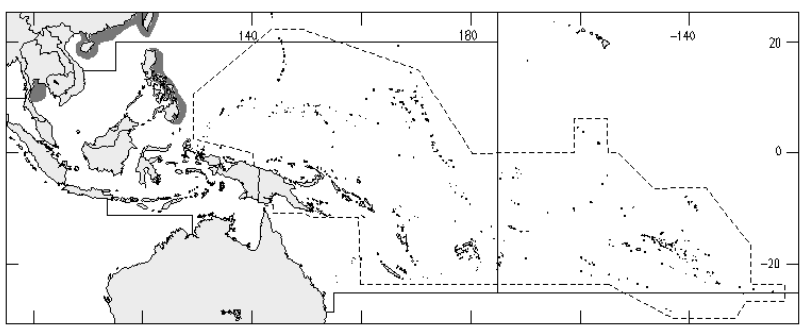
(from Holthuis, 1985)

Diagnostic characters: Body extremely flattened with **dorsal surface rather smooth or slightly pitted; only distal segment of antenna heavily pubescent, particularly in adult males**. Carapace with well-developed branchial carinae and deep cervical incisions, **posterolateral margin cut into 10 to 12 large teeth.** Eyes small and subspherical; orbits not closed and situated on anterior margin of carapace. Antennae broad, flattened and plate-like. **Merus of third maxilliped ventrally concave, with only shallow incisions on inner margin**. All legs without pincers and similar in size. **Posterior margin of fifth abdominal segment armed with a median spine and 3 or 4 lateral tubercles; abdominal pleura directed laterally**. Posterior half of tail fan soft and flexible. **Colour:** body purplish brown all over. Eyes dark brown. Legs orange-brown. Soft part of tail fan transparent and somewhat reddish brown. Setae light brown. Eggs orange.

Size: Maximum body length 23 cm, commonly to about 15 cm.

Habitat, biology, and fisheries: Found on soft substrate of sand, mud, or clay at depths from 48 to 314 m, mostly between 100 and 250 m. Taken by commercial trawlers and common in fish markets of the Philippines, but sold at lower prices than spiny lobsters. The females carry the eggs for about 30 days until the larvae hatch out; the phyllosoma larvae passes through 9 stages in 76 days and metamorphose to the benthic reptant larvae.

Distribution: Western Pacific from Japan, Korea, coast of China, Taiwan Province of China, the east coast of the Philippines, and Thailand.

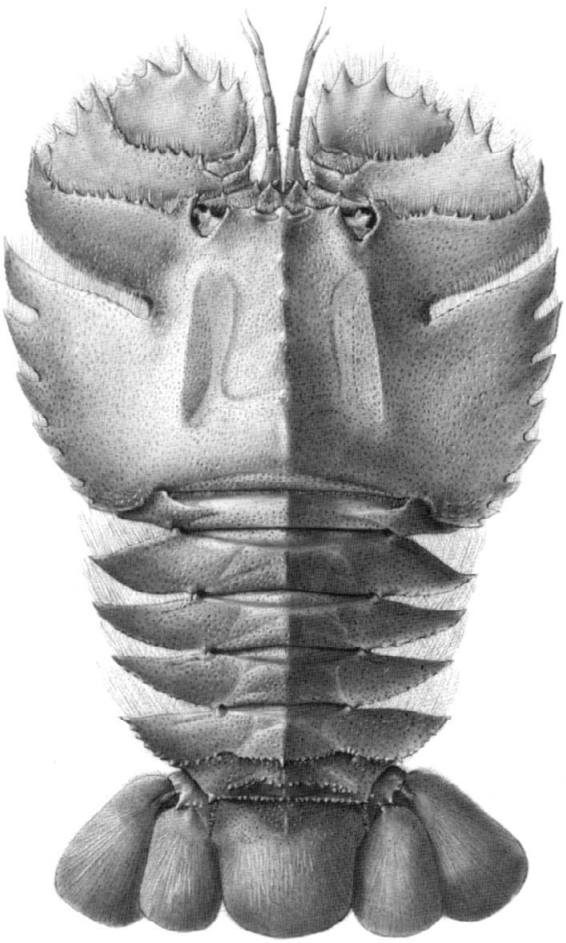


Ibacus novemdentatus Gibbes, 1850

Frequent synonyms / misidentifications: None / *Ibacus ciliatus* (Von Siebold, 1824); *I. pubescens* Holthuis, 1960; *I. peronii* Leach, 1815.

FAO names: En - Smooth fan lobster;
Fr - Cigale glabre; **Sp** - Cigarra liso.

Diagnostic characters: Body extremely flattened and with **dorsal surface rather smooth or slightly pitted. Carapace with nearly straight branchial carinae; cervical incisions deep but narrow; posterolateral margin cut into 7 or 8 large teeth.** Eyes small and subspherical; orbits not closed and **without tubercle at posterior incision,** situated on anterior margin of carapace. Antennae broad, flattened and plate-like. **Merus of third maxilliped ventrally convex, with deep incisions on inner margin.** All legs without pincers and similar in size. **Posterior margin of fifth abdominal segment evenly serrated, bearing a median spine; abdominal pleura directed laterally**. Posterior half of tail fan soft and flexible. **Colour:** body pale yellowish brown and marbled with reddish brown patches on dorsal surface. Ventral surfaces of carapace and legs brown and white. Eyes dark brown. Soft part of tail fan transparent and somewhat pale yellowish. Eggs orange.

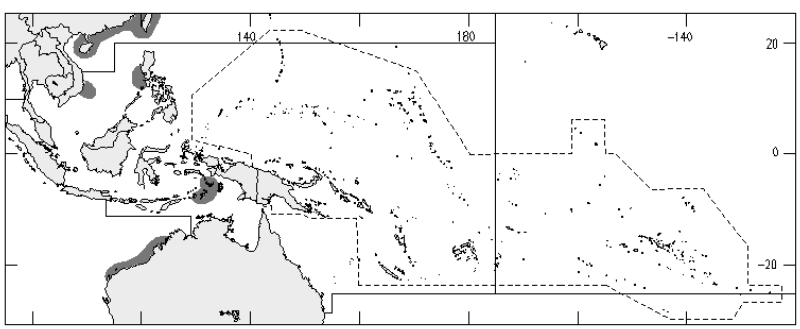


(from Holthuis, 1985)

Size: Maximum body length 19 cm, commonly between 14 and 17 cm.

Habitat, biology, and fisheries: Found at depths from 37 to 400 m on levelled bottom of sand and mud. The phyllosoma larva of this species has 7 stages and lasts for 65 days. Taken by commercial trawlers in the Philippines, but in smaller catches than *Ibacus ciliatus*. Also used as food and sold in local fish markets (with same local names as *I. ciliatus*).

Distribution: Indo-West Pacific from the east coast of Africa to Japan, the Philippines, Indonesia, and northwestern Australia.

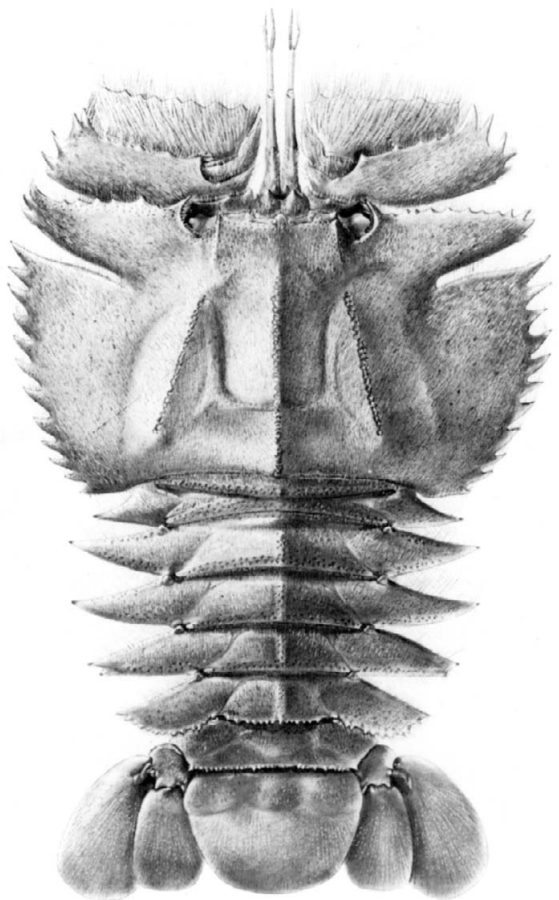


Ibacus pubescens Holthuis, 1960

Frequent synonyms / misidentifications: *Ibacus ciliatus pubescens* Holthuis, 1960 / *Ibacus ciliatus* (Von Siebold, 1824).

FAO names: En - Hairy fan lobster.

Diagnostic characters: Body extremely flattened and with **dorsal surface uniformly covered with dense short pubescence.** Carapace with well-developed branchial carinae and deep cervical incisions, **posterolateral margin cut into 11 to 15 distinct teeth**. Eyes small and subspherical; orbits not closed and situated on anterior margin of carapace. Antennae broad, flattened and plate-like. **Merus of third maxilliped ventrally concave, with only shallow incisions on inner margin.** All legs without pincers and similar in size. **Posterior margin of fifth abdominal segment evenly serrated, bearing a median spine; abdominal pleura directed laterally.** Posterior half of tail fan soft and flexible. **Colour:** body pale brown with lateral teeth on carapace somewhat whitish. Eyes dark brown. Soft part of tail fan transparent. Setae light brown.

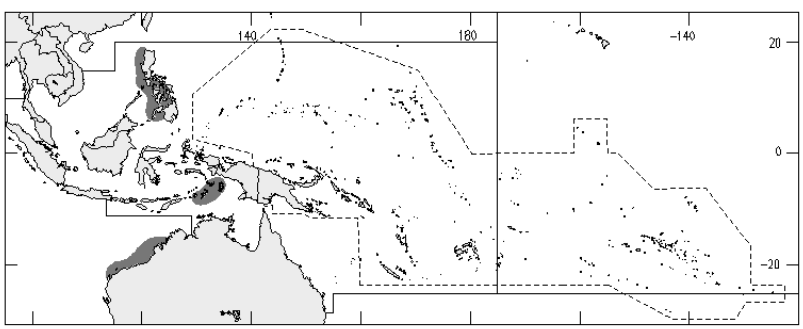


(from Holthuis, 1985)

Size: Maximum carapace length 7.8 cm, with a maximum body length of about 20 cm.

Habitat, biology, and fisheries: Over sand or mud bottoms at depths from 150 to 391 m. Taken by trawls. The hairy fan lobster was formerly often confused with *Ibacus ciliatus*, and it is still not known which of these 2 species is more common in the Western Central Pacific. Very likely mixed with *I. ciliatus* in the markets of the Philippines.

Distribution: So far only known amongst the islands and along the west coast of the Philippines, Indonesia, and northwestern Australia.

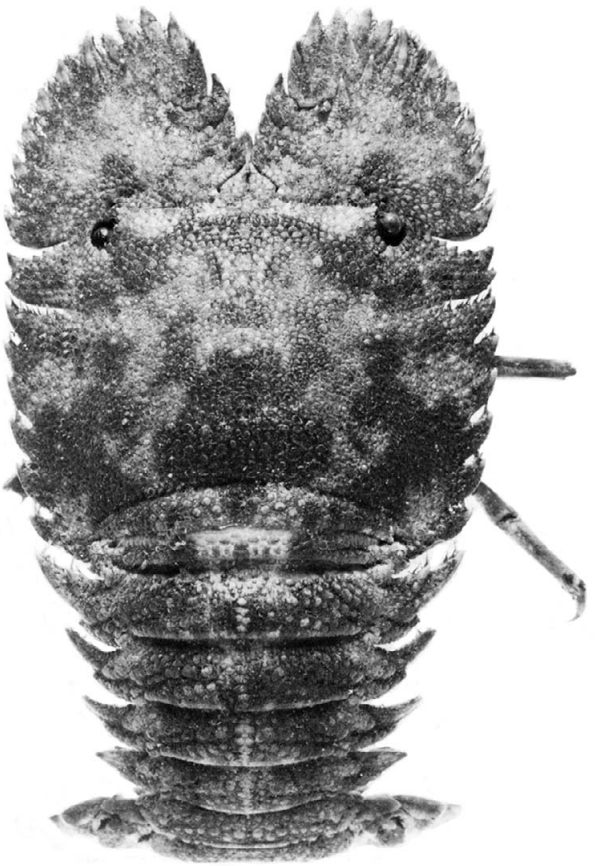


Parribacus antarcticus (Lund, 1793)

Frequent synonyms / misidentifications: *Parribacus ursus major* (Herbst, 1793) / None.

FAO names: En - Sculptured mitten lobster; **Fr** - Cigale savate; **Sp** - Cigarra chinesa.

Diagnostic characters: Body extremely flattened, with **dorsal surface uniformly covered with scale-like tubercles and short hairs.** Carapace with distinct rostral tooth; without branchial ridge but with deep cervical incisions; lateral margin cut into large teeth. Eyes small and subspherical; orbits not closed and situated on anterior margin of carapace. Antennae broad, flattened and plate-like; **fourth segment armed with 6 large outer teeth** (sometimes bifurcated and excluding apical tooth). All legs without pincers and similar in size. **Abdomen with median carina on second and third segments markedly elevated; transverse grooves separating articulated and non-articulated parts of each segment are wide and almost naked; fifth segment without posteromedian spine; pleura directed laterally**. Posterior half of tail fan soft and flexible. **Colour:** body yellowish and mottled with brown and black patches. **Rostrum and orbital margin purplish.** Eyes black. **Large teeth on lateral carapace and antennae intricately banded with yellow, orange, light purple, deep brown and black distally.** Abdomen with 2 black lateral lines; **central region of first segment yellowish with some brown patches. Ventral surface of body greenish yellow, with pale green spots. Legs greenish yellow and covered with green bands, becoming rather inconspicuous on ventral surfaces. Tail fan light brown with deep blue dots.**

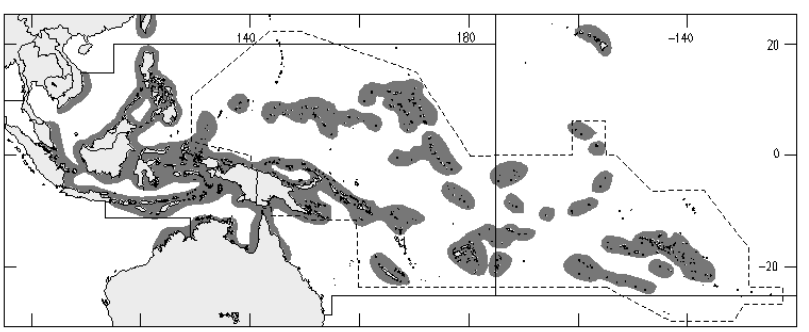


(from Holthuis, 1985)

Size: Maximum body length about 20 cm, commonly between 12 and 15 cm.

Habitat, biology, and fisheries: Lives in coral and stone reefs from shallow waters to a depth of 20 m. Nocturnal and sometimes found in small groups, hiding inside crevices and undercuts of reefs during daytime. Fished throughout its range but nowhere abundant. A common incidental catch for fisheries of spiny lobsters and caught by divers (using hand and spear), or by dipnets or tangle nets. Often considered as a delicacy, comparable to spiny lobsters, and mainly sold live or fresh in local markets.

Distribution: Worldwide in tropical seas and has been recorded in the Western Atlantic from the Caribbeans to Brazil, and in the Indo-West Pacific from the east coast of Africa to Taiwan Province of China, Hawaii, and French Polynesia.



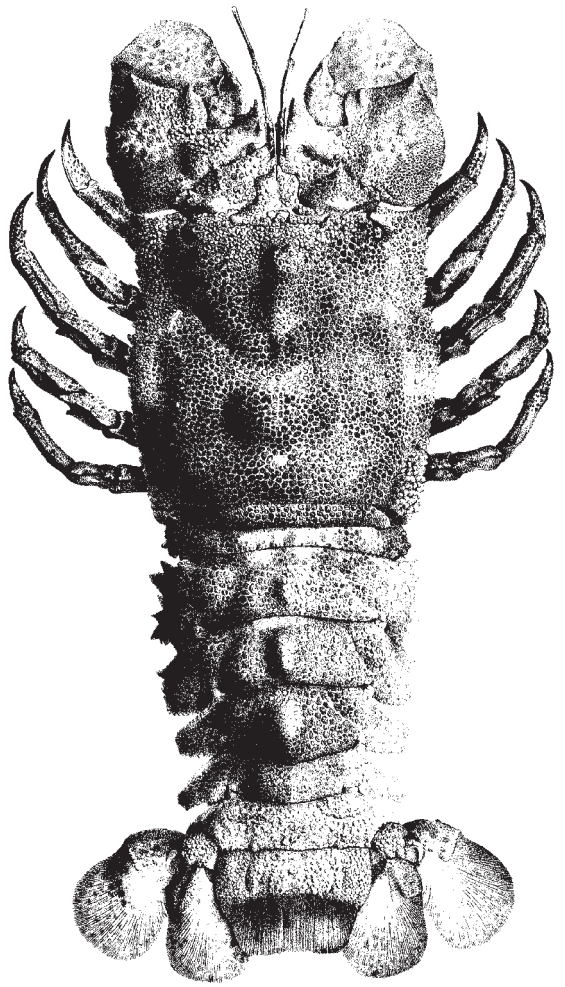
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Scyllarides haanii (De Haan, 1841)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Aesop slipper lobster.

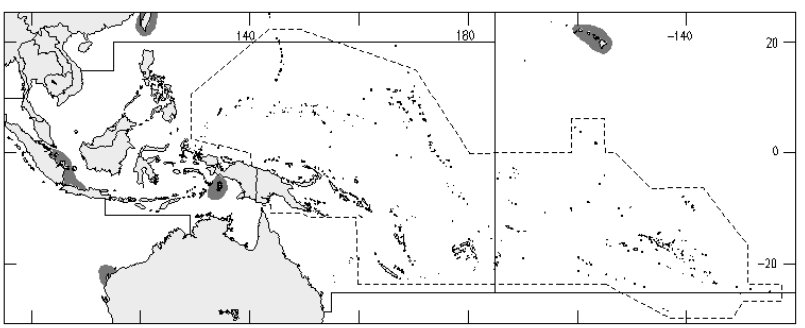


Diagnostic characters: Body vaulted, pubescent and covered with rounded tubercles. Eyes small and subspherical. **Carapace somewhat rectangular, but posterior half distinctly wider than anterior half; cervical groove strong; pregastric, gastric and cardiac teeth all strongly protruding.** Antennae broad, flattened and plate-like, with distal margin finely crenate. All legs without pincers and similar in size. Abdomen uniformly granulate and not particularly sculptured; **dorsal midline of second and third segments strongly ridged, and that of fourth segment produced into a remarkable hump; pleura directed downwards, with posterior margin of second pleuron somewhat concave.** Posterior half of tail fan soft and flexible. **Colour:** body and legs yellowish white and covered with purplish red patches; dorsal surfaces more purplish, ventral surfaces more yellowish. Eyes dark brown. **Antennae with purplish margins;** antennules somewhat orange except distal segment of peduncle and flagella purplish. **First abdominal segment yellowish with 3 diffused purplish red spots.** Soft part of tail fan light brown with numerous purple dots.

Size: Maximum body length 50.5 cm, commonly between 16 and 30 cm; probably the largest species of the genus.

Habitat, biology, and fisheries: Found in coral or rocky reefs at depths from 10 to 135 m, usually less than 50 m. Apparently nowhere abundant and in some places even uncommon. Despite of its large size therefore mostly incidentally taken during fishing activities for spiny lobsters (e.g. by hand or by lobster pots). When caught, this slipper lobster is highly esteemed as food and sold (usually live or fresh) in local markets at prices comparable to that of spiny lobsters.

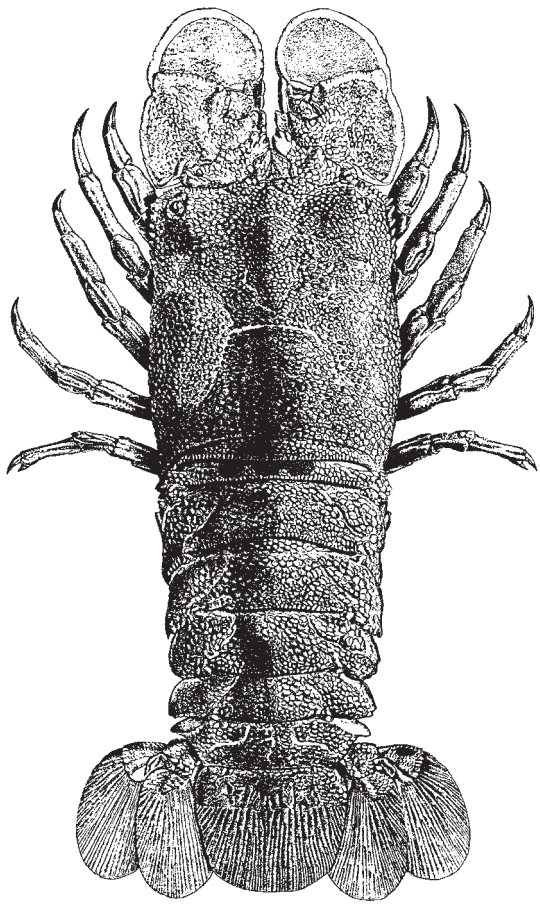
Distribution: Indo-West Pacific from Mauritius to the Red Sea, Japan, Hawaii, and Australia.



Scyllarides squammosus (H. Milne Edwards, 1837)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Blunt slipper lobster;
Fr - Cigale grenue; **Sp** - Cigarra ñato.

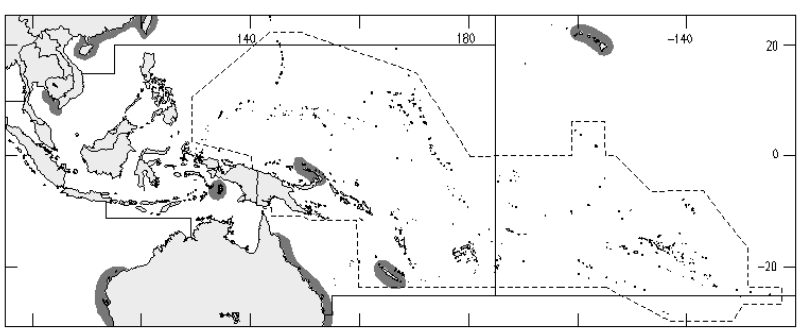


Diagnostic characters: Body vaulted, pubescent and densely covered with rounded tubercles. Eyes small and subspherical. **Carapace rectangular, with anterior half about as wide as posterior half; cervical groove shallow and constricted at middle; pregastric tooth slightly elevated, gastric tooth low and cardiac tooth almost levelled.** Antennae broad, flattened and plate-like, with distal margin finely crenate. All legs without pincers and similar in size. Abdomen uniformly granulate and not particularly sculptured; **dorsal midline of second to fourth segments weakly to moderately ridged and progressively higher posteriorly; pleura directed downwards, with posterior margin of second pleuron somewhat convex.** Posterior half of tail fan soft and flexible. **Colour:** body red-brown with depressed areas and ventral surfaces rather pale yellowish. Eyes black-brown. Margins of carapace orange-red; **antennae yellowish with orange-red margins;** antennules bright yellow with purplish flagella. Legs bright yellow with regions near joints distinctly purplish. **First abdominal segment with 3 distinct red spots, the central one much larger and anteriorly fused with lateral spots**. Soft part of tail fan light brown with red-brown dots.

Size: Maximum body length 40 cm, commonly to about 20 cm.

Habitat, biology, and fisheries: Nocturnal; inhabits coral and rocky reefs to a depth of about 80 m, mostly between 20 and 50 m. A common bycatch of fisheries for spiny lobsters and taken by hand during day and night diving, wire traps and tangle nets, but apparently nowhere abundant in the Western Central Pacific. Like other species of the genus, it is often considered as a delicacy and sold in local markets (fresh or live) at slightly lower prices than spiny lobsters.

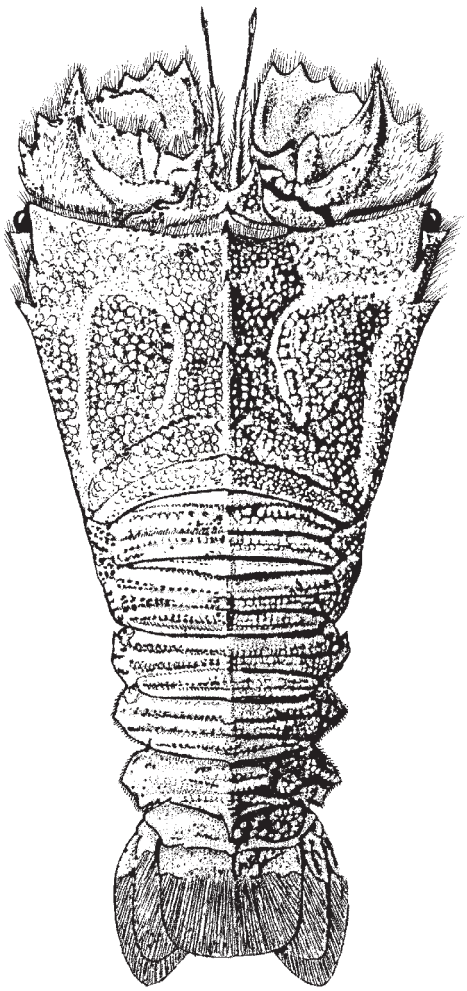
Distribution: Indo-West Pacific from the eastern coast of Africa to Japan, Australia, New Caledonia, and Hawaii.



Thenus orientalis (Lund, 1793)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Flathead lobster; **Fr** - Cigale raquette; **Sp** - Cigarra chata.

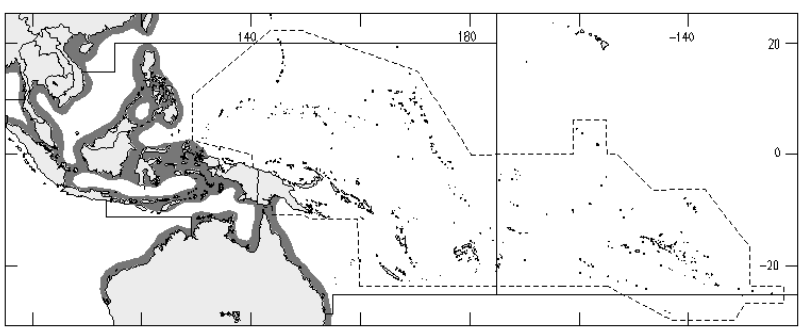


Diagnostic characters: Body markedly depressed, with surface pubescent and granulate. **Carapace trapezoid, narrowing posteriorly, with weak branchial carinae and shallow cervical incisions; anterior part of lateral margin with only 2 teeth, posterior 3/4 without teeth.** Eyes small and subspherical; **orbits situated at anterolateral angles of carapace**. Antennae broad, flattened and plate-like. All legs without pincers and similar in size. Abdomen with median carina and transverse grooves, **fifth segment armed with a strong posteromedian spine; pleura directed downwards.** Posterior half of tail fan soft and flexible. **Colour:** body brownish with reddish brown granules, ventral surface somewhat yellowish white. Eyes deep brown. Antennules yellowish white with red-brown bands. Legs yellowish white and distally brownish. Soft part of tail fan and pleopods somewhat orange-red. Setae light brown.

Size: Maximum body length 25 cm, commonly to about 16 cm; maximum weight over 0.5 kg.

Habitat, biology, and fisheries: Inhabits bottoms of soft substrate, sand and/or mud, sometimes with shells or gravel; at depths from 8 to more than 200 m, but usually between 10 and 60 m. It buries into the soft substrate with only the eyes and antennules visible during daytime; actively swims during nocturnal foraging, which covers long distances. The planktonic larval stage lasts for about 3 months. Common throughout its range but nowhere very abundant. Forms a bycatch of trawling operations and is sometimes also taken by diving (with a catch of over 500 t in Australia between 1989 and 1990). Marketed fresh or frozen in fish markets and used for food. Similar to the species of *Ibacus*, it is generally considered to have a good taste (in Queensland this species is even ranked above *Ibacus*) and sold at slightly lower prices than spiny lobsters.

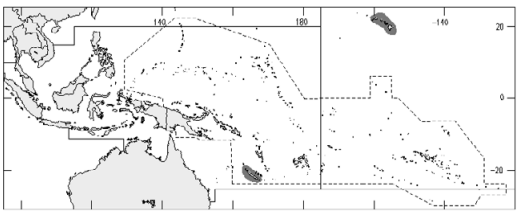
Distribution: Widely distributed in the Indo-West Pacific from the east coast of Africa to the Red Sea, Japan, and the northern coast of Australia.



Arctides regalis Holthuis, 1963

En - Royal Spanish lobster.

Maximum body length up to 17 cm. In shallow waters at depths from 5 to 50 m on the outer edges of coral reefs. Nocturnal and hides in cavities during daytime. Too rare to be of significant importance to fisheries, but highly valued in the aquarium trade for its bright coloration. Indo-West Pacific from Mauritius, La Réunion, New Caledonia, Hawaii, and Easter Islands.

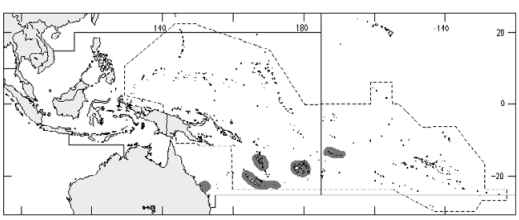


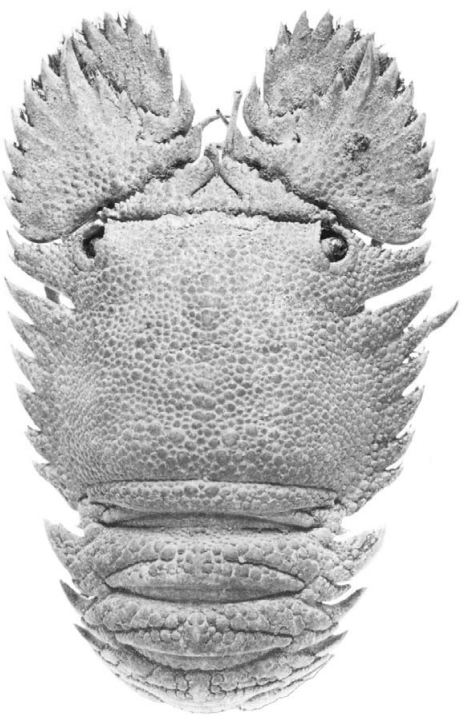


Parribacus caledonicus Holthuis, 1960

En - Caledonian mitten lobster.

Maximum body length about 18 cm. In shallow water to a depth of 6 m on reefs, usually on the exposed side and in surge channels. Hides in crevices during the daytime, often attached to the ceiling of caves. In Fiji, this species is often found in the same habitat with *Panulirus penicillatus*. Caught by divers with gloved hands and mainly for local consumption. Southern Pacific and known from Queensland (Australia), New Caledonia, Loyalty Islands, New Hebrides, Fiji, and Samoa.



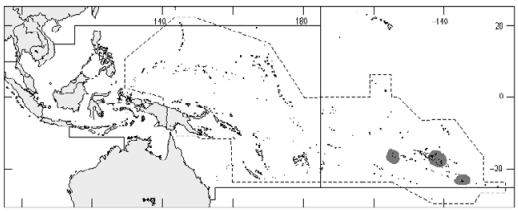


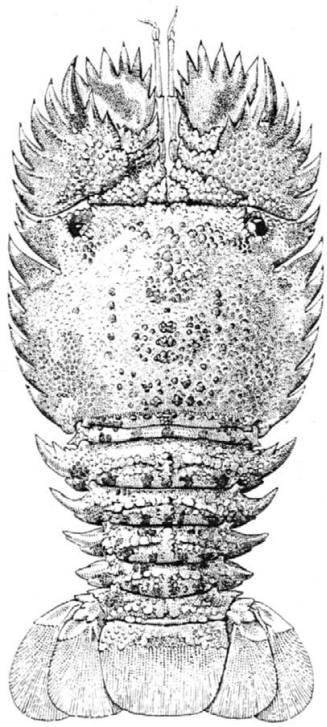
(from Holthuis, 1985)

Parribacus holthuisi Forest, 1954

En - Red-spotted mitten lobster.

Maximum body length about 14 cm. In shallow water at depths from 1 to 5 m on the sandy bottoms of coral reefs. Used as food locally and collected at night with torches. Only known from the Society, Tuamotu, and Gambier Islands (French Polynesia).



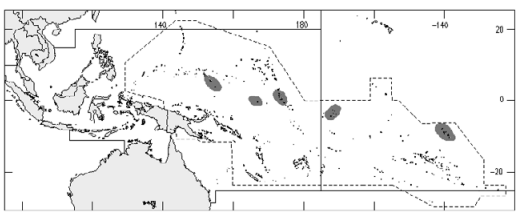


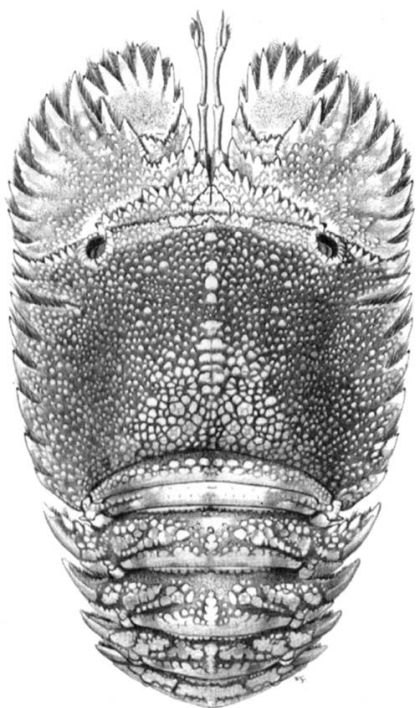
(from Forest, 1954)

Parribacus scarlatinus Holthuis, 1960

En - Marbled mitten lobster.

Maximum body length about 15 cm. In shallow reefs areas. Like other species of mitten lobsters, this species is used locally for human consumption. Central and South Pacific from Kapingamarangi through the Marshall, Gilbert, and Phoenix islands to the Marquesas.



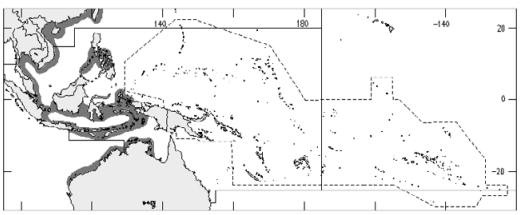


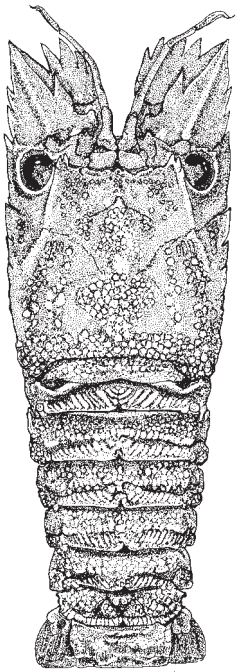
(from Holthuis, 1985)

Scyllarus bertholdii Paulson, 1875

En - Two-spot locust lobster.

Maximum body length 7 cm, commonly between 3 and 5 cm. On soft bottoms at depths from 15 to 150 m, commonly between 40 and 75 m. Caught incidentally during trawling operations. Like the other Indo-West Pacific species of the genus, it is generally considered to be of no economic importance due to its small size and limited abundance. Western Pacific and western Australia; from the East and South China Sea, Taiwan Province of China to Viet Nam, Thailand, the Philippines, Indonesia, northern and western Australia.

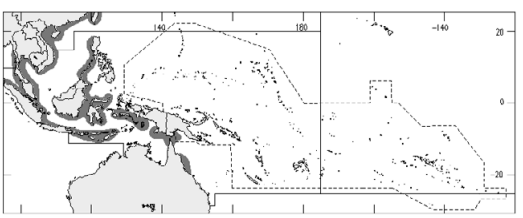


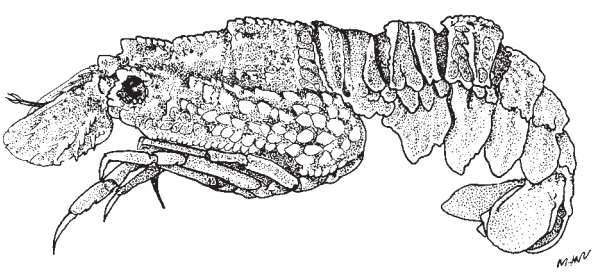


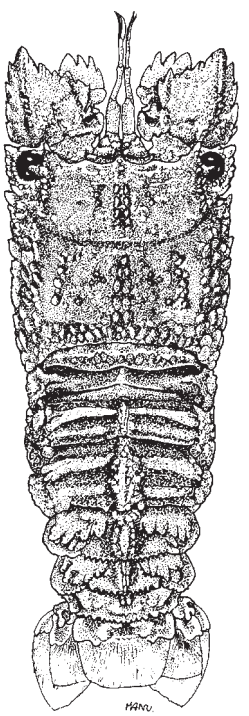
Scyllarus rugosus H. Milne Edwards, 1837

En - Hunchback locust lobster.

Maximum body length 6 cm, commonly between 4 and 5 cm. On soft bottoms at depths from 20 to 60 m, rarely to 200 m. Commonly and incidentally taken by trawlers fishing for other species. Nowhere abundant and of limited commercial importance due to its small size. Indo-West Pacific from East Africa to the Red Sea, Japan, and northeastern Australia.







(after Chan and Yu, 1986)

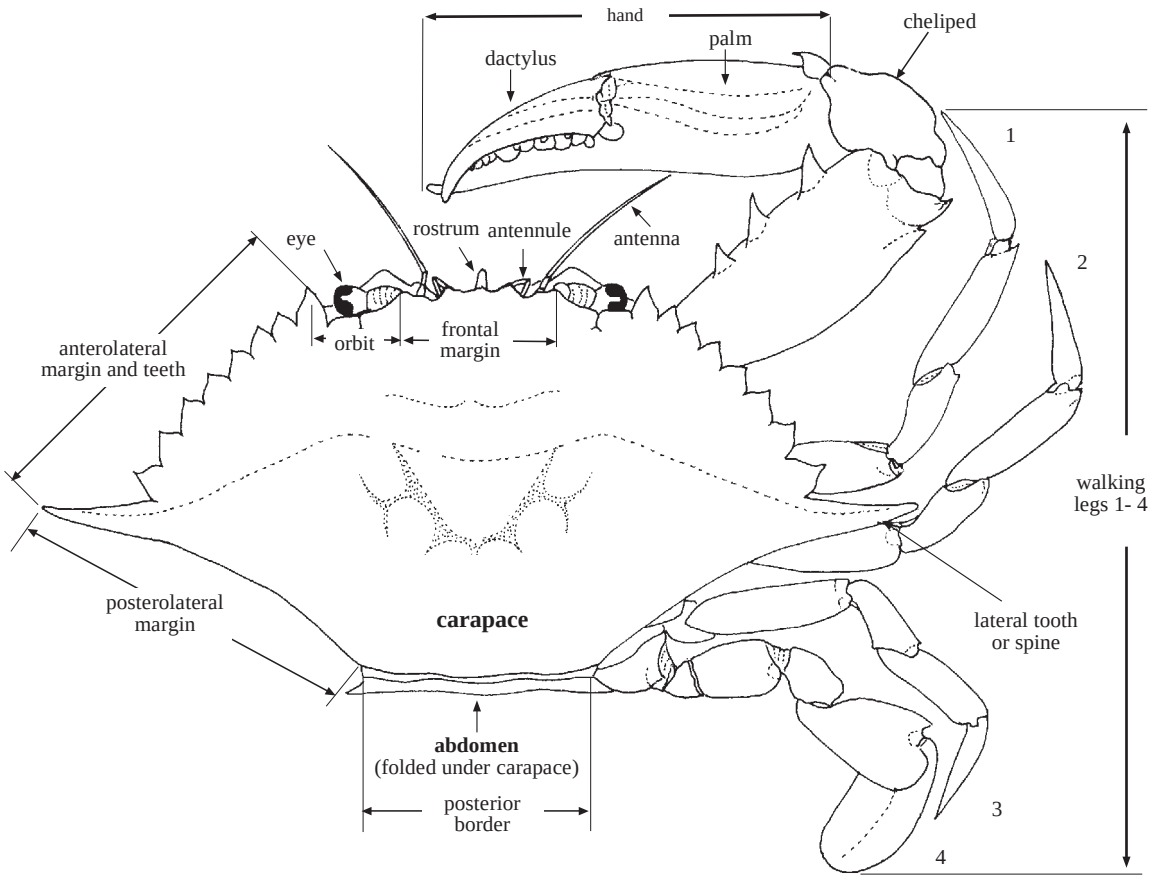
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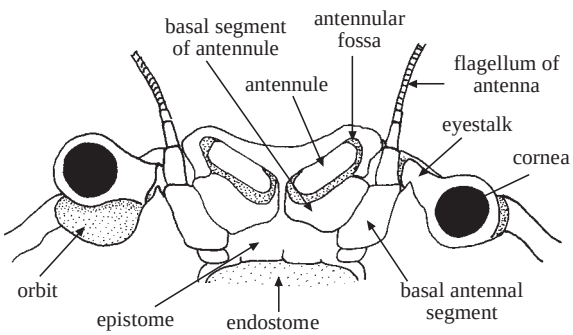
CRABS

by P.K.L. Ng

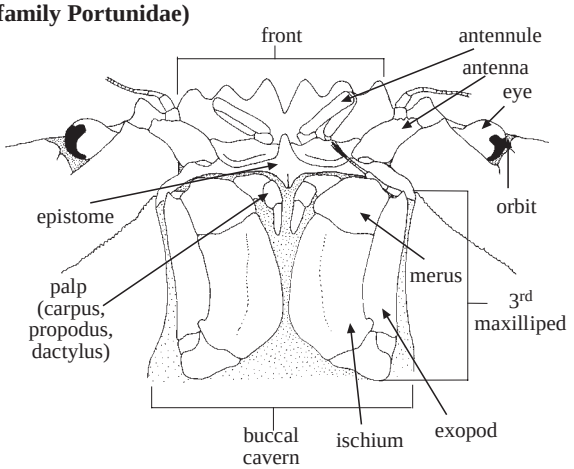
TECHNICAL TERMS AND MEASUREMENTS



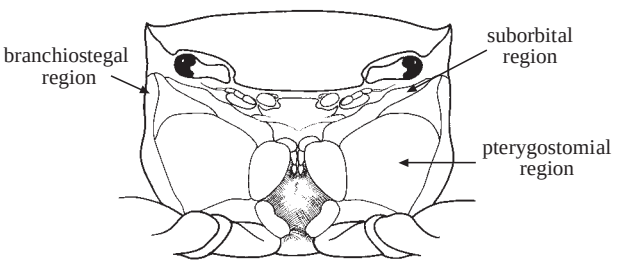
general shape (dorsal view) of a brachyuran crab (family Portunidae)



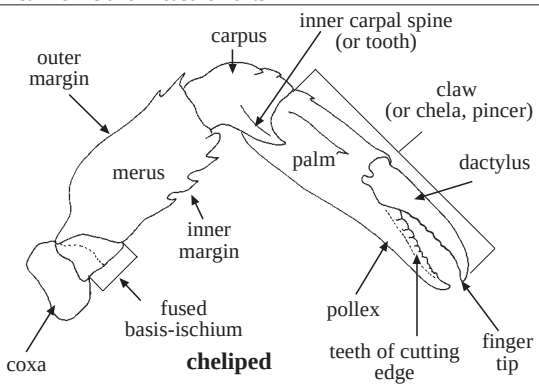
eyes, antennae, and antennules (ventral view)



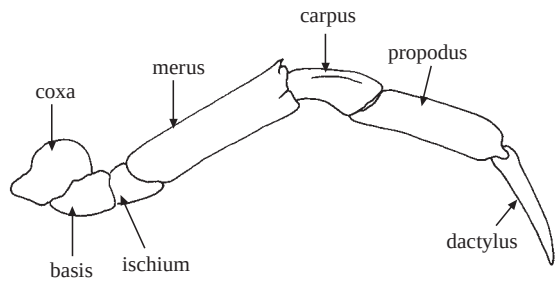
mouth field



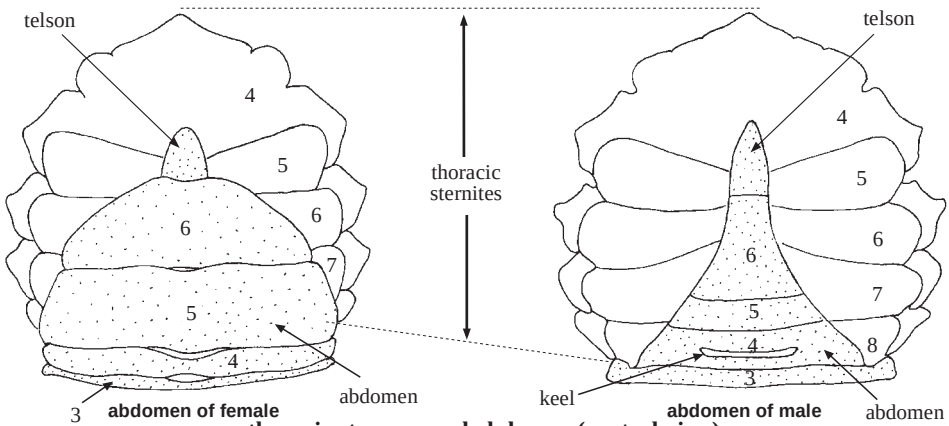
frontal view of body



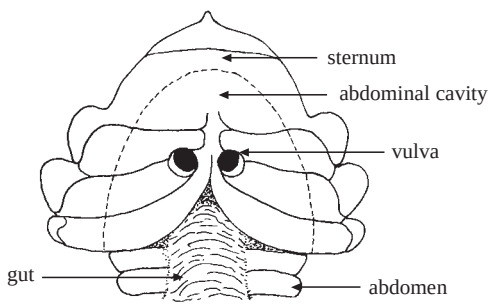
cheliped



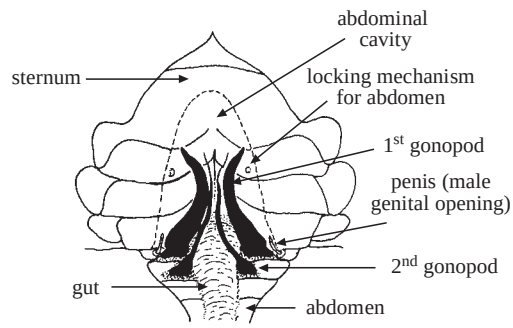
walking leg



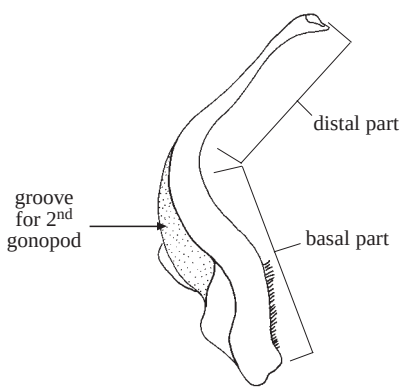
thoracic sternum and abdomen (ventral view)



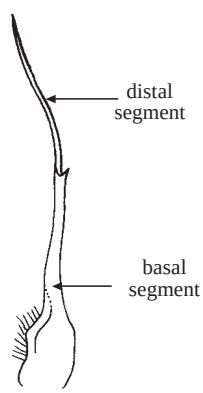
female abdominal cavity and vulvae



male abdominal cavity and gonopods



first gonopod



second gonopod

male gonopods

GENERAL REMARKS

Introduction

Like the shrimps and lobsters, crabs belong to the order Decapoda (= "ten-legged", referring to the 10 thoracic appendages normally present in these crustaceans). Crabs can be classified into 2 main groups, brachyuran crabs (infraorder Brachyura) and anomuran crabs (infraorder Anomura). Most species of Brachyura, or true crabs, can easily be separated from the so-called "false crabs" belonging to the infraorder Anomura by having 4 pairs of well-developed walking legs. Anomuran crabs always have only 3 pairs of walking legs clearly visible, while the fourth (last) pair is very small, normally tucked under the body and hardly noticeable. However, this is just a general rule rather than a distinct separating character as there are a number of true crabs which have their fourth pair of legs greatly reduced as well (e.g. Dynomenidae and Retroplumidae) or even completely reduced (Hexapodidae).

A more recent compilation of the actual number of all species of crabs known to date is pending. The last census was done by Fenner Chace Jr. (1951), who recorded worldwide 4 428 and 1 270 species of brachyuran and anomuran crabs, respectively. The late Raoul Serène (1968) estimated that perhaps some 1 000 species of brachyuran crabs occur in the Indo-Malayan area. However, these numbers have substantially increased over the last 40 years, due to the rapid pace of crab discoveries. It is not unreasonable to believe that the current number of brachyuran and anomuran crabs in the world ranges from 5 000 to 6 000 and 1 500 to 2 000 species, respectively. Of these, the largest proportion is found in the Western Central Pacific, where around 1 500 to 2 000 brachyuran crab species (marine and fresh-water taxa) are probably present.

The present contribution focuses on 15 families of brachyuran crabs and a single family of anomuran crabs which include commercially important species in the Western Central Pacific. The majority of edible crab species belong to the Brachyura, and accordingly, a large number of brachyuran crabs are caught for human consumption in the Western Central Pacific. It is important to note, however, that a much greater number of brachyuran crab species than listed here are collected for food by many poorer communities and indigenous people in the area. Any edible species which are common enough to be collected in great numbers can be eaten, even if they are small in size. To these belong many ocypodids such as soldier crabs (*Dotilla* spp.), fiddler crabs (*Uca* spp.), and periscope crabs (*Macrophtalmus* spp.), but also several medium-sized species of vinegar crabs (Sesarminae, Grapsidae). In addition, many medium-sized species of reef crabs of the families Xanthidae and Eriphiidae are locally consumed among natives of several Pacific islands. However, it is unrealistic to list and discuss every single species that is eaten once in a while or might be collected for food. Therefore, a selection has been made here of those species which at present have a distinct fishery value, are larger and more common, or have a good potential in the future as their fisheries develop. It is also worth noting that several species of fresh-water crabs of the families Potamidae and Parathelphusidae are consumed in many parts of Southeast Asia and Indo-China.

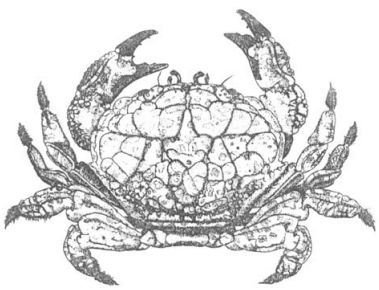
In contrast to the brachyurans, few anomuran crabs have a major fishery value in the Western Central Pacific, with a single species (the "coconut crab", *Birgus latro*) being of distinct commercial importance. The stone crabs (Lithodidae) are represented by several species within the area, but none of them are harvested so far, although some species are utilized for food in other regions of the world (the best known example is the large fishery for the "Alaskan king crab", *Paralithodes camtschaticus*, in the northern Pacific). The lithodid species occurring in the Western Central Pacific, however, are generally too rare to show any significant commercial importance, although it may be possible that a number of species can be utilized in the future. Reports that some large hermit crabs (Paguridae and Diogenidae) are sometimes caught for food are actually not very reliable, and almost certainly none of these show any commercial importance. Many species of land hermit crabs (genus *Coenobita*), however, are regularly collected for the pet trade. The so-called squat lobsters (Anomura: Galatheidae), which actually have a more crab-like than lobster-like appearance, are represented by a few edible species in the Atlantic, but none of the species in the Western Central Pacific are large or common enough to have any food value. The same is true for the deep-water chirostylids (deep-water squat lobsters). However, because of their crab-like shape, galatheids and chirostylids have been included in the present key to families of marine crab-like Anomurans. On the other hand, several anomurans of clearly lobster- or shrimp-like appearance, such as the mud lobsters (*Thalassina* spp., Thalassinidae, notably *T. anomala*) and mud shrimps (*Upogebia* spp., Upogebiidae), are occasionally caught for food in the Western Central Pacific.

Poisonous Crabs

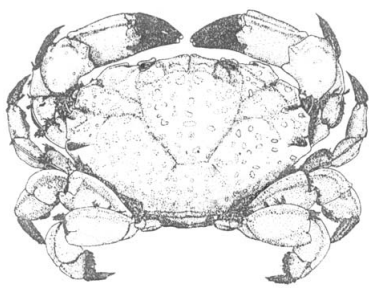
Although poisonous crabs have been known for a very long time, only in recent years have the necessary biochemical studies been done to quantify and qualify the toxins involved. Some people become violently sick after consumption of crabs because of allergic responses, a response not related to poison. In general, there are 2 categories of poisonous crabs:

The **first category** includes the permanent highly toxic species. These crabs are always poisonous, and include taxa such as the "mosaic crab" (*Lophozozymus pictor*), "demon crabs" (*Demania* spp.), "jewel crab" (*Zosimus aeneus*), "crested reef crab" (*Platypodia granulosa*), and "green egg crab" (*Atergatis floridus*). The consumption of any of these crabs, even if well cooked, is extremely dangerous and has proved fatal in several instances. It is important to note here that all these species belong to the family Xanthidae and they all have distinctive colour markings or striking colours, presumably to warn potential predators. All species are of moderately large size, reaching carapace widths from 7 to 10 cm, and as such, may be picked up by fishermen or collectors. The toxins that have been identified include palytoxins, saxitoxins, and tetrotoxins, and occur throughout the tissues and exoskeleton, being most concentrated in the liver and gonads. All these toxins act on the nervous system. As they loose their toxins when kept in captivity and fed on normal food, it is believed that the crabs obtain these toxins directly or indirectly from the food. The 2 most notorious genera are *Lophozozymus* and *Demania*, and a number of human deaths have been attributed to them. Tests on *Lophozozymus pictor* have shown that, although the degree of toxicity varies from individual to individual, they all contain enough toxins to kill an adult human. In a single analysis, 1 g of the crab's flesh contained enough toxins to kill 42 000 mice. A large specimen of *L. pictor*, however, can easily reach a weight of 100 g. This makes it one of the (if not THE) most poisonous crabs known. Not all species of *Lophozozymus* and *Demania* have been analyzed biochemically, but the general consensus is that most, if not all their members are highly toxic.

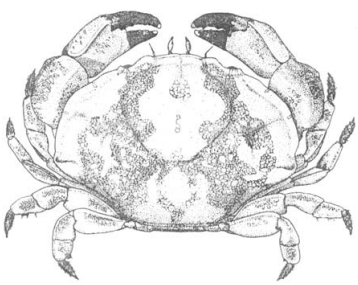
The **second category** of toxic crabs are those which are mildly poisonous and/or occasionally poisonous. The consumption of such crabs may cause illness but rarely death. The species involved here include "reef crabs" (*Carpilius* spp., Carpiliidae), "red-eyed crabs" (*Eriphia* spp., Eriphiidae), coral reef crabs like *Etisus* spp. and *Atergatis* spp. (Xanthidae) and "land crabs" (*Cardisoma* spp., Gecarcinidae). In most instances, these crabs are also not always poisonous, with their toxicity varying with place and time of year. This is very likely to be associated with the food habits of the crabs. In some cases, this is because the crabs have consumed poisonous fruits or leaves (e.g. for land crabs like *Cardisoma*). Poisonous crabs have also been associated with red-tide algal or dinoflagellate blooms. Species like the "red egg crab" (*Atergatis integerrimus*) are probably poisonous because they only occasionally feed on organisms which are toxic and only in small quantities. This second category of poisonous crabs poses problems for fishery officers as a species which is poisonous in one area may be totally harmless in another. Obviously, great care has to be taken in harvesting and consumption of those species.



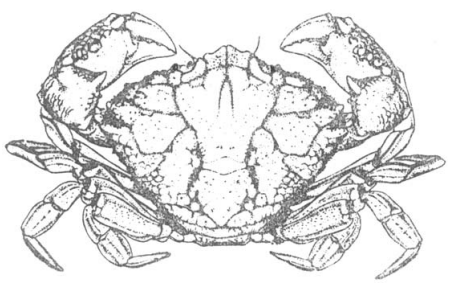
Zosimus aeneus



Lophozozymus pictor

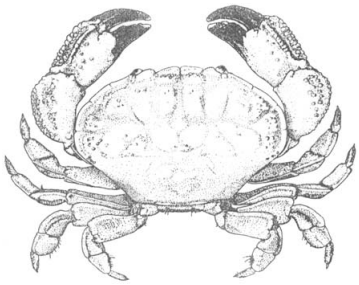


Atergatis floridus

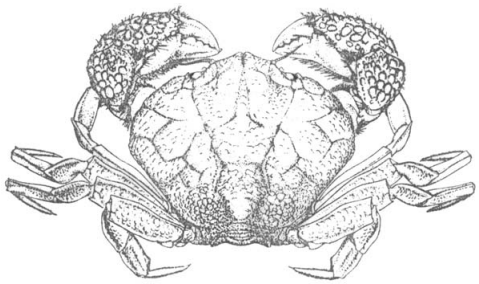


Demania cultripes

(after Garth and Alcala, 1977)



Platypodia granulosa



Demania toxica

(after Garth and Alcala, 1977)

Notes on the classification of brachyurans

The total number of families of Brachyura is still undetermined. Although many authors still follow the classification presented by Balss (1957), more recent studies by Guinot (1978, 1979) have shown that this system is artificial. Unfortunately, not all the brachyuran families currently recognized were dealt with by Guinot in detail and the status of a number of them remains unresolved. For the present report, the writer has essentially adopted Guinot's (1978) system of higher classification. Accordingly, 53 families are recognized, following mainly Guinot (1978) and Manning and Holthuis (1981). Out of these, 8 families are found in fresh water only and thus are outside the scope of the present contribution. Nevertheless, it is relevant to note that out of these 8 fresh-water families, 3 occur in the Western Central Pacific, namely the Potamidae (= Isolapotamidae), Gecarcinucidae, and Parathelphusidae (= Sundathelphusidae) (Ng, 1988). Of the 45 marine families, 40 have been recorded in the Western Central Pacific thus far, with only the Orithyiidae, Thiidae, Cheiragonidae, Pirimelidae, and Platyxanthidae apparently being absent from the area.

Some of the families recognized here have undergone nomenclatural changes. The Eriphiidae has previously been known as the Menippidae and Oziidae. However, Eriphiidae is the oldest name and thus has nomenclatural priority. The Mimilambridae Williams, 1979, is considered a junior synonym of Parthenopidae MacLeay, 1838 (see Ng and Rodriguez, 1986). The recognition of a separate family for the Eumedonidae, symbionts on echinoderms, follows Stevcic et al. (1988). Stevcic (1988) recognized a separate family, Cheiragonidae, for crabs previously classified in the Telmessinae (Atelecylidae). Finally, the Camptandriidae, previously considered to be a subfamily of the Ocypodidae, is regarded here as a separate family, following the suggestions of Harminto and Ng (1991).

Characters useful for identification

The teeth of the **anterolateral margins** of the **carapace** are also known as the epibranchial teeth. The **first anterolateral tooth** is often called the "external orbital" or "exo-orbital" angle (or tooth) and is counted separately from the following **anterolateral teeth** by many authors (but not here). The **frontal margin** (or **front)** becomes elongate and/or spiniform in many crabs such as the homolids (deep-water porter crabs) and majids (spider crabs), and is then frequently called a **rostrum**.

The maximum **carapace width** is used as principal measurement indicating the size of a crab, measured as the greatest distance between the lateral margins of the carapace.

The **buccal cavern** (location of the mouthparts), is bordered on both sides by the **pterygostomial regions**, and above by the **epistome**. The calcareous plate inside the buccal cavern is called the **endostome**. Usually, only the anterior part of the endostome is visible, even when the mouthparts are moved aside. The outer mouth parts or **third maxillipeds** are often just referred to as **"the mouthparts"**, even though there are actually 6 pairs of feeding appendages. Underneath the third maxillipeds, the **second maxillipeds** and **first maxillipeds** are located, normally covered by the third maxillipeds in life. Two smaller feeding appendages are situated below the 3 pairs of maxillipeds: the first maxilla (or maxilla) and second maxilla (or maxillules). Finally, the mouth is bordered by a pair of well-calcified, jaw-like, and highly modified appendages, the **mandibles**.

The 5 pairs of locomotory appendages of a crab (the pereiopods) are made up of a pair of usually powerful **chelipeds** (legs carrying a **chela** or **pincer**) and normally of 4 pairs of **walking** (or ambulatory) **legs**. For the present contribution, the first appendage is referred to as the **cheliped** and the last 4 appendages (walking legs) as **legs**. The claw (or chela) itself consists of a **palm** (or manus) and 2 **fingers**, one of which is movable (the **dactylus** or **movable finger**), whereas the other one (**pollex**) is fixed. The tips or edges of the fingers may be **pectinated**. In some families the last pair or all walking legs are modified for swimming or burrowing, as seen in the Portunidae and the Matutinae (the latter a subfamily of the Calappidae).

Adult male and female crabs are easily distinguished by the shape of their **abdomen**. In males, the abdomen is triangular to broadly T-shaped, whereas in females it is broad, usually semicircular, often covering most part of the ventral surface. Almost all crabs have 7 **abdominal segments** (although the seventh segment or **telson** is actually not a true segment), but in a number of families, several segments are partially or completely fused. This fusion may be complete (i.e. with the sutures between segments no longer visible) or incomplete (i.e. with parts of the sutures still present or obscure). In both cases, however, the segments are immovable.

Many crab species show a sexual dimorphism, with the males usually being larger or possessing special or excessively developed structures. In some species, however, it is the female which grows larger. Males possess **2 pairs** of **gonopods**, that is, modified pleopods specifically adapted for copulation (most crabs practice internal fertilization). The pleopods (abdominal appendages) of females are branched, setose and serve to carry the eggs: fertilized eggs are exuded, attached to the setose pleopods of females, and kept there for several weeks until the planktonic larvae (zoeae) hatch out. The larvae pass several stages before they finally metamorphose to a young crab.

Many species of crabs possess **pubescence** to varying degrees on their body and appendages. The hair (or more appropriately called **setae**) may be soft or stiff, simple or plumose (plume-like), or so short that it becomes pile-like, sometimes even short and dense, giving a velvet-like appearance. The setae may sometimes be hard and spine-like, especially on the propodus and dactylus of legs. Unlike real spines, however, those stiff setae are never calcareous. Majids often possess hook-like setae that attach to sponges, algae, and debris (similar in action to velcro), supporting the camouflage of the crab. In other species, the longer and/or plumose setae gather dirt and mud in order to obscure the animal's outline. Most of the softer setae on the legs and chelae have a sensory function.

Carapace types

The shape of the carapace is often used as a descriptive character in many guides and keys. Unfortunately, a large variety of terms have been introduced in the past, not always applied with exactly the same meaning. Therefore, an approximate categorization has been attempted here and those carapace types which belong to a respective category are illustrated below. It should be remembered, however, that there are sometimes no clear lines separating the different carapace types, and so the designation of a particular type may be somewhat subjective in certain cases. Nevertheless, the use of carapace shapes is still a useful character in many instances.

The carapace types utilized here are shown in Figures A to N.

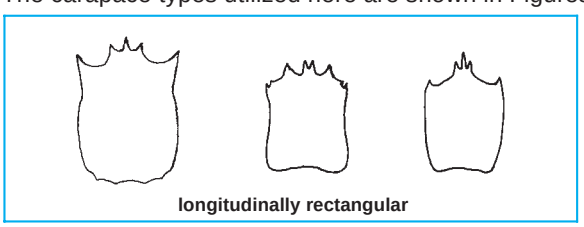


Figure A

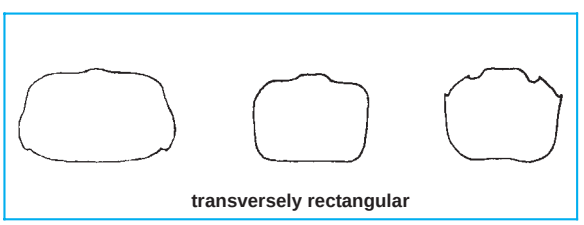


Figure B

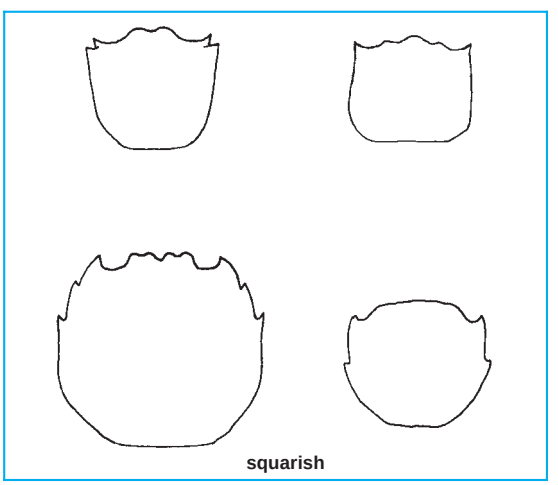


Figure C

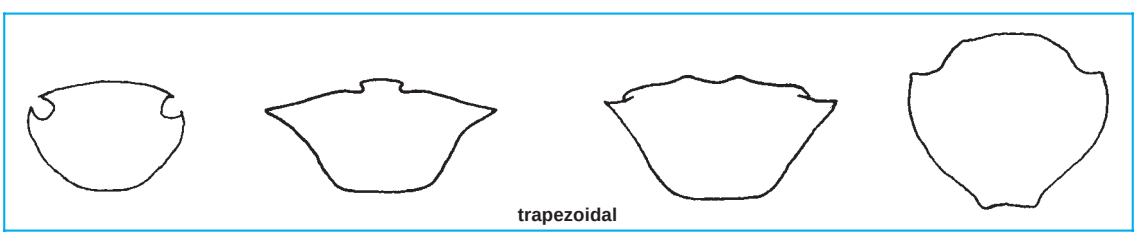


Figure D

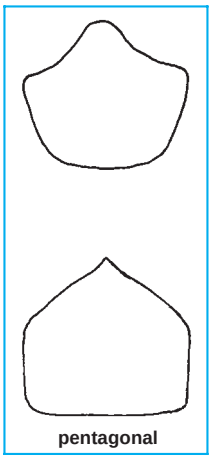


Figure E

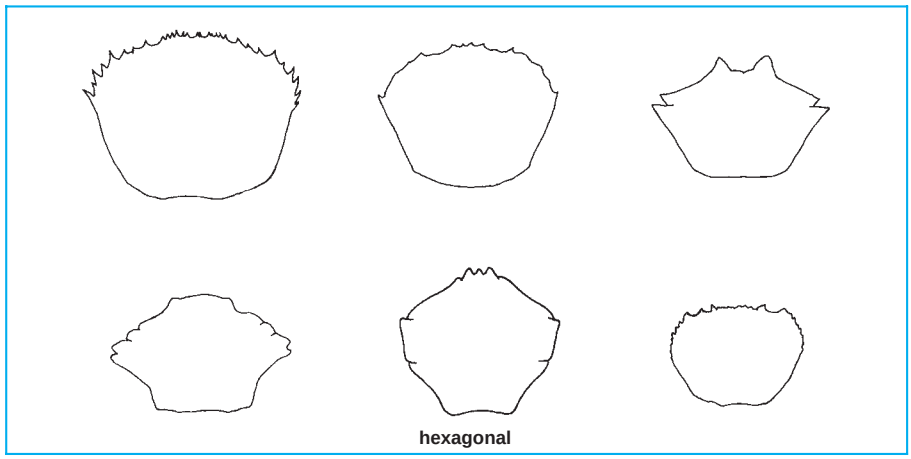


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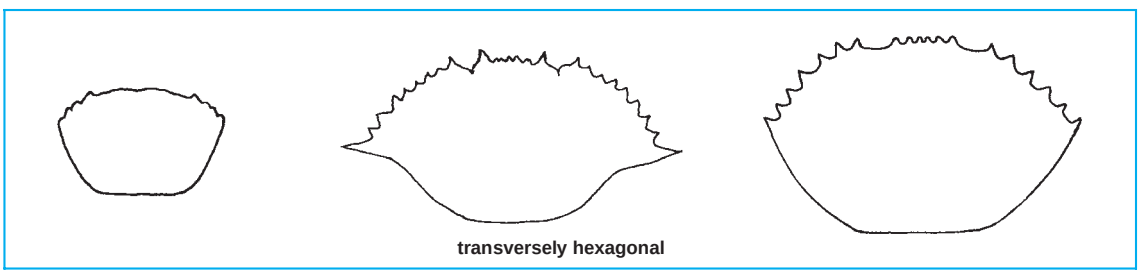


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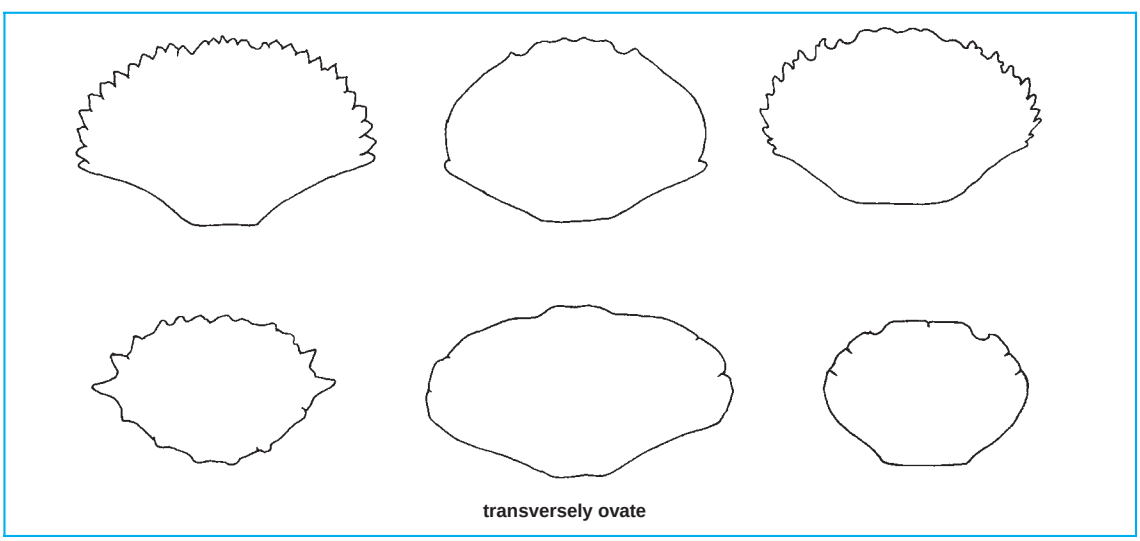


Figure H

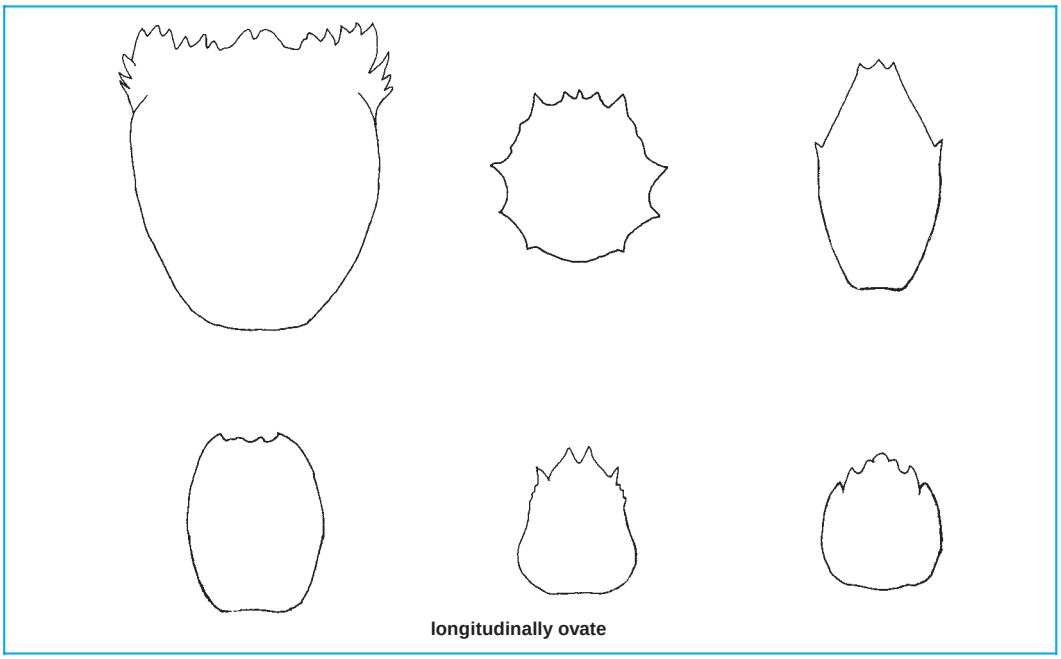


Figure I

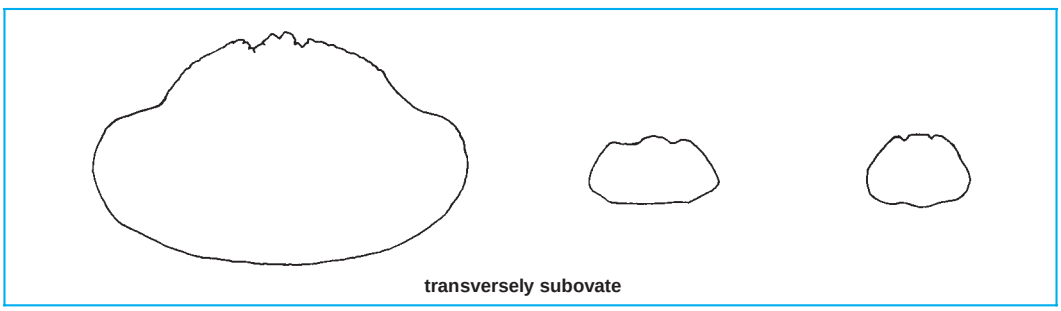


Figure J

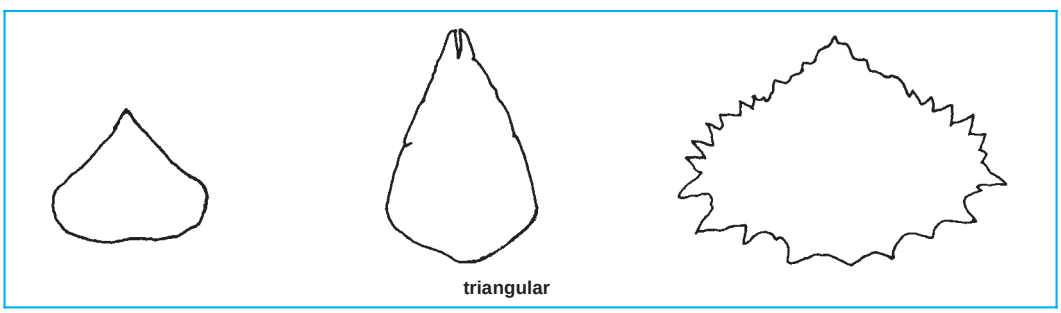


Figure K

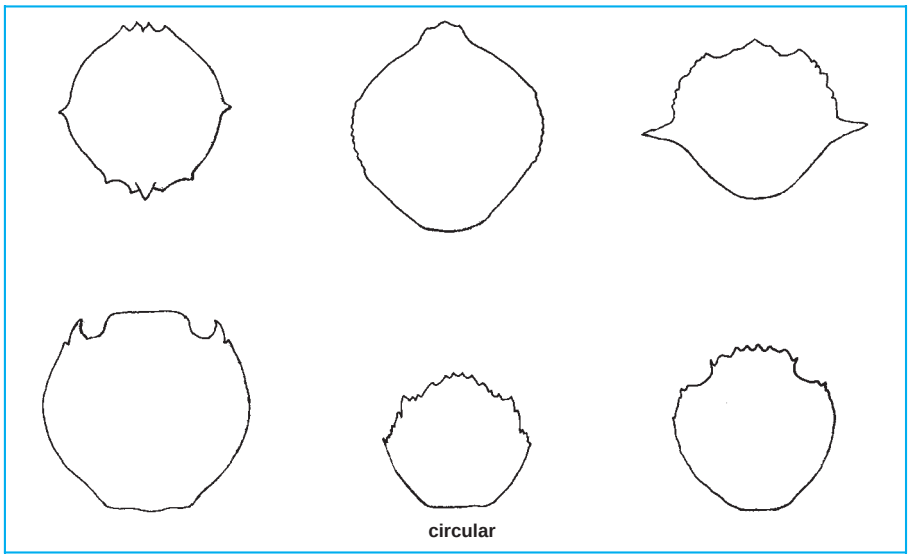


Figure L

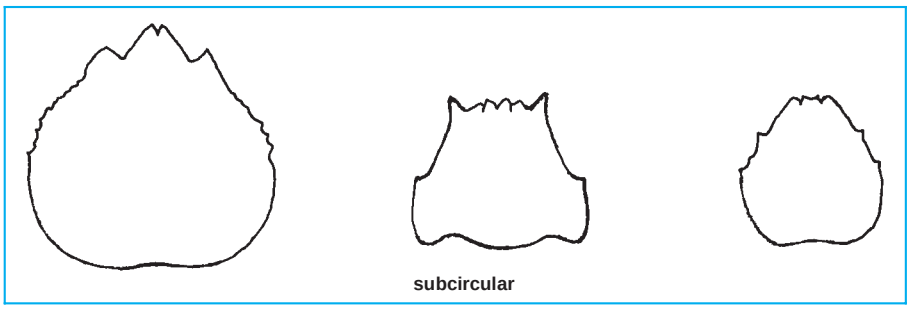


Figure M

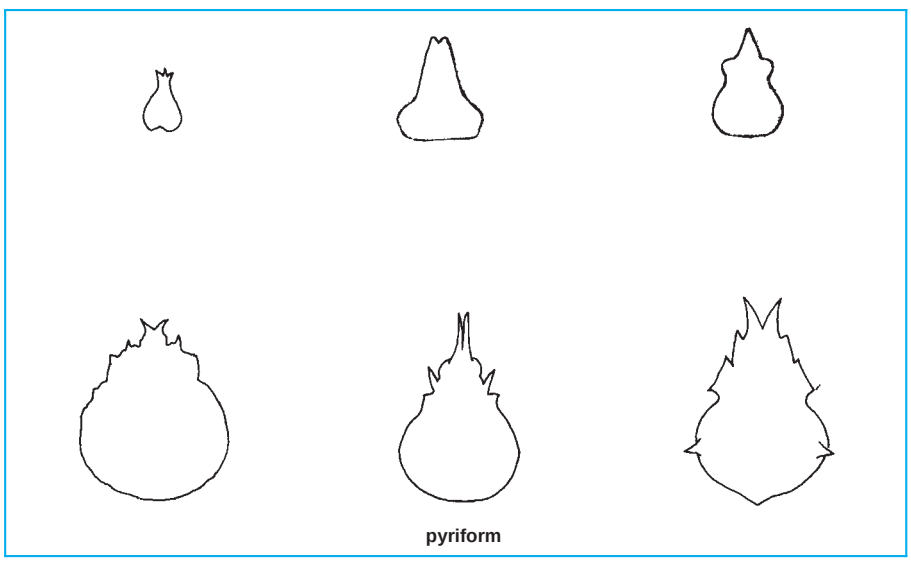
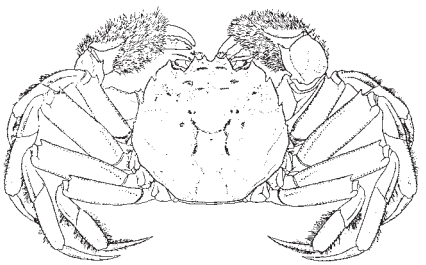


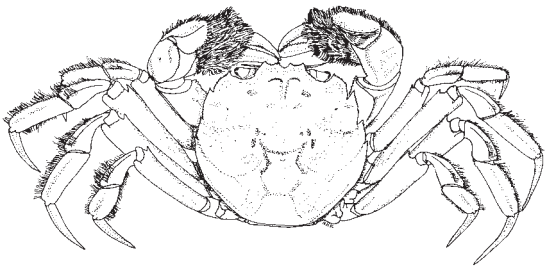
Figure N

IMPORTED CRABS OF COMMERCIAL IMPORTANCE

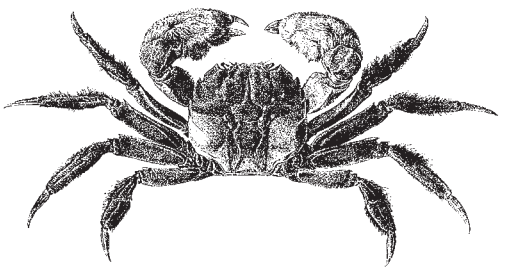
Several species of non-Western Central Pacific crabs are regularly imported into the area, notably to Singapore, Malaysia, and Thailand. They command very high market values and are popular not only among locals but also the relatively large expatriate community (especially Japanese) in these countries. In most cases, they are brought in alive for better value and for the live-seafood restaurant trade. Therefore, one would probably frequently encounter these species in markets or retailers. The main species imported are "Chinese mitten or hairy crabs" (*Eriocheir sinensis*, *E. hepuensis*), "Japanese mitten crab" (*E. japonicus*), "giant Tasmanian crab" (*Pseudocarcinus gigas*), "snow crab" (*Chionoecetes opilio* and *C. japonicus*), "queen crab" (*Erimacrus isenbeckii*), and "Alaskan king crab" (*Paralithodes camtschaticus*).



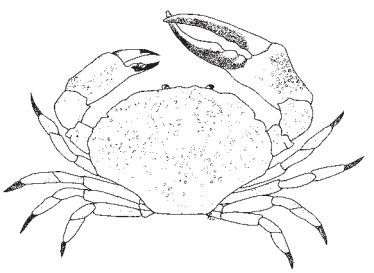
Eriocheir sinensis
(from Shen, 1932)



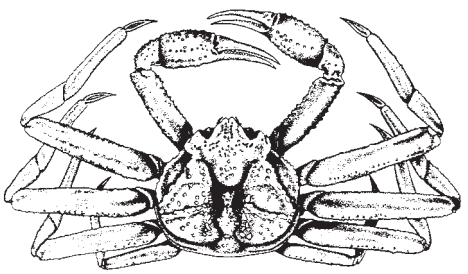
Eriocheir hepuensis



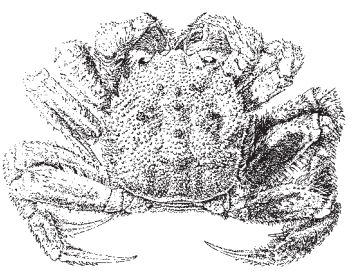
Eriocheir japonicus
(from De Haan, 1833)



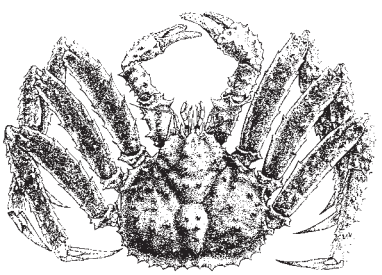
Pseudocarcinus gigas



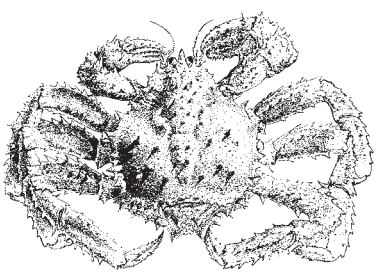
Chionoecetes opilio
(after Kobyakowa, 1955)



Erimacrus isenbeckii
(after Kobyakowa, 1955)



***Paralithodes camtschaticus* (male)**



***Paralithodes camtschaticus* (female)**

(after Kobyakowa, 1955)

click for next page

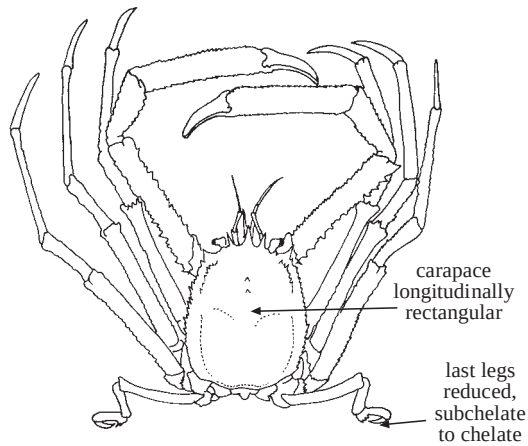
GUIDE TO FAMILIES OF INTEREST TO FISHERIES OCCURRING IN THE AREA

HOMOLIDAE

Page 1083

Deep-water carrier crabs

Carapace longitudinally rectangular; dorsal surface granulose to spinose; front narrow, usually with 3 long horn-like projections (rostra). Male chelipeds long. Last pair of legs inserted obliquely on carapace and directed upwards, reduced, subchelate to chelate, modified to carry sponges. All male abdominal segments distinct, movable.

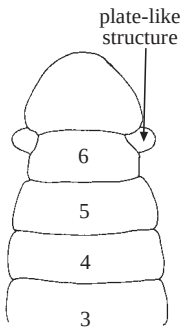


DROMIIDAE

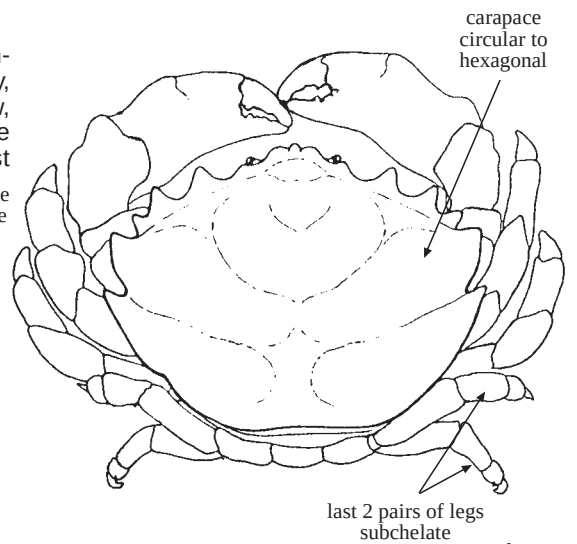
Page 1085

Sponge crabs

Carapace circular to hexagonal; dorsal surface gently to strongly convex longitudinally and transversely, smooth or granular, usually setose; front narrow, usually entire; anterolateral margins of carapace strongly convex, unarmed, or with small spines. Last 2 pairs of legs inserted obliquely on carapace and directed upwards, strongly reduced, subchelate, modified to carry sponges or tunicates on back of carapace. All male abdominal segments distinct, movable; a small platelet-like structure usually intercalated between edges of sixth abdominal segment and telson. Male first gonopod stout, simple; male second gonopod long, usually subequal or longer than length of male first gonopod. Male and female genital openings sternal.



male abdomen

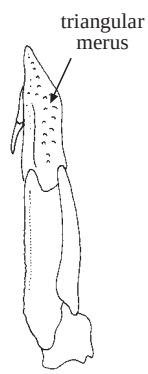


RANINIDAE

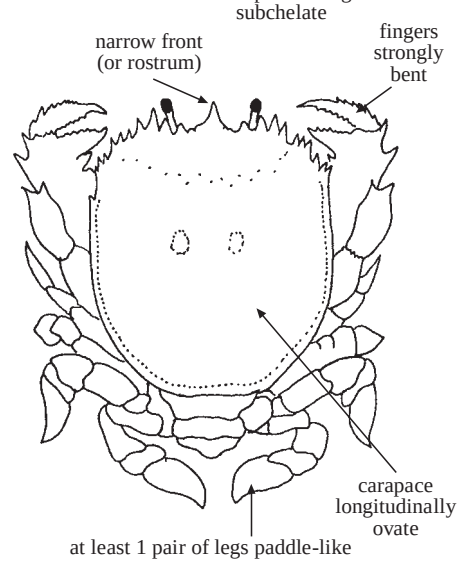
Page 1089

Spanner crabs

Carapace longitudinally ovate; dorsal surface strongly granulose or squamose to smooth; front triangular, narrow. Third maxillipeds very narrow, merus distinctly triangular. Eyestalks long, longer than front. Fingers of chela strongly bent; at least 1 pair of legs with last 2 or 3 segments paddle-like. Thoracic sternum very narrow, especially sternites 5 to 7. All male abdominal segments distinct, movable.



right 3rd maxilliped

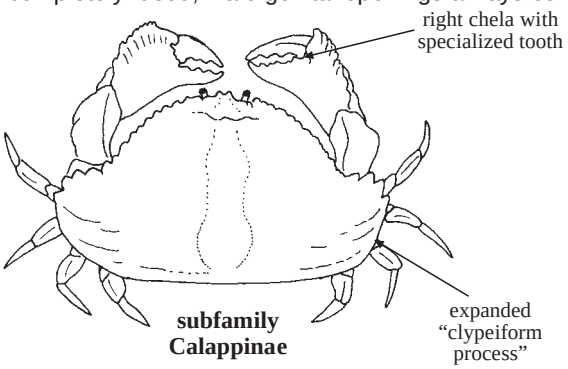


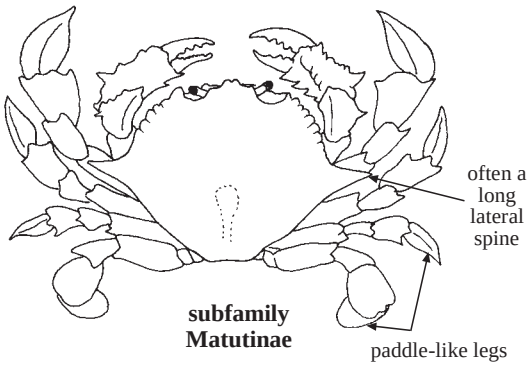
CALAPPIDAE

Page 1091

Box and moon crabs

Carapace circular, ovate to transversely ovate and subovate, sides of carapace may be expanded to form a clypeiform process (= expanded posterior edge). Merus of third maxillipeds distinctly triangular; opening for afferent respiratory current at base of chela, no canal present along sides of buccal cavern even when third maxillipeds pushed aside. Larger chela may have specialized cutting tooth for cutting gastropod shells. Propodus and dactylus of legs may be paddle-like. Male abdominal segments 3 to 5 completely fused; male genital openings always coxal.



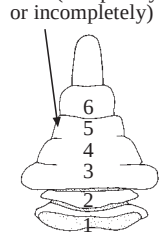


XANTHIDAE

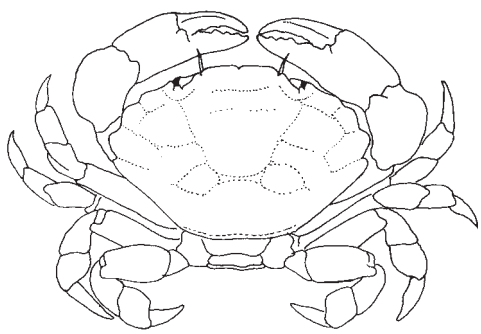
Page 1098

Stone and mud crabs

Carapace hexagonal, transversely hexagonal to transversely ovate, sometimes circular; dorsal surface usually ridged or granulose; frontal margin usually notched medially; usually 2 to 6 spines, teeth and/or lobes on each anterolateral margin. Longitudinal ridges which define efferent respiratory current usually absent or strong only on posterior part of endostome, ridges not visible on anterior part of endostome when mouthparts pushed aside. Fingers of chela may be spoon-tipped. Legs varying in structure; propodus and dactylus may show a special dactylo-propodal articulation. Male abdominal segments 3 to 5 immovable, fused completely or incompletely. Male first gonopod slender, slightly sinuous; male second gonopod very short, less than 1/4 the length of male first gonopod.



male abdomen

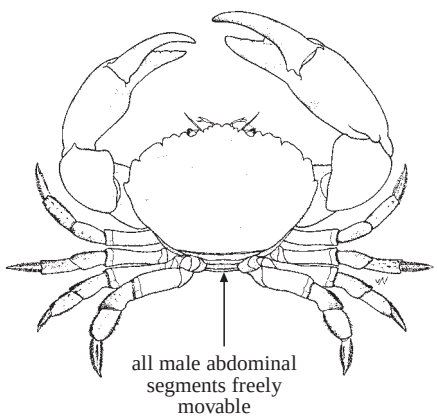


ERIPHIIDAE

Page 1103

Stone and mud crabs

Carapace hexagonal, transversely rectangular to transversely ovate; dorsal surface ridged or granulose; frontal margin notched medially; 4 teeth and/or lobes on each anterolateral margin. Legs normal. Longitudinal ridges which define efferent respiratory current well developed along entire endostome, ridges visible on anterior part of endostome when mouthparts pushed aside. All male abdominal segments distinct, movable. Male first gonopod stout, almost straight or gently curved; male second gonopod elongate, longer or subequal in length to male first gonopod.

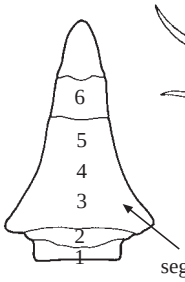


CARPILIIDAE

Page 1110

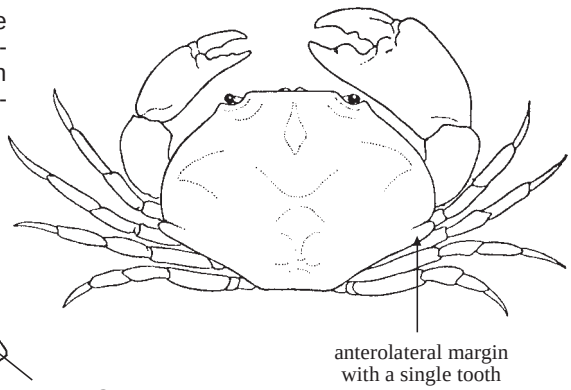
Reef crabs

Carapace transversely ovate; dorsal surface smooth, distinctly convex longitudinally and transversely; front entire; a single low, small tooth on each anterolateral margin. Legs simple. Longitudinal ridges which define efferent respiratory current usually absent or strongly developed on posterior part of endostome only; ridges not clearly visible on anterior part of endostome when mouthparts pushed aside. Male abdominal segments 3 to 5 immovable, completely fused. Male first gonopod stout, almost straight or gently curved; male second gonopod elongate, longer or subequal in length to male first gonopod.



segments 3-5 completely fused

male abdomen



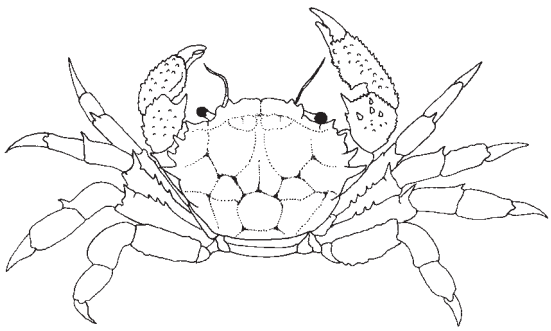
anterolateral margin with a single tooth

PILUMNIDAE

Page 1112

Hairy crabs

Carapace hexagonal, transversely rectangular or transversely ovate; dorsal surface convex, smooth to granulated; frontal margin entire to multilobate; usually 1 to 4 teeth or lobes on each anterolateral margin. Longitudinal ridges defining efferent respiratory current usually well developed along entire endostome, ridges visible on anterior part of endostome when mouthparts pushed aside. Legs normal. Male abdominal segments 3 to 5 freely movable. Male first gonopod slender, S-shaped, distal part simple; male second gonopod very short, sigmoid.



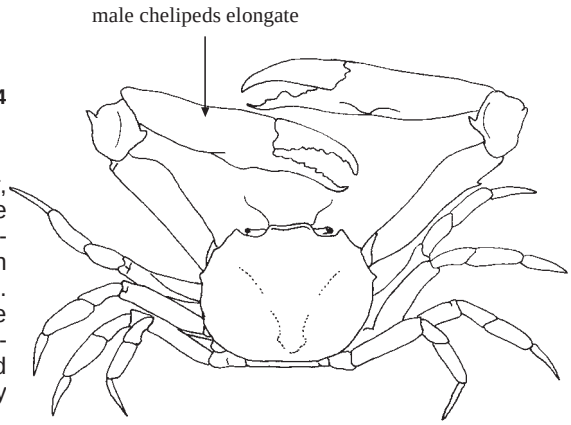
male chelipeds elongate

GONEPLACIDAE

Page 1114

Rhomboid crabs

Carapace hexagonal, transversely rectangular, trapezoidal, or transversely ovate; dorsal surface convex, usually smooth; frontal margin usually entire, sometimes multilobate; anterolateral margin usually armed with 1 to 4 teeth or lobes, or entire. Male abdominal segments 3 to 5 distinct, movable or fused and immovable. Male first gonopod moderately stout, gently curved or sinuous; male second gonopod relatively short to elongate, but usually shorter than male first gonopod.

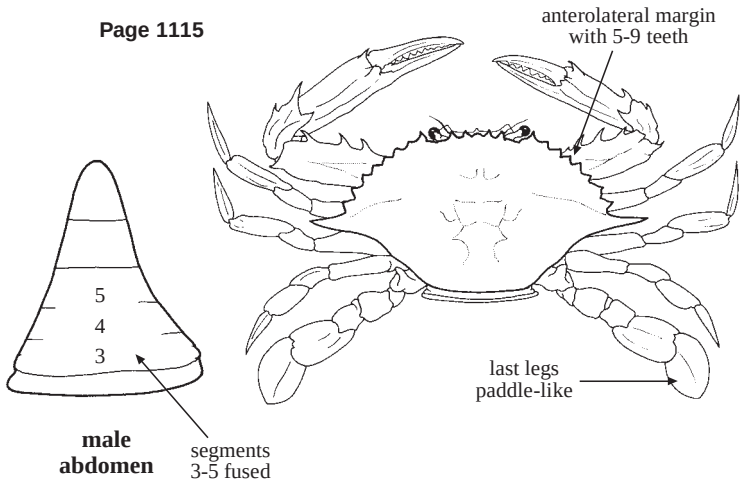


PORTUNIDAE

Page 1115

Swimming crabs

Carapace hexagonal, transversely ovate to transversely hexagonal, sometimes circular; dorsal surface relatively flat to gently convex, usually ridged or granulose; front broad, its margin usually multidentate; usually 5 to 9 teeth on each anterolateral margin of carapace; posterolateral margins usually distinctly converging. Legs laterally flattened to varying degrees, last 2 segments of last pair paddle-like. Male abdominal segments 3 to 5 completely fused, immovable.

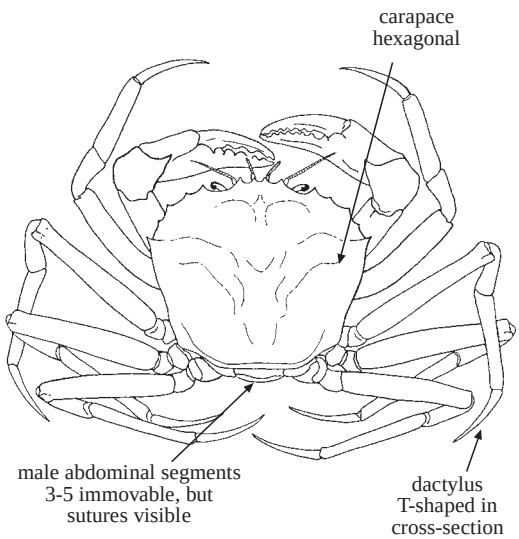


GERYONIDAE

Page 1132

Golden crabs

Carapace hexagonal; dorsal surface relatively smooth to granular; frontal margin with 4 teeth; anterolateral margins distinctly convex, each with 3 to 5 low, sometimes indistinct teeth. Dactylus of walking legs T-shaped in cross-section. Male abdominal segments 3 to 5 fused, functionally immovable, but sutures still visible.

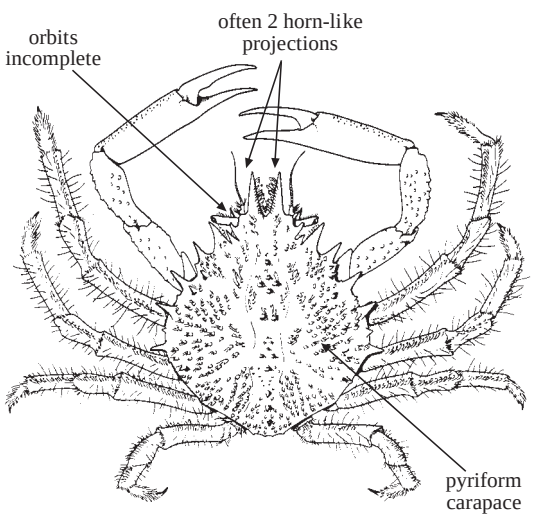


MAJIDAE

Page 1136

Spider crabs

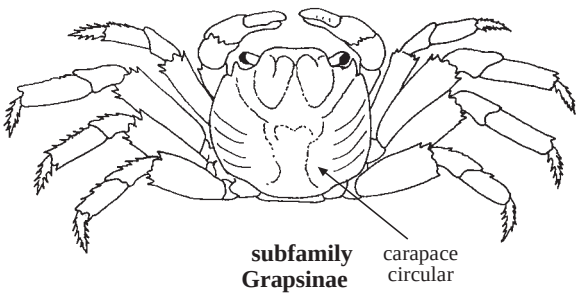
Carapace pyriform, circular to subovate, anterior 1/2 to 1/3 usually distinctly narrower than posterior part; dorsal surface gently convex, spinulose, granulose and/or ridged; front narrow, often with 2 long horn-like projections (rostra); orbits poorly developed to absent; anterolateral margins of carapace often armed with well-developed spines. Legs spinulose and/or granulose, often with stiff setae. All male abdominal segments usually freely movable in most species.



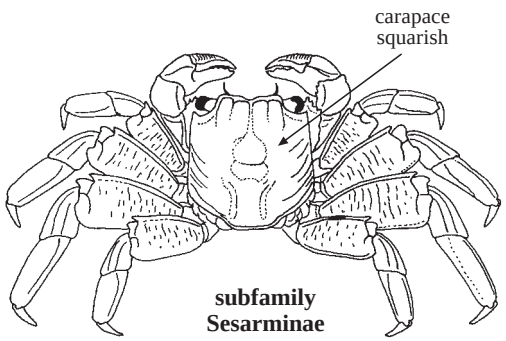
GRAPSIDAE **Page 1138**

Sally-light-foots, vinegar crabs, and paddler crabs

Carapace squarish, transversely rectangular, trapezoidal or circular; dorsal surface flat to gently convex, with low oblique or transverse ridges; front much broader than orbits; orbits occupying almost entire anterior border (excluding front); antero- and posterolateral margins of carapace usually not clearly demarcated, lateral margins appearing almost straight or gently convex, usually armed with 1 or 2 teeth anteriorly. Rhomboidal gap usually present between third maxillipeds; mandibles often exposed. Dactylus of legs with distinct spines. Male abdominal segments 3 to 5 freely movable in most species.



subfamily Grapsinae

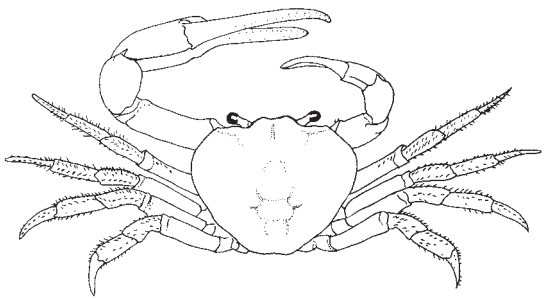


subfamily Sesarminae

GECARCINIDAE **Page 1147**

Land crabs

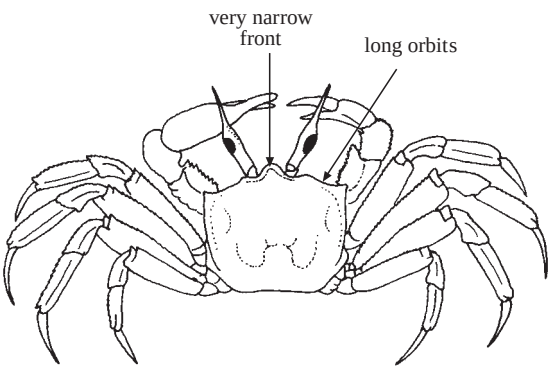
Carapace circular to transversely ovate; dorsal surface smooth, strongly convex longitudinally and transversely; frontal margin entire; anterolateral margins unarmed or each with a single tooth; rhomboidal gap present between the third maxillipeds. Legs stout, dactylus longitudinally ridged, often with dense, stiff setae, margins with spines. All male abdominal segments distinct, movable.



OCYPODIDAE **Page 1152**

Ghost crabs

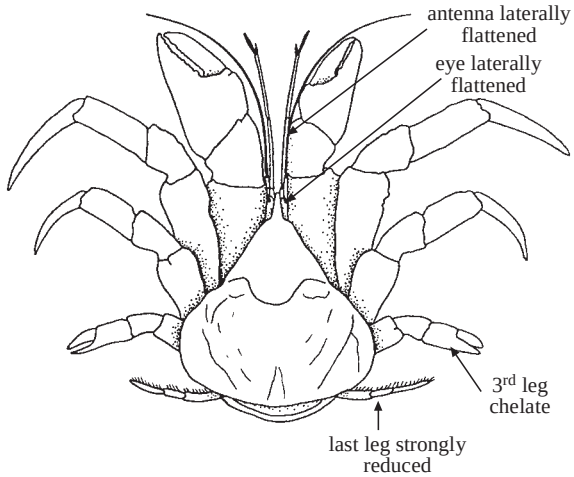
Carapace squarish, transversely rectangular, trapezoidal or transversely ovate; dorsal surface gently convex, usually smooth or with grooves; frontal margin entire, relatively narrow; orbits broad, occupying almost entire anterior border (excluding the front), antero- and posterolateral margins of carapace usually not clearly demarcated, lateral margins appearing almost straight or gently convex, lateral margins unarmed. Eyestalks long, longer than width of orbit. No rhomboidal gap between third maxillipeds. Dactylus of legs with numerous stiff setae. Ventral surface of abdomen or base of legs may have tufts of fine setae. All male abdominal segments distinct, movable.



COENOBITIDAE **Page 1154**

Land hermit crabs and coconut crabs

Carapace relatively well calcified; eyestalk laterally flattened; eyes usually held subparallel to each other. Antennae laterally flattened. Coxae of third maxillipeds close to each other, without distinct gap between them. Chelipeds short, stocky, equal or unequal; when unequal, left chela larger. First 2 pairs of walking legs well developed, last 2 pairs reduced, third legs chelate. Abdomen bilaterally asymmetrical, not clearly divided into segments. Either hermit crabs or distinctly crab-like animals with abdomen tucked under carapace; uropods modified into a "rasp" used for clinging interior of gastropod shells (except in *Birgus latro*).



KEY TO THE FAMILIES OF BRACHYURAN CRABS

Note: the following key covers all marine families of brachyuran crabs recognized in this work, most of which have been reported from the Western Central Pacific. The 5 families which so far are known only from other regions of the world have been included in the anticipation that some of them may be recorded in the future from the area. Wherever possible, external and easily viewed characters are utilized, and in most cases, no smaller structures have been chosen, such as male gonopods and structures of male and female genitalia (which are very important in crab classification). Due to the diversity in some families (e.g. Xanthidae and Goneplacidae), not all their members can be identified to the family level with this key, although it should work for the majority of species encountered. There are also a number of unusual species, the familial classification of which is still contentious. For a more comprehensive key, see Sakai (1976) and Dai and Yang (1991). For the identification of some more difficult species, the only safe way is to send the sample(s) to an expert of decapod taxonomy.

1a. Only 3 pairs of legs visible, fourth pair absent (Fig. 1) . . . . . **Hexapodidae**

1b. Four pairs of legs visible . . . . . → **2**

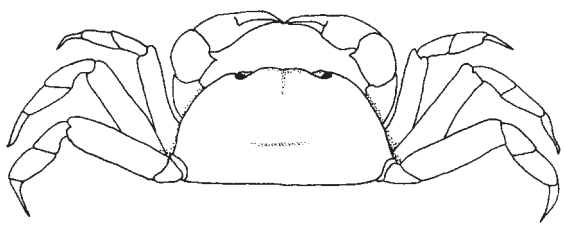


Fig. 1 Hexapodidae

2a. Basal segment of eyestalk much longer than terminal article, from dorsal view, eyestalk appears to be 2-segmented (Figs 2a and 3) . . . **Latreillidae**

2b. Basal segment of eyestalk much shorter than terminal article, from dorsal view, eyestalk appears to be unsegmented (Fig. 2b) . . . . . → **3**

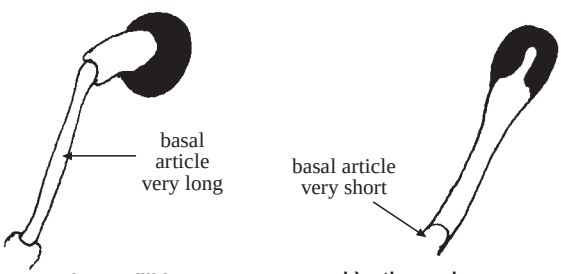


Fig. 2 eyestalk

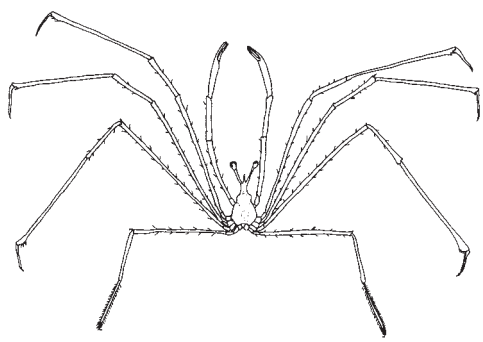


Fig. 3 Latreillidae

3a. Fourth (last) last pair of legs distinctly subchelate to chelate (Fig. 4a-f) or strongly reduced to just 3 articles, inserted obliquely on carapace and directed upwards . . . . . → **4**

3b. Fourth (last) last pair of legs normal in structure or reduced in size but not subchelate or chelate (Fig. 4g) and never reduced to just 3 articles, inserted laterally on carapace and directed laterally . . . . . → **10**

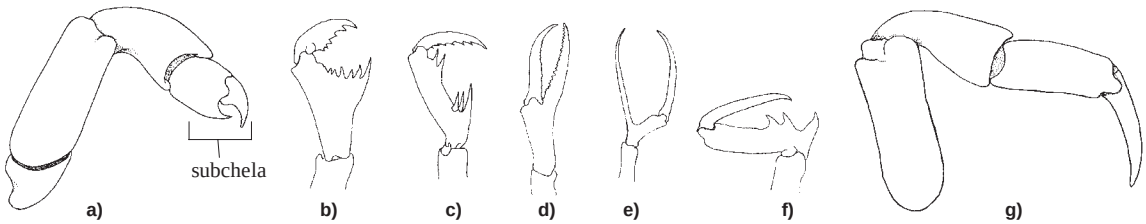


Fig. 4 last leg: (a-f) various types of subchelate to chelate conditions of propodus and dactylus; (g) normal leg

4a. Merus of third maxilliped distinctly triangular in shape (Fig. 5a) . . . . . → **5**

4b. Merus of third maxilliped quadrate to subquadrate, never clearly triangular in shape (Fig. 5b, c). . . . . → **7**

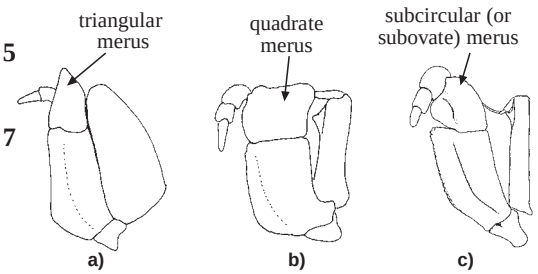


Fig. 5 third maxilliped

5a. Third maxillipeds not covering a large anterior part of buccal cavern which is normally filled by the exposed second maxillipeds (Fig. 6a); crab carries inanimate objects (e.g. shells and leaves) or sea anemones (Fig. 7) . . . **Dorippidae**

5b. Third maxillipeds covering or almost completely covering anterior part of buccal cavern, second maxillipeds always covered and not exposed (Fig. 6b); crab usually carries pieces of inanimate objects (e.g. dead shells and sticks) when alive . . . . . → **6**

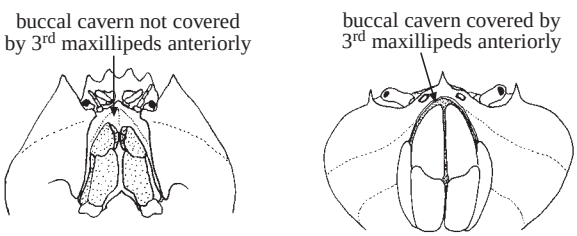


Fig. 6 mouth field

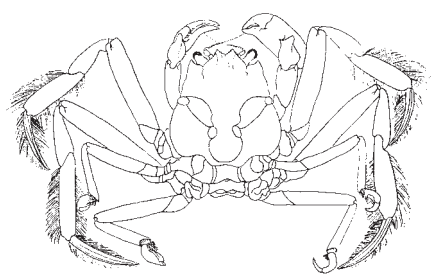


Fig. 7 Dorippidae (after Shen, 1932)

6a. Carapace hexagonal to subovate (Fig. 9); orbits distinct; exopod of third maxilliped usually without flagellum (Fig. 8a). . . . . **Cyclodorippidae**

6b. Carapace rectangular to squarish (Fig. 10); orbits absent; exopod of third maxilliped with distinct flagellum (Fig. 8b) . . . . . **Cymonomidae**

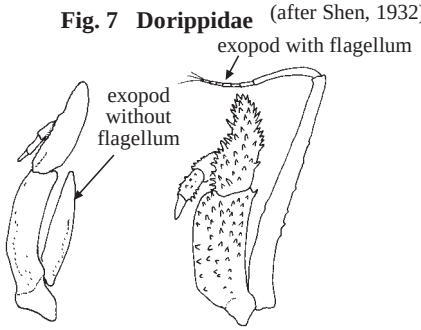


Fig. 8 third maxilliped

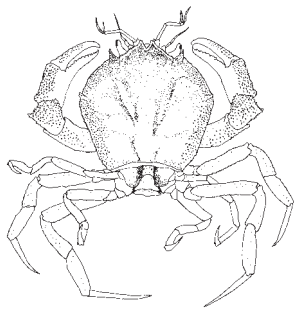


Fig. 9 Cyclodorippidae

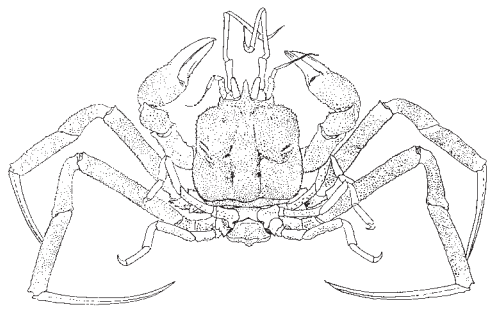


Fig. 10 Cymonomidae

7a. Carapace pyriform (pear-shaped) (Fig. 12); orbits incomplete; carapace, chelipeds, and legs often with hooked setae; vulvae of adult female on thoracic sternum (Fig. 11a) . . . . . **Majidae** (in part) (p. 1136)

7b. Carapace shape not as above; orbits usually complete; carapace, chelipeds, and legs without hooked setae; vulvae of adult female on coxae of third legs (Fig. 11b) . . . . . → **8**

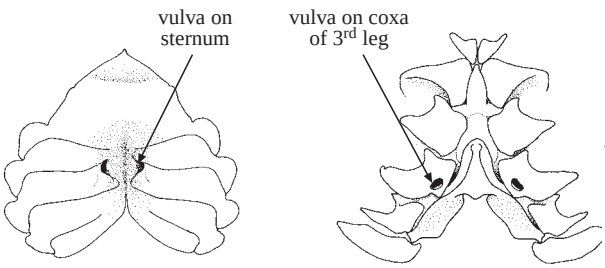


Fig. 11 position of female vulvae on ventral side of body (abdomen omitted)

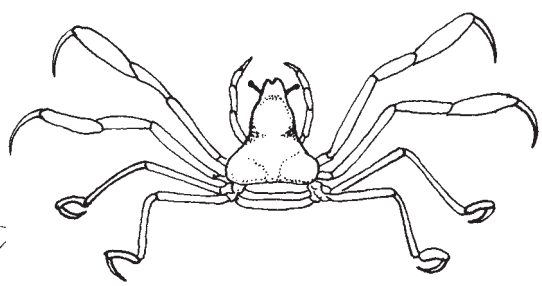


Fig. 12 Majidae

8a. Carapace longitudinally rectangular, dorsal surface glabrous or with scattered stiff setae; only fourth pair of legs with dactylus and propodus subchelate to chelate (Fig. 13) . . . . . **Homolidae** (p. 1083)

8b. Carapace longitudinally ovate, circular or hexagonal, dorsal surface usually with dense, soft setae; both third and fourth legs with dactylus and propodus subchelate to chelate; carries sponges and sea anemones when alive . . . . . → **9**

9a. Carapace circular to hexagonal; a small platelet-like structure usually intercalated between edges of sixth abdominal segment and telson (Fig. 14a); crab carries sponges, tunicates, and bivalve shells (Fig. 15) . . . . . **Dromiidae** (p. 1085)

9b. Carapace longitudinally ovate; no platelet-like structure intercalated between edges of sixth abdominal segment and telson (Fig. 14b); crab believed to carry sponges or related objects (Fig. 16) . . . . . **Homolodromiidae**

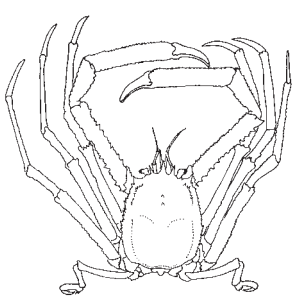


Fig. 13 Homolidae

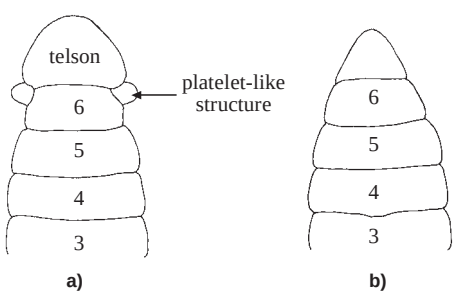


Fig. 14 male abdomen

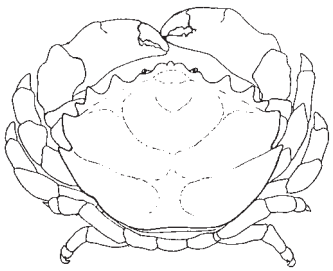


Fig. 15 Dromiidae

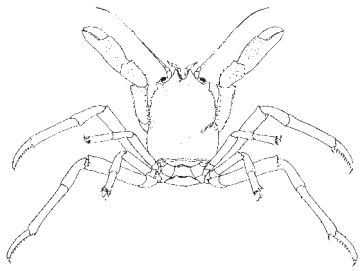


Fig. 16 Homolodromiidae
(after Alcock and Anderson, 1899)

10a. Merus of third maxilliped distinctly triangular in shape (Fig. 17a) . . . . . → **11**

10b. Merus of third maxilliped quadrate to ovoid, never distinctly triangular in shape (Fig. 17b) . . . . . → **14**

11a. Carapace longitudinally ovate; sternum very narrow, thoracic sternites 5 to 7 very narrow (Fig. 18a); fingers of chela strongly bent (Fig. 19) . . . . . **Raninidae** (p. 1089)

11b. Carapace shape not as above; sternum normal, thoracic sternites 5 to 7 not strongly narrowed (Fig. 18b); fingers of chela not strongly bent . . . . . → **12**

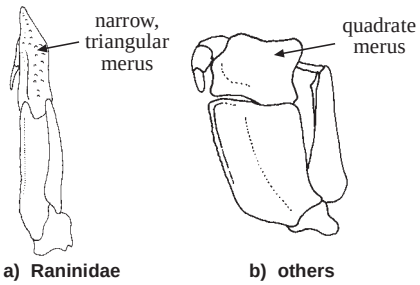


Fig. 17 third maxilliped

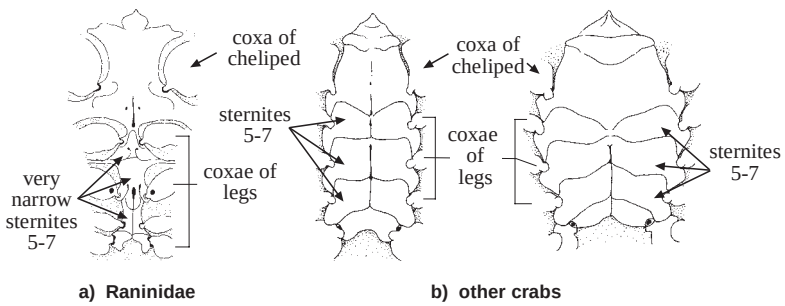


Fig. 18 thoracic sternum
(ventral side of body, between legs)

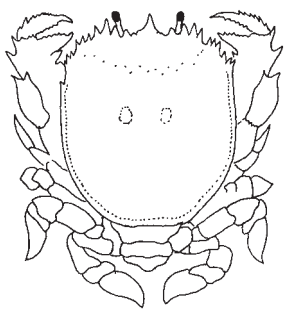


Fig. 19 Raninidae

12a. Carapace subcircular with strong teeth on lateral margins; only dactylus of fourth leg paddle-like (Fig. 21); vulvae of adult female exposed, not covered by abdomen (Fig. 20a) . . . . . **Orithyiidae**
(family not recorded from the area so far)

12b. Carapace either of differing shape, or, if subcircular, never with strong teeth on lateral margins; dactylus of fourth leg normal and styliform, or, if paddle-like, all other dactyli of legs are also similarly structured; vulvae of adult female always covered by abdomen (Fig. 20b) . . . . . → **13**

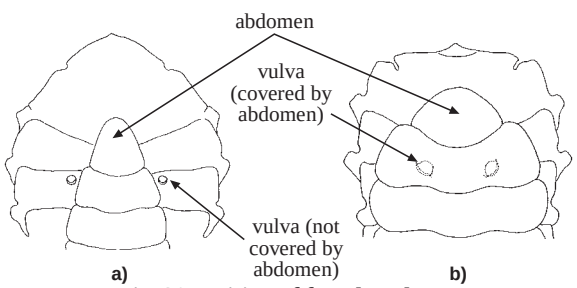


Fig. 20 position of female vulvae

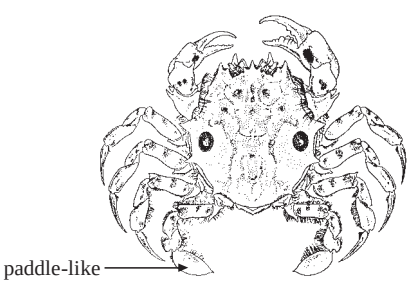


Fig. 21 Orithyiidae
(after Shen, 1932)

13a. Opening for afferent respiratory current below orbits, adjacent to endostome, with distinct canal present along sides of buccal cavern (Fig. 22a) when third maxillipeds pushed aside; sides of carapace never expanded to form a clypeiform process (= expanded posterior edge); larger chela never with specialized cutting tooth; legs never paddle-like (Fig. 23) . . . . . **Leucosiidae**

13b. Opening for afferent respiratory current at base of chela, no canal present along sides of buccal cavern even when third maxillipeds pushed aside (Fig. 22b); sides of carapace may be expanded to form a clypeiform process; larger chela may have a specialized cutting tooth (Fig. 24); propodus and dactylus of legs may be paddle-like (Fig. 25) . . . . . **Calappidae** (p. 1091)

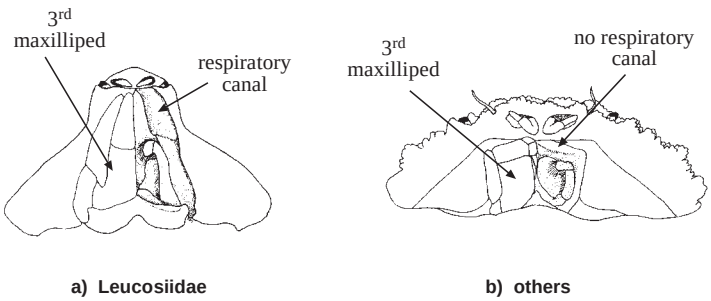


Fig. 22 presence or absence of respiratory canal

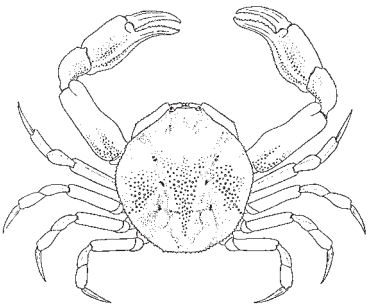


Fig. 23 Leucosiidae
(after Shen, 1932)

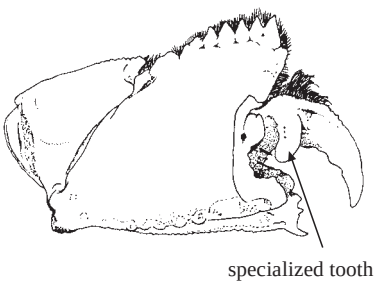


Fig. 24 right chela (Calappidae)

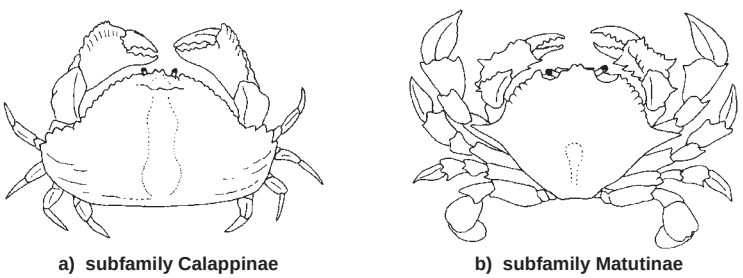


Fig. 25 Calappidae

14a. A small platelet-like structure always intercalated present between edges of sixth abdominal segment and telson (Fig. 26a); fourth leg strongly reduced, present only as a short appendage (only partially subchelate in 1 Atlantic species); no known carrying behaviour (Fig. 27) . . . . . **Dynomenidae**

14b. No platelet-like structure intercalated between edges of sixth abdominal segment and telson (Fig. 26b); fourth leg reduced but always distinct, with most segments slender, relatively long . . . . . → **15**

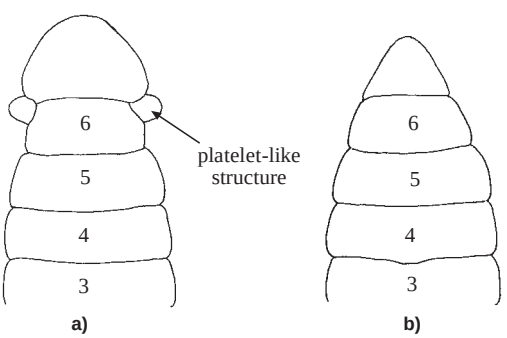


Fig. 26 male abdomen

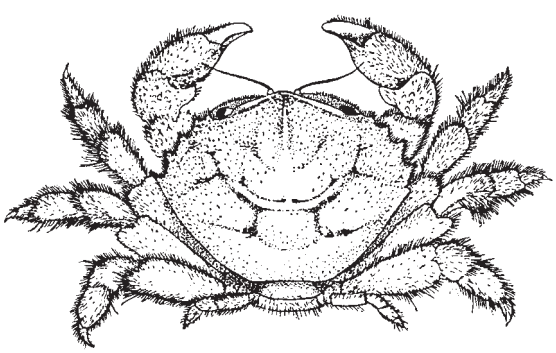


Fig. 27 Dynomenidae

15a. Fourth leg strongly reduced compared to other legs (Fig. 28a) . . . . . → **16**

15b. Fourth leg subequal to other legs, or if smaller, not greatly reduced in size compared to third leg (Fig. 28b) . . . . . → **17**

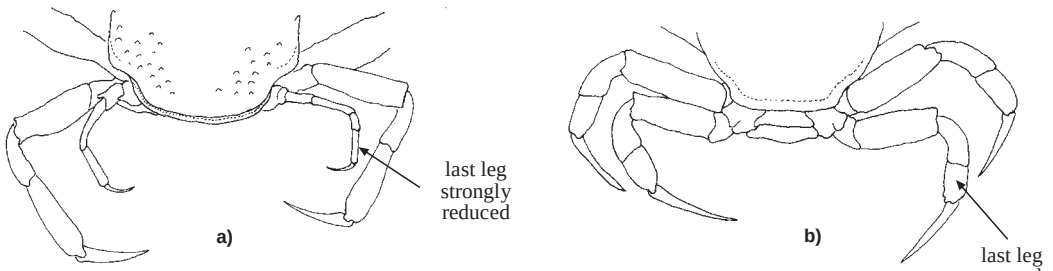


Fig. 28 last 2 pairs of legs

16a. Carapace circular; dorsal surface granulated; fourth leg reduced but normal in structure, dactylus curved, tapering to a sharp point (Fig. 29) . . . . . **Palicidae**

16b. Carapace hexagonal, dorsal surface usually with 1 or 2 distinct transverse ridges; fourth pair of legs very slender, almost filament-like, often appearing feather-like, dactylus straight, with rounded tip (Figs 30 and 31) . . . . . **Retroplumidae**

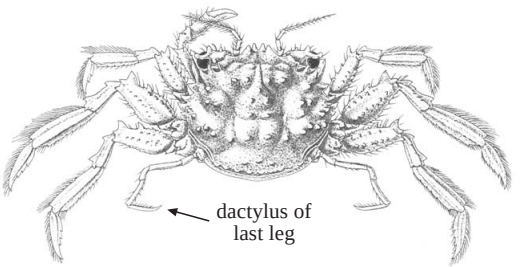


Fig. 29 Palicidae
(from Alcock and Anderson, 1899)

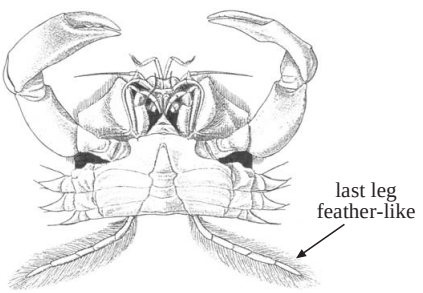


Fig. 30 Retroplumidae (ventral view)
(from Alcock and Anderson, 1899)

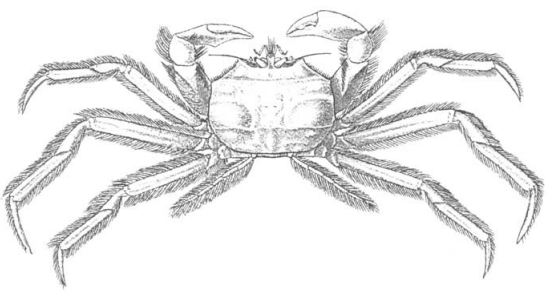


Fig. 31 Retroplumidae (dorsal view)
(from Alcock and Anderson, 1899)

17a. Carapace longitudinally rectangular (Fig. 33); female genital opening on coxa of third walking leg (Fig. 32a) . . . . . **Poupiniidae**

17b. Carapace not longitudinally rectangular; female genital opening on sternum (Fig. 32b) . . . . → **18**

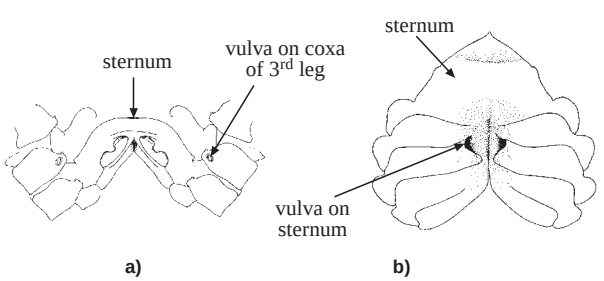


Fig. 32 position of female vulvae

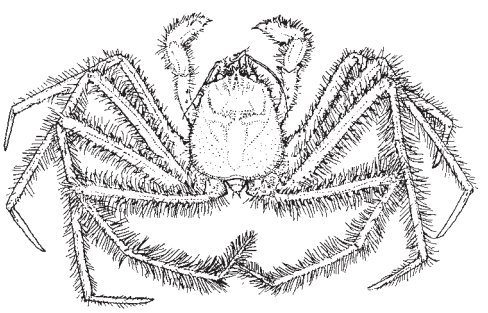


Fig. 33 Poupiniidae

18a. Antennae (excluding basal segment) strongly reduced (Figs 34a and 35) . . . . . **Belliidae**

18b. Antennae (excluding basal segment) normal, with distinct flagellum (Fig. 34b, c). . . . . → **19**

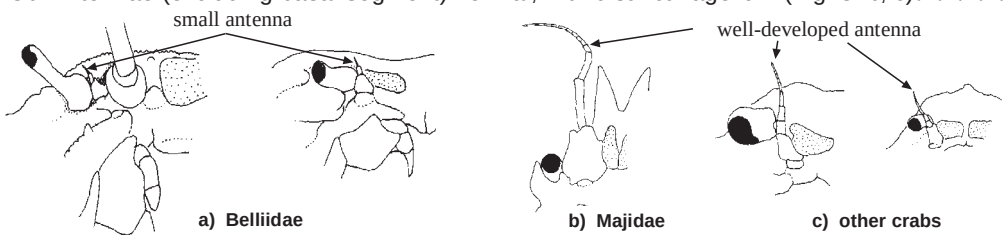


Fig. 34 front and antenna

19a. Fossae (sockets) for antennulae squarish to longer than broad, antennulae fold longitudinally or almost so (Fig. 36a, b) . . . . → **20**

19b. Fossae for antennulae broader than long, antennulae fold transversely or obliquely (Fig. 36c, d) . . . . . → **27**

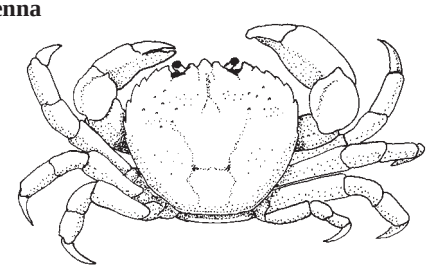


Fig. 35 Belliidae

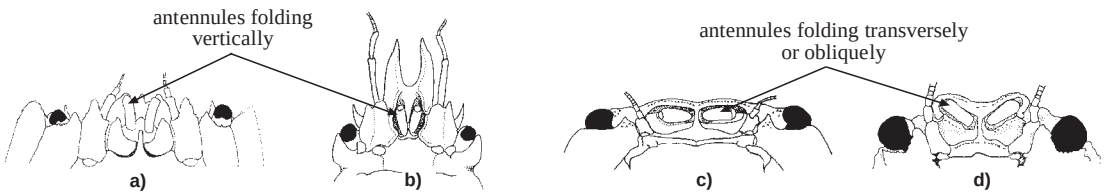


Fig. 36 anteriormost part of body (ventral view)

20a. Carapace pyriform, subpyriform, triangular, circular, or subcircular; orbits incomplete to absent (Fig. 37a) . . . . . → **21**

20b. Carapace longitudinally and transversely ovate, hexagonal, circular, or subcircular; orbits complete (Fig. 37b) . . . . → **22**

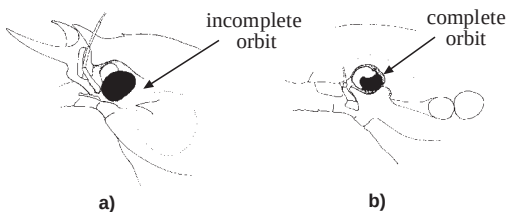


Fig. 37 orbits

21a. Carapace well calcified, dorsal surface gently to strongly convex, almost always covered with spines or granules (Fig. 40); hooked setae often present; abdomen usually with 6 segments and a telson (Fig. 38a) (rarely 5 segments and a telson); male genital openings coxal (i.e. situated at basis of coxae of fourth legs, Fig. 39a) . . . . . **Majidae** (in part) (p. 1136)

21b. Carapace poorly calcified, soft, dorsal surface flat to almost flat, never covered with spines or granules (Fig. 41); hooked setae absent; abdomen always with only 5 segments and a telson (Fig. 38b) (or fewer segments, some completely fused); male genital openings sternal (Fig. 39b) . . . . . **Hymenosomatidae**

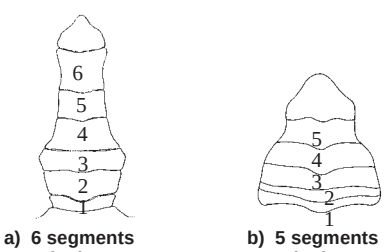


Fig. 38 abdomen

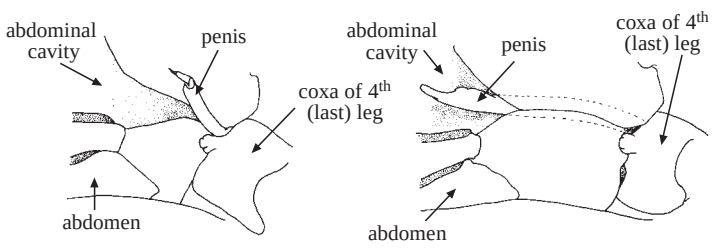


Fig. 39 position of male genital opening

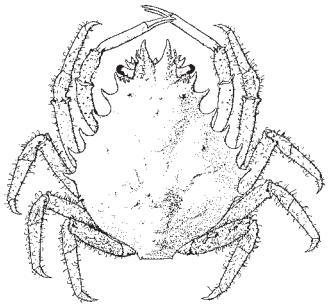


Fig. 40 Majidae

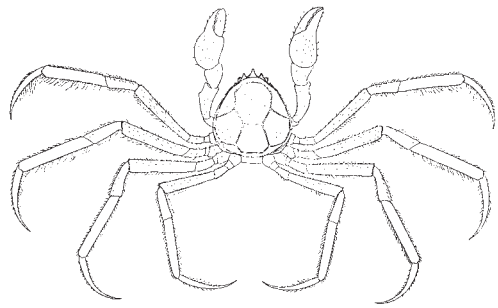


Fig. 41 Hymenosomatidae
(after Shen, 1932)

22a. Antennal flagellum distinctly setose (Fig. 42a) . . . . . → **23**

22b. Antennal flagellum slightly setose to glabrous (Fig. 42b) . . . . . → **26**

23a. Front entire, without teeth or lobes; anterolateral and posterolateral margins of carapace lined with dense, long setae forming distinct fringe (Fig. 43) . . . . . **Thiidae**
(family not recorded from the area so far)

23b. Front with teeth or lobes; anterolateral and posterolateral margins of carapace with relatively dense setae, but not forming distinct fringe . . . . . → **24**

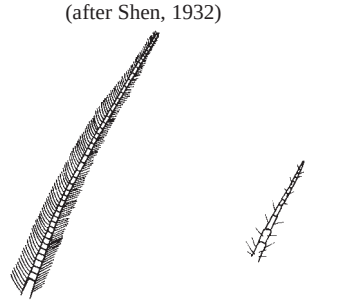


Fig. 42 antennal flagellum

24a. Antennae very long, longer than or as long as carapace length, strongly setose (Fig. 44). . **Corystidae**

24b. Antennae short, much shorter than carapace length, not strongly setose. . . . . → **25**

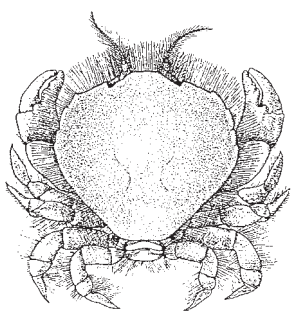


Fig. 43 Thiidae
(after Christiansen, 1969)

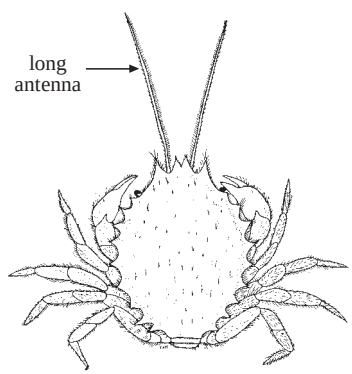


Fig. 44 Corystidae

25a. Carapace usually rounded to longitudinally ovate; vulvae of adult female completely covered by abdomen (Figs 45a and 46) . . . . **Atelecylidae**

25b. Carapace squarish to hexagonal; vulvae of adult female exposed, not covered by abdomen (Figs 45b and 47) . . . . . **Cheiragonidae**
(family not recorded from the area so far)

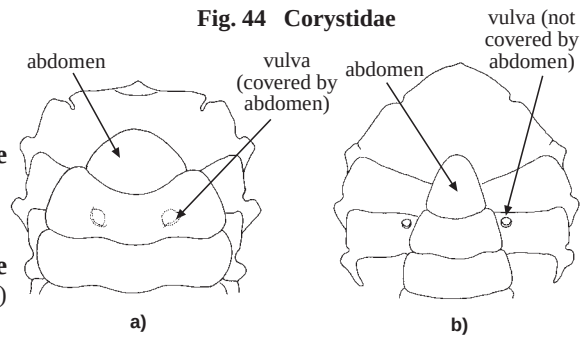


Fig. 45 position of female vulvae

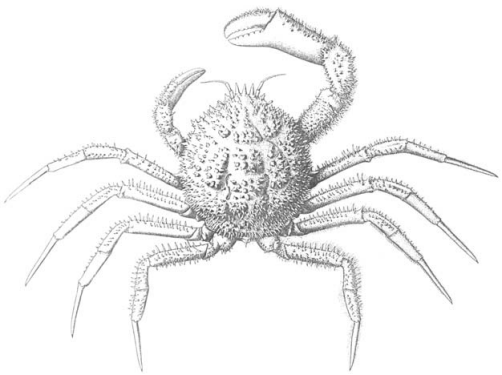


Fig. 46 Atelecylidae
(after Alcock and Anderson, 1899)

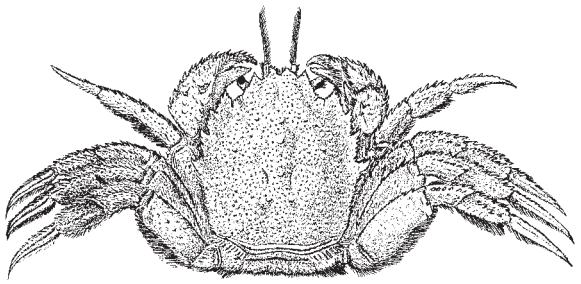


Fig. 47 Cheiragonidae
(after Sakai, 1976)

26a. Carapace hexagonal, its width and length subequal; front broad compared to maximum carapace width; anterolateral margins of carapace weakly convex, each with 4 or 5 well-developed teeth (Fig. 48) . . . . . **Pirimelidae**
(family not recorded from the area so far)

26b. Carapace transversely ovate; front narrow compared to maximum carapace width; anterolateral margins of carapace strongly convex, each usually with well-defined teeth or lobes (Fig. 49) . . . . . **Cancridae**

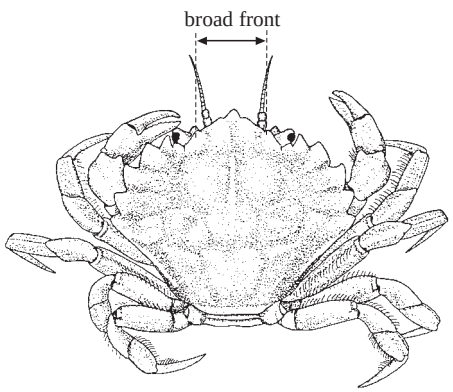


Fig. 48 Pirimelidae
(after Christiansen, 1969)

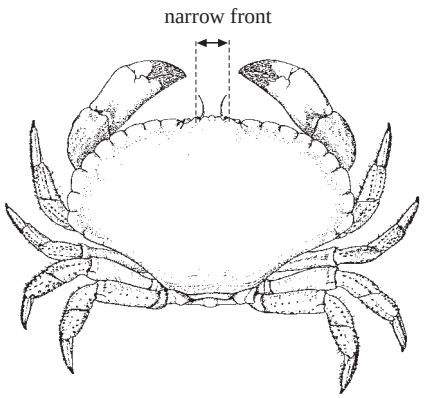
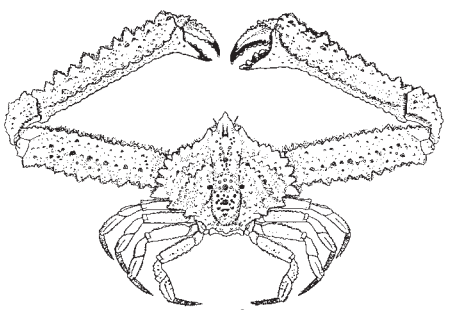


Fig. 49 Cancridae
(after Christiansen, 1969)

27a. Carapace triangular or hexagonal; front triangular, forked or spiniform; chelipeds usually stout, very elongate (Fig. 50) . . . . . **Parthenopidae**

27b. Carapace shape not as above; front usually truncate or multidentate; chelipeds usually stout to slender, relatively short; if chelipeds long, usually slender . . . . . → **28**



(after Shen, 1932)

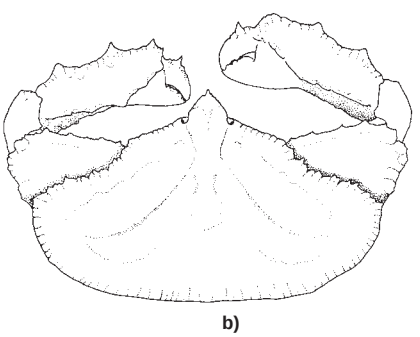


Fig. 50 Parthenopidae

28a. Merus of third maxilliped strongly reduced compared to ischium and other segments (Fig. 51a), sometimes completely fused with ischium (Fig. 51b); male genital openings always sternal (Fig. 52a); males always much smaller than females; parasites on hard corals, or symbionts on molluscs, echinoderms or worms . . . . . → **29**

28b. Merus of third maxilliped well developed, usually quadrate in shape (Fig. 51c); male genital openings usually coxal (i.e. situated at basis of coxae of fourth legs, Fig. 52b), occasionally sternal; males not much smaller, subequal or larger in size to females; free-living crabs, not parasites of hard corals, not symbionts on molluscs or worms . . . . . → **30**

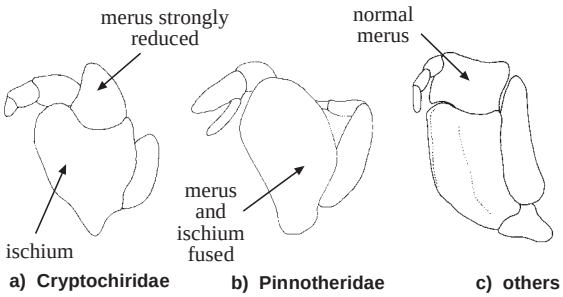


Fig. 51 third maxilliped

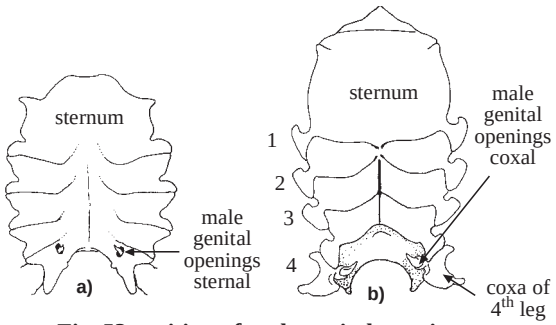


Fig. 52 position of male genital opening

29a. Carapace longitudinally ovate to longitudinally rectangular; dorsal surface of carapace usually with small spines or tubercles; merus of third maxilliped always separated from ischium, dactylus terminally attached to propodus; dactylus of legs strongly hooked; parasites on hard corals (Fig. 53) . . . . . **Cryptochiridae**

29b. Carapace circular to transversely ovate; dorsal surface of carapace smooth; merus of third maxilliped may be fused with ischium; dactylus usually subterminally to basally attached to propodus with palp often appearing bifurcated; dactylus of legs weak, not strongly hooked; parasitic or commensal on molluscs or worms (Fig. 54). . . **Pinnotheridae**

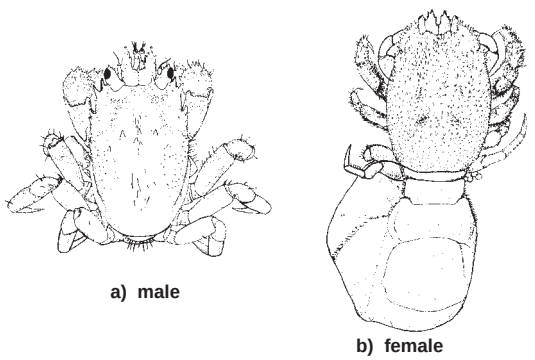


Fig. 53 Cryptochiridae

(after Takeda and Tamura, 1980)

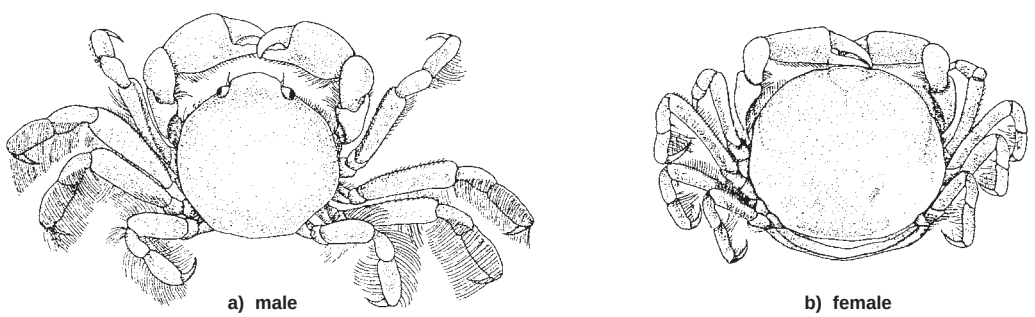


Fig. 54 Pinnotheridae

(after Christiansen, 1969)

30a. Last pair of legs with dactylus flattened, paddle-like (Fig. 55a) (with the exception of a few mud-dwelling and obligate coral-symbionts) (Fig. 56) . . . . . **Portunidae** (p. 1115)

30b. Last pair of legs with normal dactylus (Fig. 55b) . . . . . → **31**

31a. Distinct rhomboidal gap between third maxillipeds; mandibles usually visible when mouthparts closed (Fig. 57a) . . . . . → **32**

31b. No distinct rhomboidal gap between third maxillipeds (Fig. 57b); mandibles never visible when mouthparts closed. . . . . → **33**

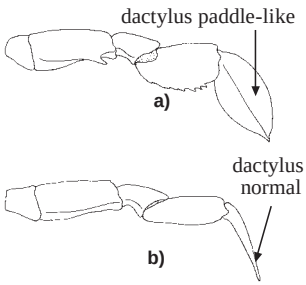


Fig. 55 fourth leg

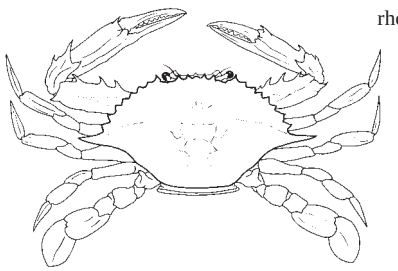


Fig. 56 Portunidae

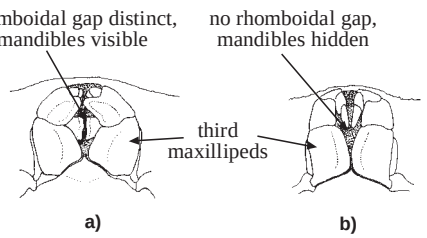


Fig. 57 third maxillipeds

32a. Carapace transversely ovate to circular, dorsal surface usually very smooth, rounded; land crabs (Fig. 58) . . . . . **Gecarcinidae** (p. 1147)

32b. Carapace squarish, transversely rectangular, trapezoidal or circular, dorsal surface rough, rugose or setose (Fig. 59) . . . . . **Grapsidae** (in part) (p. 1138)

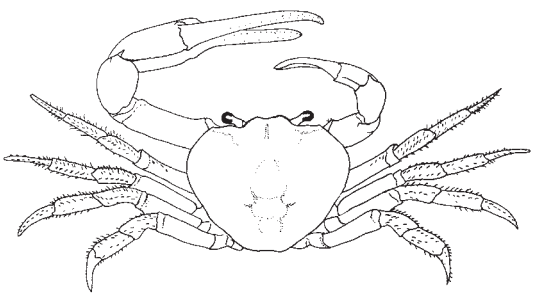
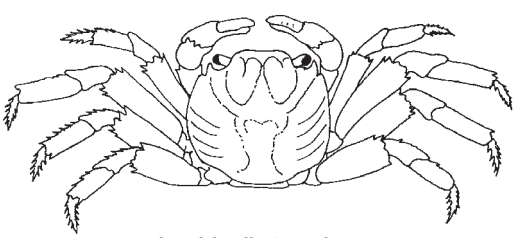


Fig. 58 Gecarcinidae



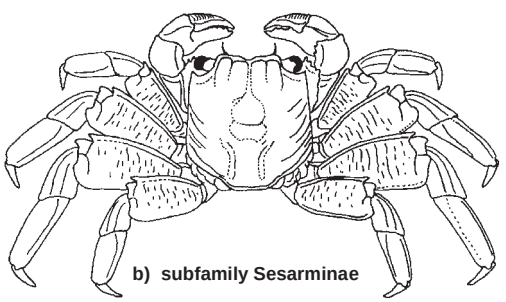
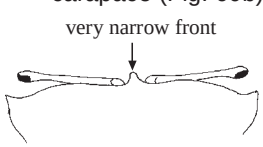


Fig. 59 Grapsidae

33a. Front simple, triangular, very narrow compared to broader carapace (Fig. 60a) . . . . . → **34**

33b. Front truncate, multilobate or multidentate, relatively broad compared to transverse carapace (Fig. 60b) . . . . . → **35**



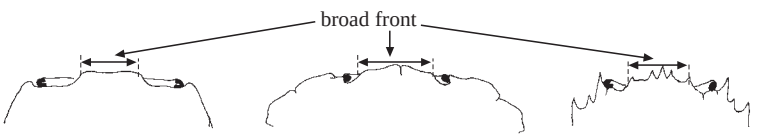


Fig. 60 anterior part of carapace (dorsal view)

34a. Orbits long, eyes elongate; terrestrial to semiterrestrial crabs (Fig. 61) . . . . **Ocypodidae** (p. 1152)
34b. Orbits absent, eyes relatively short; semiterrestrial crabs (Fig. 62) . . . . . **Mictyridae**



Fig. 61 Ocypodidae
(after Shen, 1932)

35a. Cross-section of dactylus of walking leg T-shaped (Figs 63 and 64). . . . . **Geryonidae** (p. 1132)
35b. Cross-section of dactylus of walking leg not T-shaped, usually quadrate to ovate (Fig. 63b) . . . . . → **36**

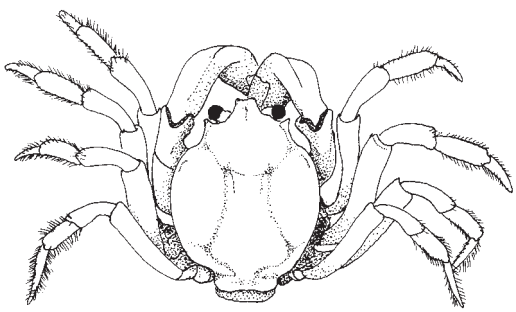


Fig. 62 Mictyridae

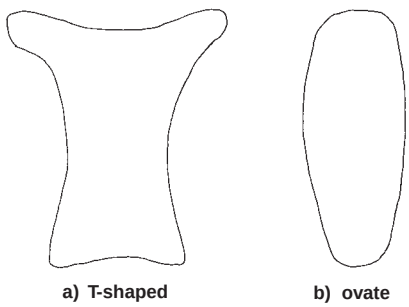


Fig. 63 cross-section of dactylus of walking leg

36a. Male abdominal segments 2 and 3 always immovable, completely to incompletely fused (Fig. 65a); male first gonopods strongly bent (Fig. 66a); small semiterrestrial crabs usually associated with estuarine habitats and mangroves (Fig. 67) . . . . . **Camptandriidae**
36b. Male abdominal segments 2 and 3 always movable, never fused (Fig. 65b); male first gonopods normal (Fig. 66b); aquatic to semiterrestrial crabs . . . . . → **37**

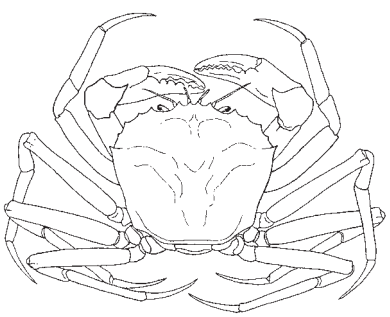


Fig. 64 Geryonidae

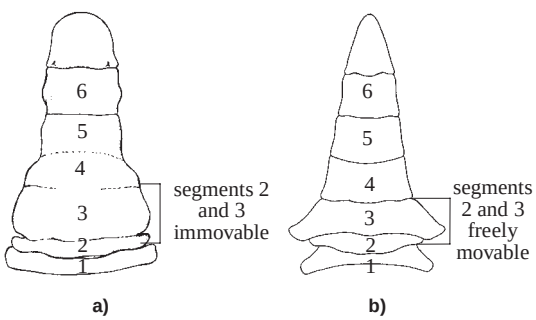


Fig. 65 abdomen

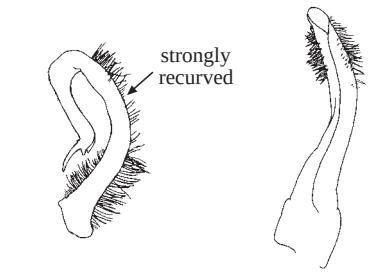


Fig. 66 male first gonopod

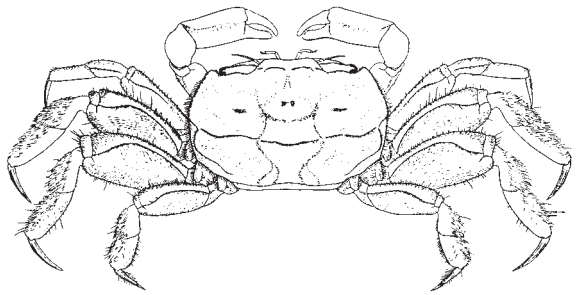


Fig. 67 Camptandriidae
(after Shen, 1932)

37a. Carapace squarish to longitudinally rectangular, posterolateral margins subparallel, dorsal surface flat or gently convex; free-living intertidal, estuarine, or fresh-water crabs (Fig. 68) . . . . . **Grapsidae** (in part) (p. 1138)

37b. Carapace shape not as above; dorsal surface usually convex; posterolateral margins gently to strongly converging; sublittoral to deep-water crabs . . . . . → **38**

38a. Legs with special dactylo-propodal articulation (formed by a rounded, submedian extension of the lateral margin of the propodus, sliding underneath a projecting button on the subproximal edge of the dactylus; Fig. 69a) . . . . . → **39**

38b. Legs without special articulation between propodus and dactylus (Fig. 69b) . . . . . → **41**

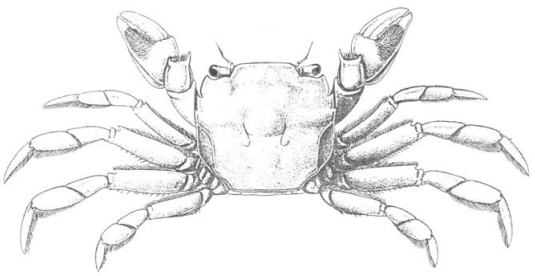


Fig. 68 Grapsidae (subfamily Varuninae)
(from Alcock and Anderson, 1899)

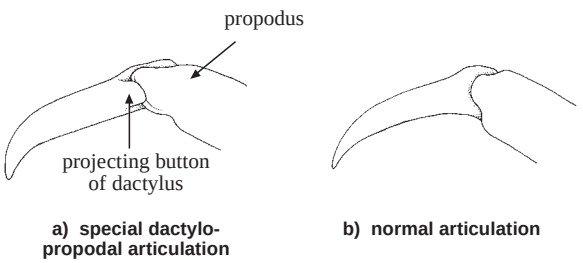


Fig. 69 distal end of walking leg

39a. Fingers of chelipeds distinctly spoon-tipped (Fig. 70a); male abdominal segments 3 to 5 always immovable, completely fused although sutures may be partially visible (Figs 71a and 72) . . . . . **Xanthidae** (in part) (p. 1098)

39b. Fingers of chelipeds with sharp tip, not distinctly spoon-tipped (Fig. 70b); male abdominal segments 3 to 5 freely movable (Fig. 71b) or fused . . . . . → **40**

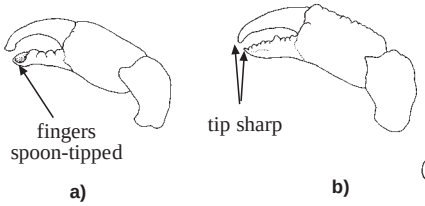


Fig. 70 pincer

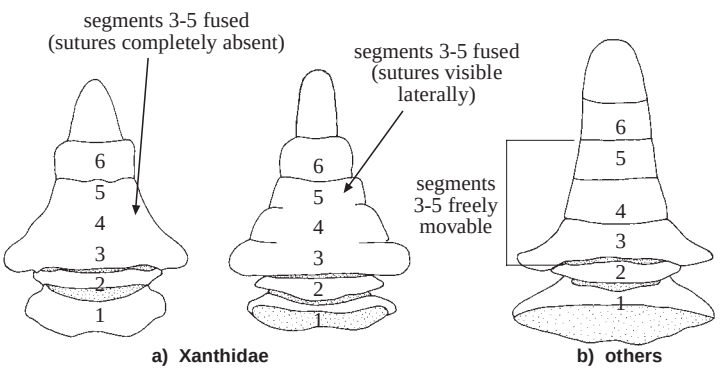


Fig. 71 abdomen

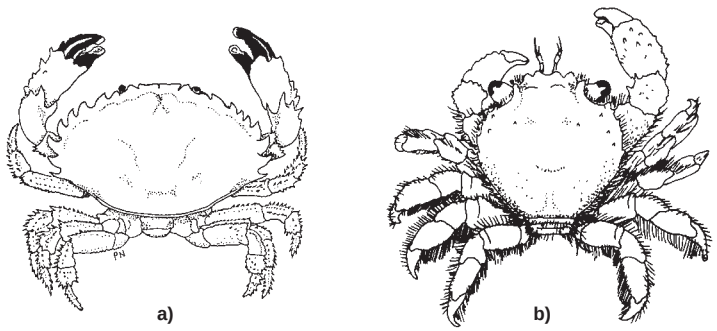


Fig. 72 Xanthidae

40a. Male first gonopod very slender, S-shaped (Fig. 73a); male second gonopod very short, sigmoid (very short, stout, comma-shaped) less than 1/4 the length of male first gonopod (Fig. 74b); internal and external commensals of echinoderms (Fig. 75) . . . **Eumedonidae**

40b. Male first gonopod moderately stout, slightly sinuous to almost straight (Fig. 73b); male second gonopod short but not sigmoid, always longer than 1/4 the length of male first gonopod (Fig. 74b); commensals on corals (Fig. 76) . . . . . **Trapeziidae**



Fig. 73 male first gonopod

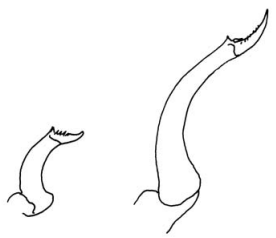


Fig. 74 male second gonopod

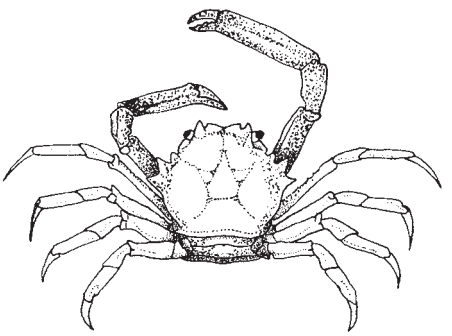


Fig. 75 Eumedonidae

41a. Male abdominal segments 3 to 5 distinct, movable (Fig. 77a); regions on carapace usually poorly defined . . . . → **42**

41b. Male abdominal segments 3 to 5 fused, immovable, although sutures may be partially visible (Fig. 77b, c); regions on carapace usually well defined . . . . . → **46**

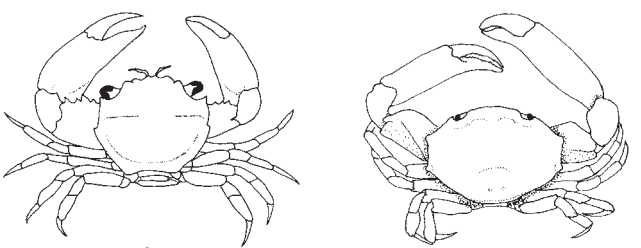


Fig. 76 Trapeziidae

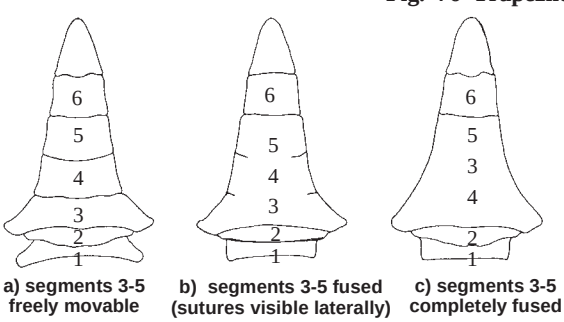


Fig. 77 male abdomen

42a. Longitudinal ridges which define efferent respiratory current absent, or strong only on posterior part of endostome, ridges not clearly visible on anterior part of endostome when mouthparts pushed aside (Fig. 78a, b); carapace and legs never spinose . . . . . → **43**

42b. Longitudinal ridges which define efferent respiratory current well developed along entire endostome, ridges visible on anterior part of endostome when mouthparts pushed aside (Fig. 78c); or carapace and legs strongly spinose . . . . . → **44**

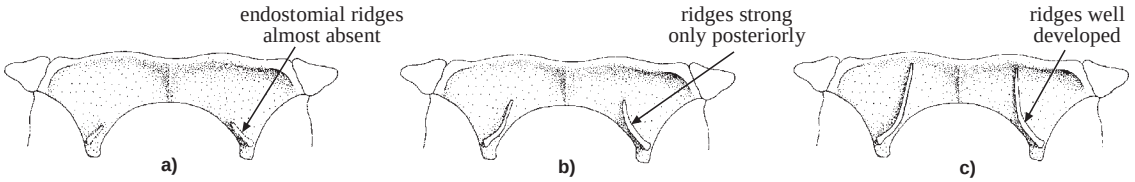


Fig. 78 endostome (= part of the "mouth field")

43a. Carapace transversely ovate; endopodite of first maxilliped usually with distinct lobe on inner angle (Fig. 79a); deep-water crabs, associated with hydrothermal vents (Fig. 80) . . . . . **Bythograeidae**

43b. Carapace hexagonal; endopodite of first maxilliped with small lobe or without small lobe on inner angle (Fig. 79b); mainly shallow-water crabs, if in deep waters, not known to be associated with hydrothermal vents (Fig. 81) . . . . . **Platyxanthidae**
(family not recorded from the area so far)

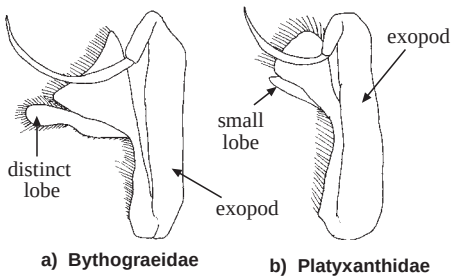


Fig. 79 first maxilliped

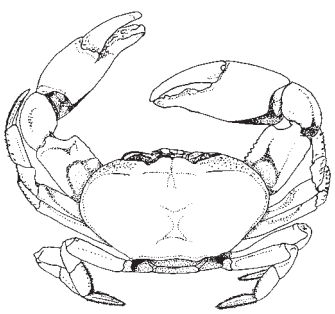


Fig. 80 Bythograeidae

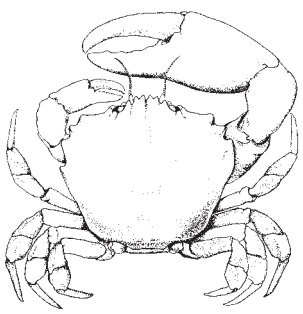


Fig. 81 Platyxanthidae

44a. Male first gonopod stout, straight (Fig. 82a); male second gonopod very elongate, subequal in length to, or longer than, male first gonopod (Figs 83a, b and 84) . . . . . **Eriphiidae** (p. 1103)

44b. Male first gonopod slender to stout, slightly sinuous to almost straight (Fig. 82b); male second gonopod distinctly shorter than length of male first gonopod (Fig. 83c). . . . . → **45**

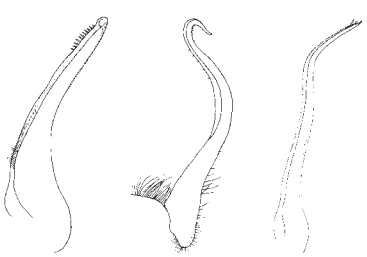


Fig. 82 male first gonopod

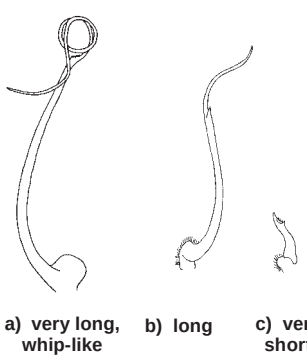


Fig. 83 male second gonopod

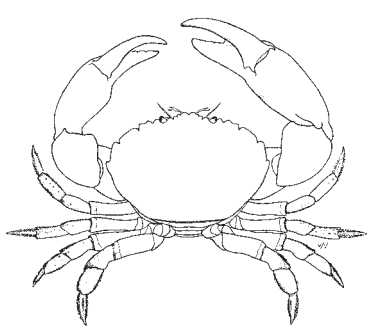


Fig. 84 Eriphiidae

45a. Male first gonopod slender, distinctly S-shaped to almost straight (Fig. 85a); male second gonopod sigmoid (very short, stout, comma-shaped) (Figs 86a and 87) . . . . . **Pilumnidae** (p. 1112)

45b. Male first gonopod moderately stout, slightly sinuous (Fig. 85b); male second gonopod about 1/3 to 1/2 the length of male first gonopod (Figs 86b and 88) . . **Goneplacidae** (in part) (p. 1114)

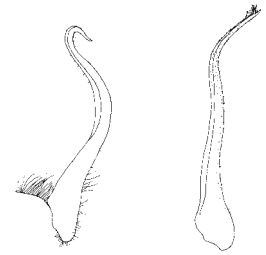


Fig. 85 male first gonopod



Fig. 86 male second gonopod

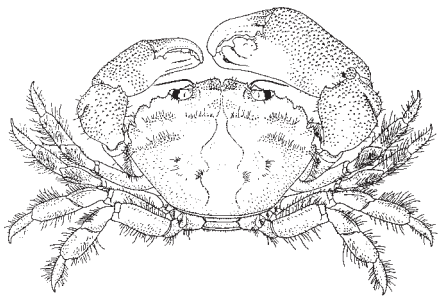


Fig. 87 Pilumnidae

(after Shen, 1932)

46a. Anterolateral margins entire, only 1 rounded lateral tooth present on each margin (Fig. 89) . . . . . **Carpiliidae** (p. 1110)

46b. Anterolateral margins multidentate or multilobate . . . . . → **47**

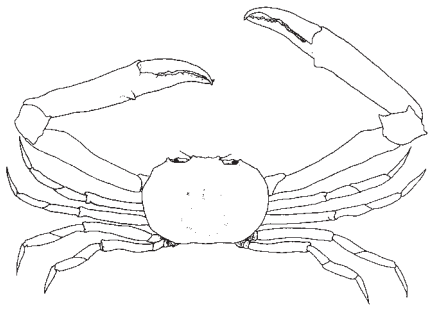


Fig. 88 Goneplacidae

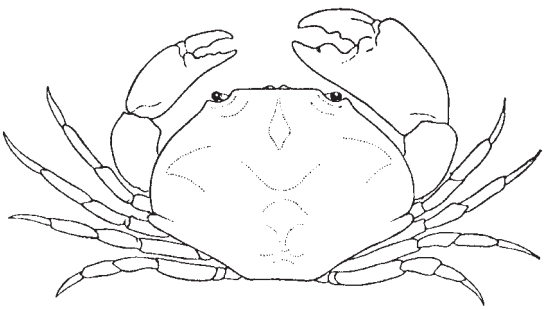


Fig. 89 Carpiliidae

47a. Carapace usually transversely rectangular, subcircular, sometimes transversely ovate; male second gonopod usually 0.3 times the length, to subequal length, of male first gonopod (Figs 90a and 91) . . . . . **Goneplacidae** (in part)

47b. Carapace usually hexagonal or transversely ovate; male second first gonopod short, subequal to, or less than, 0.3 times the length of male first gonopod but not distinctly sigmoid (stout, comma-shaped) (Fig. 90b) . . . . . → **48**

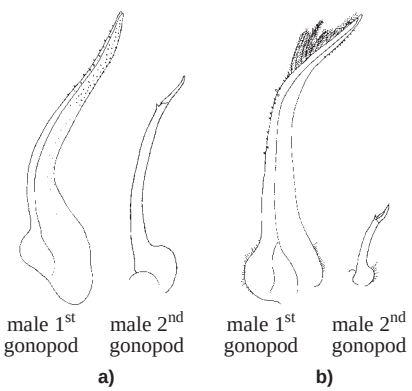


Fig. 90 relative length of male first and second gonopods

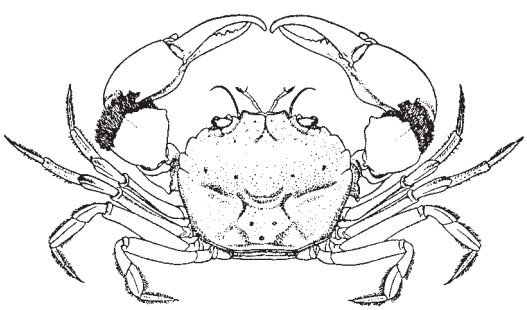


Fig. 91 Goneplacidae

(after Shen, 1932)

48a. Male first gonopods very slender, usually S-shaped, tip relatively simple, often with long setae subdistally and distally (Figs 92 and 93) . . . . **Xanthidae** (in part) (p. 1097)

48b. Male first gonopods moderately stout, sometimes slightly sinuous, tip usually with numerous complex folds (Figs 92b and 94) . . . . . **Panopeidae**

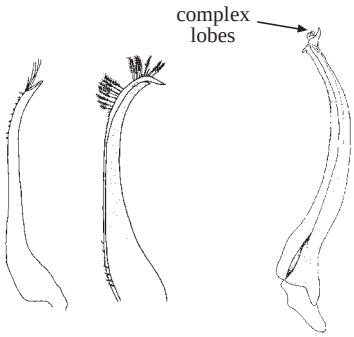


Fig. 92 male first gonopods

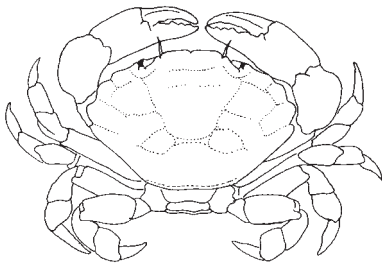


Fig. 93 Xanthidae

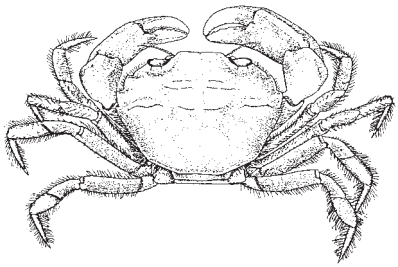


Fig. 94 Panopeidae
(after Christiansen, 1969)

KEY TO THE FAMILIES OF CRAB-LIKE ANOMURA

Notes: the following key covers all marine families of crab-like anomuran crabs recognized here, most of which (except the Lomidae) have been reported from the Western Central Pacific. The key uses, wherever possible, external and easily viewed characters. Due to the diversity in some families, however, not all their members can be identified to the family level with this key, although it should work for the majority of species encountered. A specialist should be consulted for the more difficult species. For further useful information on crab-like anomurans and allies see De Man (1928), Miyake (1982), Macpherson (1988), McLaughlin (1997), and Baba (1988).

1a. Carapace usually longitudinally ovate; dactyli of second to fourth legs curved, laterally flattened (Fig. 95a-c); burrowing crabs . . . . . → **2**

1b. Carapace usually not longitudinally ovate; dactyli of second to fourth legs normal, not laterally flattened, usually non-burrowing crabs . . . . . → **3**

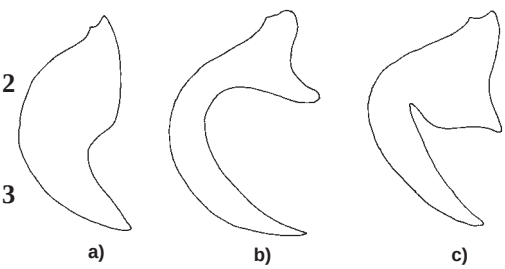


Fig. 95 dactylus of legs 2-4

2a. Carapace dorsoventrally flattened; first leg subchelate, with pincer-like structure (Fig. 96) . . . . . **Albuneidae**

2b. Carapace subcylindrical in cross-section; first leg simple, not subchelate (Fig. 97) . . . **Hippidae**

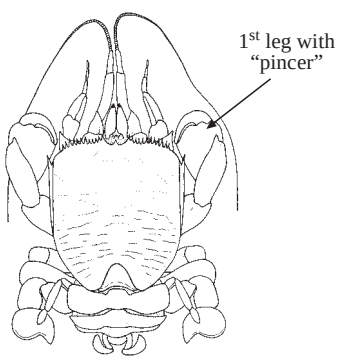


Fig. 96 Albuneidae

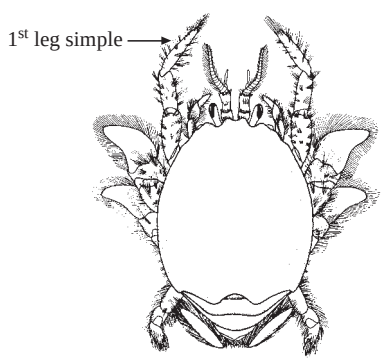


Fig. 97 Hippidae

3a. Uropods usually structurally modified into a "rasp" (Fig. 98a) and used for clinging onto interior of gastropod shells or hollow wood or underside of bivalve shells, at least in early crab stages . . . . . → **4**

3b. Uropods (may be absent) not modified for clinging purposes, no "rasp" present (Fig. 98b); crabs not associated with hollow or concave objects even in early crab stages . . . . . → **9**

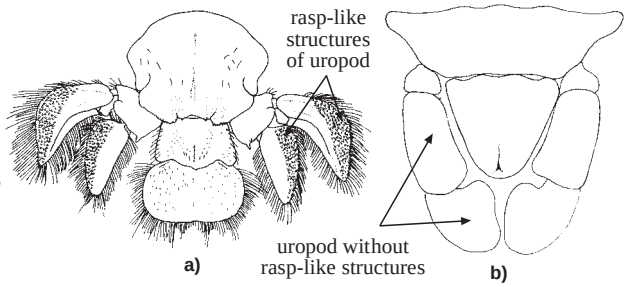


Fig. 98 posterior portion of body (dorsal view)

4a. Abdomen bilaterally symmetrical, clearly divided into segments, usually well calcified even at early crab stages, pleurites (side plates) distinct; shrimp- to lobster-like appearance, abdomen not tucked under carapace (Fig. 99) . . . . . **Pylochelidae**

4b. Abdomen usually bilaterally asymmetrical, not clearly divided into segments, usually weakly calcified or membranous, at least in early crab stages, pleurites (side plates) absent; typical hermit crabs or distinctly crab-like with abdomen tucked under the carapace . . . . . → **5**

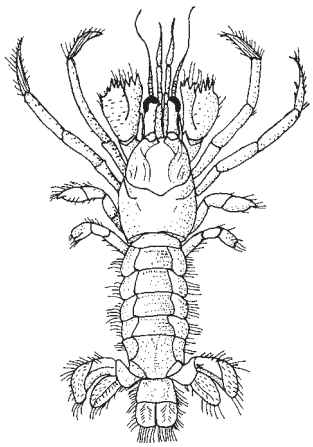


Fig. 99 Pylochelidae

5a. Coxae of third maxillipeds close to each other, no distinct gap between them (Fig. 100a); chelipeds equal or unequal, when unequal, left chela larger . . . . . → **6**

5b. Coxae of third maxillipeds distinctly separated from each other, wide gap between them (Fig. 100b); chelipeds unequal, with right chela larger . . . . . → **7**

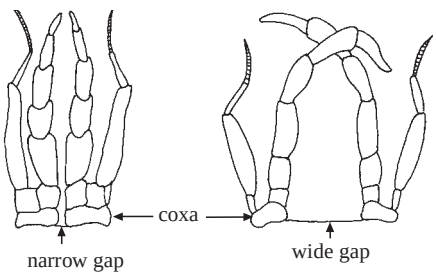


Fig. 100 third maxillipeds

6a. Eyestalk laterally flattened (Fig. 101a); eyes usually held subparallel to each other (Fig. 102a); antennae laterally flattened, short; completely terrestrial crabs (Fig. 103). . . . . **Coenobitidae** (p. 1154)

6b. Eyestalk circular to subcircular in cross-section, not laterally flattened (Fig. 101b); eyes held obliquely to each other (Fig. 102b); antennae long, subcylindrical in cross-section; completely aquatic crabs (Fig. 104). . . . . **Diogenidae**

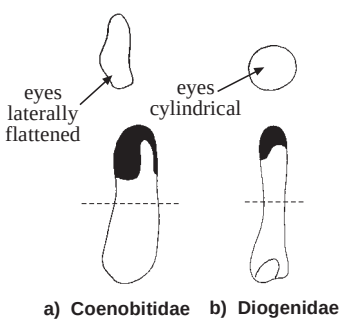


Fig. 101 eye in dorsal view

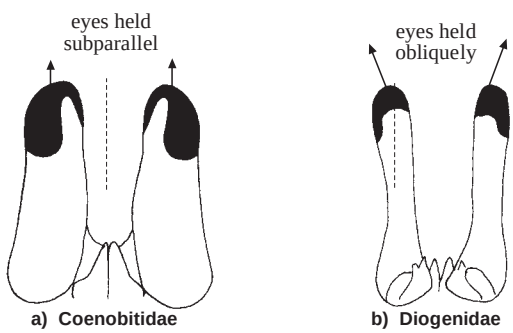


Fig. 102 relative position of eyes (dorsal view)

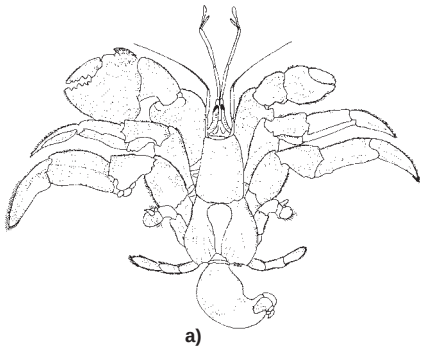


Fig. 103 Coenobitidae

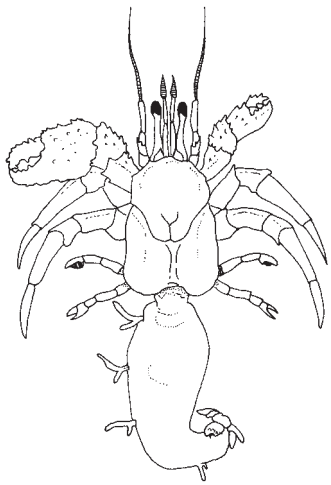


Fig. 104 Diogenidae

7a. Adults distinctly crab-like; carapace well calcified in adults, often with numerous strong granules or spines; rostrum spiniform, distinct; second to fourth legs distinct, fifth pair strongly reduced, inserted into branchial chamber (Fig. 105) . . . . . **Lithodidae**

7b. Adults typical hermit crabs; carapace weakly calcified in adults, rarely with granules or spines; rostrum weak to indiscernible; second to third legs distinct, fourth and fifth pair strongly reduced, but not inserted into branchial chamber . . . . . → **8**

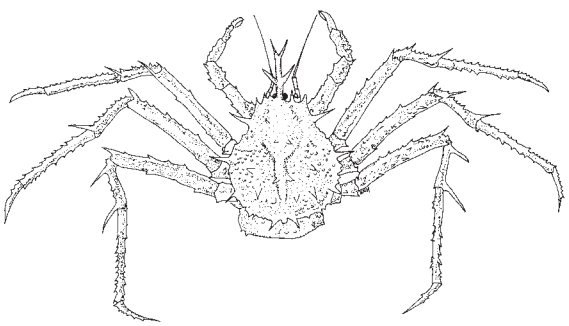


Fig. 105 Lithodidae

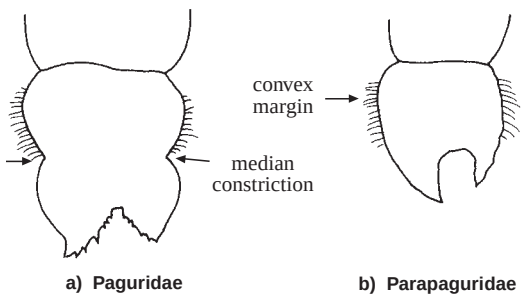


Fig. 106 sixth segment and telson (dorsal view)

8a. First maxilliped with distinct flagellum; telson usually with median constriction, lateral margins with median cleft (Fig. 106a); mostly shallow water with some deep-water species (Fig. 107) . . . . . **Paguridae**

8b. First maxilliped without flagellum; telson without median constriction, lateral margins entire (Fig. 106b); deep-water species (Fig. 108) . . . . . **Parapaguridae**

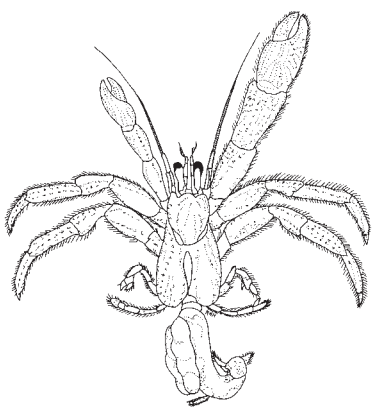


Fig. 107 Paguridae

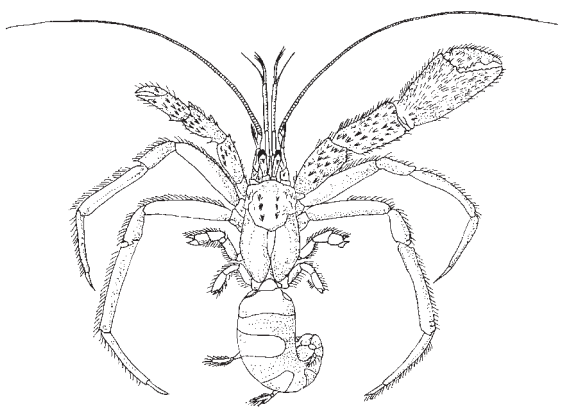


Fig. 108 Parapaguridae

9a. No tail fan (telson and uropods) present; eye peduncles broad and flat, cornea inserted laterally on peduncle (Fig. 109) . . . . . **Lomidae**
(family not recorded from the area so far)

9b. Distinct tail fan (telson and uropods) present; eye peduncles normal; cornea inserted terminally on peduncle . . . . . → **10**

10a. Carapace circular, subcircular to longitudinally ovate; rostrum short to absent; most of abdomen tucked underneath carapace (Fig. 110) . . . . . **Porcellanidae**

10b. Carapace longitudinally rectangular to longitudinally ovate, rarely circular; rostrum distinct; most of abdomen not tucked underneath carapace . . . . . → **11**



Fig. 109 Lomidae

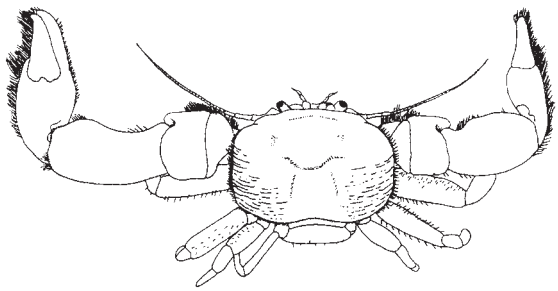


Fig. 110 Porcellanidae

11a. Antennular peduncle with 4 movable articles; telson divided into 2 or more smaller plates (Figs 111a and 112) . . . . . **Galatheidae**

11b. Antennular peduncle with 5 movable articles; telson entire, not divided into smaller plates (Figs 111b and 113) . . . . . **Chirostylidae**



a) divided into 2 or more small plates **b) not divided into small plates**

Fig. 111 telson (dorsal view)

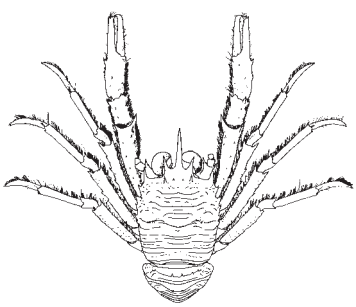


Fig. 112 Galatheidae

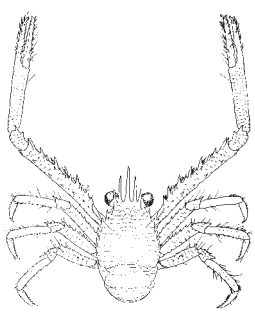


Fig. 113 Chirostylidae

LIST OF FAMILIES OF MARINE BRACHYURA AND CRAB-LIKE ANOMURA PRESENTLY RECOGNIZED

Note: the following list also includes 5 families of Brachyura and a single family of anomuran crab which have not been recorded yet from the Western Central Pacific. They are included in the list and above keys since it is likely that some of these families may be discovered in the future in the area. These families are marked in the list by an asterisk (*).

The symbol 🦀 is given for those families which are treated further in this contribution.

Infraorder BRACHYURA Latreille, 1803
ATELECYLIDAE Ortmann, 1893
BELLIIDAE Dana, 1852 (= Acanthocyclidae Dana, 1852)
BYTHOGRAEIDAE Williams, 1980
🦀CALAPPIDAE De Haan, 1833
CAMPTANDRIIDAE Stimpson, 1858
CANCRIDAE Latreille, 1803 (= Trichoceridae Dana, 1852)

* CHEIRAGONIDAE Ortmann, 1893 (= Telmessidae Guinot, 1977)
CARPILIIDAE Ortmann, 1893
CORYSTIDAE Samouelle, 1819 (= Nautilocorystidae Ortmann, 1893; Euryalidae Rathbun, 1930)
CRYPTOCHIRIDAE Paulson, 1875 (= Hapalocarcinidae Calman, 1900)
CYCLODORIPPIDAE Ortmann, 1892 (= Tymolidae Alcock, 1896)
CYMONOMIDAE Bouvier, 1898
DORIPPIDAE MacLeay, 1838
DROMIIDAE De Haan, 1833
DYNOMENIDAE Ortmann, 1892
ERIPHIIDAE MacLeay, 1838 (= Menippidae Ortmann, 1893; Oziidae Dana, 1851)
EUMEDONIDAE Dana, 1852
HEXAPODIDAE Miers, 1886
HOMOLIDAE De Haan, 1839 (= Thelxiopeidae Rathbun, 1937)
HOMOLODROMIIDAE Alcock, 1899
HYMENOSOMATIDAE MacLeay, 1838
GECARCINIDAE MacLeay, 1838
GERYONIDAE Colosi, 1923
GONEPLACIDAE MacLeay, 1838
GRAPSIDAE MacLeay, 1838
LATREILLIDAE Stimpson, 1858
LEUCOSIIDAE Samouelle, 1819
MAJIDAE Samouelle, 1819 (= Inachidae MacLeay, 1838; Epialtidae MacLeay, 1838; Blastidae Stebbing, 1902; Mamaiidae Stebbing, 1902)
MICTYRIDAE Dana, 1852
OCYPODIDAE Rafinesque, 1815
* ORTHIYIIDAE Dana, 1852
PALICIDAE Bouvier, 1897 (= Cymopoliidae Faxon, 1895)
PANOPEIDAE Ortmann, 1893
PARTHENOPIDAE MacLeay, 1838 (= Mimilambridae Williams, 1979)
PILUMNIDAE Samouelle, 1819
PINNOTHERIDAE De Haan, 1833
* PIRIMELIDAE Alcock, 1899
* PLATYXANTHIDAE Guinot, 1977
PORTUNIDAE Rafinesque, 1815 (= Megalopidae Haworth, 1825; Carcinidae MacLeay, 1838; Xaividae Berg, 1900)
POUPINIIDAE Guinot, 1993
RANINIDAE De Haan, 1839
RETROPLUMIDAE Gill, 1894
* THIIDAE Dana, 1852
TRAPEZIIDAE Miers, 1886
XANTHIDAE MacLeay, 1838

Infraorder ANOMURA H. Milne Edwards, 1832 (crab-like families listed only)
ALBUNEIDAE Stimpson, 1858
CHIROSTYLIDAE Ortmann, 1892
COENOBITIDAE Dana, 1851
DIOGENIDAE Ortmann, 1892
GALATHEIDAE Samouelle, 1819
HIPPIDAE Latreille, 1825
LITHODIDAE Samouelle, 1819
PAGURIDAE Latreille, 1803
PARAPAGURIDAE Smith, 1882
PORCELLANIDAE Haworth, 1825
PYLOCHELIDAE Bate, 1888 (= Pomatochelidae Stebbing, 1914)
* LOMIDAE Bouvier, 1895

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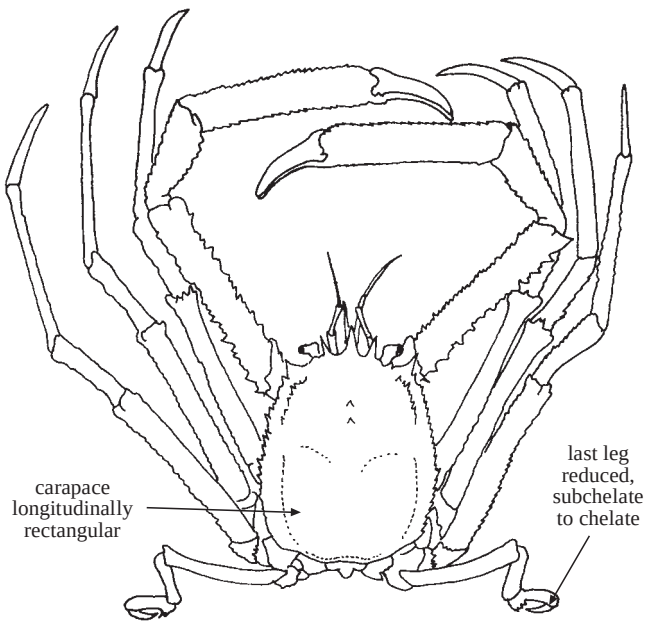
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Infraorder BRACHYURA

HOMOLIDAE

Deep-water carrier crabs

Diagnostic characters: Carapace longitudinally rectangular; dorsal surface granulose to spinose; **front narrow, usually with 3 long horn-like projections** (rostra). Male chelipeds long. **Last (fourth) pair of legs inserted obliquely on carapace and directed upwards, reduced, subchelate to chelate**, modified to carry sponges. All male abdominal segments distinct, movable.



Habitat, biology, and fisheries: Benthic deep-water crabs, usually occurring in depths below 200 m. Most species are of minor commercial value, being either too small or only occasionally caught. Only the large *Paromola japonica* and *P. macrochira* have some fishery value. *P. macrochira*, however, is known only from Japanese and Taiwanese waters, but not from the Western Central Pacific.

Similar families occurring in the area

The only other crab families which have the last (fourth) pair of legs modified to carry objects are the Dromiidae (sponge crabs), Homolodromiidae (deep-water sponge crabs), Latreillidae (spindle crabs), Cymonomidae and Cyclodorippidae (deep-water porter crabs) and Dorippidae (porter crabs); some Majidae (spider crabs) also have a similar structure. All these families, however, differ markedly in body shape (not longitudinally rectangular/subrectangular) from the Homolidae and none of them include species of commercial interest.

Poupiniidae (deep-water hedgehog crabs, non-commercial): in body shape, these recently discovered deep-water crabs are most similar to the Homolidae, but poupiniids have the fourth (last) walking leg unmodified (not subchelate or chelate).

References

Guinot, D. and B. Richer de Forges. 1995. Crustacea Decapoda Brachyura: Révision de la famille des Homolidae de Haan, 1839. In Résultats des Campagnes MUSORSTOM, Vol. 13, edited by A. Crosnier. *Mém. Mus. natn. Hist. nat.*, 163:283-517.

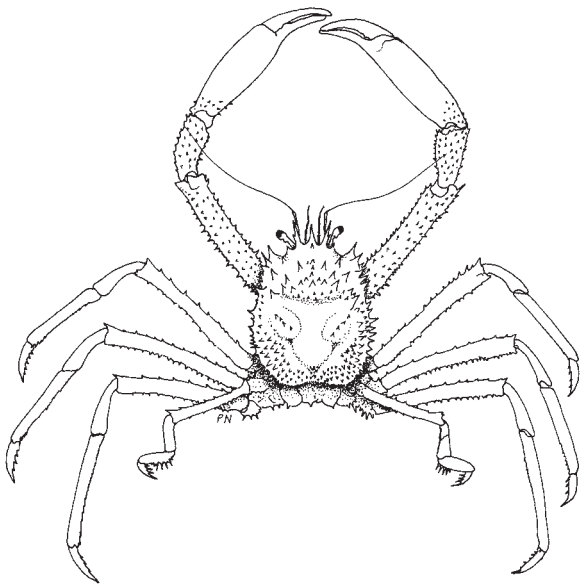
Serène, R. and P. Lohavanijaya. 1973. *The Brachyura (Crustacea: Decapoda) collected by the NAGA Expedition, including a review of the Homolidae*. Naga Report, Scientific Results of Marine Investigation of the South China Sea and the Gulf of Thailand 1959-1961, 4(4), 186 p.

A single species of interest to fisheries occurring in the area.

Paromola japonica Parisi, 1915

Frequent synonyms / misidentifications: *Latreillopsis hawaiiensis* Edmondson, 1932 / *Paromola macrochira* Sakai, 1961.

FAO name: En - Japanese deepwater carrier crab.



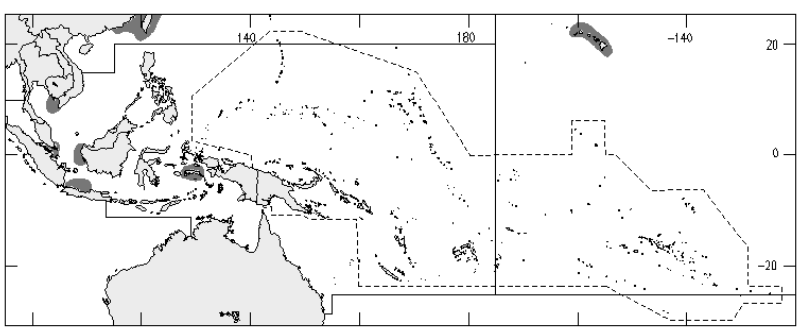
Diagnostic characters: Carapace rectangular, longer than broad, surface granular; lateral margins granular to spiniform; frontal margin (rostrum) with 3 spiniform projections. Last pair of legs short, with dactylus and propodus subchelate, modified for carrying objects. **Colour:** light to reddish brown overall.

Size: Maximum carapace length 18 cm (males).

Habitat, biology, and fisheries: A deep-water crab, found in depths from 150 to 250 m. No targeted fisheries are known for this species. Taken as incidental catch by benthic trawls and occasionally by traps. Commands low prices when sold in markets.

Distribution: West Pacific, including Southeast Asia and Hawaii.

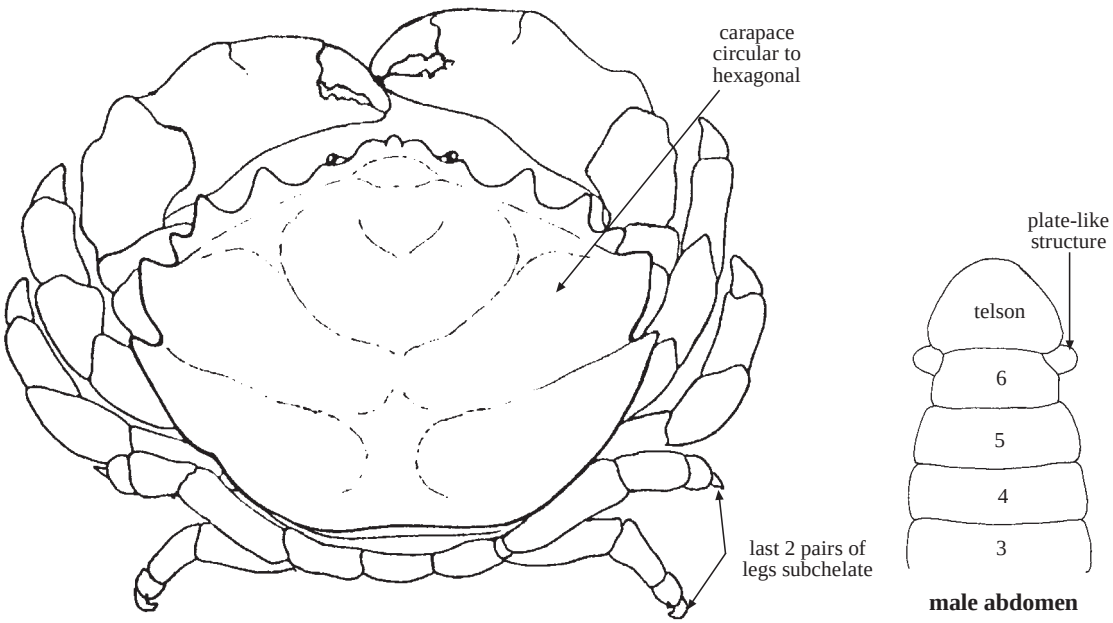
Remarks: The only other species that *Paromola japonica* might be confused with is *P. macrochira* which is also taken incidentally by trawls and traps, but so far known only from Japanese and Taiwanese waters. *P. japonica* is easily distinguished from *P. macrochira* by the more spiniform lateral margins of carapace and the basal antennal segment bearing several sharp tubercles (absent in *P. macrochira*).



DROMIIDAE

Sponge crabs

Diagnostic characters: Carapace circular to hexagonal; dorsal surface gently to strongly convex longitudinally and transversely, smooth or granular, usually setose; front narrow, usually entire; anterolateral margins of carapace strongly convex, unarmed, or with small spines. Anterior 2 pairs of legs normal; **last 2 pairs of legs inserted obliquely on carapace and directed upwards, strongly reduced, subchelate**, modified to carry sponges or tunicates on back of carapace. All male abdominal segments distinct, movable; **a small platelet-like structure usually intercalated between edges of sixth abdominal segment and telson**. Male first gonopod stout, simple; male second gonopod long, usually subequal or longer than length of male first gonopod. **Male and female genital openings sternal**.



Habitat, biology, and fisheries: Benthic crabs, with most species occurring in or near reefs or on soft-substrate bottoms. Omnivorous and known to feed on sea stars (Asteroidea). Best known for their habit of carrying sponges and colonial tunicates on their backs for camouflage. Only of minor commercial importance, as most species are too small to have any food value. Large members of the genera *Dromia* and *Lauridromia* are occasionally collected by trawls or traps and are sold in local markets.

Similar families occurring in the area

The only other crab families which have their last 2 pairs of legs turned upwards and adapted for carrying objects are the Homolodromiidae, Cymonomidae, Cyclodorippidae, and Dorippidae.

Homolodromiids (non-commercial): closest to the dromiids in general body shape, but dromiids are generally more rounded to quadrate in shape, and only dromiids possess a pair of intercalated platelet-like structures between the abdominal segments 6 and the telson.

Cymonomidae, Cyclodorippidae, and Dorippidae (all non-commercial): carapace much more rounded and flatter; legs proportionately much longer; merus of third maxillipeds triangular in shape (distinctly rectangular in dromiids).

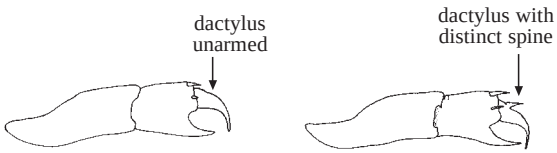
Key to species of interest to fisheries occurring in the area

1a. Dactylus of fourth leg without spine on outer margin (Fig. 1a) . . . . . ***Dromia dormia***

1b. Dactylus of fourth leg with distinct spine on outer margin (Fig. 1b) . . . . . → ***2***

2a. Carapace wider than long, surfaces with soft pubescence; 6 teeth on each anterolateral margin; 4 to 8 spines on inner margins of dactyli of first 2 pairs of legs (Fig. 2a) . . . . . ***Lauridromia indica***

2b. Carapace as wide as long, surfaces with coarse pubescence; 4 teeth on each anterolateral margin; 16 to 20 spines on inner margins of dactyli of first 2 pairs of legs (Fig. 2b) . . . . . ***Lauridromia dehaani***



a) ***Dromia dormia*** **b) genus** ***Lauridromia***

Fig. 1 fourth leg



a) ***Lauridromia indica*** **b)** ***Lauridromia dehaani***

Fig. 2 dactylus of first 2 legs

List of species of interest to fisheries occurring in the area

The symbol is given when species accounts are included.

Dromia dormia (Linnaeus, 1763)

Lauridromia dehaani (Rathbun, 1923)

Lauridromia indica (Gray, 1831)

References

Alcock, A.A. 1901. *Catalogue of the Indian decapod Crustacea in the collection of the Indian museum. Part I. Brachyura. Fascicle I. Introduction and Dromides or Dromiacea (Brachyura Primigenia)*. Calcutta, Trustees of the India Museum, 80 p.

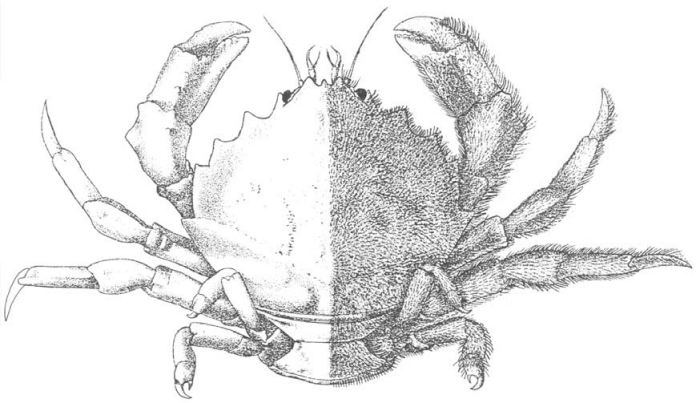
McLay, C.L. 1993. Crustacea: Decapoda: The sponge crabs (Dromiidae) of New Caledonia and the Philippines with a review of the genera. In Résultats des Campagnes MUSORSTOM, 10, edited by A. Crosnier. *Mém. Mus. natn. Hist. nat.*, 156:111-251.

Dromia dormia (Linnaeus, 1763)

Frequent synonyms / misidentifications: *Cancer dormitator* Herbst, 1790; *Dromia rumphii* Weber, 1795; *D. hirsutissima* Dana, 1852 / None.

FAO name: En - Common sponge crab.

Diagnostic characters: Carapace rounded, as wide as or slightly wider than long; surfaces convex, with dense pubescence; 5 anterolateral teeth, median ones largest. No spine present on outer margin of dactylus of last walking leg. **Colour:** light brown overall with pink fingers.



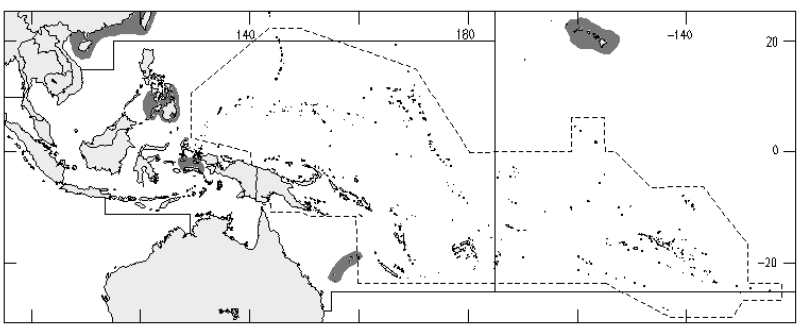
(from Alcock, 1901)

Size: Maximum carapace width 20 cm (males) and 12 cm (females).

Habitat, biology, and fisheries: Prefers moderately shallow waters with rocky-muddy substrates, at depths from 5 to 50 m; sometimes found near reefs. Occasionally appears in markets in parts of eastern Indonesia and Philippines. Caught incidentally in nets, fish or crab traps, and sometimes by benthic trawls.

Distribution: Southern Philippines, Ambon, southern China, New Caledonia, and Hawaii.

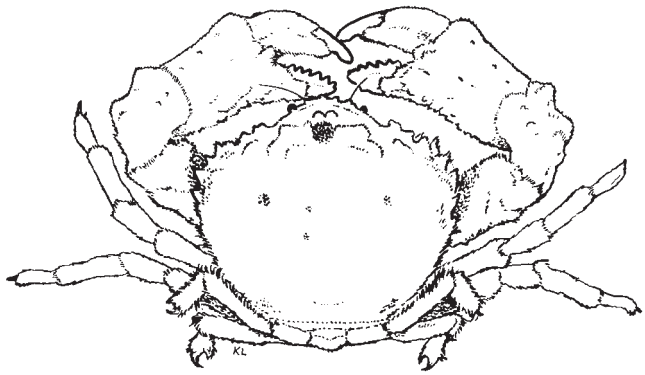
Remarks: Only 3 species of *Dromia* are known to occur in the Indo-West Pacific, and *D. dormia* is one of the largest representatives. It is the only Indo-West Pacific species of *Dromia* with all the 5 anterolateral teeth well developed and large.



Lauridromia indica (Gray, 1831)

Frequent synonyms / misidentifications: *Dromia orientalis* Miers, 1880; *Dromidiopsis cranioides* (De Man, 1888) / None.

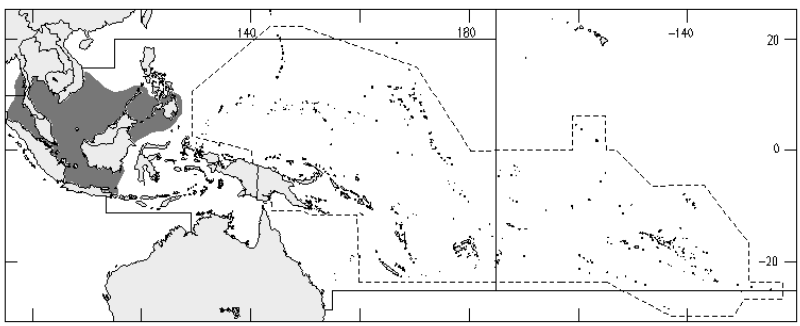
FAO name: En - Cannonball sponge crab.



Diagnostic characters: Carapace rounded, much wider than long; surfaces convex, with dense pubescence; 6 anterolateral teeth. Spine present on outer margin of dactylus of last walking leg. **Colour:** light brown with bright pink fingers.

Size: Maximum carapace width 8 cm (males) and 7 cm (females).

Habitat, biology, and fisheries: In muddy substrates from depths of 10 to 60 m. A relatively common species, caught incidentally by trawlers and benthic nets in various parts of Southeast Asia, sometimes in very large numbers. No targeted fisheries are known for this species, which has a minor commercial value due to the poor quality of its flesh.



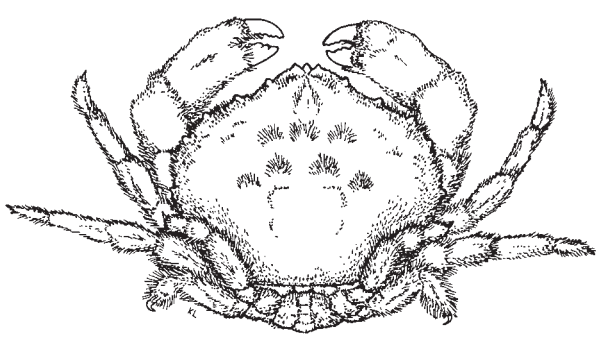
Distribution: Thailand, Malaysia, Singapore, northern Borneo, and southern Philippines.

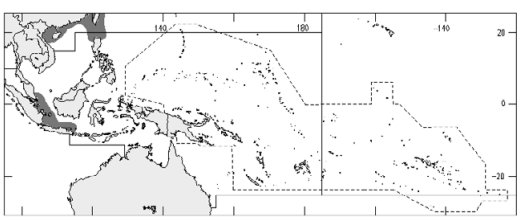
Remarks: Only 3 species of this Indo-West Pacific genus are known. *Lauridromia indica* can easily be distinguished from other species of the genus by its proportionately wider carapace with relatively soft pubescence and by having 6 teeth on each anterolateral margin.

Lauridromia dehaani (Rathbun, 1923)

En - Japanese sponge crab.

Maximum carapace width 10 cm (males) and 8 cm (females). On mud or sandy-muddy substrates from depths of 50 to 150 m. Locally consumed by some rural communities, rarely sold in markets. Japan, Taiwan Province of China, China, Hong Kong, Java, India, and Gulf of Aden.



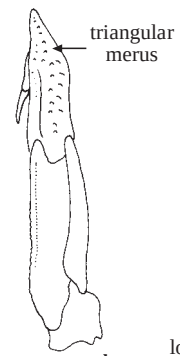


RANINIDAE

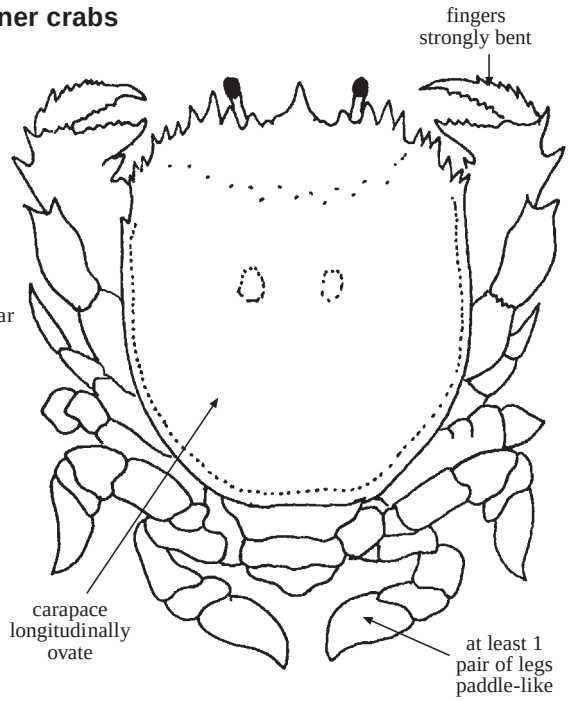
Spanner crabs

Diagnostic characters: Carapace longitudinally ovate; dorsal surface strongly granulose or squamose to smooth; front triangular, narrow. **Third maxillipeds very narrow, merus distinctly triangular**. Eyestalks long, longer than front. At least one pair of legs with last 2 or 3 segments paddle-like. **Thoracic sternum very narrow, especially sternites 5 to 7**. All male abdominal segments distinct, movable.

Habitat, biology, and fisheries: Spanner crabs burrow in soft substrates and tend to occur in moderately shallower waters. They are absent or rare in continental shelf waters and prefer more saline waters. They feed on a variety of worms and soft-shelled molluscs. Most species are moderately small and are not often encountered. A single species, *Ranina ranina*, is large and abundant enough to be fished commercially.



right 3rd maxilliped

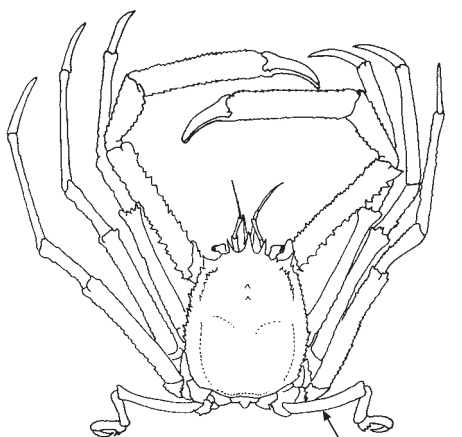


Similar families occurring in the area

The combination of a longitudinally ovate, elongate carapace with its very narrow thoracic sternum, and the narrow third maxillipeds with a triangular merus easily distinguish raninids from other crab families. The following 2 families look superficially similar to the Raninidae:

Homolidae: carapace similarly longitudinally elongate, but subcylindrical in shape; last pair of legs reduced, subchelate, turned upwards and adapted for carrying objects.

Corystidae (non-commercial): many species similar in body shape, but have broader and more rectangular mouthparts, a broader thoracic sternum, and never have any of their legs paddle-like and possess a pair of very long and highly setose antennae.



Homolidae

References

Brown, I. W. 1986. South Queensland's spanner crabs - a growing fishery. *Australian Fisheries*, 45(10):3-7.

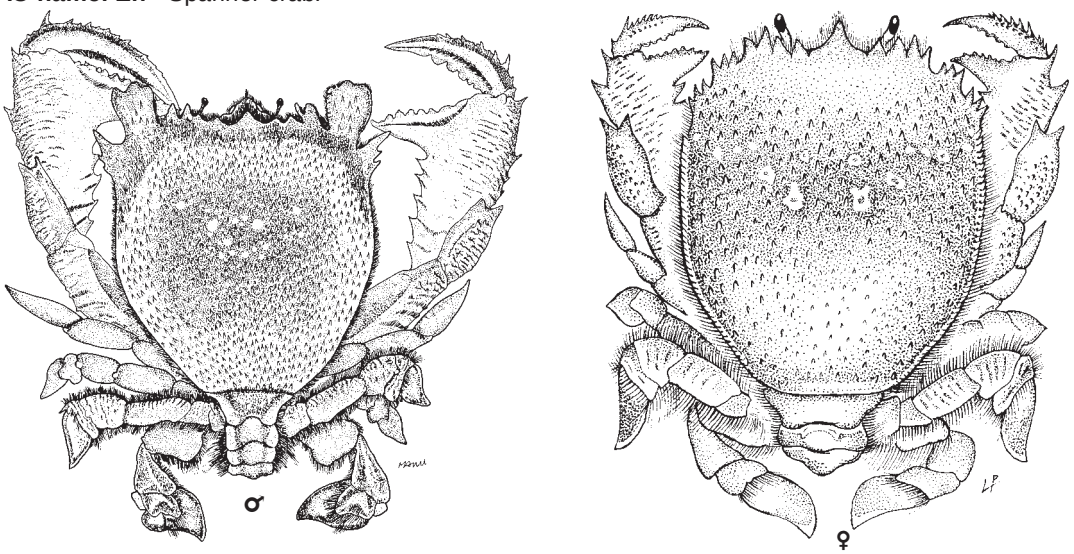
Ihle, J.E.W. 1918. Die Decapoda Brachyura der Siboga-Expedition. III. Oxystomata: Calappidae, Leucosiidae, Raninidae. *Siboga Exped. Monogr.*, 39b(2):159-322.

A single species of interest to fisheries occurring in the area.

Ranina ranina (Linnaeus, 1758)

Frequent synonyms / misidentifications: *Ranina dentata* H. Milne Edwards, 1837 / None.

FAO name: En - Spanner crab.

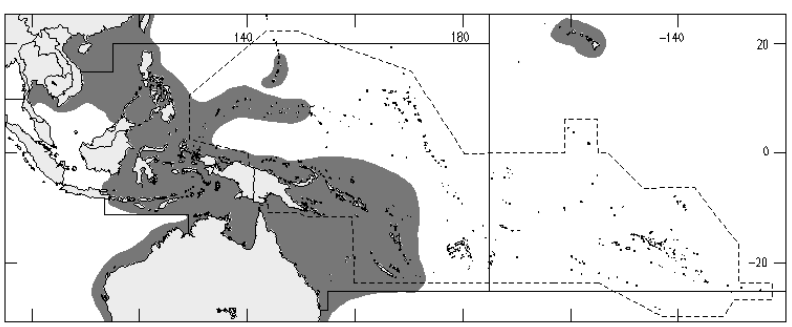


Diagnostic characters: Carapace very elongate, much longer than broad; anterior part much broader than narrow, posterior part waist-like. Abdomen clearly visible from dorsal view. Chelae greatly outsized in males; chelae and legs laterally flattened, spade-like. **Colour:** orange to red overall.

Size: Maximum carapace length 15 cm (males) and 12 cm (females); weight up to 900 g (males) and 400 g (females).

Habitat, biology, and fisheries: Mainly in more oceanic waters, but also in intertidal waters, to depths of more than 100 m, with preference for open sandy areas. Harvested throughout its range, taken by trawls, dredges, baited tangle nets, and bottom nets. A widely exploited species in the Philippines, eastern Indonesia, East Asia, and eastern and northern Australia. The fishery for *Ranina ranina* in Australia has grown substantially in the 1980s and is probably one of the largest for this species, with almost 700 t landed in Queensland and New South Wales from 1989 to 1990. Large specimens command very high prices, especially in live-seafood markets. Prices in Australia amount to about US$2 to US$3 per kg, while live specimens in Hong Kong (China) and Taiwan Province of China are sold for US$5 to US$10 per kg. The fishery for this species is managed in Australia but not elsewhere.

Distribution: Indo-West Pacific, including Australia, Guam, New Caledonia, and Hawaii.



CALAPPIDAE

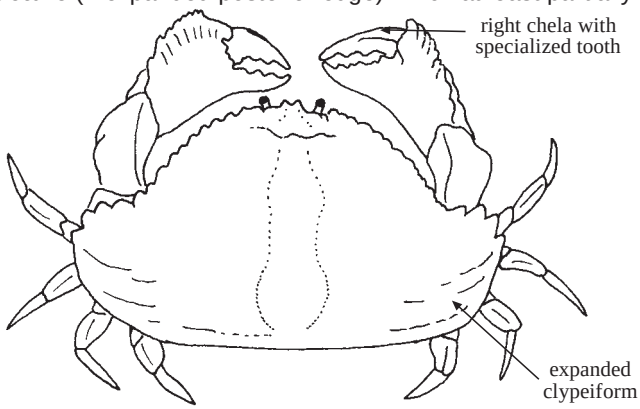
Box and moon crabs

Diagnostic characters (principal family characters): Carapace circular or ovate to transversely ovate or subovate; frontal margin triangular, narrow. **Merus of third maxillipeds distinctly triangular. Opening for afferent respiratory current at base of chela, no canal present along sides of buccal cavern** (even when third maxillipeds pushed aside). **Male abdominal segments 3 to 5 completely fused; male genital openings always coxal**.

Subfamily Calappinae (box crabs): **carapace circular or subcircular to transversely ovate or subovate**; dorsal surface strongly convex longitudinally and transversely, smooth to granular, and ridged; anterolateral margins armed with numerous small teeth and lobes, **posterolateral parts of carapace sometimes strongly expanded to form a clypeiform structure** (= expanded posterior edge) which at least partially conceals the legs. Chelae laterally flattened, dorsal margin with high, multidentate crest, **right (larger) chela with special tooth on base of pollex** for peeling gastropods, left chela with forceps-like fingers. Legs smooth, laterally flattened to varying degrees but never paddle-like.

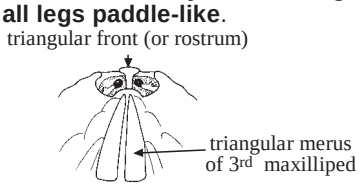


right chela

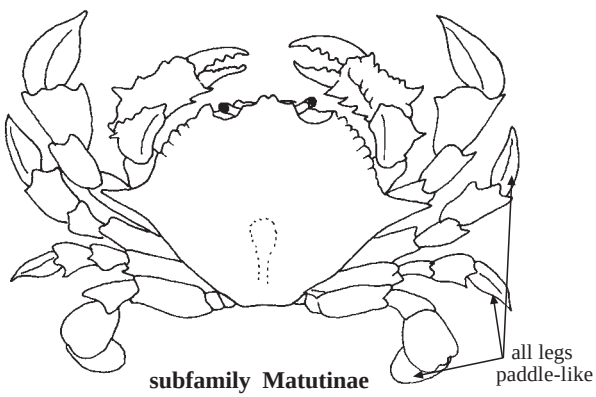


subfamily Calappinae

Subfamily Matutinae (moon crabs): **carapace circular to ovate**; dorsal surface usually almost smooth to granulose; junction of antero- and posterolateral margins well developed, often with long spine. **Legs distinctly flattened laterally, last 2 segments of all legs paddle-like**.



anterior part of body



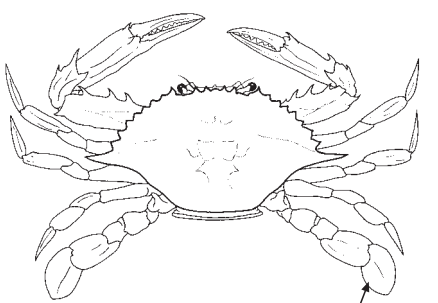
subfamily Matutinae

Habitat, biology, and fisheries: Burrowing crabs on soft and mud substrates. Most species of minor commercial importance, with only *Calappa lophos*, *C. philargius*, and *Ashtoret lunaris* being more commonly seen in markets.

Similar families occurring in the area

Portunidae: may be confused with members of the Matutinae (also with paddle-like legs and often long lateral spines), but can be readily distinguished by the following combination of characters: carapace hexagonal, transversely ovate to transversely hexagonal; only the last pair of legs paddle-like; meri of third maxillipeds quadrate.

Dorippidae (non-commercial): also with triangular meri of the third maxillipeds, but differ by having the last 2 pairs of legs small, inserted obliquely on carapace and directed upwards for carrying objects; sides of the carapace never expanded into a clypeiform process; chelae relatively delicate, never with specialized teeth for opening mollusc shells.



Portunidae

Leucosiidae (non-commercial): small, pea-like crabs, also possess triangular meri of the third maxillipeds, but differ by having the opening for afferent respiratory current located below the orbits, adjacent to the endostome; a distinct canal present along sides of buccal cavern when third maxillipeds are pushed aside; sides of carapace never expanded into a clypeiform process; chelae usually delicate, never with specialized teeth for opening mollusc shells; legs never paddle-like.

Key to the subfamilies of Calappidae

1a. Dactylus of legs normal, not paddle-like; right (larger) chela with specialized cutting tooth (Fig. 1a); posterolateral part of carapace often strongly expanded to form a clypeiform structure (= expanded posterior edge) which covers legs (Fig. 2) . . . . . **Calappinae**

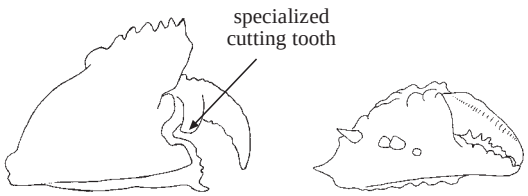


Fig. 1 right chela

1b. Dactylus of legs paddle-like; larger chela normal, without specialized cutting tooth (Fig. 1b); carapace round, lateral spine very strong; posterorlateral part of carapace never expanded; propodus and dactylus of all legs paddle-like (Fig. 3) . . . . . **Matutinae**

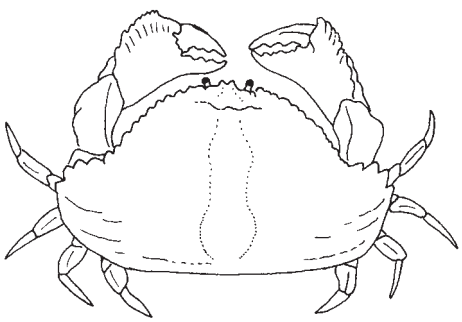


Fig. 2 Calappinae

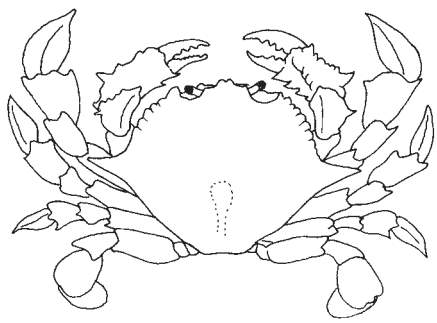


Fig. 3 Matutinae

Key to food species of Calappinae occurring in the area

1a. Clypeiform part (= expanded posterior edge) of carapace with margin smooth, entire, not armed with spines or teeth (Fig. 4) . . . . . ***Calappa calappa***

1b. Clypeiform part of carapace with margin armed with spines or teeth . . . . . → ***2***

2a. Lateral part of clypeiform part (= expanded posterior edge) of carapace with strong, transverse, outwardly pointing projections; carapace with purple lines on lateral regions, purple spots on median and posterior regions in life (Fig. 5) . . . . . ***Calappa lophos***

2b. Lateral part of clypeiform part of carapace with dentate margin, colour pattern of life specimens not as above . . . . . → ***3***

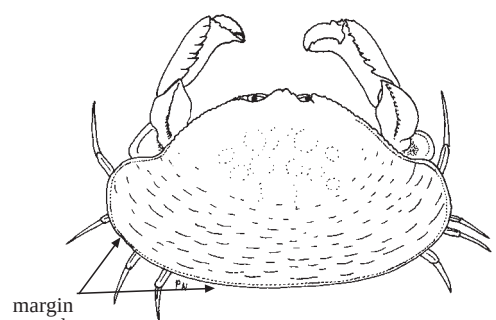


Fig. 4 ***Calappa calappa***

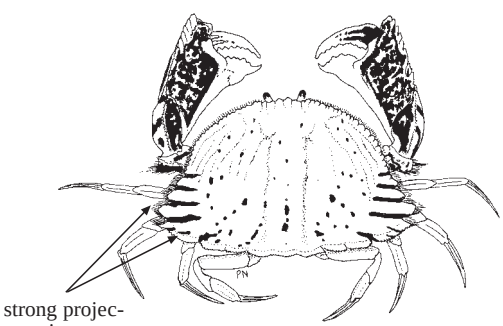


Fig. 5 ***Calappa lophos***

3a. Entire posterior margin of carapace and clypeiform part (= expanded posterior edge) armed with strong teeth; large purple spot on palm and carpus of cheliped, and around each orbit in life (Fig. 6) . . . . . ***Calappa philargius***

3b. Only anterior edge of clypeiform part of carapace gently denticulate; life colour a uniform yellowish grey to grey (Fig. 7) . . . . . ***Calappa hepatica***

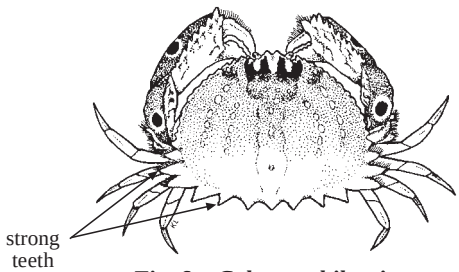


Fig. 6 ***Calappa philargius***

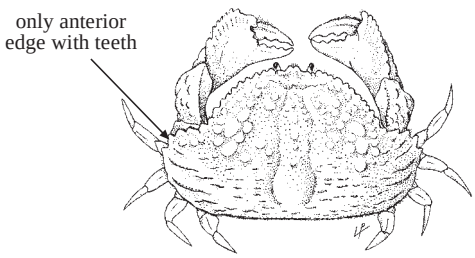


Fig. 7 ***Calappa hepatica***

Key to food species of Matutinae occurring in the area

1a. Outer surface of palm with ridge subparallel to ventral margin (Fig. 8a) . . . . . ***Ashtoret lunaris***

1b. Outer surface of palm with oblique ridge (Fig. 8b) . . . . . → ***2***

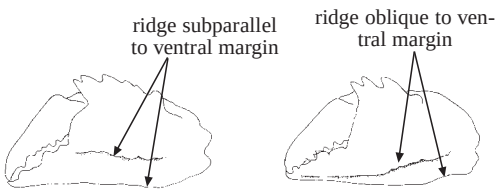


Fig. 8 chela

2a. Carapace surface with pattern of fine red lines forming mesh-like pattern; ventral margin of palm entire (Fig. 9) . . . . . ***Matuta planipes***

2b. Carapace surface with numerous small spots; ventral margin of palm serrated (Fig. 10) . . ***Matuta victor***

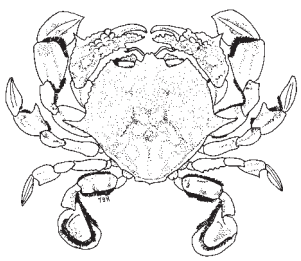


Fig. 9 ***Matuta planipes***

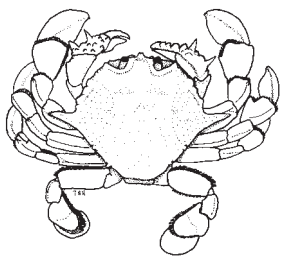


Fig. 10 ***Matuta victor***

List of species of interest to fisheries occurring in the area

The symbol 🕷 is given when species accounts are included.

Subfamily CALLAPINAE

- 🕷 *Calappa calappa* (Linnaeus, 1758)
- 🕷 *Calappa hepatica* (Linnaeus, 1758)
- 🕷 *Calappa lophos* (Herbst, 1785)
- 🕷 *Calappa philargius* (Linnaeus, 1758)

Subfamily MATUTINAE

- 🕷 *Ashtoret lunaris* (Forsskål, 1775)
- 🕷 *Matuta planipes* Fabricius, 1798
- 🕷 *Matuta victor* (Fabricius, 1781)

References

Chen, H.L. 1993. The Calappidae (Crustacea: Brachyura) of Chinese waters. In *The marine biology of the South China Sea*, by E.B. Morton, pp. 675-704.

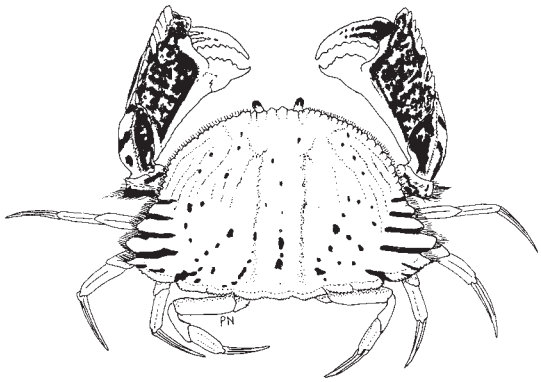
Galil, B.S. 1997. Crustacea Decapoda: A revision of the Indo-Pacific species of the genus *Calappa* Weber, 1795 (Calappidae). In Résultats des Campagnes MUSORSTOM, Vol. 18, edited by A. Crosnier. *Mém. Mus. natn. Hist. nat.*, 176:271-335.

Ihle, J.E.W. 1918. Die Decapoda Brachyura der Siboga-Expedition. III. Oxystomata: Calappidae, Leucosiidae, Raninidae. *Siboga Exped. Monogr.*, 39b(2):159-322.

Calappa lophos (Herbst, 1785)

Frequent synonyms / misidentifications: *Calappa guerini* Brito Capello, 1871 / None.

FAO name: En - Common box crab.

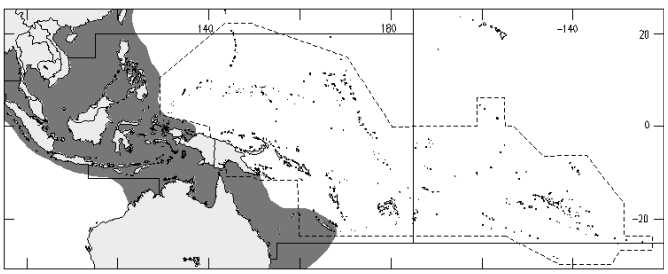


Diagnostic characters: Clypeiform posterolateral part of carapace with strong lateral projections. **Colour:** ground colour yellowish beige to yellow; posterior 1/3 of carapace with distinct red spots, posterolateral part with transverse red stripes; outer surface of cheliped with red streaks and spots.

Size: Maximum carapace width 10 cm.

Habitat, biology, and fisheries: In sandy-muddy areas from depths of 10 to 100 m. Irregularly sold in markets, like most of the larger species of *Calappa*. They are more frequently marketed in the Philippines and East Asia, but do not command high prices. The crabs are caught mainly by trawlers, benthic nets, and sometimes in traps.

Distribution: Japan, China, Southeast Asia, and Australia; westwards to Sri Lanka.

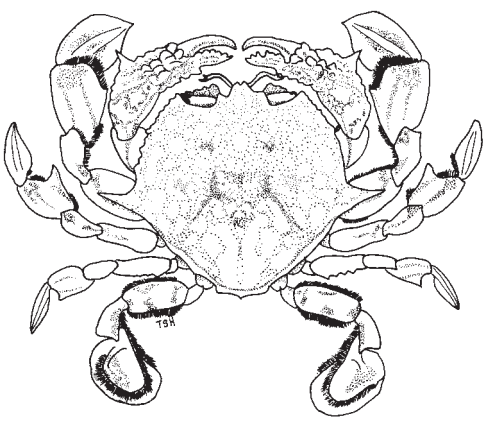


Remarks: Aside from *Calappa lophos*, several larger species of *Calappa* are found in the area, of which only *C. philargius*, *C. hepatica*, and *C. calappa* are large and/or common enough to be sold in markets.

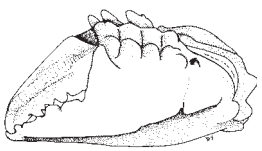
Matuta planipes Fabricius, 1798

Frequent synonyms / misidentifications: None / None.

FAO name: En - Flower moon crab.



Diagnostic characters: Carapace rounded, with 2 long, well-developed lateral spines; anterolateral margins unevenly serrated. Outer surface of palm with strong oblique ridge. **Colour:** mosaic to reticulate network of maroon lines on a white background.

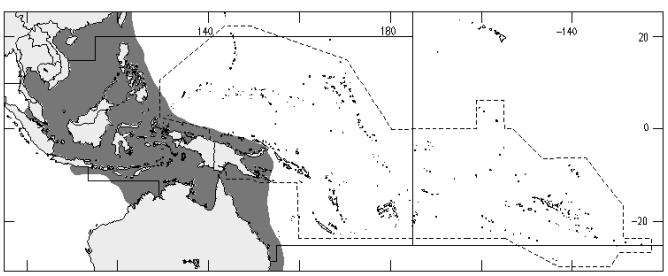


chela (outer surface)

Size: Maximum carapace width (excluding lateral spines).

Habitat, biology, and fisheries: Mainly in soft substrates from depths of 10 to 40 m. Taken mainly as a bycatch of trawlers, but rarely caught in sufficient numbers to have significant market value. Sometimes caught in nets and consumed locally.

Distribution: China, Japan, Southeast Asia, and Australia; westwards to India.

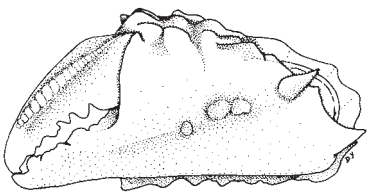


Remarks: The coloration of this species is very distinctive and it cannot be confused with any other species in the area.

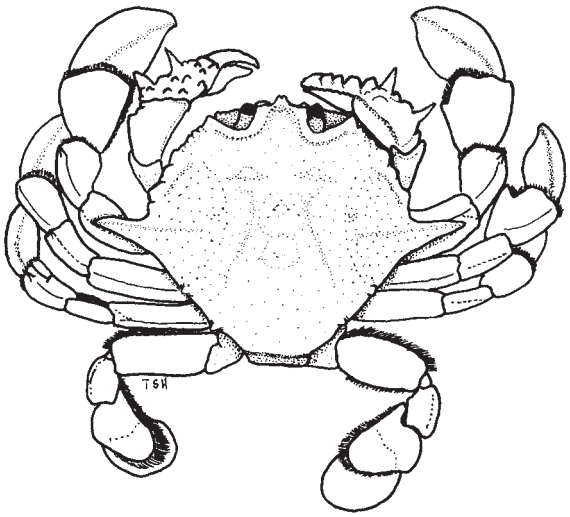
Matuta victor (Fabricius, 1781)

Frequent synonyms / misidentifications: *Matuta lunaris* Forsskål, 1775 (in part); *M. peronii* Leach, 1817; *M. lesuerii* Leach, 1817; *M. crebripunctata* Miers, 1877 / None.

FAO name: En - Common moon crab.



chela (outer surface)



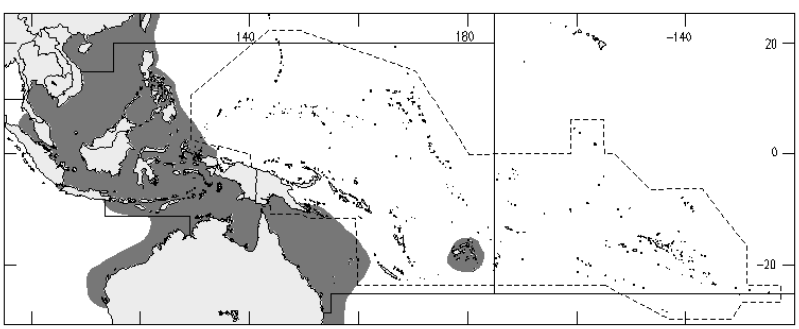
Diagnostic characters: Carapace rounded, with 2 long, well-developed lateral spines; anterolateral margins gently serrated. Outer surface of palm with low but distinct oblique ridge. **Colour:** yellowish ground colour with numerous fine black spots and several larger ones on carapace; legs and chelae bright yellow.

Size: Maximum carapace width 5 cm (excluding lateral spines).

Habitat, biology, and fisheries: Prefers sandy areas, from the intertidal zone to depths of about 20 m. Often caught by local communities in nets, by hand, or beach seines.

Distribution: Southeast Asia to the Philippines, New Caledonia, Fiji, and New Hebrides.

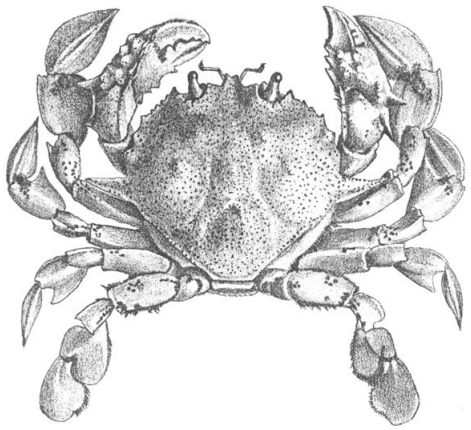
Remarks: The identity of *Matuta victor* has been badly confused with *Ashtoret lunaris* (Forsskål, 1775) and *Matuta banksii* Leach, 1817. The recent revision by Galil and Clark (1994) has shown that the type material of *Cancer lunaris* Forsskål, 1775, is mixed and *Matuta banksii* is in fact a junior synonym of *Ashtoret lunaris*. The common Indo-West Pacific species with the carapace pattern of fine black spots which has been identified at one time or another as *Matuta lunaris*, *M. victor,* or *M. banksii*, is actually either *Matuta victor* or *Ashtoret lunaris*.



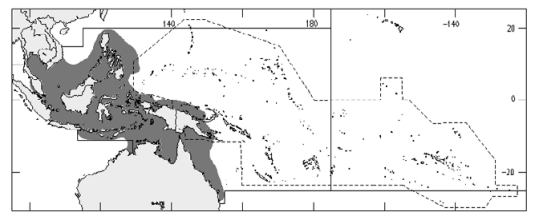
Ashtoret lunaris (Forsskål, 1775)

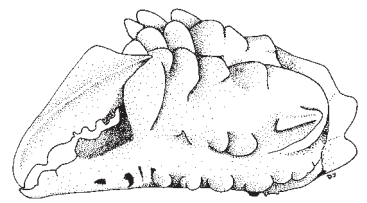
En - Yellow moon crab.

Maximum carapace width 5 cm. Found in sandy substrates, often near reefs or seagrass beds, from the intertidal zone to a depth of 50 m. Caught in nets for food in some parts of its range, often in good numbers. Indo-West Pacific, eastwards to Papua New Guinea and Australia.



(from Rüppell, 1830)



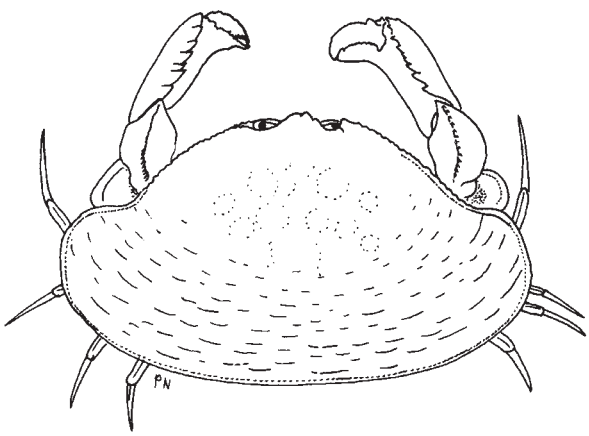


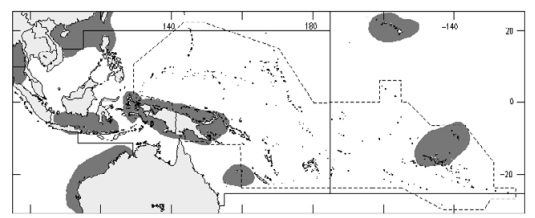
chela (outer surface)

Calappa calappa (Linnaeus, 1758)

En - Giant box crab.

Maximum carapace width 13 cm. Two colour morphs are known: one uniform tan and the other speckled with numerous red to maroon spots. Found in rocky to shelly substrates, from depths of 10 to 50 m. Usually caught in traps or nets. Of interest to fisheries due to its large size, but nowhere common enough to have major commercial importance. Also popular as a curiosity (e.g. in Hawaii). Indo-West Pacific, including Japan, Australia, Papua New Guinea, New Caledonia, and Hawaii.

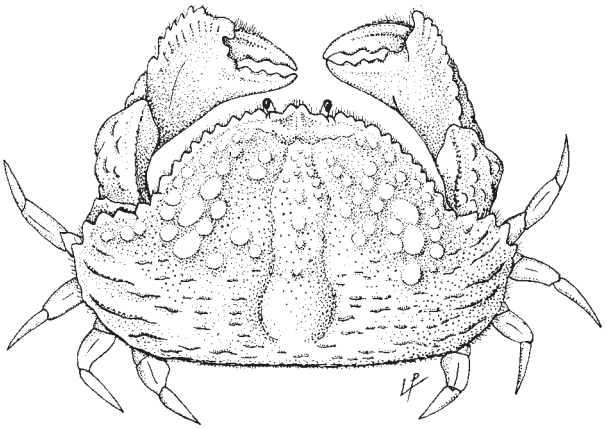


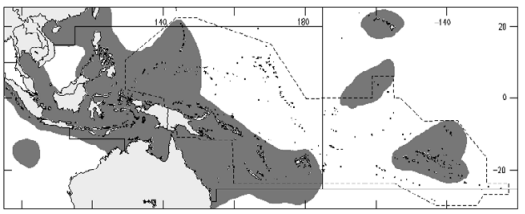


Calappa hepatica (Linnaeus, 1758)

En - Reef box crab.

Maximum carapace width 8 cm. In sandy and shelly substrates, often in reefs and among seagrass beds, from the intertidal zone to a depth of about 100 m. Collected for food, occasionally by hand or in traps. Indo-West Pacific, reaching Australia, Hawaii, and French Polynesia.

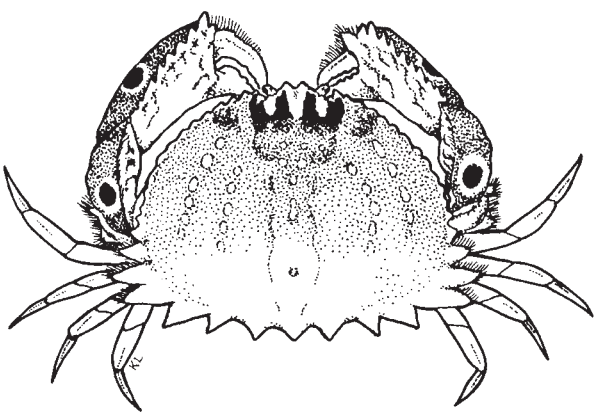


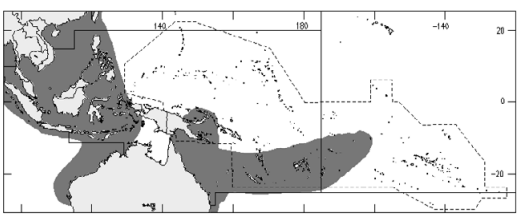


Calappa philargius (Linnaeus, 1758)

En - Spectacled box crab.

Maximum carapace width 12 cm. Prefers sandy to slightly muddy substrates at depths from 10 to 100 m. Usually collected in nets or trawls. Caught for food in many parts of its range but nowhere very important and rarely sold in markets. Indo-West Pacific, including Korea and Japan.

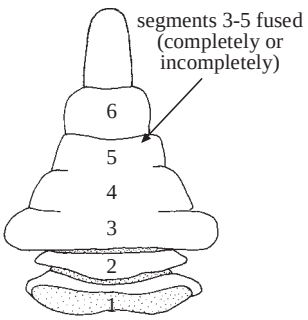




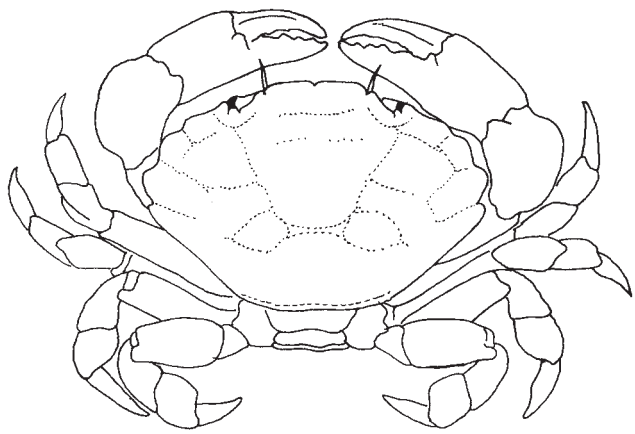
XANTHIDAE

Xanthid stone and mud crabs

Diagnostic characters: Carapace hexagonal, transversely hexagonal to transversely ovate, sometimes circular; dorsal surface usually ridged or granulose; frontal margin usually notched medially; usually 2 to 6 spines, teeth and/or lobes on each anterolateral margin. Longitudinal ridges which define the efferent respiratory current usually absent or strong only on posterior part of endostome; ridges not visible on anterior part of endostome when mouthparts pushed aside. Fingers of chela may be spoon-tipped. Legs varying in structure; propodus and dactylus with or without a special dactylo-propodal articulation, which is formed by a rounded submedian extension of the lateral margin, shaped to slide underneath a projecting button on the subproximal edge of the dactylus. **Male abdominal segments 3 to 5 immovable**, fused completely or incompletely. **Male first gonopod slender, slightly sinuous**; distal part relatively simple, without complex folds, long setae usually present distally or subdistally; **male second gonopod very short**, less than 1/4 the length of male first gonopod.



male abdomen

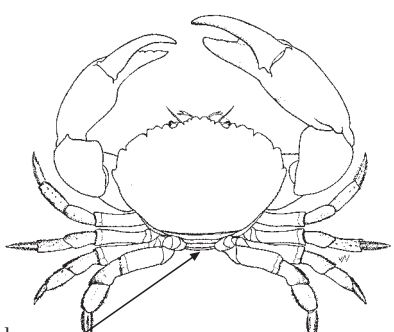


Habitat, biology, and fisheries: Benthic crabs with diverse habits. Most species of minor or no commercial importance. A single species of *Atergatopsis* ("egg crabs") and 4 of the reef species of *Etisus* ("spooner crabs") are of interest to fisheries in the area. **It is important to note here that several species of xanthids are highly poisonous,** particularly *Zosimus aeneus*, *Lophozozymus pictor*, and *Atergatis floridus*, and their consumption has caused a number of human deaths (see General Remarks).

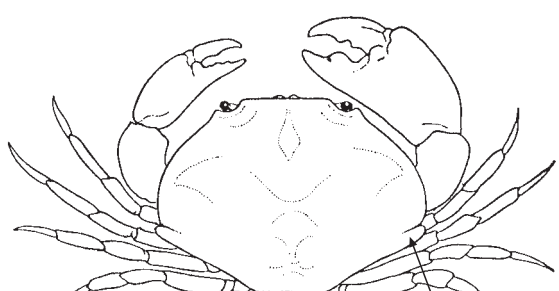
Similar families occurring in the area

The Xanthidae is a very diverse group and can easily be confused with a number of families. Particularly difficult to distinguish are the Eriphiidae (likewise called "stone and mud crabs") and Carpiliidae (reef crabs), both of which were previously included in the Xanthidae.

Carpiliidae, Eriphiidae: adult males can be distinguished from xanthids by having the male first gonopods stout and cylindrical (rather than slender and sinuous), and the male second gonopods very slender, longer than the male first gonopod (rather than very short). Male eriphiids can also be distinguished from xanthids by having all the male abdominal segments freely movable, with the sutures clearly visible (versus male abdominal segments 3 to 5 completely fused, with sutures not dicernible).



Eriphiidae



Carpilidae

Key to species of interest to fisheries occurring in the area

1a. Anterolateral margins almost entire except for a weak lateral tooth (Fig. 1) . . . . . ***Atergatopsis signatus***

1b. Anterolateral margins multidentate to multispinate . . . . . → ***2***

2a. Anterolateral margins each with first 2 teeth lobiform, not spine-tipped; adult chelipeds elongate; margins of legs unarmed (Fig. 2) . . . . . ***Etisus laevimanus***

2b. Anterolateral margins with teeth distinct, sharp; adult chelipeds normal; margins of legs armed with sharp granules or spines . . . . . → ***3***

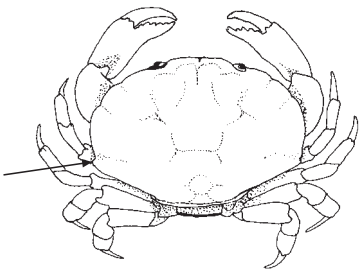


Fig. 1 ***Atergatopsis signatus***

3a. Anterolateral margins each with 8 strong, equal-sized teeth which curve distinctly forward (Fig. 3) . . . . . ***Etisus utilis***

3b. Anterolateral margins each with 6 strong, equal-sized triangular teeth which do not curve distinctly forward, often with 4 to 5 smaller teeth between them (Figs 4 and 5) . . . . . → ***4***

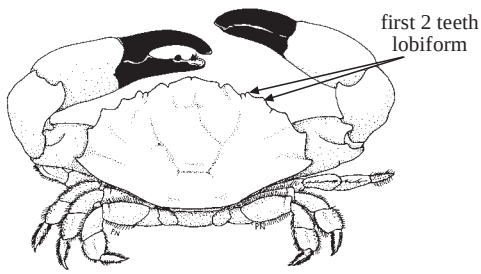


Fig. 2 ***Etisus laevimanus***

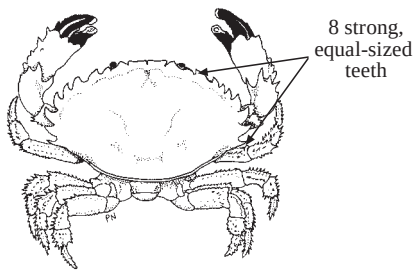


Fig. 3 ***Etisus utilis***

4a. Frontal lobes separated by narrow groove; carpus of cheliped with 1 spine on inner margin (Fig. 4) . . . . . ***Etisus dentatus***

4b. Frontal lobes separated by shallow, broad, V-shaped sulcus (cleft); carpus of cheliped with 2 spines on inner margin (Fig. 5) . . . . . ***Etisus splendidus***

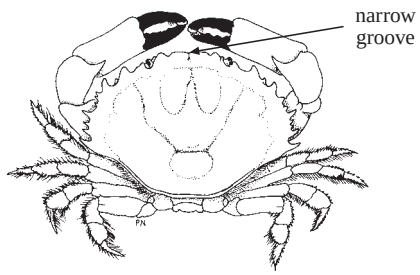


Fig. 4 ***Etisus dentatus***

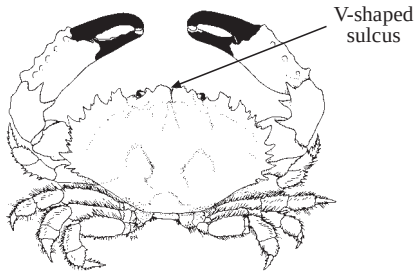


Fig. 5 ***Etisus splendidus***

List of species of interest to fisheries occurring in the area

The symbol is given when species accounts are included.

Atergatopsis signatus (Adams and White, 1848)

Etisus dentatus (Herbst, 1785)
Etisus laevimanus Randall, 1840
Etisus splendidus Rathbun, 1906
Etisus utilis Jacquinot, 1852

References

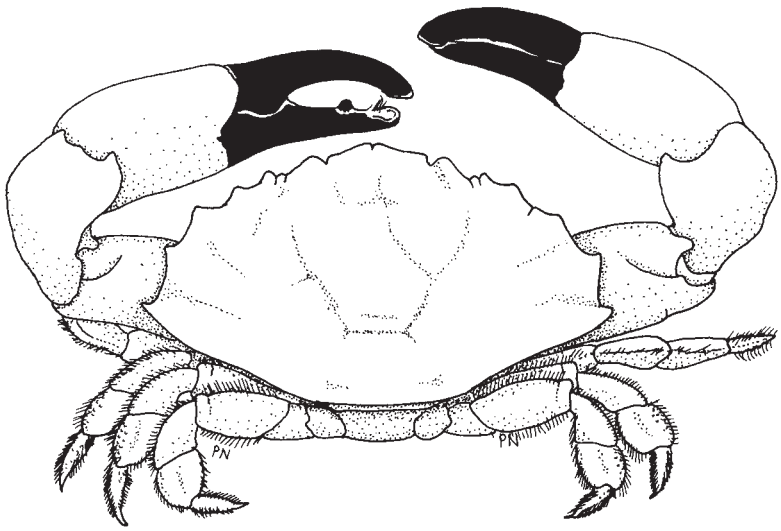
Alcock, A., 1898. Materials for a carcinological fauna of India. No. 3. The Brachyura Cyclometopa. Part I. The family Xanthidae. *J. Asiat. Soc. Bengal*, 67(2), No. 1:67-233.

Serène, R. 1984. Crustacés Décapodes Brachyoures de l'Ocean Indien occidental et de la Mer Rouge. Xanthoidea: Xanthidae et Trapeziidae. Addendeum Carpiliidae et Menippidae - A. Crosnier. *Faune Tropicale (ORSTOM)*, 24:1-400.

Etisus laevimanus Randall, 1840

Frequent synonyms / misidentifications: *Etisus macrodactylus* Bianconi, 1851; *E. convexus* Stimpson, 1858; *E. maculatus* Heller, 1861 / None.

FAO name: En - Smooth spooner.



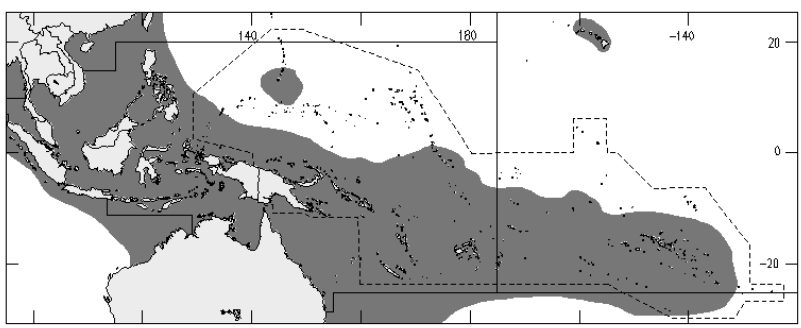
Diagnostic characters: Carapace distinctly broader than long, surfaces very smooth; anterolateral margin with 5 lobiform teeth (first 2 teeth never spine-tipped). Chelae very long in adults, reaching or almost reaching maximum width of carapace. **Colour:** quite variable, from dark grey to reddish brown, often with a patchwork of grey and dark brown.

Size: Maximum carapace width 8 cm.

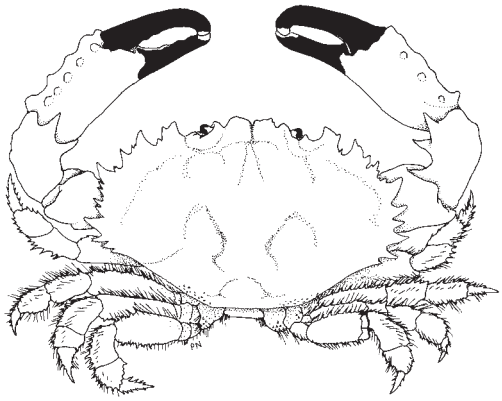
Habitat, biology, and fisheries: Inhabits reefs from the intertidal zone to a depth of about 20 m. Caught incidentally on reefs, using nets and fish traps; also collected by hand in some parts of its range. Of low market value, although it may be very common in certain regions, especially on disturbed reef flats.

Distribution: Indo-West Pacific, reaching eastwards to Guam, Hawaii, and French Polynesia.

Remarks: One of the most distinctive members of the genus because of its very broad and smooth carapace with lobiform anterolateral margins, and the elongate chelipeds.



Etisus splendidus Rathbun, 1906



Frequent synonyms / misidentifications: None / *Etisus utilis* Jacquinot, 1852; *E. dentatus* (Herbst, 1785).

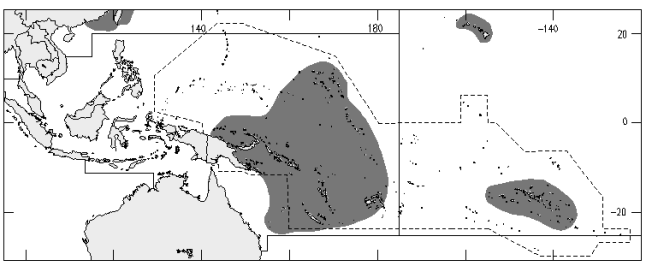
FAO name: En - Splendid spooner.

Diagnostic characters: Carapace ovate, surfaces smooth; 8 large teeth on each anterolateral margin (often with smaller denticles between them); front divided into 2 distinct lobes, separated by distinct V-shaped cleft. Carpus of cheliped with 2 spines on inner margin. **Colour:** red to reddish brown overall.

Size: Maximum carapace width 15 cm.

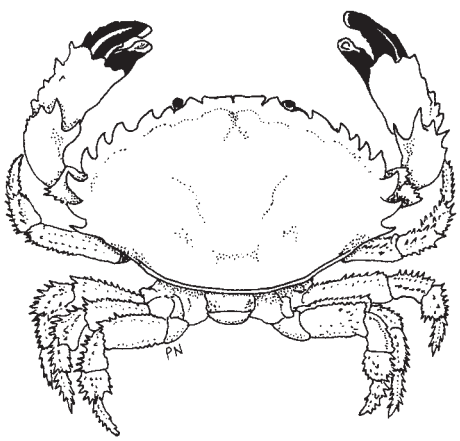
Habitat, biology, and fisheries: A coral reef crab. Never collected in large numbers, but prized when caught, because of its large size. Often caught in benthic nets and fish traps, or by hand in intertidal reef areas.

Distribution: Indo-West Pacific, eastwards to Hawaii and French Polynesia, but not yet known from Southeast Asia.



Remarks: There are 2 species in the area similar to *Etisus splendidus* in size and general morphology, namely *E. utilis* and *E. dentatus* (see species accounts below). *E. utilis* is easily recognized by its 8 anterolateral teeth which are curved forwards and dorsoventrally flattened, whereas *E. dentatus* can be distinguished by the distinct sinus between the 2 frontal lobes being very narrow and the carpus of the cheliped possessing only 1 spine on the inner margin.

Etisus utilis Jacquinot, 1852



Frequent synonyms / misidentifications: None / *Etisus splendidus* Rathbun, 1906; *E. dentatus* (Herbst, 1785).

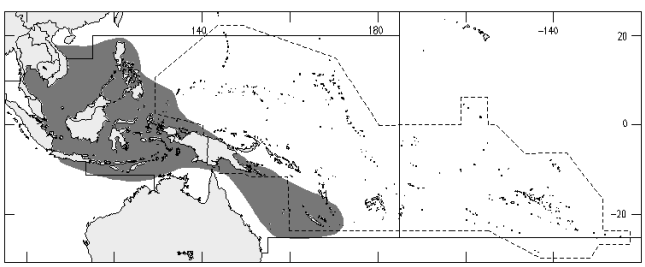
FAO name: En - Sawedged spooner.

Diagnostic characters: Carapace ovate, surfaces smooth; 8 large teeth on each anterolateral margin (often with smaller denticles between them); front divided into 2 distinctly truncate lobes, separated by narrow fissure. Carpus of cheliped with 2 large spines on inner margin. **Colour:** reddish brown overall; tips of dactylus of legs red.

Size: Maximum carapace width 15 cm.

Habitat, biology, and fisheries: A coral reef crab. Caught by hand, in benthic nets, and fish traps. Often collected for food, although rarely in large numbers. There is some evidence that this species may be temporarily mildly poisonous in some parts of its range.

Distribution: Indo-West Pacific, reaching eastwards to New Caledonia.

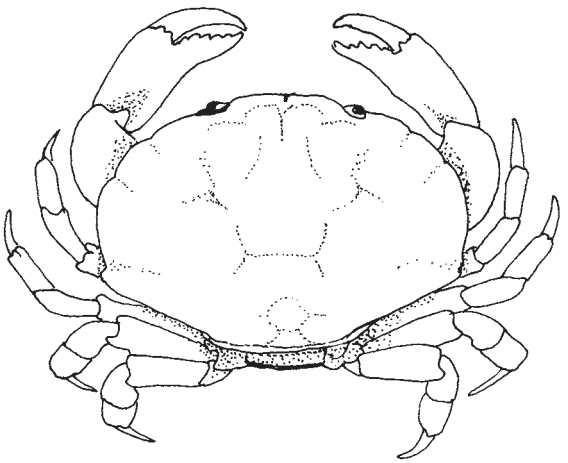


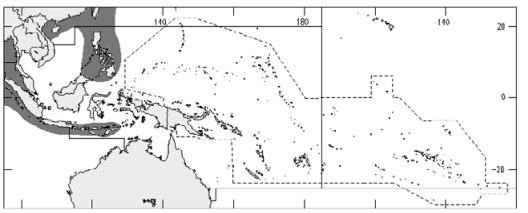
Remarks: See *Etisus splendidus*.

Atergatopsis signatus (Adams and White, 1848)

En - Giant egg crab.

Maximum carapace width 12 cm. Inhabits reefs from the intertidal zone to a depth of 25 m. Occasionally collected by hand or in traps because of its large size, but not a common species and therefore only locally of importance. Indo-West Pacific to Japan.

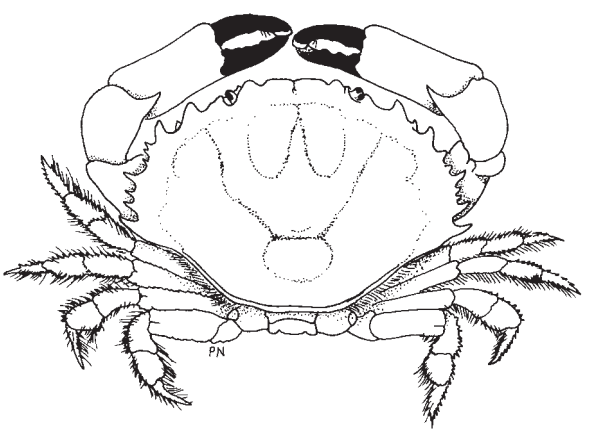


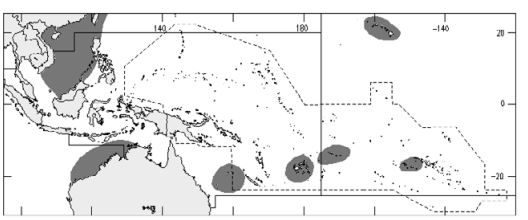


Etisus dentatus (Herbst, 1785)

En - Spiny spooner.

Maximum carapace width 12 cm. In reefs or among rocky substrates, from the intertidal zone to a depth of 20 m. Occasionally collected by hand or in traps, but nowhere of significant importance. Indo-West Pacific, eastwards to Tahiti and Hawaii, but not recorded from most of Southeast Asia.





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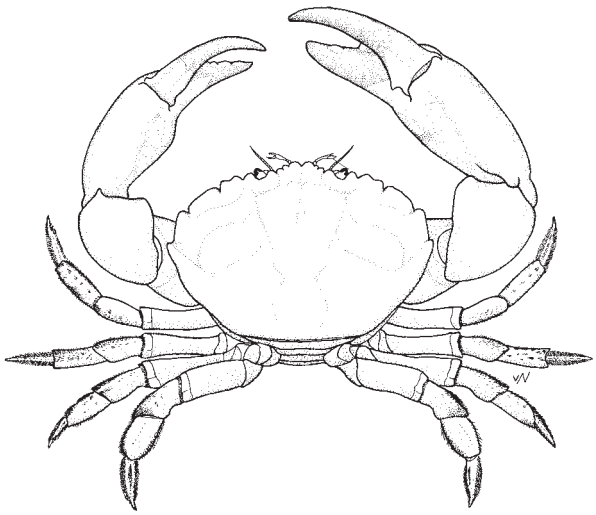
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ERIPHIIDAE

(= Menippidae, Oziidae)

Eriphiid stone and mud crabs

Diagnostic characters: Carapace hexagonal, transversely rectangular to transversely ovate; dorsal surfaces ridged or granulose; frontal margin notched medially; 4 teeth and/or lobes on each anterolateral margin. Legs normal. Longitudinal ridges which define efferent respiratory current well developed along entire endostome, ridges visible on anterior part of endostome when mouthparts pushed aside. **All male abdominal segments distinct, movable. Male first gonopod stout, almost straight or gently curved; male second gonopod elongate**, longer or subequal in length to male first gonopod.



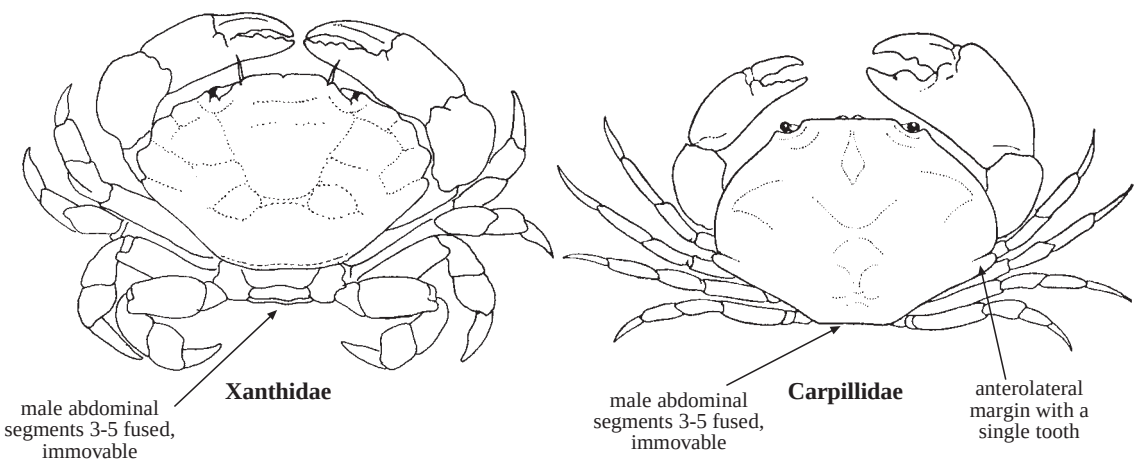
Habitat, biology, and fisheries:[1/] Benthic crabs. Most eriphiids are only of minor importance to fisheries. The more commonly collected species in the area are *Myomenippe hardwickii*, *Menippe rumphii*, and *Hypothalassia armata*.

Similar families occurring in the area

The Eriphiidae can easily be confused with the Xanthidae (likewise called “stone and mud crabs”) and Carpiliidae. These 3 groups were previously classified together in the Xanthidae.

Xanthidae: adult males can be distinguished from eriphiids by having abdominal segments 3 to 5 fused and immovable (versus all segments freely movable), the male first gonopods slender and sinuous (rather than stout, cylindrical), and the male second gonopods very short (rather than very elongate, longer than first gonopod).

Carpiliidae: can only be effectively distinguished from eriphiids by having male abdominal segments 3 to 5 immovable, completely fused, and the sutures not discernible (versus all male abdominal segments freely movable, sutures clearly visible).



1/ The most important commercial species of this family is probably the Australian “Tasmanian giant crab”, also known as the “queen crab”, *Pseudocarcinus gigas* (Lamarck, 1818), which occurs just outside the boundaries of the Western Central Pacific. It grows up to 40 cm in carapace width, at a maximum weight in excess of 12 kg. Over 50 t of these giant crabs are caught annually in Australia, where it commands prices of US$6 per kg, but it is even more expensive when exported.

Key to species of interest to fisheries occurring in the area

1a. Surfaces of carapace, chelipeds and legs with numerous sharp, long, slender spines (Fig. 1) . . . . . ***Hypothalassia armata***

1b. Surfaces of carapace, chelipeds and legs smooth or armed at most with low granules or tubercles . . . . . → ***2***

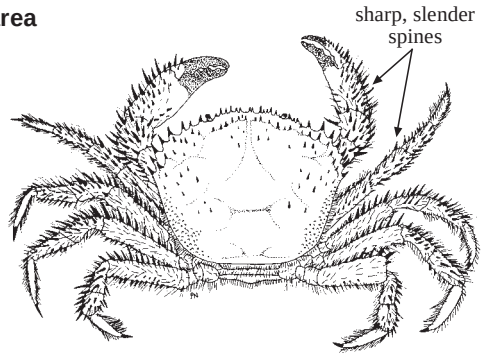


Fig. 1 ***Hypothalassia armata***

2a. Front finely granulate; anterolateral margins with clearly defined lobes or teeth . . . . . → ***3***

2b. Front multilobed or multidentate; anterolateral margins denticulate but without distinct lobes or teeth . . . . . → ***4***

3a. Outer surface of palm smooth (Fig. 2) . . . . . ***Eriphia sebana***

3b. Outer surface of palm granulose (Fig. 3) . . . . . ***Eriphia smithii***

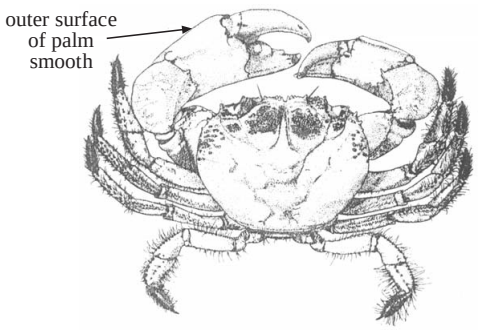


Fig. 2 ***Eriphia sebana***
(after Garth and Alcala, 1977)

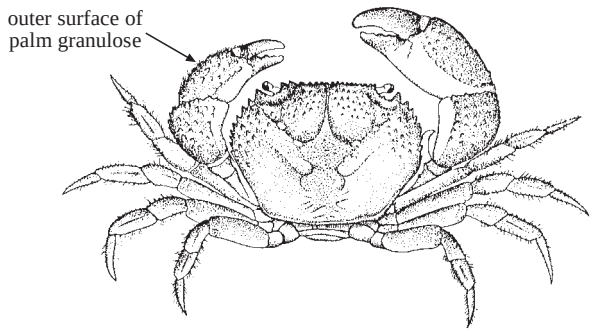


Fig. 3 ***Eriphia smithii***

4a. Anterolateral teeth not crested (Fig. 4a); base of movable finger of larger chela with large, gently curved tooth (Fig. 5a) . . . . . → ***5***

4b. Anterolateral teeth crested (Fig. 4b); base of movable finger of larger chela with large molariform tooth (Fig. 5b) . . . . . → ***7***

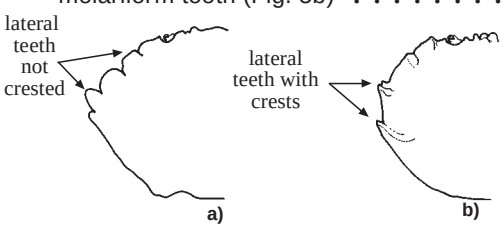


Fig. 4 anterolateral margin of carapace

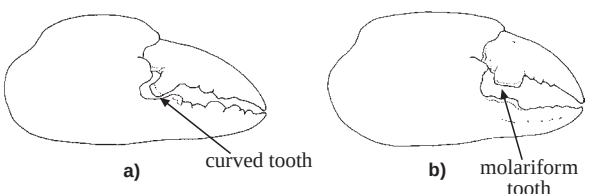


Fig. 5 outer surface of large chela

5a. Palm of smaller chela slender; fingers slender, forceps-like; palm and fingers either subequal in length, or fingers longer (Fig. 6a) . . . . . ***Epixanthus dentatus***

5b. Palm of smaller chela moderately stout; fingers not forceps-like; palm and fingers either subequal in length, or (usually) fingers shorter (Fig. 6b) . . . . . → ***6***

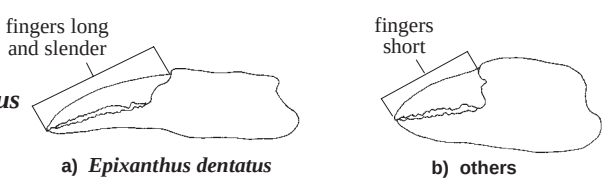


Fig. 6 outer surface of small chela

6a. Dorsal surface of carapace smooth or with numerous small, shallow pits (Fig. 7) . . . ***Ozius guttatus***

6b. Dorsal surface of carapace with numerous small but distinct rounded granules (Fig. 8) . . . . . ***Ozius tuberculosus***

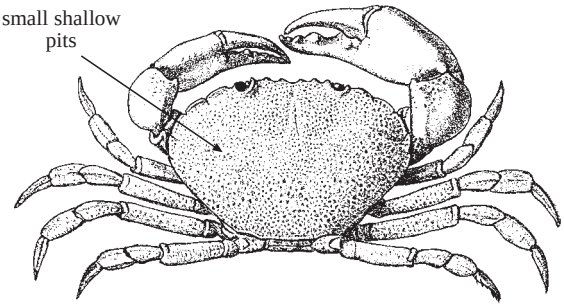


Fig. 7 ***Ozius guttatus***
(from A. Milne Edwards, 1873)

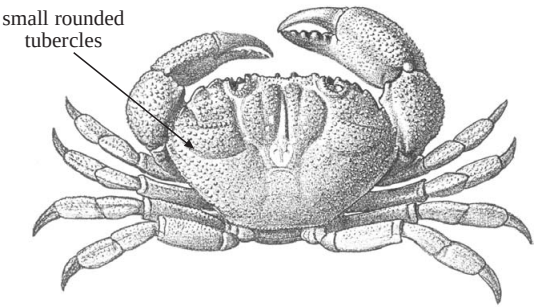


Fig. 8 ***Ozius tuberculosus***
(from A. Milne Edwards, 1873)

7a. Dorsal surface of carapace and chelipeds granulose (Fig. 9) . . . . . ***Myomenippe hardwickii***

7b. Dorsal surface of carapace and chelipeds smooth . . . . . → ***8***

8a. Basis-ischium and merus of cheliped movable, with suture demarcating them still distinct (Fig. 10a); reddish brown in life; non-mangrove species . . . . . ***Menippe rumphii***

8b. Basis-ischium and merus of cheliped fused, immovable, with suture demarcating them partially to almost completely reduced (Fig. 10b); dirty-brown in life; usually mangrove species . . . . . ***Myomenippe fornasinii***

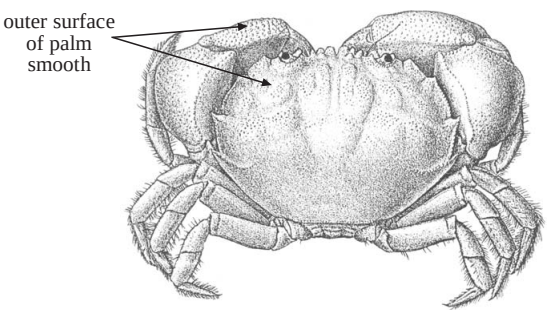
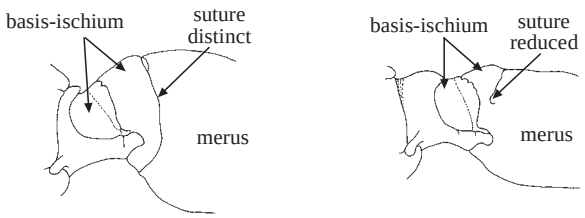


Fig. 9 ***Myomenippe hardwickii***
(from De Man, 1887)



a) ***Menippe rumphii*** **b)** ***Myomenippe fornasinii***

Fig. 10 basis-ischium and merus of cheliped

List of species of interest to fisheries occurring in the area

The symbol is given when species accounts are included.

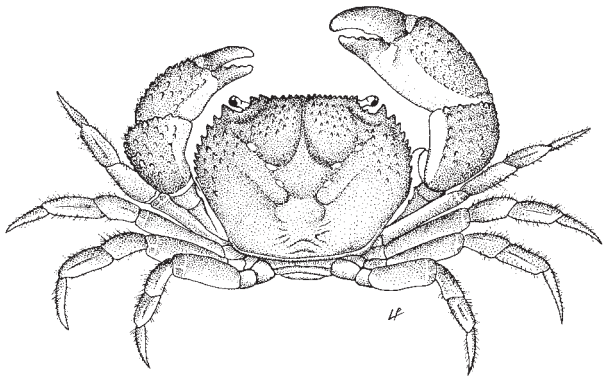
- *Epixanthus dentatus* (White, 1847)
- *Eriphia sebana* (Shaw and Nodder, 1803)
- *Eriphia smithii* (MacLeay, 1838)
- *Hypothalassia armata* (De Haan, 1835)
- *Menippe rumphii* (Fabricius, 1798)
- *Myomenippe hardwickii* (Gray, 1831)
- *Myomenippe fornasinii* (Bianconi, 1851)
- *Ozius guttatus* H. Milne Edwards, 1834
- *Ozius tuberculosus* H. Milne Edwards, 1834

References

Alcock, A. 1898. Materials for a carcinological fauna of India. No. 3. The Brachyura Cyclometopa. Part I. The family Xanthidae. *J. Asiat. Soc. Bengal*, 67(2), No. 1:67-233.

Serène, R. 1984. Crustacés Décapodes Brachyoures de l'Ocean Indien occidental et de la Mer Rouge. Xanthoidea: Xanthidae et Trapeziidae. Addendeum Carpiliidae et Menippidae - A. Crosnier. *Faune Tropicale (ORSTOM)*, 24:1-400.

Eriphia smithii MacLeay, 1838



Frequent synonyms / misidentifications: None / *Eriphia sebana* (Shaw and Nodder, 1803).

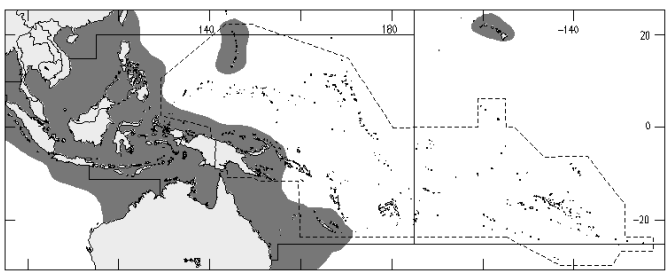
FAO name: En - Rough redeyed crab.

Diagnostic characters: Carapace rectangular, anterior surface granulated; anterolateral margins with numerous spines, but without distinct teeth or lobes. Base of movable finger of larger claw with large molarifom tooth. **Colour:** dark reddish brown overall, with bright red eyes.

Size: Maximum carapace width 6 cm.

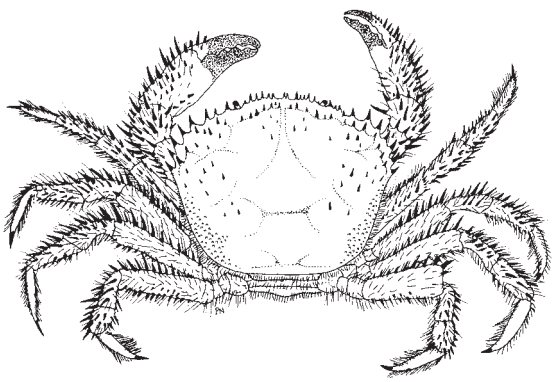
Habitat, biology, and fisheries: A reef species, preferring intertidal areas. Both species of *Eriphia* included here have a low fishery value and are only collected locally, although frequently, by hand during low tide periods. *Eriphia* species are said to be poisonous in some areas, but those reports could not been confirmed biochemically. It may be possible that upon feeding on poisonous molluscs or material, the crabs become toxic for a short period as well.

Distribution: Indo-West Pacific, reaching to Hawaii.



Remarks: Can only be confused with *Eriphia sebana*, which is easily distinguished by the smooth outer surface of the palm (palm covered with numerous granules in *E. smithii*). *E. sebana* also has a lighter coloured, beige-brown carapace (dark-reddish brown in *E. smithii*).

Hypothalassia armata (De Haan, 1835)



Frequent synonyms / misidentifications: *Acanthodes armatus* De Haan, 1835 / None.

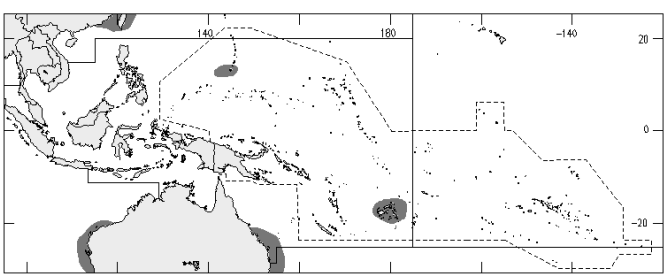
FAO name: En - Champagne crab.

Diagnostic characters: Carapace smooth; anterolateral margins with numerous very sharp spines of differing sizes. Surfaces of legs and chelae with numerous sharp, brown-black spines of differing sizes. **Colour:** carapace reddish brown to brown, especially on anterior part; spines black to brown; fingers black.

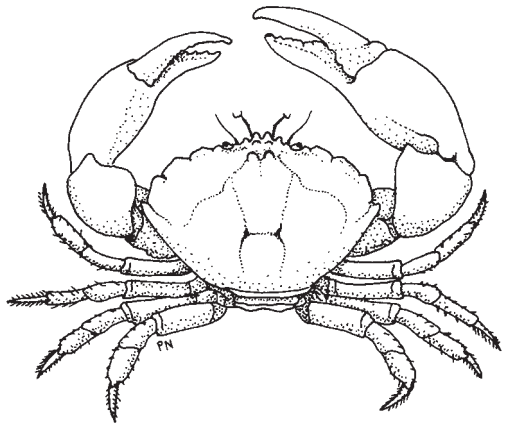
Size: Maximum carapace width 15 cm for males, females generally smaller.

Habitat, biology, and fisheries: The monotypic *Hypothalassia armata* prefers rocky and muddy substrates, at depths from 30 to 540 m. It is caught in deep-water lobster pots and sometimes in bottom trawls. Highly valuable for human consumption because of its large size and the enlarged chelae. The common name, “champagne crab”, refers to its flesh, which is considered to be of a very fine quality. Occasionally marketed in Australia. Larger markets are being sought for this crab which is exported to Taiwan Province of China and Singapore, where live specimens command premium prices of up to US$40 per kg. Outside the area, it is occasionally caught off Western Australia; sometimes also collected for food in southern Japan and Taiwan Province of China, but more frequently cleaned, dried, and mounted for the souvenir trade.

Distribution: Australia, Guam, Fiji, Taiwan Province of China, and Japan.



Menippe rumphii (Fabricius, 1798)



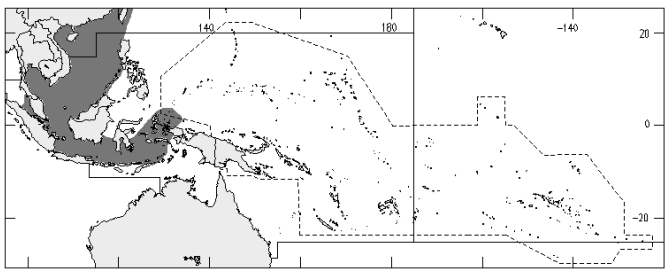
Frequent synonyms / misidentifications: None / *Myomenippe hardwickii* (Gray, 1831).

FAO name: En - Maroon stone crab.

Diagnostic characters: Carapace ovate, smooth, regions well defined; 4 broad lobiform teeth on each anterolateral margin. Eyes red in life. A large molariform tooth at base of movable finger of larger chela. **Colour:** carapace and appendages reddish brown to pinkish brown and maroon in adults; young crabs maroon to reddish brown, longitudinally striped with white.

Size: Maximum carapace width 9 cm.

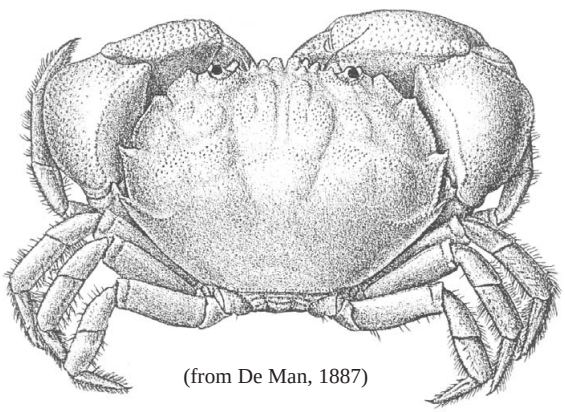
Habitat, biology, and fisheries: Prefers shallow to intertidal waters, on sandy-muddy substrates, usually under rocks. *Menippe rumphii* is occasonally fished for food, collected by hand or with nets and fish traps. There are no targeted fisheries for this species, although it can be quite common in parts of the Sunda Shelf. Like *Myomenippe hardwickii*, usually only the chelae are retained for sale.



Distribution: Malaysia, Singapore, Indonesia Thailand, southern China and Taiwan Province of China.

Remarks: Can only be confused with *Myomenippe hardwickii*, which is easily distinguished by the dull brown coloration, green eyes, and rougher carapace surface.

Myomenippe hardwickii (Gray, 1831)



(from De Man, 1887)

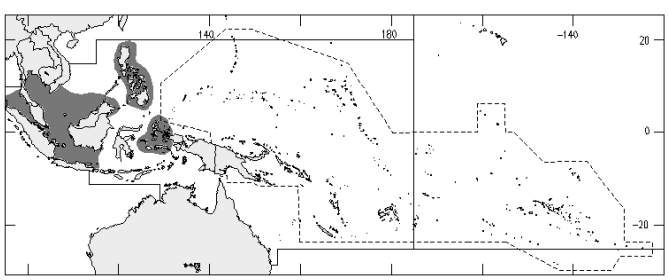
Frequent synonyms / misidentifications: *Menippe granulosa* De Man, 1888; *Myomenippe granulosa* (Gray, 1831) / *Menippe rumphii* (Fabricius, 1798); *Myomenippe fornasinii* (Bianconi, 1851).

FAO name: En - Mangrove stone crab.

Diagnostic characters: Carapace ovate, covered with numerous very small granules; regions well defined; 4 broad lobiform teeth on each anterolateral margin. Eyes green in life. A large molariform tooth at base of movable finger of larger chela. **Colour:** carapace dirty-brown overall; eyes green, fingers black.

Size: Maximum carapace width 10 cm.

Habitat, biology, and fisheries: Essentially a shallow-water to intertidal mangrove species, preferring rocky areas, or areas densely covered by bivalves, such as *Perna* spp. Caught using fish traps, drift nets, and also taken by hand. An abundant species, caught in large quantities for its massive chelae, but no targeted fisheries are known. Similar to practice in the Americas with certain crab species, the chelae are frequently broken off and the animal is thrown back into the water.



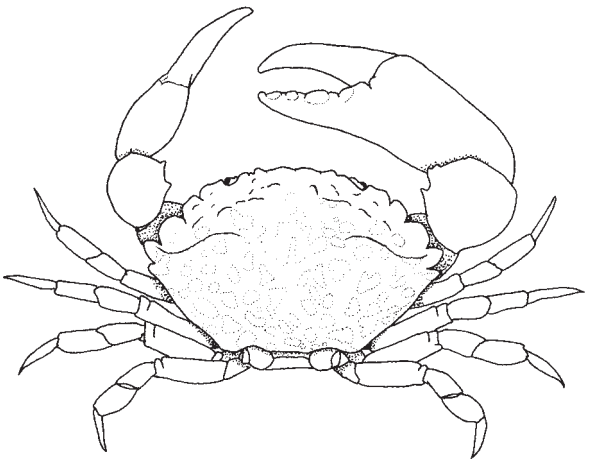
Distribution: Throughout Southeast Asia, reaching the Philippines.

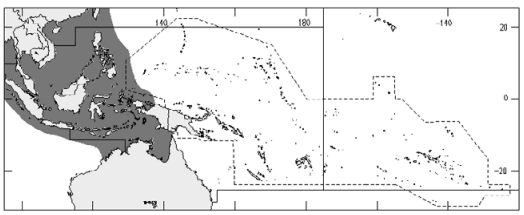
Remarks: Can be confused with *Myomenippe fornasinii* and *Menippe rumphii*, but these 2 species have much smoother carapace and cheliped surfaces (not granulose as seen in *Myomenippe hardwickii*). *Menippe rumphii* additionally differs by its reddish brown coloration and its red eyes.

Epixanthus dentatus (White, 1847)

En - Longfingered peeler crab.

Maximum carapace width 7 cm. Mainly along mangroves, usually under rocks or timber. A moderately large species, quite common in many areas and therefore very likely collected for food by local populations. Indo-West Pacific in distribution, southwards reaching northern Australia.

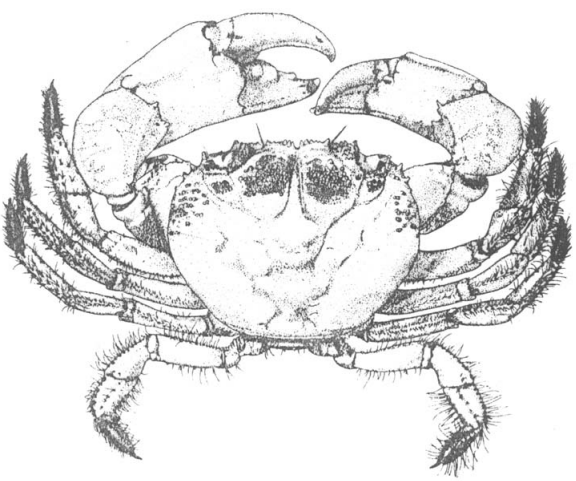




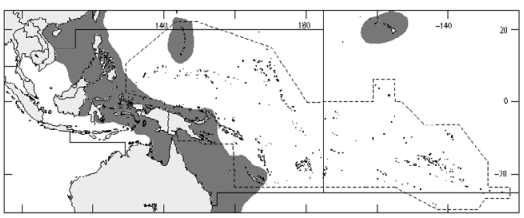
Eriphia sebana (Shaw and Nodder, 1803)

En - Smooth redeyed crab.

Maximum carapace width 8 cm. A rocky-shore or reef-dwelling species. Occasionally collected for food, but never in large numbers. There have been reports that this species is occasionally mildly poisonous in some parts of its range (see also *E. smithii*). Throughout Indo-West Pacific, including Hawaii and various parts of Southeast Asia.



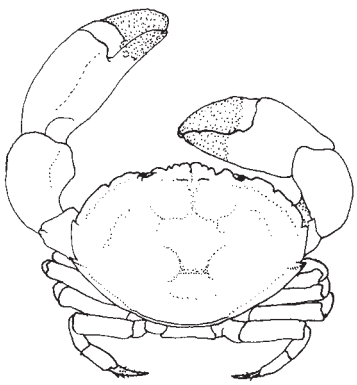
(from Garth and Alcala, 1977)

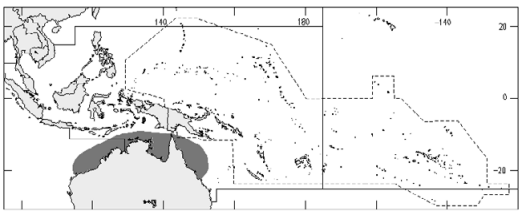


Myomenippe fornasinii (Bianconi, 1851)

En - Smooth stone crab.

Maximum carapace width 9 cm. A littoral species, with preference for rocky shores with muddy-sand bottoms, commonly found under rocks and timber, and in crevices in mangroves. Probably occasionally collected for food by local populations for its large size. Occurs in parts of the Indian Ocean and northern Australia.

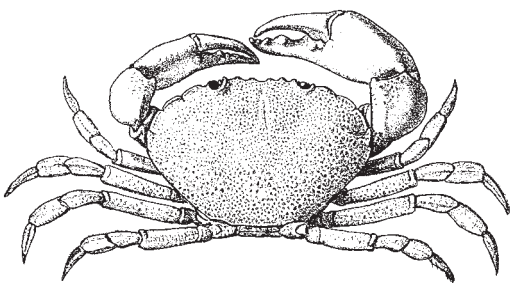




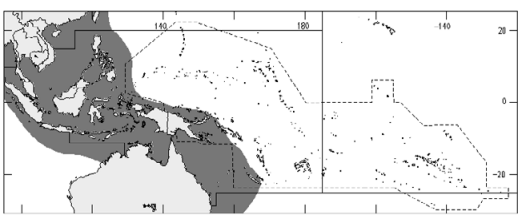
Ozius guttatus H. Milne Edwards, 1834

En - Spottedbelly rock crab.

Maximum carapace width 9 cm. Along rocky shores in intertidal to shallow subtidal waters, sometimes in estuaries, usually hiding in crevices. Occasionally collected by hand for human consumption. Indo-West Pacific, from the Indian Ocean to Southeast Asia, Japan, and New Caledonia.



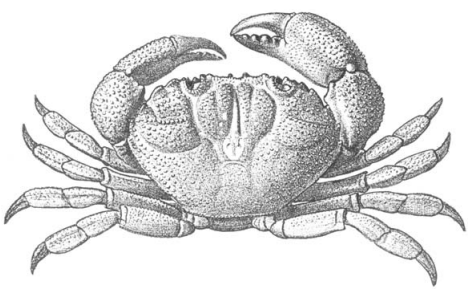
(from A. Milne Edwards, 1873)



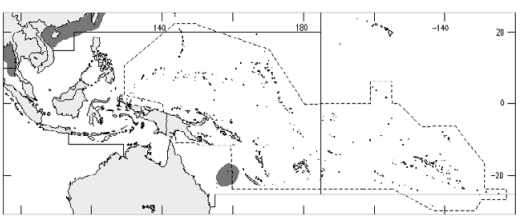
Ozius tuberculosus H. Milne Edwards, 1834

En - Beaded rock crab.

Maximum carapace width 9 cm. Usually along rocky shores in intertidal to shallow subtidal waters. Occasionally collected by hand or traps for human consumption. Indo-West Pacific, known from Mauritius and southern India to Southeast Asia, China, Japan, and New Caledonia.



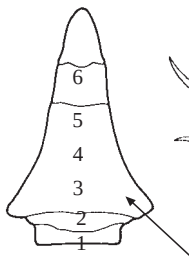
(from A. Milne Edwards, 1873)



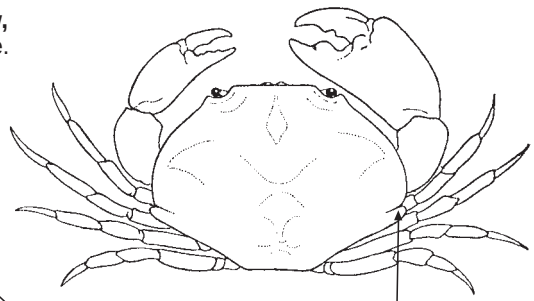
CARPILIIDAE

Reef crabs

Diagnostic characters: Carapace transversely ovate; dorsal surface smooth, distinctly convex longitudinally and transversely; front entire; **a single low, small tooth on each anterolateral margin of carapace**. Legs simple. Longitudinal ridges which define efferent respiratory current usually absent or strongly developed on posterior part of endostome only; ridges not clearly visible on anterior part of endostome when mouthparts pushed aside. **Male abdominal segments 3 to 5 immovable, completely fused. Male first gonopod stout, almost straight or gently curved; male second gonopod elongate**, longer or subequal in length to male first gonopod.



male abdomen



segments 3-5 completely fused

anterolateral margin with a single tooth

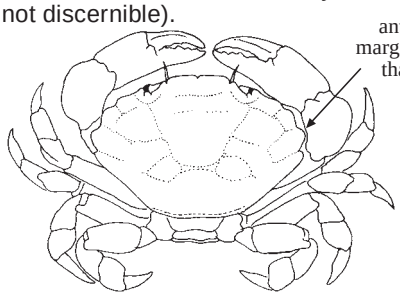
Habitat, biology, and fisheries: Benthic reef crabs. A single genus of Carpiliidae, *Carpilius* (with only 2 species in the Pacific), has fishery value. Both Pacific species of *Carpilius*, *C. maculatus* and *C. convexus*, are occasionally collected for food.

Similar families occurring in the area

Only the Xanthidae and Eriphiidae (both families known as “stone and mud crabs”) can easily be confused with carpiliids. These 3 taxa were all previously classified in a single family (Xanthidae).

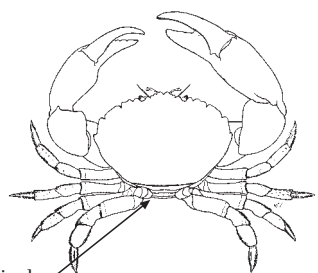
Xanthidae: can be distinguished from carpiliids by the shape of the male first gonopods, which are slender and sinuous (rather than stout, cylindrical), and the male second gonopods, which are very short (rather than very elongate, longer than first gonopod).

Eriphiidae: can only be effectively distinguished from carpiliids by having all the male abdominal segments freely movable, with the sutures clearly visible (versus male abdominal segments 3 to 5 completely fused, sutures not discernible).



anterolateral margin with more than 1 tooth

Xanthidae



all male abdominal segments freely movable

Eriphiidae

Key to species of interest to fisheries occurring in the area

1a. Cream to pink ground colour in life, carapace with 9 large violet to maroon spots . . . . . ***Carpilius maculatus***

1b. Uniform red to reddish brown colour in life . . . . . ***Carpilius convexus***

List of species of interest to fisheries occurring in the area

The symbol 🦀 is given when species accounts are included.

🦀 *Carpilius convexus* (Forsskål, 1775)
🦀 *Carpilius maculatus* (Linnaeus, 1758)

References

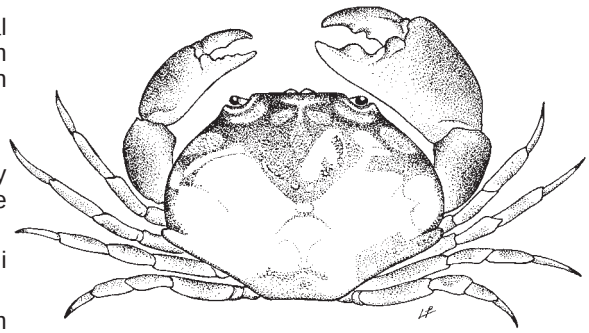
Alcock, A. 1898. Materials for a carcinological fauna of India. No. 3. The Brachyura Cyclometopa. Part I. The family Xanthidae. *J. Asiat. Soc. Bengal*, 67(2), No. 1:67-233.

Serène, R. 1984. Crustacés Décapodes Brachyoures de l’Ocean Indien occidental et de la Mer Rouge. Xanthoidea: Xanthidae et Trapeziidae. Addendeum Carpiliidae et Menippidae - A. Crosnier. *Faune Tropicale (ORSTOM)*, 24:1-400.

Carpilius convexus (Forsskål, 1775)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Red reef crab.



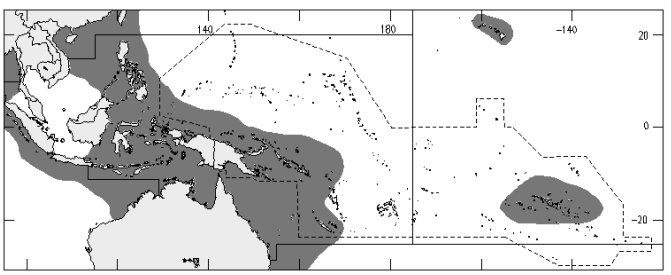
Diagnostic characters: Carapace ovate; dorsal surface very smooth and convex. **Colour:** uniform red to reddish brown, with irregular dark brown patches on the dorsal surface of carapace.

Size: Maximum carapace width 15 cm.

Habitat, biology, and fisheries: A reef crab. Biology and fisheries similar to *Carpilius maculatus* (see below).

Distribution: Indo-West Pacific, reaching Hawaii and French Polynesia.

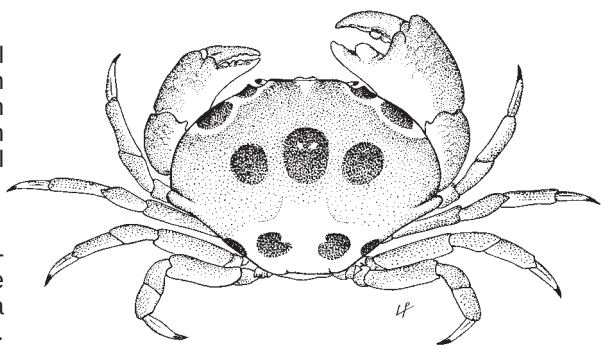
Remarks: *C. convexus* is easily distinguished from *C. maculatus* by its distinct coloration which remains even after preservation.



Carpilius maculatus (Linnaeus, 1758)

Frequent synonyms / misidentifications: None / None.

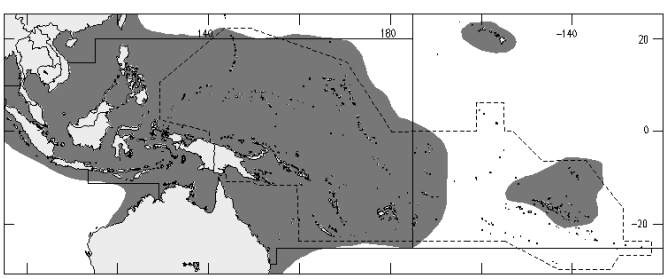
FAO name: En - Spotted reef crab.



Diagnostic characters: Carapace ovate; dorsal surface very smooth and convex. **Colour:** cream to pink ground colour, with 9 large violet to maroon spots on dorsal surface of carapace: 3 on median region, 2 on posterior region, 2 on anterolateral region, and 2 around the orbits.

Size: Maximum carapace width 18 cm.

Habitat, biology, and fisheries: A reef crab. Collected extensively for food, although never in large quantities. Frequently seen in markets of East Asia and parts of Indonesia, but only in small numbers. Usually collected by hand or with baited traps. There have been reports that this species is poisonous, but this could not been confirmed by biochemical tests. It is possible that after feeding on poisonous molluscs, the crabs become toxic for a short period as well.



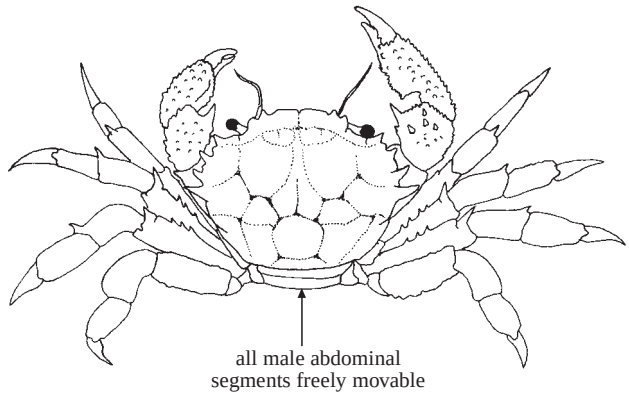
Distribution: Indo-West Pacific, reaching Hawaii and French Polynesia.

Remarks: The only other species of *Carpilius* in the area is *C. convexus*, which can easily be distinguished by its very different coloration.

PILUMNIDAE

Hairy crabs

Diagnostic characters: Carapace hexagonal, transversely rectangular or transversely ovate; dorsal surface convex, smooth to granulated; frontal margin entire to multilobate; usually 1 to 4 teeth or lobes on each anterolateral margin. **Longitudinal ridges defining efferent respiratory current usually well developed along entire endostome**, ridges visible on anterior part of endostome when mouthparts pushed aside. Legs normal. **Male abdominal segments 3 to 5 freely movable. Male first gonopod slender, usually S-shaped**, distal part simple; **male second gonopod very short**, sigmoid.



Habitat, biology, and fisheries: Benthic crabs with diverse habits. Most species in this family are of no commercial value. The moderately large-sized *Galene bispinosa* has minor economic importance.

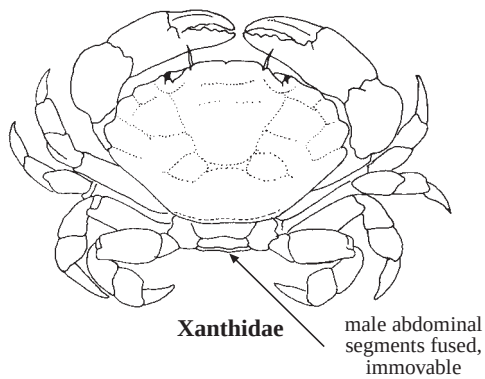
Remarks: Despite their common name, "hairy crabs", many pilumnids (including *Galene bispinosa*) are actually not very setose (or "hairy").

Similar families occurring in the area

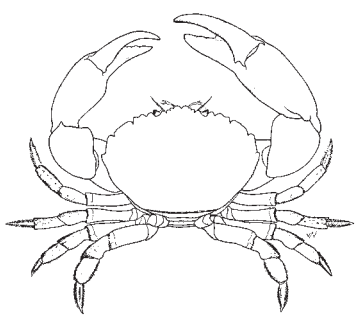
The Pilumnidae is a very diverse group and its taxonomy remains unsettled. As their general (usually hexagonal) carapace shape is similar to those of xanthids, eriphiids, and goneplacids, the safest way to identify a pilumnid species is to examine the male abdomen and gonopods. All pilumnids share very similar male abdominal, male pleopodal, and larval characters.

Xanthidae: male abdominal segments 3 to 5 fused (instead of freely movable).

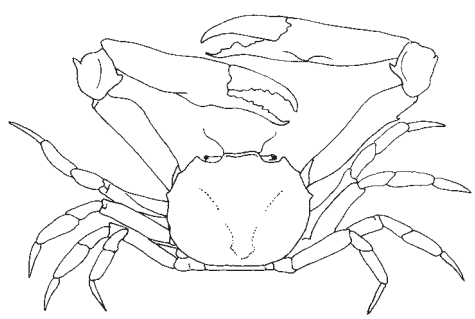
Eriphiidae: male first gonopods stout (rather than slender and sinuous); male second gonopods long (rather than very short).



Goneplacidae: generally have stouter male first gonopods and/or proportionately longer male second gonopods; some species with male abdominal segments 3 to 5 fused.



Eriphiidae



Goneplacidae

References

Balss, H. 1933. Beitrage zur Kenntnis der Gattungen *Pilumnus* (Crustacea Dekapoda) und verwandter Gattungen. *Capita Zoologica*, 4(3):1-47.

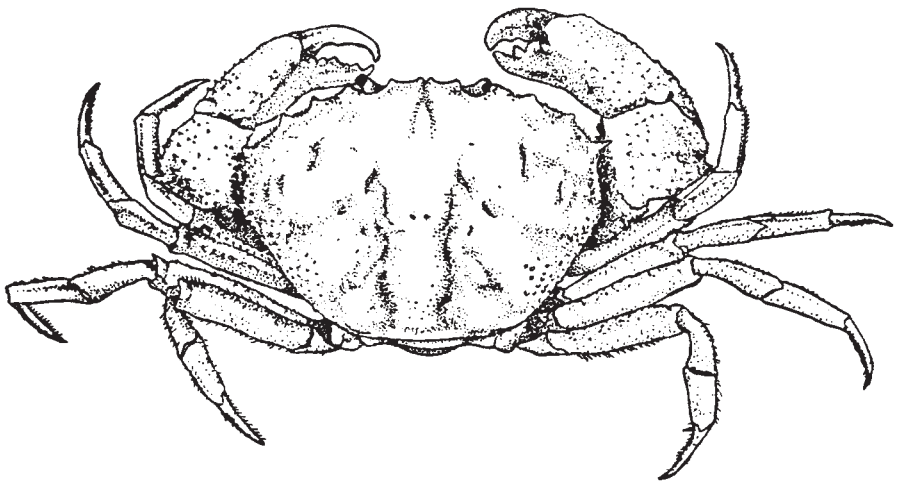
Ng, P.K.L. 1987. The Indo-Pacific Pilumnidae II. A revision of the genus *Rhizopa* Stimpson, 1858 and the status of the Rhizopinae Stimpson, 1858 (Crustacea: Decapoda: Brachyura). *Indo-Malayan Zoology*, 4(1):69-111.

A single species of interest to fisheries occurring in the area.

Galene bispinosa (Herbst, 1783)

Frequent synonyms / misidentifications: *Podopilumnus fittoni* M'Coy, 1849; *Gecarcinus trispinosus* Desmarest, 1822; *Galene granulosa* Miers, 1884 / None.

FAO name: En - Square-shelled crab.

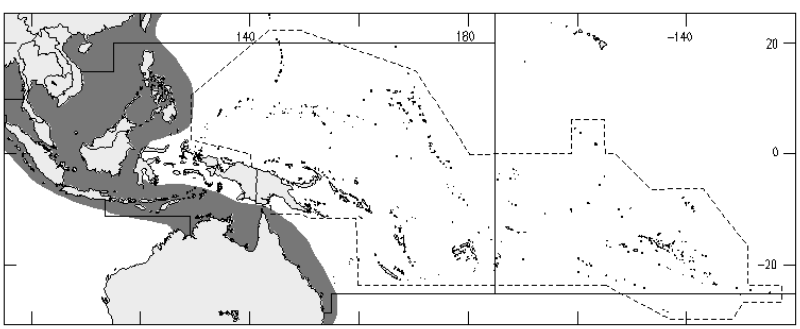


Diagnostic characters: Carapace subpentagonal, dorsal surface gently convex, lateral regions with numerous small, rounded granules; 2 or 3 distinct conical teeth on each lateral margin (2 teeth always distinct). Chelipeds stout, surfaces finely granulated. **Colour:** tan to purplish tan.

Size: Maximum carapace width 8 cm.

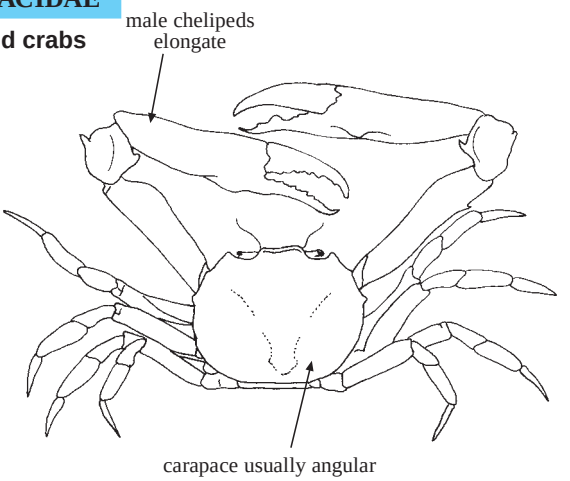
Habitat, biology, and fisheries: In shallower waters, down to depths of about 100 m, living on muddy substrates. Caught mainly by bottom trawls, often in large quantities. Of low fishery value, although very abundant in some areas. Only occasionally seen in markets and sold for low prices. Fished mainly in Thailand and various parts of Indonesia.

Distribution: India and Southeast Asia to Australia and Japan.



GONEPLACIDAE

Rhomboid crabs



Diagnostic characters: Carapace hexagonal, transversely rectangular, trapezoidal, or transversely ovate; dorsal surface convex, usually smooth; frontal margin usually entire, sometimes multilobate; anterolateral margin usually armed with 1 to 4 teeth or lobes, or entire. **Male abdominal segments 3 to 5 distinct, movable or fused and immovable. Male first gonopod moderately stout, gently curved or sinuous; male second gonopod relatively short to elongate**, but usually shorter than male first gonopod.

Habitat, biology, and fisheries: Benthic crabs with diverse habits. Most species in this family are of little or no commercial value. The relatively common and large *Carcinoplax longimanus* has a minor importance to fisheries in the Western Central Pacific.

Similar families occurring in the area

The Goneplacidae is doubtless a very heterogeneous group. Obviously, the genera included here were assigned to this family due to lacking evidence to place them into any others of the known families. Although the angular carapace of most goneplacids readily separates them from species of other families, a clear definition of the Goneplacidae is not known. Accordingly, any comparisons with outside taxa are very difficult and must be done on a genus by genus basis. *Carcinoplax*, the only genus in the area that includes an edible species, resembles in general body shape some species of Xanthidae, Eriphiidae, and Carpiliidae.

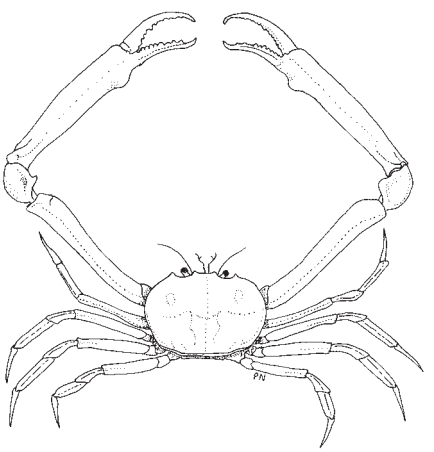
Xanthidae, Eriphiidae, and Carpiliidae: compared to species of these families, in *Carcinoplax*, the carapace is clearly more ovate in shape and the adult male chelipeds are extremely elongated. In addition, the male second gonopods of *Carcinoplax* are intermediate in relative length between xanthids (very short, as in pilumnids) and eriphiids (very long).

References

Guinot, D. 1989. Le genre *Carcinoplax* H. Milne Edwards, 1852 (Crustacea: Decapoda: Goneplacidae). In *Résultats des Campagnes MUSORSTOM*, 4, edited by J. Forest. *Mém. Mus. natn. Hist. nat.*, 144:265-345.

Tesch, J.J. 1918. The Decapoda Brachyura of the Siboga Expedition. II. Goneplacidae and Pinnotheridae. *Siboga Exped. Monogr.*, 39c(1):149-295.

A single species of interest to fisheries occurring in the area.



Carcinoplax longimanus (De Haan, 1833)

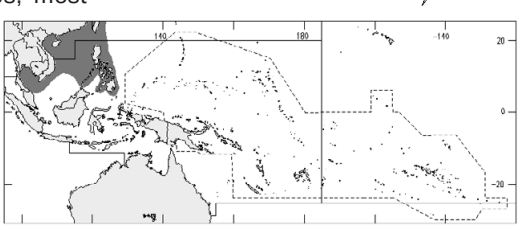
Frequent synonyms / misidentifications: *Carcinoplax longimanus japonicus* Doflein, 1904; *Carcinoplax longimanus typicus* Doflein, 1904 / None.

FAO name: En - Long-armed crab.

Diagnostic characters: Carapace ovoid; dorsal surface convex and smooth; lateral margin with 3 strong teeth in juveniles, becoming small to almost indiscernible in adults. Male chelipeds very elongate. **Colour:** red to pink overall.

Size: Maximum carapace width 8 cm.

Habitat, biology, and fisheries: On muddy substrates, most commonly found in deeper waters from depths of 100 to 800 m. Fished mainly in southern Japan and southern China. Taken incidentally in major fishery operations, mainly by bottom trawls and often in large numbers. Only larger specimens are sold, but have a low value in most markets.



Distribution: Japan, Taiwan Province of China, China, Philippines, and Thailand.

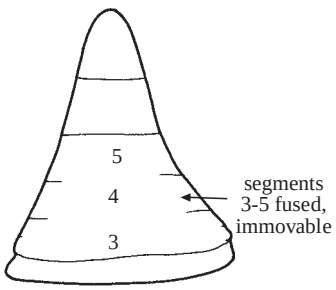
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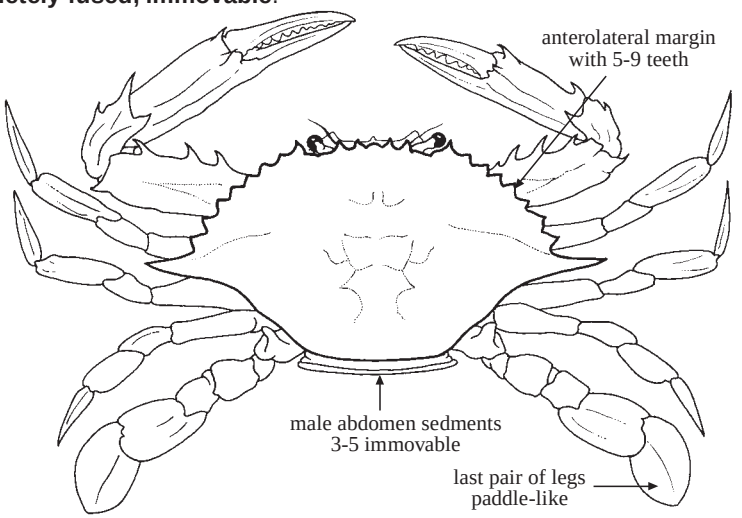
PORTUNIDAE

Swimming crabs

Diagnostic characters: Carapace hexagonal, transversely ovate to transversely hexagonal, sometimes circular; dorsal surface relatively flat to gently convex, usually ridged or granulose; front broad, margin usually multidentate; usually 5 to 9 teeth on each anterolateral margin, posterolateral margins usually distinctly converging. **Endopodite of second maxillipeds with strongly developed lobe on inner margin**. Legs laterally flattened to varying degrees, **last 2 segments of last pair paddle-like. Male abdominal segments 3 to 5 completely fused, immovable**.



male abdomen



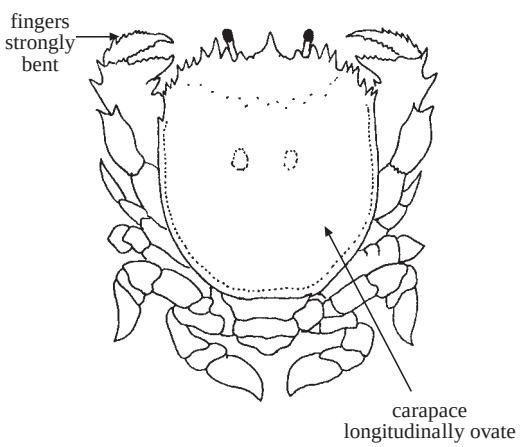
Habitat, biology, and fisheries: Benthic to semipelagic crabs with diverse habits. Many species of great fishery value, notably *Scylla serrata*, *Portunus pelagicus, P. sanguinolentus, P. trituberculatus,* and *Charybdis feriatus*.

Similar families occurring in the area

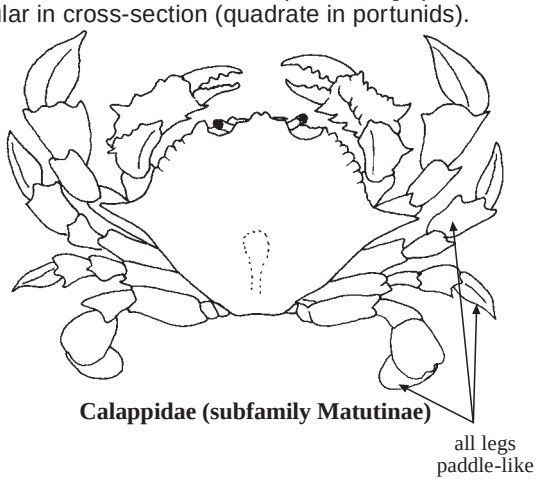
Portunids may be confused with spanner crabs (Raninidae) and moon crabs (Calappidae: Matutinae), which also possess paddle-like legs. They can be separated from portunids as follows:

Raninidae: carapace usually longitudinally ovate; sternum very narrow; fingers of chela strongly bent; meri of third maxillipeds triangular (quadrate in portunids).

Calappidae (subfamily Matutinae): carapace circular to subcircular; at least last 3 pairs of legs paddle-like, (not only the last pair); meri of third maxillipeds triangular in cross-section (quadrate in portunids).



Raninidae



Calappidae (subfamily Matutinae)

Key to species of interest to fisheries occurring in the area

1a. Carapace with 2 anterolateral teeth; eyes very long, reaching lateral edge of carapace (Fig. 1) . . . . . ***Podophthalmus vigil***

1b. Carapace with more than 2 anterolateral teeth; eyes normal in size . . . . . → ***2***

2a. Carapace rounded; ventral surface of palm with stridulatory (sound-producing) ridges (Fig. 2a) . . . . . ***Ovalipes punctatus***

2b. Carapace transversely ovate; palm without any stridulatory (sound-producing) ridges (Fig. 2b) . . . . . → ***3***

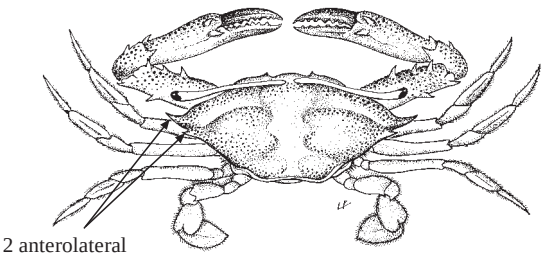


Fig. 1 ***Podophthalmus vigil***

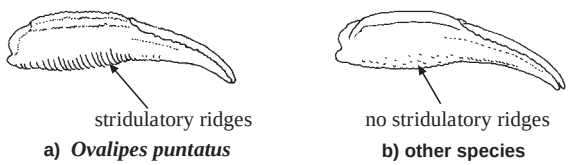


Fig. 2 chela in ventral view

3a. Five to 7 teeth on each anterolateral margin (Fig. 3a-c) . . . . . → ***4***

3b. Nine teeth on each anterolateral margin (Fig. 3d) . . . . . → ***12***

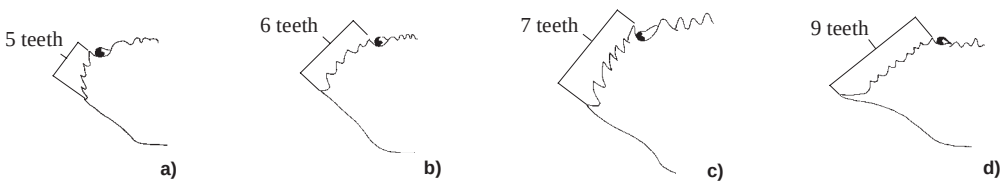


Fig. 3 lateral margin of carapace (dorsal view)

4a. Width of frontal-orbital border not much less than greatest width of carapace; 5 teeth on each anterolateral margin (first tooth sometimes with accessory denticle) (Fig. 4a) . . . . . → ***5***

4b. Width of frontal-orbital border distinctly less than greatest width of carapace; 6 or 7 teeth on each anterolateral margin (Fig. 4b) . . . . . → ***6***

5a. Basal antennal segment with a smooth or granulated ridge (Fig. 5a) . . . . . ***Thalamita crenata***

5b. Basal antennal segment with several sharp spines (Fig. 5b) . . . . . ***Thalamita spinimana***

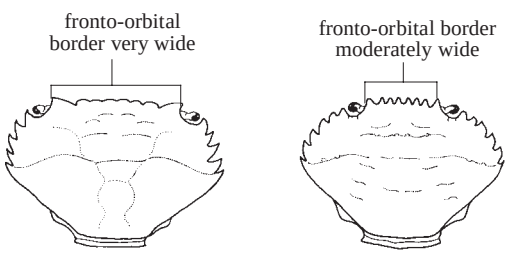


Fig. 4 carapace (dorsal view)

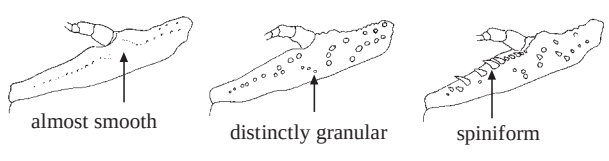


Fig. 5 basal antennal segment

6a. Posterior border of carapace forming an angular junction with posterolateral border (Fig. 6a); merus of cheliped without distal spine on posterior border . . . . . ***Charybdis truncata***

6b. Posterior border of carapace forming a curve with posterolateral border (Fig. 6b); merus of cheliped with distal spine on posterior border . . . . . → ***7***

7a. Carapace with distinct ridges or granular patches behind level of last pair of anterolateral teeth (Fig. 7a) . . . . . ***Charybdis natator***

7b. Carapace without distinct ridges or granular patches behind level of last pair of anterolateral teeth (Fig. 7b) . . . . . → ***8***

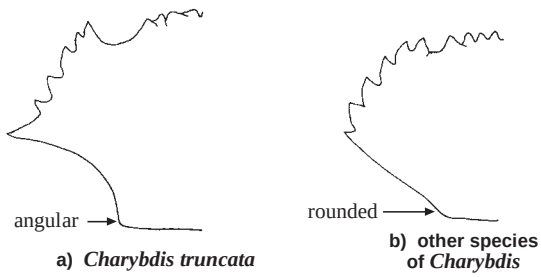


Fig. 6 left side of carapace (dorsal view)

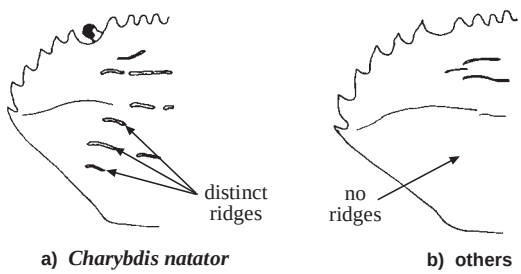


Fig. 7 left side of carapace (dorsal view)

8a. Merus of cheliped with 2 spines on anterior border; palm with 2 spines on upper surface (Fig. 8a) . . . . . ***Charybdis anisodon***

8b. Merus of cheliped with 3 or 4 spines on anterior border; palm with more than 2 spines on upper surface (Fig. 8b) . . . . . → ***9***

9a. First anterolateral tooth not truncate or notched (Fig. 9a) . . . . . ***Charybdis annulata***

9b. First anterolateral tooth truncate or notched (Fig. 9b) . . . . . → ***10***

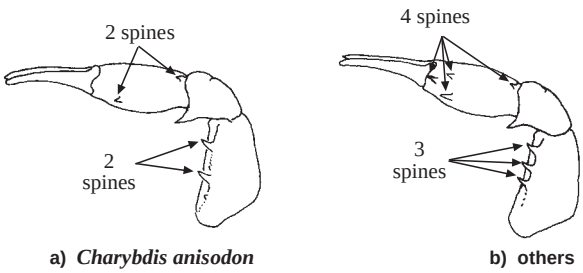


Fig. 8 right cheliped (dorsal view)

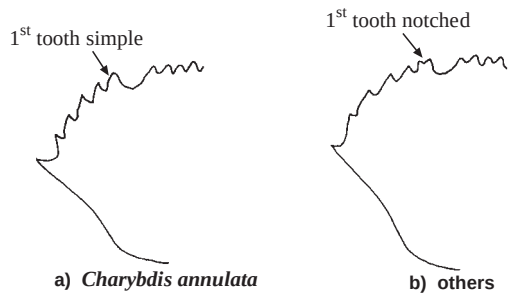


Fig. 9 lateral margin of carapace (dorsal view)

10a. Palm of cheliped with 4 spines on upper surface (Fig. 10a); male abdominal segment 4 keeled (Fig. 11a) . . . . . ***Charybdis feriatus***

10b. Palm of cheliped with 5 spines on upper surface (Fig. 10b); male abdominal segment 4 not keeled (Fig. 11b) . . . . . → ***11***



Fig. 10 right cheliped (dorsal view)

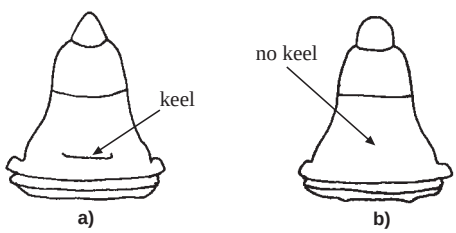


Fig. 11 male abdomen

11a. Palm with well-developed spines (Fig. 12a); male abdominal segment 6 with convex lateral borders (Fig. 13a); last anterolateral tooth smallest and spiniform, not projecting beyond preceding tooth (Fig. 14a) . . . . . ***Charybdis japonica***

11b. Palm with poorly developed spines (Fig. 12b); male abdominal segment 6 with lateral borders parallel in proximal half (Fig. 13b); last anterolateral tooth elongate, projecting laterally beyond preceding tooth (Fig. 14b) . . . . . ***Charybdis affinis***

12a. Last anterolateral tooth subequal in size to others (Fig. 15a) . . . . . → ***13***

12b. Last anterolateral tooth at least 2 times larger than others (Fig. 15b) . . . . . → ***16***

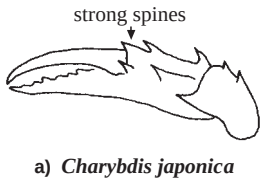


Fig. 12 right cheliped

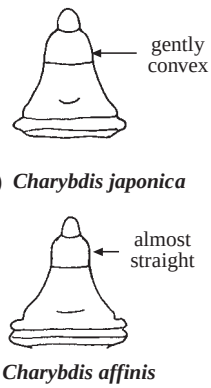


Fig. 13 male abdomen

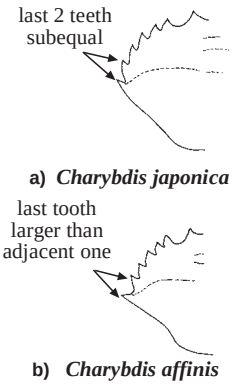


Fig. 14 anterolateral teeth

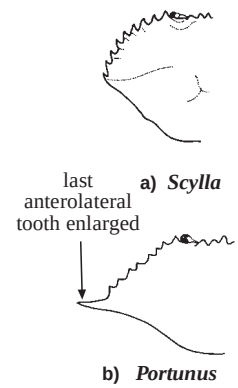


Fig. 15 anterolateral teeth

13a. Carpus of cheliped with only 1 low to very low granule on outer surface, never spiniform (Fig. 16a); colour of palm usually with at least some patches of orange or yellow in life . . . . → ***14***

13b. Carpus of cheliped with 2 distinct spiniform or sharp granules or spines on outer surface (Fig. 16b); colour of palm in life green to purple . . . . . → ***15***

14a. Frontal margin usually with sharp teeth (Fig. 17a); palm usually with distinct, sharp spines (Fig. 18a) . . . . . ***Scylla paramamosain***

14b. Frontal margin usually with rounded teeth (Fig. 17b); palm usually with reduced, blunt spines (Fig. 18b) . . . . . ***Scylla olivacea***

15a. Frontal margin usually with rounded teeth (Fig. 19a); sharp granules on palm and carpus never spiniform; colour in life: carapace usually very dark green to black, outer surface of palm purple and never with marbled pattern, last legs marbled only in males . . . . . ***Scylla tranquebarica***

15b. Frontal margin usually with sharp teeth (Fig. 19b); sharp granules on palm and carpus often spiniform; colour in life: carapace usually green to olive-green, outer surface of palm green and often with marbled pattern, last legs marbled both in males and females . . . . . ***Scylla serrata***

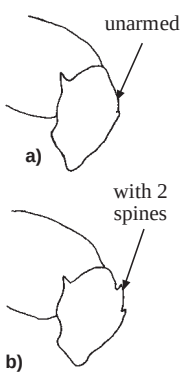


Fig. 16 carpus of cheliped

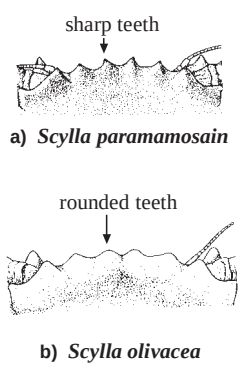


Fig. 17 frontal margin of carapace (dorsal view)

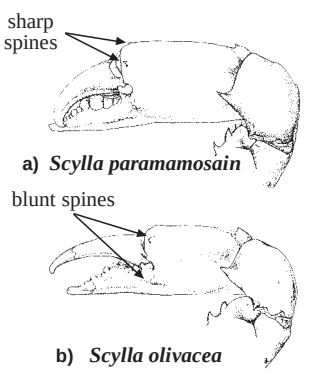


Fig. 18 right cheliped

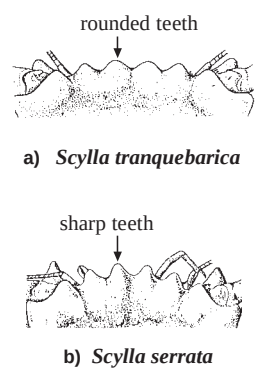


Fig. 19 frontal margin of carapace (dorsal view)

16a. Carapace with 3 purple to red spots on posterior half (Fig. 20) . . . ***Portunus sanguinolentus***

16b. Carapace marbled or with uniform coloration . . . . . → ***17***

17a. Front with 4 teeth (Fig. 21a); inner margin of merus of cheliped with 3 spines (Fig. 22a) . . . . . ***Portunus pelagicus***

17b. Front with 3 teeth (Fig. 21b); inner margin of merus of cheliped with 4 spines (Fig. 22b) . . . . . ***Portunus trituberculatus***

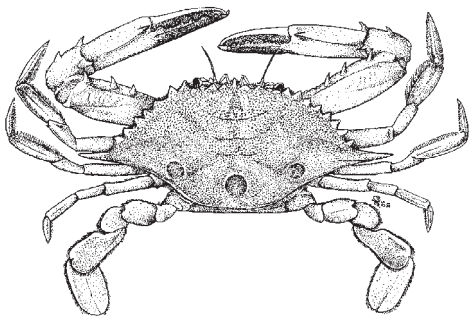


Fig. 20 ***Portunus sanguinolentus***



Fig. 21 frontal margin of carapace (dorsal view)

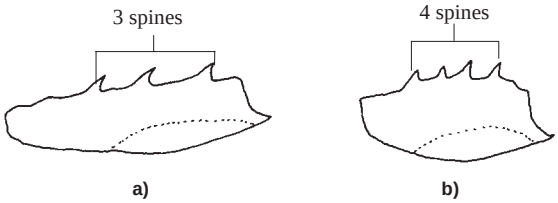


Fig. 22 merus of cheliped (inner margin)

List of species of interest to fisheries occurring in the area

The symbol 🕷 is given when species accounts are included.

🕷 *Charybdis affinis* Dana, 1852
🕷 *Charybdis anisodon* (De Haan, 1850)
🕷 *Charybdis annulata* (Fabricius, 1798)
🕷 *Charybdis feriatus* (Linnaeus, 1758)
🕷 *Charybdis japonica* (A. Milne Edwards, 1861)
🕷 *Charybdis natator* (Herbst, 1794)
🕷 *Charybdis truncata* (Fabricius, 1798)

🕷 *Ovalipes punctatus* (De Haan, 1833)

🕷 *Podophthalmus vigil* (Fabricius, 1798)

🕷 *Portunus pelagicus* (Linnaeus, 1758)
🕷 *Portunus sanguinolentus* (Herbst, 1783)
🕷 *Portunus trituberculatus* (Miers, 1876)

🕷 *Scylla olivacea* (Herbst, 1796)
🕷 *Scylla serrata* (Forsskål, 1775)
🕷 *Scylla paramamosain* Estampodor, 1949
🕷 *Scylla tranquebarica* (Fabricius, 1798)

🕷 *Thalamita crenata* (Latreille, 1829)
🕷 *Thalamita spinimana* (Dana, 1852)

References

Keenan, C.P., P.J.F. Davie, and D.L. Mann. 1998. A revision of the genus *Scylla* De Haan (Crustacea: Decapoda: Brachyura: Portunidae). *Raffles Bull. Zool.*, 46(1):in press.

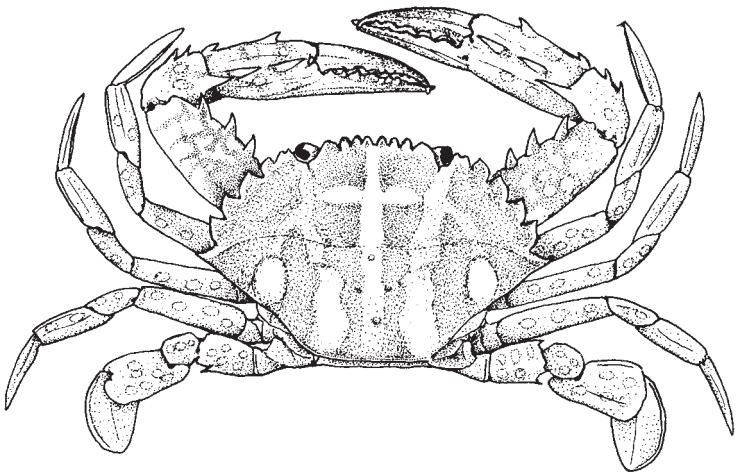
Leene, J.E. 1938. The Decapoda Brachyura of the Siboga Expedition. VII. Brachygnatha: Portunidae. *Siboga Exped. Monogr.*, 39c(131):1-156.

Stephenson, W. 1972. An annotated check list and key to the Indo-West Pacific swimming crabs (Crustacea: Decapoda: Portunidae). *Royal Society of New Zealand Bulletin*, 10:1-64.

Charybdis feriatus (Linnaeus, 1758)

Frequent synonyms / misidentifications: *Charybdis crucifer* (Fabricius, 1792); *C. cruciata* (Herbst, 1794) / None.

FAO name: En - Crucifix crab.



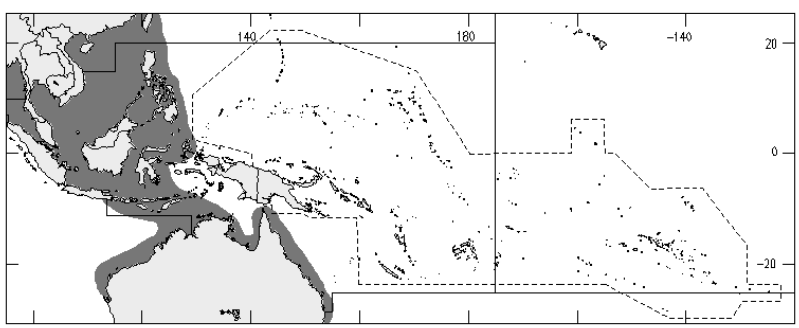
Diagnostic characters: Carapace ovate; 5 distinct teeth on each anterolateral margin. **Colour:** distinctive pattern of longitudinal stripes of maroon and white, usually with distinct white cross on median part of gastric region; legs and pincers with numerous scattered white spots.

Size: Maximum carapace width 20 cm.

Habitat, biology, and fisheries: Prefers sandy to sandy-muddy substrates, at depths from 30 to 60 m. Collected mainly by bottom trawls, sometimes by traps and nets. The commercially most important species of *Charybdis*. Like *Portunus* spp., *Charybdis feriatus* is more delicate than *Scylla*, and is frequently sold frozen. The lucrative and booming live-seafood market, however, is seeing the increased use of aquaria to keep these species alive. The crucifix crab is especially important in markets in East Asia where it commands substantially higher premium prices than *Portunus* spp., being sold for US$8 to US$15 per kg.

Distribution: Widely distributed in the Indo-West Pacific, reaching Japan and Australia.

Remarks: There are several species of *Charybdis* in the area which are also occasionally fished and infrequently appear in markets. These include *C. affinis* Dana, 1852, *C. acuta* (A. Milne Edwards, 1869), *C. anisodon* (De Haan, 1850), *C. annulata* (Fabricius, 1798), *C. natator* (Herbst, 1789) and *C. truncata* (Fabricius, 1798). They are all easily distinguished by carapace and cheliped armature features.

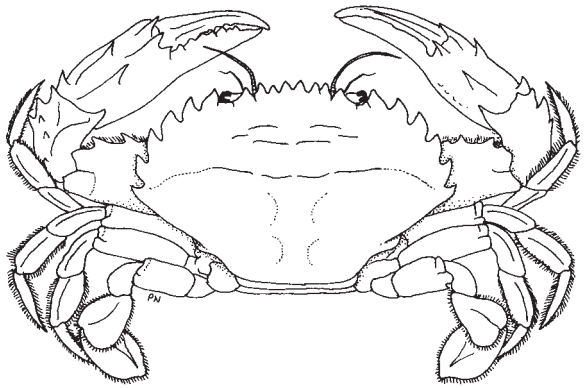


Charybdis japonica (A. Milne Edwards, 1861)

Frequent synonyms / misidentifications: None / None.

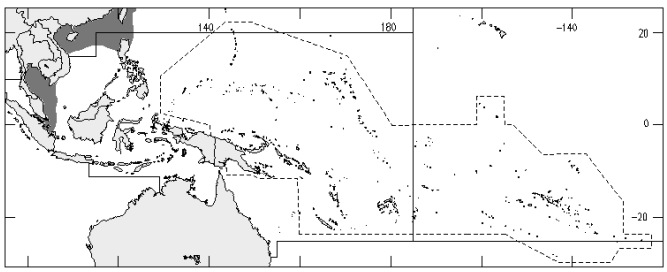
FAO name: En - Japanese swimming crab.

Diagnostic characters: Carapace without transverse ridges behind last anterolateral tooth; frontal teeth acutely triangular; anterolateral teeth all acutely triangular. Posterior border of propodus of legs serrated. Palm with 5 sharp spines, longitudinal ridges on palm granulated. **Colour:** carapace white with large greyish patches, tips of anterolateral teeth reddish brown; fingers red and white.



Size: Maximum carapace width 7 cm.

Habitat, biology, and fisheries: Occurs just offshore on muddy, sandy, or stony substrates. Taken mainly by trawlers or in nets as incidental catch. Although locally common, there is no sustained fishery for this species. Fished mainly in Japanese and Chinese waters.



Distribution: Japan, China, Taiwan Province of China, Thailand, and Malaysia.

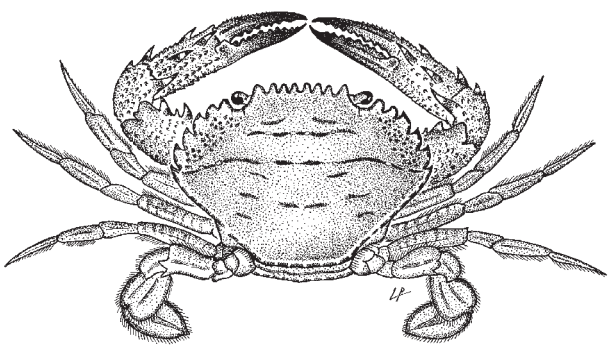
Remarks: See *Charybdis feriatus*. The above characters and coloration of *C. japonica* readily distinguish it from all other species of *Charybdis*.

Charybdis natator (Herbst, 1789)

Frequent synonyms / misidentifications: None / None.

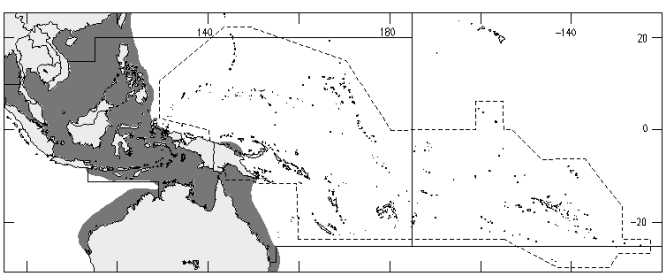
FAO name: En - Ridged swimming crab.

Diagnostic characters: Carapace with densely covered with very short pubescence which is absent on several distinct transverse granulated ridges in anterior half. **Colour:** orangish red overall, with ridges on carapace and legs dark reddish brown.



Size: Maximum carapace width 17 cm.

Habitat, biology, and fisheries: Near or in rocky-sandy substrates, sometimes near reefs, from depths of 5 to 40 m. *Charybdis natator* is caught incidentally by trawlers, and has some commercial value because of its large size.



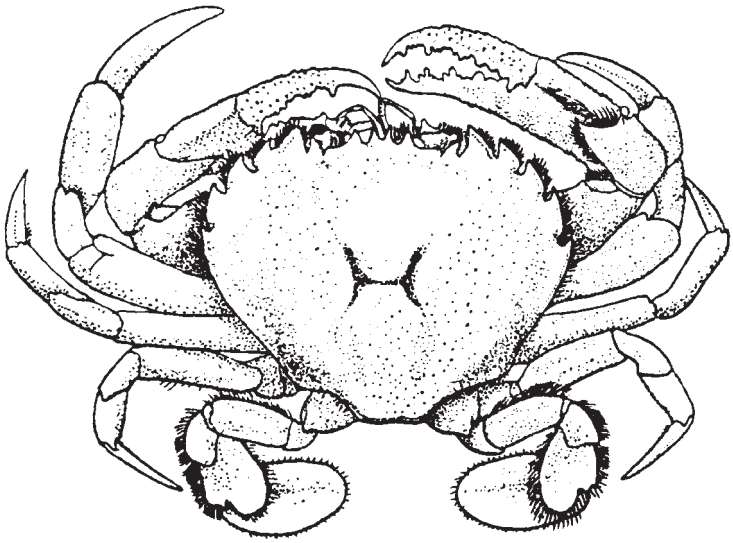
Distribution: China, Taiwan Province of China, Philippines, Thailand, Indonesia, Malaysia, Singapore, and Australia.

Remarks: See *Charybdis feriatus*.

Ovalipes punctatus (De Haan, 1833)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Sand crab.



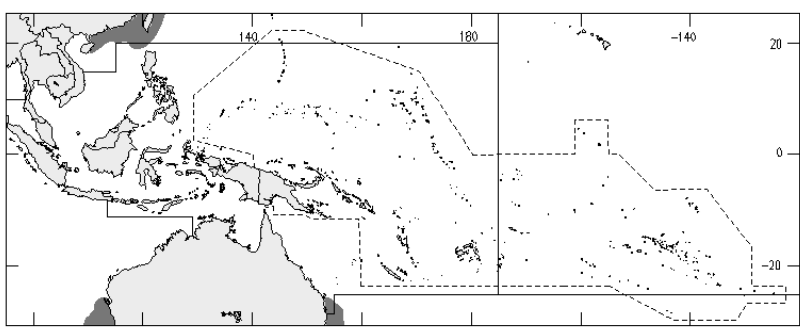
(after Shen and Dai, 1964)

Diagnostic characters: Carapace rounded, surfaces finely granular, appearing almost smooth; 4 well-developed teeth on each anterolateral margin; stridulatory ridges present on ventral surface of palm. **Colour:** carapace reddish brown to maroon, margins lighter coloured, with scattered dirty-white and darker spots, white gastric depression, margins lighter coloured; dactylus of fourth walking leg bluish purple.

Size: Maximum carapace width 9.5 cm.

Habitat, biology, and fisheries: Found from depths of 30 to 50 m. Caught mainly by trawls or dredges, and fished intensively in southern Japan, Taiwan Province of China, and China (mainly off southern China and Japan). Usually, only the chelae are sold in markets, where they command premium prices.

Distribution: Throughout the northern and southern hemispheres in the Pacific. In the area, it occurs in the northern part of the South China Sea and in Queensland (Australia).

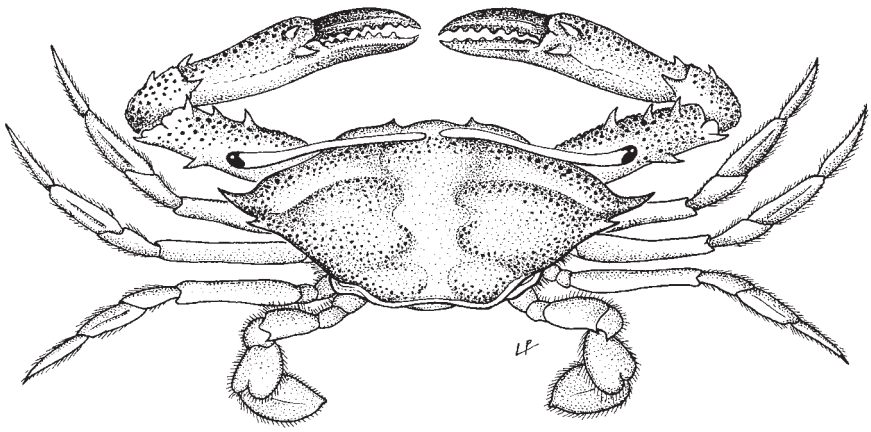


Remarks: Several species of *Ovalipes* of minor commercial importance are known, notably *O. australiensis* Stephenson and Mees, 1968, from Australia, which, however, does not occur in the Western Central Pacific. It can easily be separated from *O. punctatus* by the condition of the carapace surface (finely granular in *O. punctatus*, but coarsely granular in *O. australiensis*). In addition, *O. australiensis* has 2 large, clear pigmented ovate spots on the posterolateral region (absent in *O. punctatus*).

Podophthalmus vigil (Fabricius, 1798)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Sentinel crab.



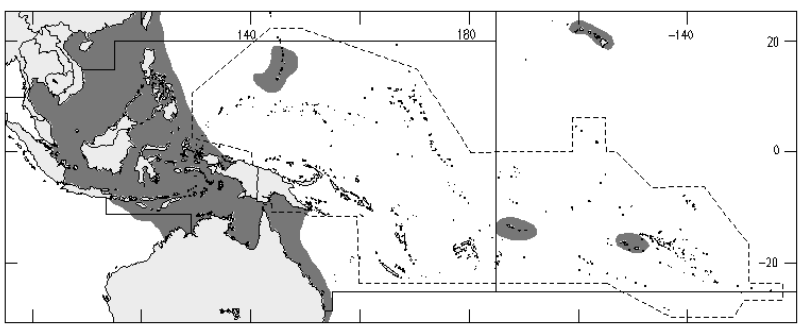
Diagnostic characters: Carapace distinctly broader than long; anterior margin much broader than posterior margin, with posterolateral margins converging strongly towards narrow posterior carapace margin; orbits very broad. Eyes very long, reaching to or extending beyond edge of carapace. **Colour:** carapace green; chelipeds and parts of legs violet to maroon in adults.

Size: Maximum carapace width 15 cm.

Habitat, biology, and fisheries: On sandy to muddy substrates in offshore waters. Occasionally caught by offshore trawlers, although rarely in large numbers. When marketed, it commands prices similar to those for *Portunus pelagicus*.

Distribution: Indo-West Pacific.

Remarks: Three species of *Podophthalmus* are known. *P. vigil* is the only large species that shows the colour pattern described above, and the only species of the genus with commercial value.



Portunus pelagicus (Linnaeus, 1758) SCD

Frequent synonyms / misidentifications: *Portunus mauritianus* Ward, 1942 / *Portunus trituberculatus* (Miers, 1876).

FAO name: En - Flower crab.

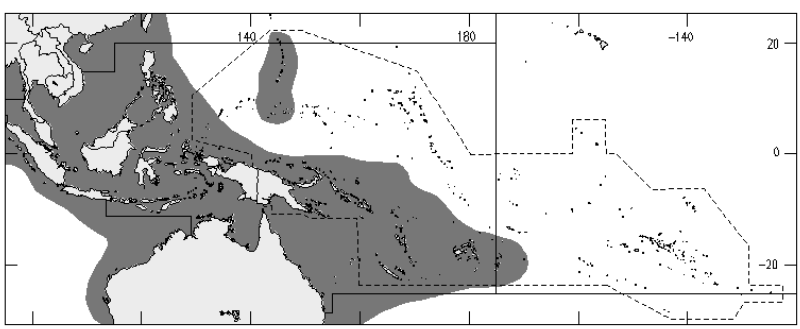


Diagnostic characters: Carapace rough to granulose, regions discernible; front with 4 acutely triangular teeth; 9 teeth on each anterolateral margin, the last tooth 2 to 4 times larger than preceding teeth. Chelae elongate in males; larger chela with conical tooth at base of fingers; pollex ridged. **Colour:** males with blue markings, females dull green.

Size: Maximum carapace width 20 cm for males (including lateral teeth).

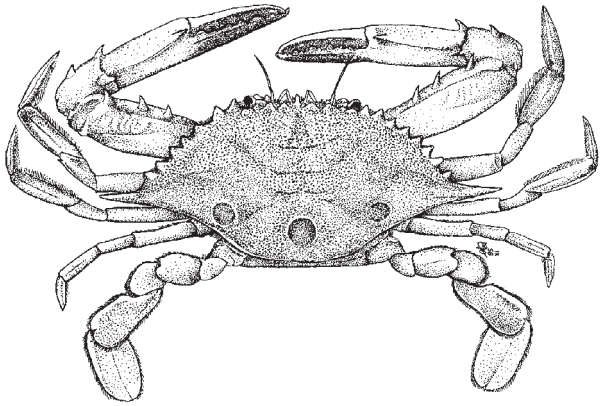
Habitat, biology, and fisheries: Prefers sandy to sandy-muddy substrates in shallow waters down to a depth of 50 m, including areas near reefs, mangroves, and in seagrass and algal beds. Juveniles tend to occur in shallow intertidal areas. The crabs mature at about 1 year. Collected mainly by artisanal traps, trawls, beach seines, cylindrical wire traps, folding traps, pots, hop nets, drop nets, and sunken crab gill nets. In shallow waters, beach seines, rakes, and dab nets are used. Although sold for lower prices than *Scylla*, crabs of *Portunus* are taken in much larger quantities. They are caught in enormous numbers for sale in local markets (frozen or fresh) and for the crab-flesh canning industry. Many species of *Portunus* are commercially collected in the area. Among the 3 more frequently collected species included here, *P. pelagicus* is most widely sold in markets in Southeast Asia, including the Philippines. The market price varies from US$3 to US$5 per kg for fresh crabs, and from about US$5 to US$8 for live crabs. The fisheries for this species is well managed in Australia. From 1990 to 1995, the reported yearly catch of *P. pelagicus* from the Western Central Pacific (Australia, Indonesia, and Thailand) ranged from around 36 700 to 48 000 t (FAO Yearbook of Fishery Statistics).

Distribution: Throughout Indo-West Pacific.



Remarks: May be confused with *P. trituberculatus*, which resembles a large stocky female of *P. pelagicus*. *P. trituberculatus*, however, can easily be distinguished by having only 3 frontal teeth (4 teeth in *P. pelagicus*), and by the presence of 4 spines on the inner margin of the chelipedal merus (only 3 spines in *P. pelagicus*).

Portunus sanguinolentus (Herbst, 1783)



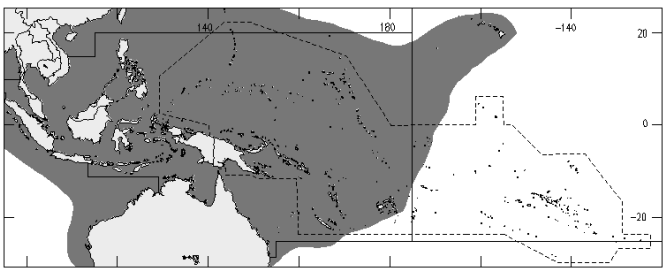
Frequent synonyms / misidentifications: None / None.

FAO name: En - Three-spot swimming crab.

Diagnostic characters: Carapace finely granulose, regions just discernible; 9 teeth on each anterolateral margin, the last tooth 2 to 3 times larger than preceding teeth. Chelae elongated in males; larger chela with conical tooth at base of fingers; pollex ridged. **Colour:** olive to dark green, with 3 prominent maroon to red spots on posterior 1/3 of carapace.

Size: Maximum carapace width 20 cm.

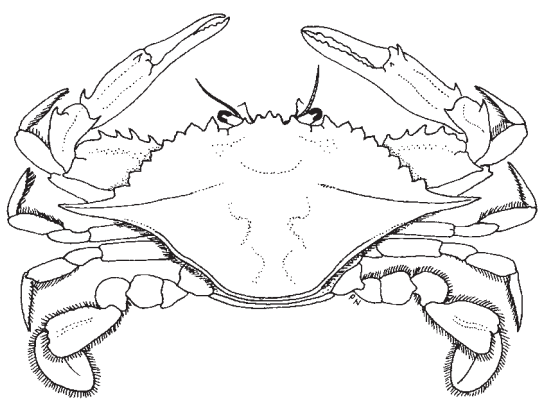
Habitat, biology, and fisheries: Occurs on sandy to sandy-muddy substrates, from the intertidal zone (especially juveniles) to depths of 30 m. Collected mainly by nets or seines. This species is less common than *Portunus pelagicus*, and appears only occasionally in markets. It is priced similarly to, or for slightly lower prices as, *P. pelagicus*.



Distribution: Indo-West Pacific.

Remarks: This species can be easily separated from all other *Portunus* species by its very distinctive colour markings.

Portunus trituberculatus (Miers, 1876)



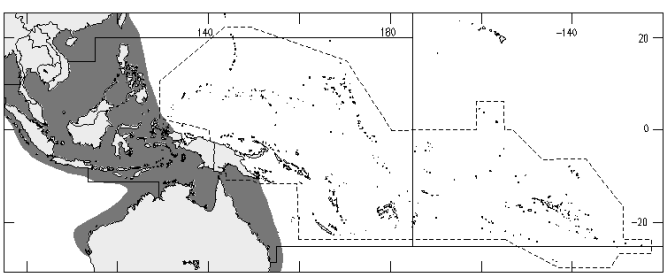
Frequent synonyms / misidentifications: None / *Portunus pelagicus* (Linnaeus, 1758).

FAO name: En - Horse crab.

Diagnostic characters: Carapace rough to granulose, regions discernible; front with 3 acutely triangular teeth; 9 teeth on each anterolateral margin, the last tooth much larger than preceding teeth. Larger chela with conical tooth at base of fingers; pollex ridged. **Colour:** carapace dull green to brown.

Size: Maximum carapace width 15 cm (males).

Habitat, biology, and fisheries: Prefers sandy to sandy-muddy substrates in shallow waters, up to depths of 50 m. Caught mainly by trawls. A commercially very important species in Japan and collected in large numbers in some areas.



Distribution: Indo-West Pacific.

Remarks: This species is perhaps closest to *Portunus pelagicus* in its general appearance, resembling a large stocky female of that species. *P. pelagicus*, however, is easily distinguished by having 4 frontal teeth (only 3 teeth in *P. trituberculatus*) and by the presence of 3 spines on the inner margin of the chelipedal merus (4 spines in *P. trituberculatus*).

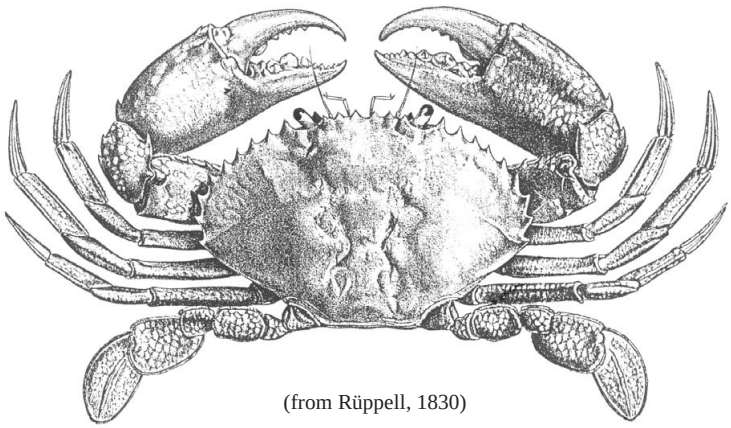
Scylla serrata (Forsskål, 1775) MUD

Frequent synonyms / misidentifications: *Acheolus crassimanus* MacLeay, 1838; *Scylla serrata* var. *oceanica* Dana, 1852 / see **Remarks**.

FAO name: En - Giant mud crab.

Diagnostic characters: Carapace smooth, with strong transverse ridges; H-shaped gastric groove deep; relatively broad frontal lobes, all more or less in line with each other; broad anterolateral teeth, projecting obliquely outwards. Well-developed spines present on outer surface of chelipedal carpus and anterior and posterior dorsal parts of palm. **Colour:** carapace green to almost black; legs may be marbled.

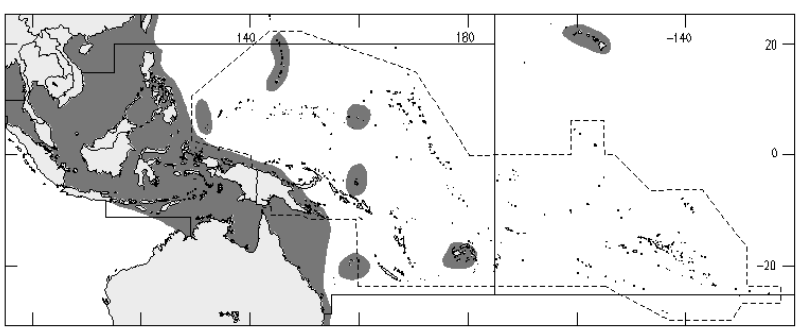
Size: Maximum carapace width between 25 and 28 cm (males); maximum weight between 2 and 3 kg.



(from Rüppell, 1830)

Habitat, biology, and fisheries: *Scylla serrata* prefers more oceanic waters, usually found just offshore on soft muddy bottoms. Crabs can be caught up to 50 km offshore as they migrate there to spawn. The other 3 species of *Scylla* included here prefer mangroves in continental shelves with less saline waters. All species of *Scylla* dig deep burrows in mangroves and soft substrates in shallow or intertidal waters. Species of *Scylla* are collected mainly using trawls, traps, baited wire mesh pots, hooking, and by hand throughout their ranges. From 1990 to 1995, the reported yearly catch of *Scylla serrata* from the Western Central Pacific ranged from around 6 150 to 18 600 t (FAO Yearbook of Fishery Statistics). It must be pointed out, however, that these figures cover all 4 species of *Scylla* recognized here (see remarks on that problem below). Species of *Scylla* are almost always marketed alive. At present, the main markets are Taiwan Province of China, Hong Kong (China), and Singapore, where large crabs (so-called “meat crabs”) and females with ripe ovaries (“roe crabs”) command premium prices. For both kinds of crabs, current demand still far exceeds the supply. They are always sold for high prices, ranging from US$5 to US$10 per kg. “Roe crabs” can even cost 25 to 50% more. In Australia, they are sold for an average price of US$6 per kg. Currently, the largest exporters of mud crabs in Asia are Indonesia, Sri Lanka, India, and Bangladesh, with the markets in Myanmar, Viet Nam, and Pakistan picking up rapidly. *S. serrata* and *S. olivacea* are also the main food species in Australia. There is no clear management for the 4 species of *Scylla* in Southeast and East Asia. In Australia, the fishery for *S. serrata* and *S. olivacea* is quite intense (700 t collected between 1989 to 1990, mainly from Queensland with over 400 t) but is reasonably well managed. There have been attempts to culture the crabs in captivity, but none of the closed-cycle enterprises have gone commercial. Many *Scylla* crab farms rely on the tide to bring megalopae or late zoeae into ponds, where the crabs grow out. Alternatively, many farms in Southeast Asia keep smaller or freshly moulted crabs (so-called “water crabs” because of the consistency of their flesh) caught from natural stocks to grow them out or add on more flesh. Similarly, female crabs of all 4 species are kept until their ovaries are full to improve their market prices.

Distribution: All 4 species of *Scylla* apparently have a wide Indo-West Pacific distribution. *Scylla serrata*, has been introduced to Hawaii from Samoa 55 years ago, and has become established there.



Remarks: The taxonomy of the genus *Scylla* has been terribly confused and is still difficult. While generally a single, supposedly widely distributed species is recognized, namely *S. serrata*, it is now known that the genus includes 4 species. Recent research in Australia (Keenan et al., 1998) has clearly shown, using morphological, DNA, and allozyme data, that there are 4 species of *Scylla*.

The differences in allozyme and mtDNA are substantial, but the morphological features which separate the 4 species are rather subtle and sometimes difficult to recognize in smaller specimens. The distal parts of the male gonopods are also slightly but distinctly different (unpublished data). Given that all 4 species of *Scylla* are marketed throughout their range by the extensive export market, the existing catch figures and fishery management practices currently applied to a single species (*S. serrata*) obviously have to be revised.

The very large species depicted above (often called the “Sri Lanka crab” in South, Southeast and East Asia) is the “real” *Scylla serrata* and has a wide distribution, with preference for more saline waters. It varies from green to almost black, has a smooth carapace with distinct transverse ridges, deep H-shaped gastric groove, relatively broad frontal lobes, all of which are more or less in line with each other, broad anterolateral teeth which project obliquely outwards, and has very well-developed spines on the outer surface of the chelipedal carpus and palm.

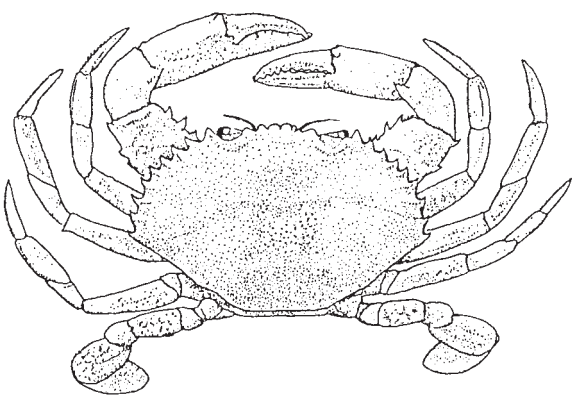
Two of the species are smaller and more closely associated with mangroves than the real *S. serrata*, and occur more or less in the same region, but generally prefer less saline conditions and are more common in continental shelf waters. *S. serrata* is not known to occur inside the Sunda Shelf, but it is the only species of *Scylla* known from the Red Sea. *Scylla olivacea* (Herbst, 1796) is usually brownish to brownish green in colour (sometimes orangish). It has a smoother, more evenly convex carapace with very low transverse ridges, a shallow H-shaped gastric groove, the median pair of the frontal lobes more rounded and projecting slightly forwards of the lateral ones, the anterolateral teeth gently curving anteriorly, giving the carapace a less transverse appearance. It also has very low spines on both the outer surface of the chelipedal carpus and the dorsal surface of palm. (See abbreviated species account below). The second mangrove species, *Scylla tranquebarica* (Fabricius, 1798) (= *Lupa lobifrons* H. Milne Edwards, 1834) varies from brown to almost black in coloration, and has very well-developed spines on the outer surfaces of the chelipedal carpus and the palm (as seen in *S. serrata*). It differs from *S. serrata*, however, by having the frontal teeth more acutely triangular, the median pair projecting slightly forwards of the lateral pair, and the anterolateral teeth gently curving anteriorly, giving the carapace a less transverse appearance. (See abbreviated species account below).

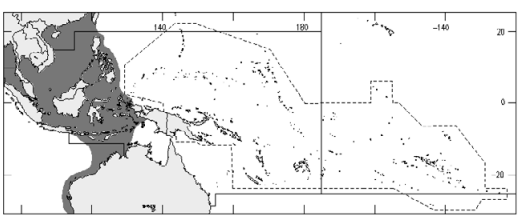
The fourth *Scylla* species, *Scylla paramamosain* Estampador, 1949, seems to prefer areas which are more rocky or near reefs, although it is also known from estuarine ponds and mangrove forests. It seems to be intermediate between *S. serrata* and *S. olivacea* both in morphology and coloration but can usually be distinguished by the form of its frontal margin and cheliped armature (see key). (See abbreviated species account below).

Scylla olivacea (Herbst, 1796)

En - Orange mud crab.

Maximum carapace width 18 cm (males). Carapace brownish to brownish green in colour (sometimes orangish), palm orange to yellow. Inhabits mangroves. Collected in large numbers and probably the most common species of *Scylla* to be found in many markets in Sundaic Southeast Asia and Thailand. Known so far from the continental waters of the Sunda Shelf and various parts of the East Pacific. (See species account of *S. serrata* for further information).

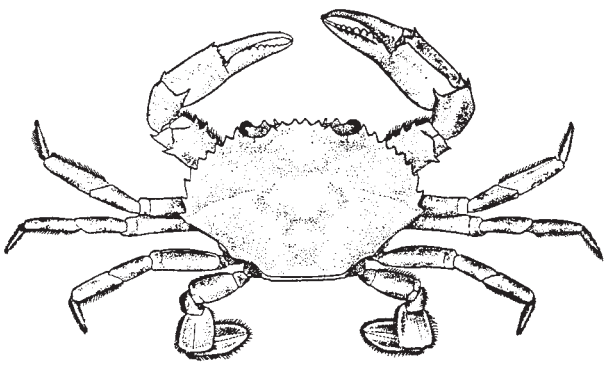


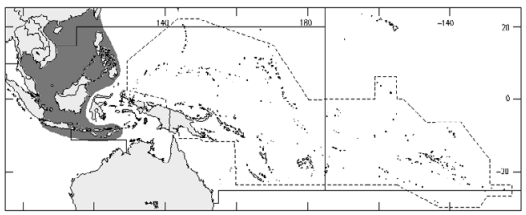


Scylla paramamosain Estampador, 1949

En - Green mud crab.

Maximum carapace width 20 cm (males), commonly between 15 and 18 cm; weight up to 2 kg. Carapace usually green to light green, palm green to greenish blue with lower surface and base of fingers usually pale yellow to yellowish orange. Rock areas, near reef, and mangroves. Common in northern parts of South China Sea and parts of Java, but less so elsewhere. Shelf species. (See species account of *S. serrata* for further information).

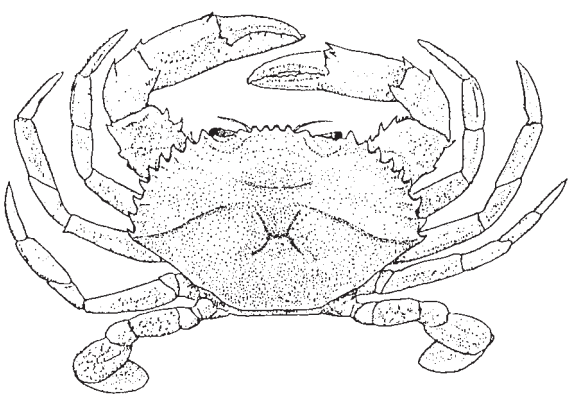


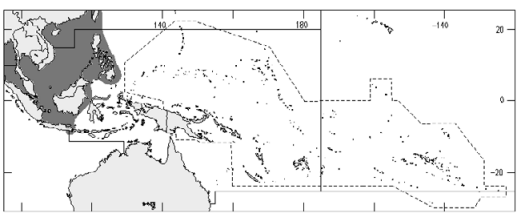


Scylla tranquebarica (Fabricius, 1798)

En - Purple mud crab.

Maximum carapace width 20 cm (males); weight up to 2 kg. Carapace green to almost black, palm purple. Mainly in mangroves (down to sublittoral parts) and collected in large numbers. This is probably the second most common species seen in Sundaic Southeast Asian markets, but less common in Thailand and the Philippines. Known from various parts of the Indo-West Pacific, including shelf waters. (See species account of *S. serrata* for further information).



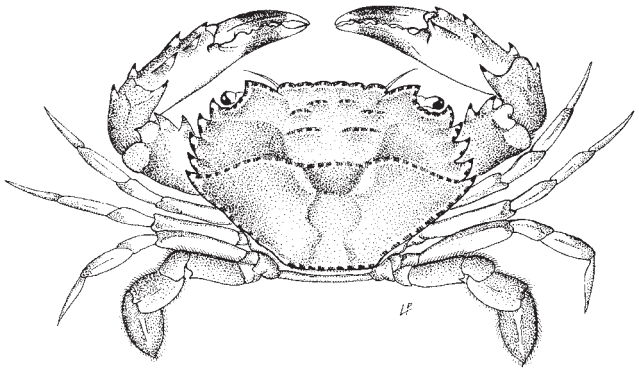


Thalamita crenata (Latreille, 1829)

Frequent synonyms / misidentifications: None / None.

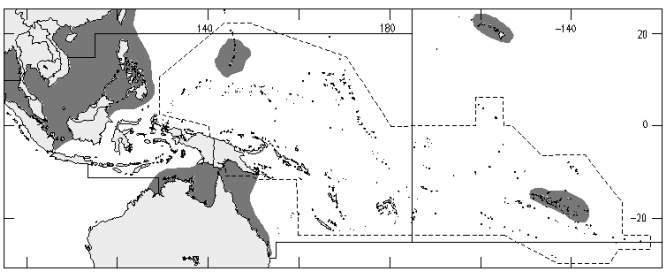
FAO name: En - Crenate swimming crab.

Diagnostic characters: Surface of carapace smooth, ridges low but distinct; front with 6 equal-sized, rounded lobes. **Colour:** dark to olive green overall.



Size: Maximum carapace width 8 cm.

Habitat, biology, and fisheries: One of the most distinctive species of the genus, and one of the few found in shallow non-reef habitats with soft substrates. Prefers areas near mangroves or with muddy-rocky substrates. Frequently collected by traps, trawlers, seines, and nets. Fished mainly in Southeast and East Asian countries. Although it can be very common in some areas, *T. crenata* has a low value in markets as it grows smaller than other, more commercial portunids found in the area.



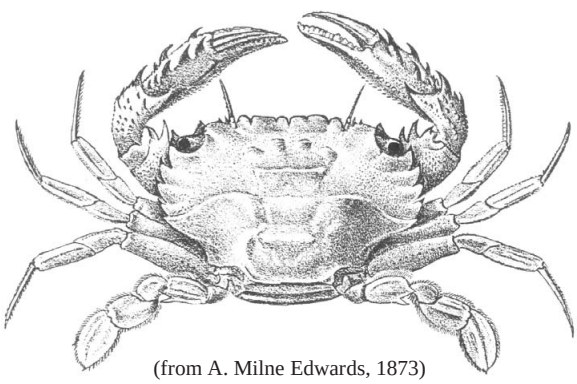
Distribution: China, Indonesia, Malaysia, Singapore, Australia, Tuamotu, Tonga, French Polynesia, and Hawaii.

Thalamita spinimana (Dana, 1852)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Spiny claw swimming crab.

Diagnostic characters: Surface of carapace smooth, sometimes with low pubescence; ridges distinct; front with 6 lobes, median 4 lobes truncate, lateral 2 lobes rounded. **Colour:** usually bright red overall, but sometimes green, or with a mixture of red and green.



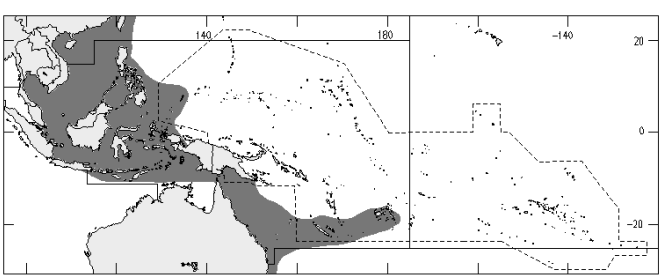
(from A. Milne Edwards, 1873)

Size: Maximum carapace width 12 cm.

Habitat, biology, and fisheries: Occasionally collected for food throughout its range, caught by traps and nets. It is sold for comparatively low prices in markets.

Distribution: West Pacific.

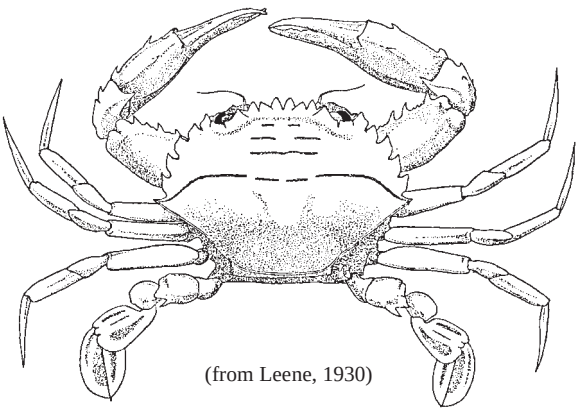
Remarks: A large number of coral reef species of *Thalamita* are found in the area. Most of these, however, are of small size and have no economic value. *T. spinimana* is one of the more common larger species in the genus, easily distinguished by its spinose palm and the bright red coloration.



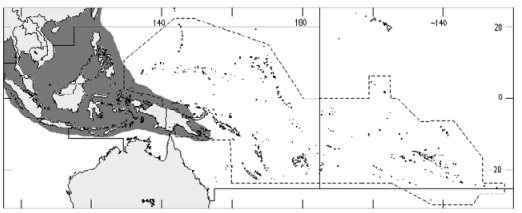
Charybdis affinis Dana, 1852

En - Smoothshelled swimming crab.

Maximum carapace width 6 cm. Prefers sandy to muddy substrates in subtidal waters. Fished sporadically and occasionally seen in local markets where it is sold for low prices, due to its small size. China and Japan to various parts of India and Southeast Asia.



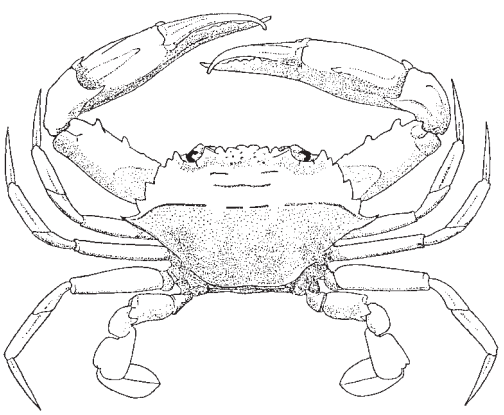
(from Leene, 1930)



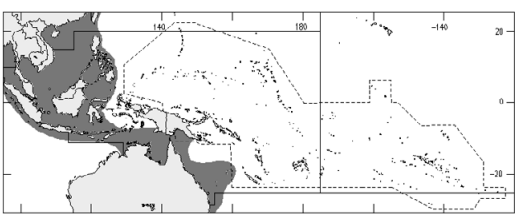
Charybdis anisodon (De Haan, 1850)

En - Twospined arm swimming crab.

Maximum carapace width 8 cm. Prefers muddy substrates at depths to 15 m. Occasionally collected by trawls and sold in local markets for its moderately large size. Indo-West Pacific in distribution, reaching Hawaii.



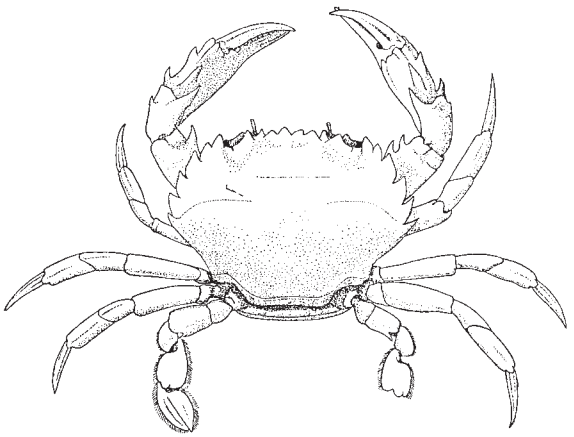
(from Leene, 1930)



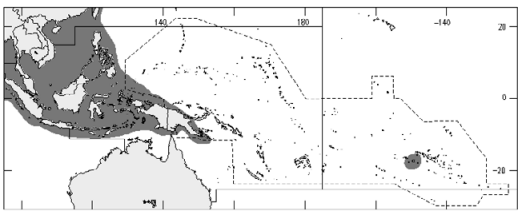
Charybdis annulata (Fabricius, 1798)

En - Banded-legged swimming crab.

Maximum carapace width 7 cm. Shows distinctive broad blue and white bands on the legs when alive. Prefers rocky areas and reefs, from the intertidal zone to a depth of about 20 m. Occasionally collected for food, but never abundant enough to be commercially important. Indo-West Pacific, from South Africa to Southeast Asia, Japan, and Tahiti.



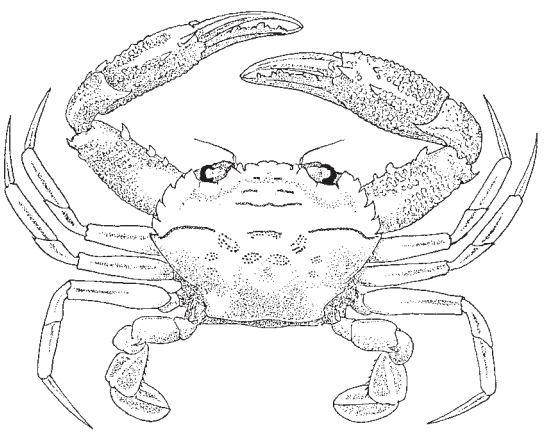
(from Leene, 1930)



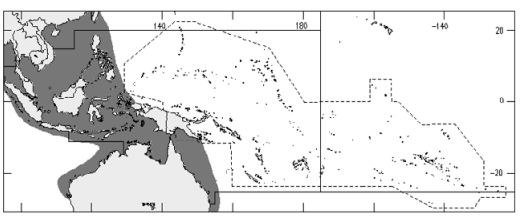
Charybdis truncata (Fabricius, 1798)

En - Blunt-toothed crab.

Maximum carapace width 5 cm. Prefers muddy bottoms at depths from 10 to 100 m. Locally abundant in some areas and obtained by trawls. Not commonly sold in markets. Indo-West Pacific, reaching Japan and Australia.



(from Leene, 1930)

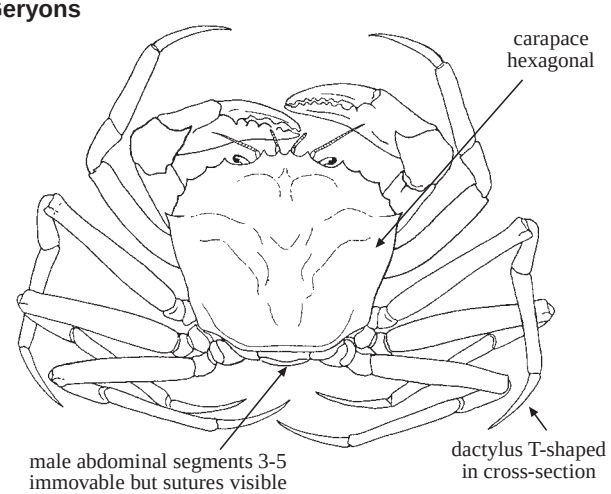


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GERYONIDAE

Geryons



Diagnostic characters: Carapace hexagonal; dorsal surface relatively smooth to granular; frontal margin with 4 teeth; anterolateral margins distinctly convex, each with 3 to 5 low, sometimes indistinct teeth. **Dactylus of walking legs T-shaped in cross-section. Male abdominal segments 3 to 5 fused**, functionally immovable, but sutures still visible.

Habitat, biology, and fisheries: These are deep-sea crabs, normally occurring in depths below 100 m. Taken incidentally by trawls and traps. Crabs of the genus *Chaceon* are represented by numerous species of interest to fisheries. Although not all these species are harvested in large numbers, the fishery potential of geryons is quite great. The most widely exploited species is the Atlantic *C. maritae*. Five species of *Chaceon* are known from the Western Central Pacific so far. The more important species in the area are *C. granulatus* and *C. bicolor*. Further new species can be expected when more deep-water areas are sampled.

Remarks: The golden crabs or geryons (genus *Chaceon*) are a very distinctive taxonomic group. However, the composition of the family is still not settled and some genera which have been assigned to the Geryonidae should probably be transferred to the Goneplacidae instead. The known species of *Chaceon* can easily be separated into 2 groups: among the species occurring in the area, *C. bicolor*, *C. australis*, and *C. poupini* belong to the group in which the dactylus of walking legs is not laterally flattened, and the height at midlength is greater than, or subequal to, the width at midlength.[1/] Only 2 species in the area, namely *C. granulatus* and *C. karubar*, belong to the other group, in which the dactylus of legs is laterally flattened, and the height at midlength is less than the width at midlength.

Similar families occurring in the area

Members of the genus *Chaceon* can only be confused with some members of the Goneplacidae which also have a squarish carapace (the only commercial species of Goneplacidae in the area, *Carcinoplax longimanus*, has an ovoid carapace). In addition, the large size of geryons (usually exceeding 14 cm carapace width), the relatively long legs, the T-shaped cross-section of the dactylus of walking legs, and their occurrence in deep waters (deeper than 200 m), easily separates them from the goneplacids (no geryons are known from shallow waters).

Key to species of *Chaceon* occurring in the area

1a. Dorsal surface of carapace smooth to gently rugose, not granulose; branchial and posterolateral regions not swollen; dorsoventrally flattened, height at midlength 0.8 times or less than width at midlength . . . . . → ***2***

1b. Dorsal surface of carapace granulose; branchial and posterolateral regions raised; dactylus of legs laterally flattened, height at midlength subequal to or greater than width at midlength (0.9 times and more) . . . . . → ***4***

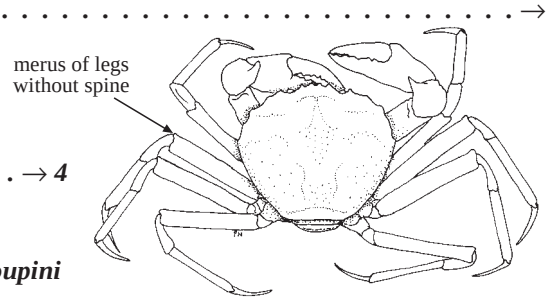


Fig. 1 ***Chaceon poupini***

2a. Merus of walking leg unarmed, without distinct dorsal distal spine or tooth (Fig. 1) . . . . . ***Chaceon poupini***

2b. Merus of walking leg with dorsal distal spine or tooth . . . . . → ***3***

1/ Three other species belonging to the same group have been reported from other places in the Pacific: *Chaceon yaldwyni* Manning, Dawson, and Webber, 1989 (New Zealand), *C. imperialis* Manning, 1992 (Emperor Seamount Chain), and *C. manningi* Ng, Lee, and Yu, 1994 (Tung-Sa Islands, South China Sea).

3a. Anterolateral margin of adults with spiniform teeth (Fig. 2). . . . . ***Chaceon australis***

3b. Anterolateral margins of adults with low, lobiform teeth (Fig. 3) . . . . . ***Chaceon bicolor***

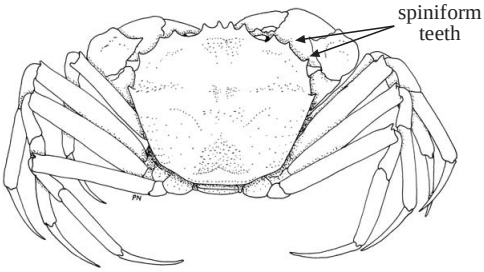


Fig. 2 ***Chaceon australis***

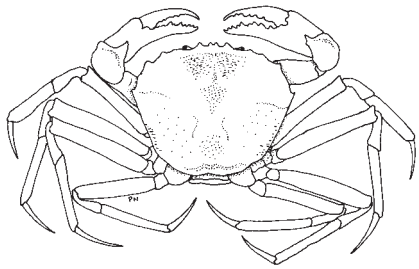


Fig. 3 ***Chaceon bicolor***

4a. Outer surface of chelipedal carpus with spine or projection on outer surface; merus of legs with distinct dorsal distal spine or tooth (Fig. 4) . . . . . ***Chaceon karubar***

4b. Outer surface of chelipedal carpus unarmed; merus of legs unarmed, without distinct dorsal distal spine or tooth (Fig. 5) . . . . . ***Chaceon granulatus***

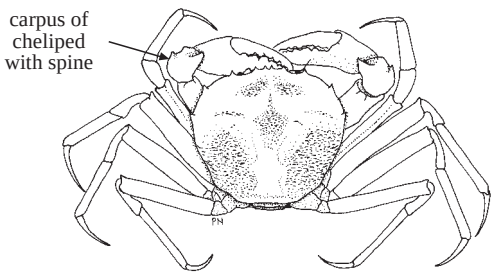


Fig. 4 ***Chaceon karubar***

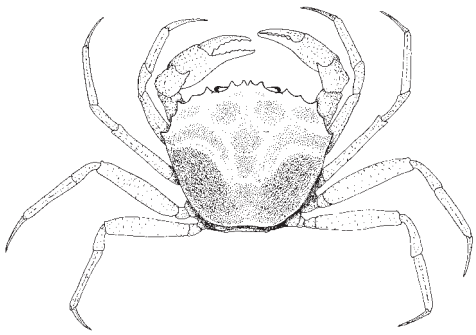


Fig. 5 ***Chaceon granulatus***

List of species of interest to fisheries occurring in the area

The symbol is given when species accounts are included.

- *Chaceon australis* Manning, 1993
- *Chaceon bicolor* Manning and Holthuis, 1989
- *Chaceon granulatus* (Sakai, 1978)
- *Chaceon karubar* Manning, 1993
- *Chaceon poupini* Manning, 1992

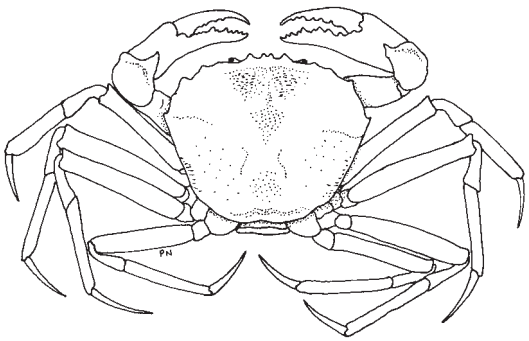
References

Manning, R.B. and L.B. Holthuis. 1981. West African Brachyuran Crabs (Crustacea: Decapoda). *Smithson. Contrib. Zool*., 306:1-379.

Manning, R.B. and L.B. Holthuis. 1989. Two new genera and nine new species of geryonid crabs (Crustacea: Decapoda: Geryonidae). *Proc. Biol. Soc. Wash.*, 102:50-77.

Ng, P.K.L. and R.B. Manning. 1998. A new deepwater crab from the Palau Islands, Micronesia (Decapoda: Brachyura: Geryonidae). *Proc. Biol. Soc. Wash.*, 111:in press.

Chaceon bicolor Manning and Holthuis, 1989

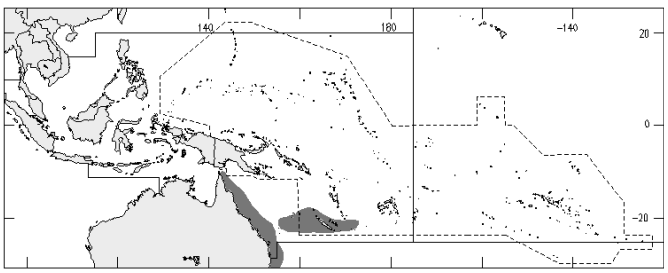


Frequent synonyms / misidentifications: None / None.

FAO name: En - Pacific golden crab.

Diagnostic characters: Carapace hexagonal; dorsal surface not inflated; anterolateral teeth low. Merus of legs long, slender. Dactylus of legs not laterally flattened, height at midlength greater than or subequal to width at midlength. **Colour:** reddish tan to purplish black (anterior half of carapace may be differently coloured than posterior half), sometimes cream-white throughout.

Size: Maximum carapace width 18 cm (males) and 15 cm (females).



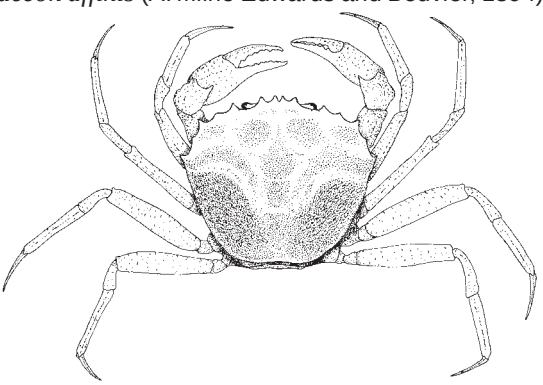
Habitat, biology, and fisheries: Like most of the known species of the genus, *Chaceon bicolor* lives on muddy substrates in deeper waters at depths between 200 and 1 600 m, and apparently burrows sometimes into the sediment. Occasionally caught throughout its range, especially in Australia. Taken in bottom trawls and lobster pots, and is believed to be commercially valuable in the future, being supposedly quite abundant in some areas.

Distribution: New Caledonia, northwest and eastern Australia, and Loyalty Islands.

Chaceon granulatus (Sakai, 1978)

Frequent synonyms / misidentifications: None / *Chaceon affinis* (A. Milne Edwards and Bouvier, 1894).

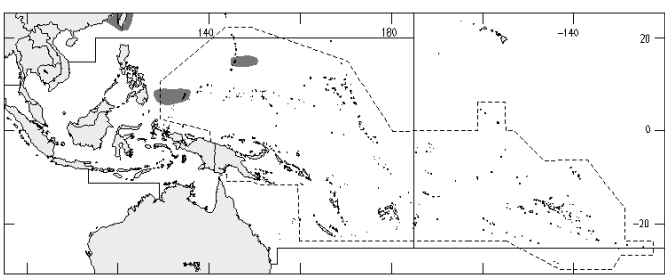
FAO name: En - Japanese golden crab.



Diagnostic characters: Carapace hexagonal; dorsal surface (especially branchial regions) distinctly inflated; anterolateral teeth low in adults. Merus of legs long, slender, with dorsal subdistal tooth; dactylus of legs laterally flattened, height at midlength less than width at midlength. **Colour:** uniform tan to cream colour overall.

Size: Maximum carapace width 30 cm.

Habitat, biology, and fisheries: On soft substrates in deep waters from 300 to 1 500 m. Caught on a regular basis in Japan, but never in large numbers. When it does appear in markets, it commands high prices (up to US$60 to US$80 for a fresh crab of 20 cm width). Also caught for sale in Palau.



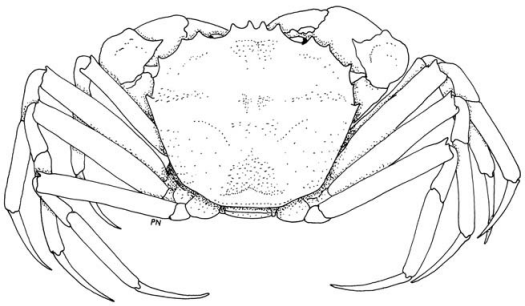
Distribution: Japan, China, Taiwan Province of China, and Palau.

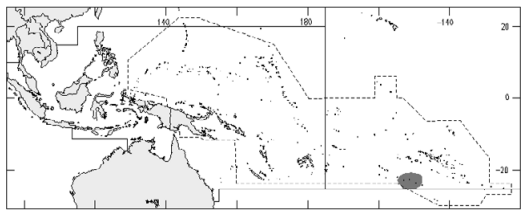
Remarks: Only 3 Pacific species of *Chaceon*, *C. granulatus*, *C. karubar*, and *C. manningi* belong to the group in which the dactylus of legs is laterally flattened, and the height at midlength is less than the width at midlength. Specimens from Saipan and Palau which have been identified with *C. granulatus* possibly belong to separate species, but studies on these are still ongoing. For the moment, crabs from these 2 islands are tentatively identified as *C. granulatus*. The Palau specimens were recently recognized as belonging to a new species.

Chaceon australis Manning, 1993

En - Austral golden crab.

Maximum carapace width 10 cm. Carapace pink and tan in life. Occurs in deeper waters at depths of about 900 m. Not collected commercially for food so far, but has good fishery potential with the future development of deep-water fisheries, due to its large size. Known only from the Austral Islands.

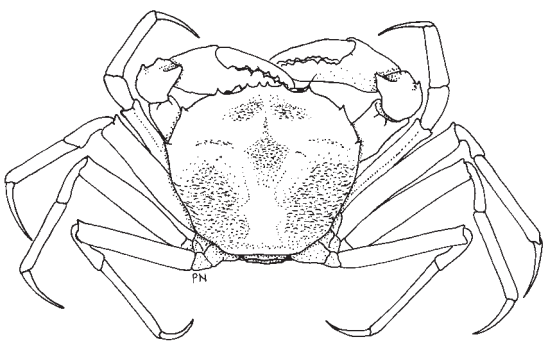


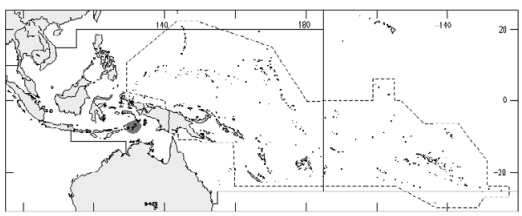


Chaceon karubar Manning, 1993

En - Indonesian golden crab.

Maximum carapace width 19 cm. In deeper waters at depths of about 550 m. Not collected commercially for food so far, but has a good fishery potential because of its large size. Known only from the Tanimbar Islands in Indonesia.

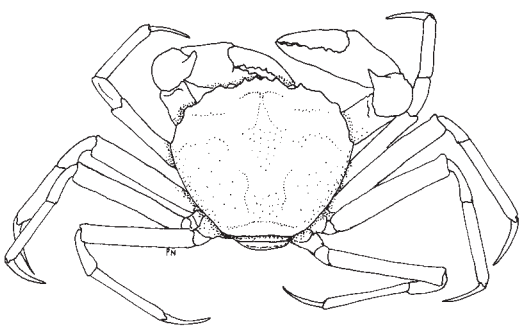


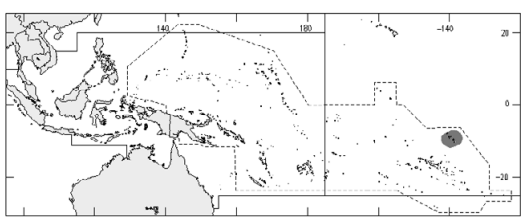


Chaceon poupini Manning, 1992

En - Polynesian golden crab.

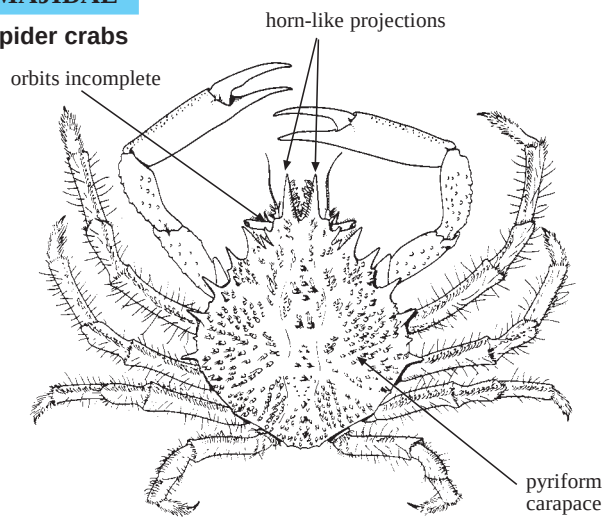
Maximum carapace width 14 cm. Colour uniform red in life. Occurs in deeper waters at depths from 600 to 1 000 m. Not collected commercially for food so far, but has a good fishery potential because of its large size. Known only from the Marquesas Islands.





MAJIDAE

Spider crabs



Diagnostic characters: Carapace pyriform (pear-shaped), circular to subovate, anterior 1/2 to 1/3 usually distinctly narrower than posterior part; dorsal surface gently convex, spinulose, granulose, and/or ridged; front narrow, often with 2 long horn-like projections (rostra); **orbits poorly developed to absent**; anterolateral margins of carapace often armed with well-developed spines. Legs spinulose and/or granulose, often with stiff setae. All male abdominal segments usually freely movable in most species.

Habitat, biology, and fisheries:[1/] Benthic crabs. Most species of minor or no importance to fisheries, with only the larger species of *Schizophrys* being occasionally collected in the Western Central Pacific.

Similar families occurring in the area

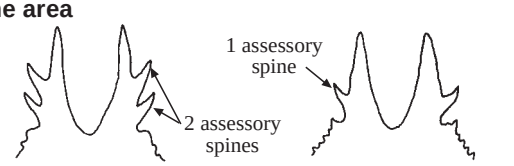
None. The generally pyriform (pear-like) shape of many majids easily distinguishes them from other families. Their orbits are usually poorly demarcated to incomplete and this feature is often quite diagnostic. In addition, many species have hook-like setae on their bodies and appendages with which they use to attach various materials for camouflage.

The Hymenosomatidae (crown crabs, non-commercial) closely resemble many majids, but are easily distinguished by their very small size (small species at 2 mm adult carapace width, being contenders with the pinnotherids for the smallest crabs in the world), the absence of hook-like setae, and having only 5 abdominal segments (excluding the telson).

Key to species of interest to fisheries occurring in the area

1a. Two accessory spines at base of each rostral horn (Fig. 1a) . . . . . ***Schizophrys dama***

1b. One accessory spine at base of each rostral horn (Fig. 1b) . . . . . ***Schizophrys aspera***



a) *Schizophrys dama* **b) *Schizophrys aspera***

Fig. 1 rostral horn (dorsal view)

List of species of interest to fisheries occurring in the area

The symbol 🕷 is given when species accounts are included.

🕷 *Schizophrys aspera* (H. Milne Edwards, 1834)
🕷 *Schizophrys dama* (Herbst, 1804)

References

Griffin, D.J.G. 1966. A review of the Australian majid spider crabs (Crustacea, Brachyura). *Australian Zoologist*, 13:259-298.

Griffin, D.J.G. and H.A. Tranter. 1986. The Decapoda Brachyura of the Siboga Expedition. VII. Majidae. *Siboga Exped. Monogr.*, 39c(4):1-335.

1/ The most important majids in fisheries are the large crabs of the genus *Chionoecetes* which occur in cold northern waters only. Near the area, the "Japanese giant spider crab" (*Macrocheira kaempferi*), known only from Japan and Taiwan Province of China, is occasionally collected for food. This is the largest crab in the world, reaching a carapace width of 30 cm and with legs spanning 2.5 m from tip to tip. The only other majid crab of fishery importance near the area is the southern spider crab (*Jacquinotia edwardsii*) from New Zealand, with several tonnes a month being landed.

Schizophrys aspera (H. Milne Edwards, 1834)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Common decorator crab.

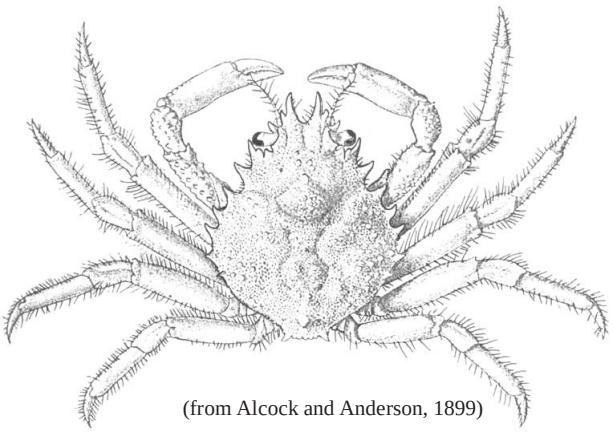
Diagnostic characters: Carapace pear-shaped, with 2 pronounced rostral horns. **Colour:** brown overall.

Size: Maximum carapace width 6 cm.

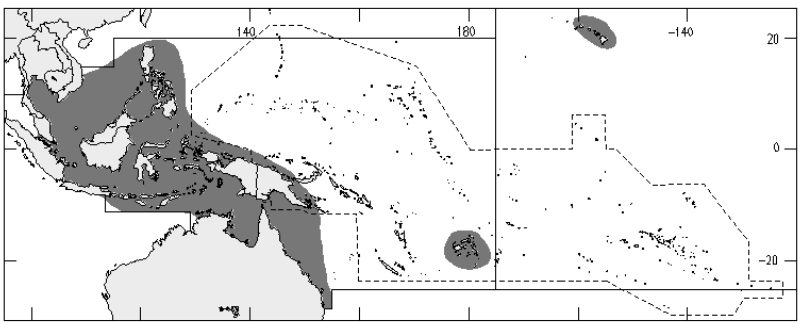
Habitat, biology, and fisheries: Found on rocks, especially near reefs, from intertidal areas to a depth of 40 m. Usually caught incidentally by hand, sometimes in crab pots. Only of local commercial importance.

Distribution: Indo-West Pacific, eastwards to Hawaii.

Remarks: *Schizophrys aspera* can be confused with *S. dama*, which is easily distinguished by the 2 accessory spines near the base of each rostral horns (only 1 spine in *S. aspera*).



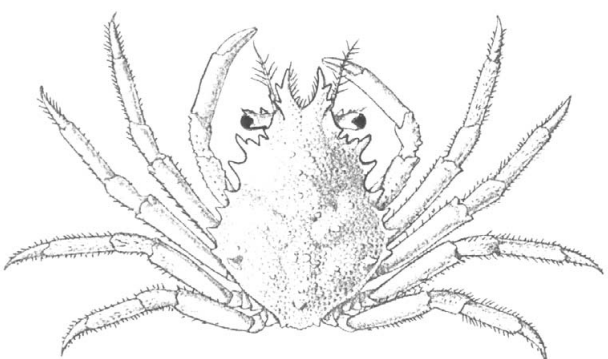
(from Alcock and Anderson, 1899)



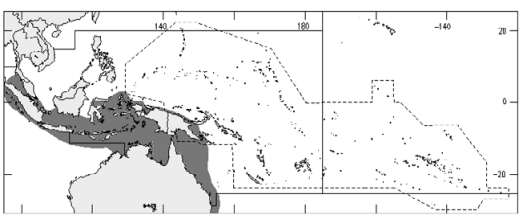
Schizophrys dama (Herbst, 1804)

En - Pronghorn decorator crab.

Maximum carapace width 6 cm. A subtidal coral reef species, occasionally invades rocky and sandy areas. Collected incidentally by hand or with nets, but nowhere commercially important. Southeast Asia to New Guinea and Australia.



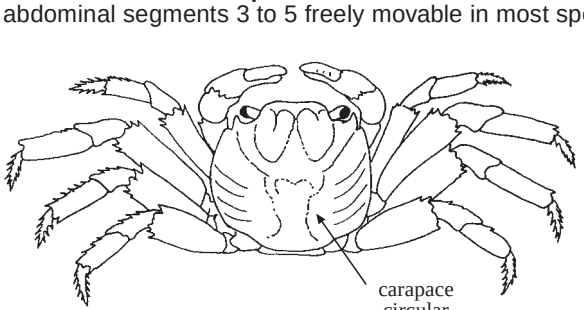
(from Alcock and Anderson, 1899)



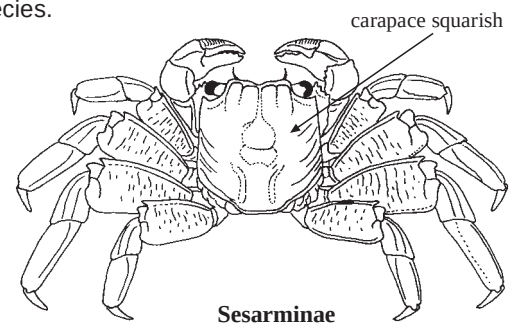
GRAPSIDAE

Sally-light-foots, vinegar crabs, and paddler crabs

Diagnostic characters: Carapace squarish, transversely rectangular, trapezoidal, or circular; dorsal surface flat to gently convex, with low oblique or transverse ridges; front much broader than orbits; **orbits occupying almost entire anterior border** (excluding front); antero- and posterolateral margins of carapace usually not clearly demarcated, lateral margins appearing almost straight or gently convex, usually armed with 1 or 2 teeth anteriorly, sometimes unarmed. **Rhomboidal gap usually present between third maxillipeds**, often with mandibles exposed. Dactylus of legs with distinct spines. Male abdominal segments 3 to 5 freely movable in most species.



Grapsinae

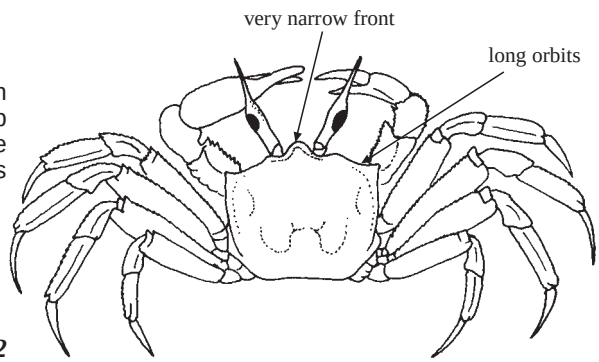


Sesarminae

Habitat, biology, and fisheries: Swimming, climbing, or terrestrial crabs, with the majority of species occurring in intertidal areas or semiterrestrial habitats. Many also occur in estuarine waters and a few species live exclusively in fresh water. Most species are of minor commercial importance, with species of the genera *Episesarma* and *Varuna* being most often collected for food.[1/]

Similar families occurring in the area

Ocypodidae: with a much narrower frontal margin of the carapace; always lack a rhomboidal gap between their third maxillipeds; crabs walk on the tip of dactyli of legs, not on the sides of dactyli (as seen in grapsids).

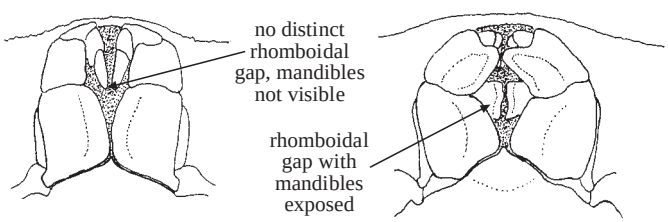


Ocypodidae

Key to the subfamilies of Grapsidae

1a. No distinct rhomboidal gap between third maxillipeds (Fig. 1a) . . . . . → ***2***

1b. Distinct rhomboidal gap between third maxillipeds (Fig. 1b) . . . . . → ***3***



a) Varuninae, Plagusiinae **b) Sesarminae, Grapsinae**

Fig. 1 third maxillipeds

1/ The most important grapsids commercially are the "mitten crabs" of the genus *Eriocheir* (Varuninae) from China, Taiwan Province of China, Japan, and Korea (see Guo et al., 1997). Costing up to US$ 20 each, these relatively large grapsids are netted in enormous numbers when they migrate from fresh waters to the sea to spawn. They are much sought after for their ripe ovaries.

2a. Carapace squarish; frontal margin entire, without lobes or teeth; third maxilliped with broad exopod and long flagellum (Fig. 2a); male abdomen with all segments movable (Fig. 3a) . . . . . **Varuninae**

2b. Carapace circular; third maxilliped with slender exopod and no flagellum (Fig. 2b); male abdomen with segments 3 to 6 immovable, with suture between segments 3 and 4 still evident (Fig. 3b) . . . . . **Plagusiinae**

(a single species of interest to fisheries, *Plagusia tuberculata*, occurring in the area)

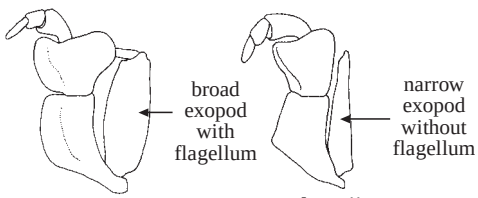


Fig. 2 third maxilliped

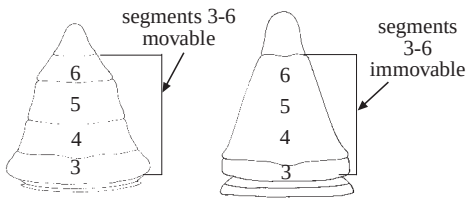


Fig. 3 male abdomen

3a. Merus and ischium of third maxillipeds with ridge (Fig. 4a); pterygostomial region with network-like (reticulated) pattern of very short, stiff setae (Fig. 5a); carapace usually squarish . . . . . **Sesarminae**

3b. Merus and ischium of third maxillipeds without hairy oblique ridge (Fig. 4b); pterygostomial region may be setose but no network-like pattern discernible (Fig. 5b); carapace usually circular . . . . . **Grapsinae**

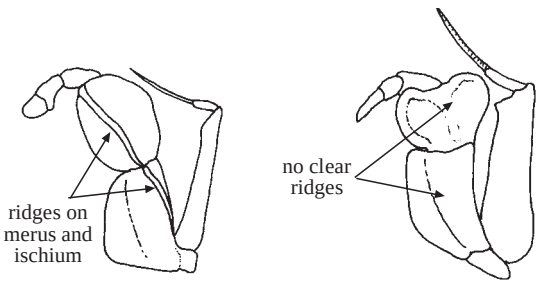


Fig. 4 third maxilliped

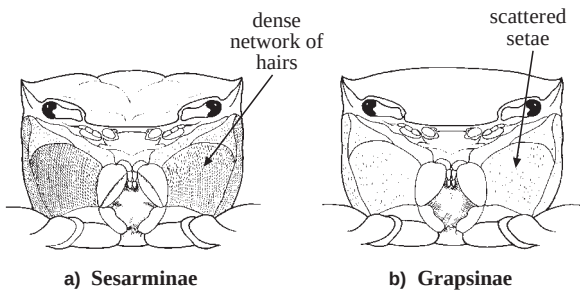


Fig. 5 body in frontal view

Key to food species of Grapsinae occurring in the area

1a. Front gently deflexed, margin weakly serrated (Fig. 6a); inner angle of carpus of cheliped with acutely triangular spine (Fig. 7a); pectinated fingertips of chela longitudinally broad (Fig. 8a); adult male sixth abdominal segment shorter than fifth segment (Fig. 9a) . . . . . ***Grapsus albolineatus***

1b. Front strongly deflexed and appears almost vertical from frontal view, margin serrated (Fig. 6b); inner angle of carpus of cheliped with subtruncate base (Fig. 7b); pectinated fingertips of chela longitudinally narrow (Fig. 8b); adult male sixth abdominal segment distinctly longer than or subequal in length to fifth segment (Fig. 9b) . . . . . ***Grapsus tenuicrustatus***

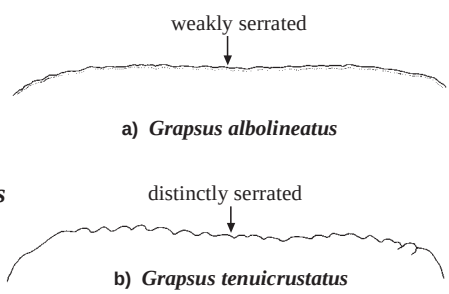
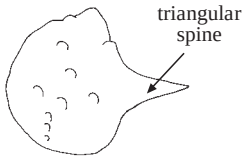
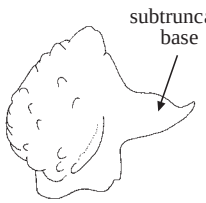


Fig. 6 frontal margin of carapace

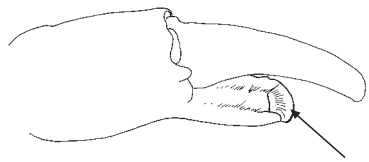


a) *Grapsus albolineatus*

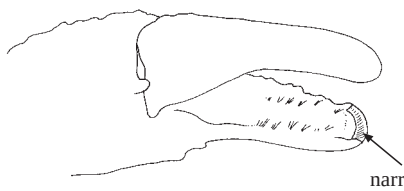


b) *Grapsus tenuicrustatus*

Fig. 7 carpus of cheliped

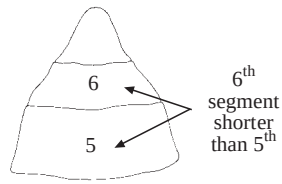


a) *Grapsus albolineatus*

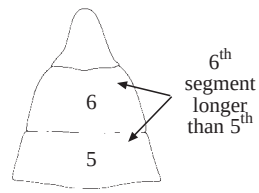


b) *Grapsus tenuicrustatus*

Fig. 8 chela



a) *Grapsus albolineatus*



b) *Grapsus tenuicrustatus*

Fig. 9 male abdomen

Key to food species of Sesarminae occurring in the area

1a. Tubercles on dorsal margin of dactylus of chela numbering 64 to 76 (Fig. 10a); male first gonopod with broad, truncate pectinated tip (Fig. 11a); most of outer surface of palm and proximal part of dactylus purple to reddish, dactylus white distally, pollex orangish red to pink . . . . . ***Episesarma chengtongense***

1b. Tubercles on dorsal margin of dactylus of chela numbering less than 61; male first gonopod tip not as above; outer surface of palm not coloured as above . . . . . → ***2***

2a. Tubercles on dorsal margin of dactylus of chela similarly sized throughout length, numbering 40 to 50 (Fig. 10b); male first gonopod with broad, rounded pectinated tip (Fig. 11b); outer surface of palm light brown with white fingertips . . . . . ***Episesarma palawanense***

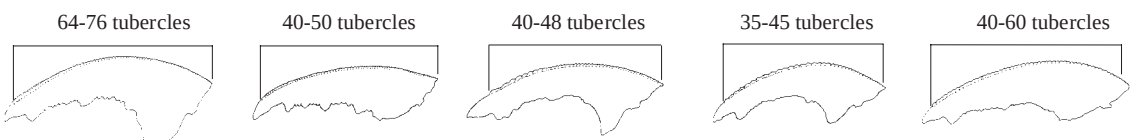
2b. Tubercles on dorsal margin of dactylus of chela increasing in size towards finger tip; male first gonopod not as above; outer surface of palm light brown with white fingertips or coloured in other ways . . . . . → ***3***

3a. Outer surface of palm violet at the proximal part, distal part and fingers white; tubercles on dorsal margin of dactylus of chela 40 to 48 (Fig. 10c); male first gonopod with relatively narrow truncate pectinated tip (Fig. 11c) . . . . . ***Episesarma versicolor***

3b. Outer surface of palm uniformly red or brown; tubercles on dorsal margin of dactylus of chela 35 to 60; male first gonopod tip not as above . . . . . → ***4***

4a. Tubercles on dorsal margin of dactylus of chela numbering 35 to 45 (Fig. 10d); male first gonopod with relatively broad, bent pectinated tip (Fig. 11d); outer surface of palm uniformly red to chestnut brown . . . . . ***Episesarma singaporense***

4b. Tubercles on dorsal margin of dactylus of chela numbering 40 to 60 (Fig. 10e); male first gonopod with relatively narrow, bent pectinated tip (Fig. 11e); outer surface of palm light brown with white fingertips . . . . . ***Episesarma mederi***



a) *Episesarma chengtongense* b) *Episesarma palawanense* c) *Episesarma versicolor* d) *Episesarma singaporense* e) *Episesarma mederi*

Fig. 10 dactylus of chela (lateral view)

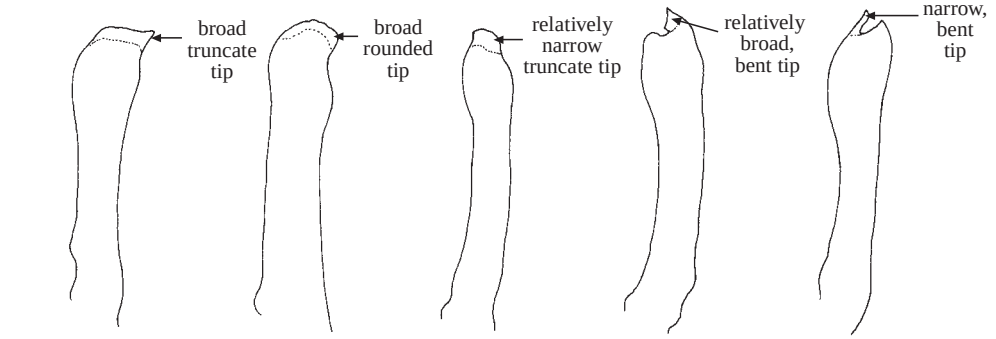


Fig. 11 male first gonopod

Key to food species of Varuninae occurring in the area

1a. Distal process of male first gonopod with 1 process distinctly longer than the other (Fig. 12a); occurs mainly in continental shelf waters . . . . . ***Varuna yui***

1b. Distal process of male first gonopod with both processes subequal in size (Fig. 12b); occurs mainly in areas with more oceanic waters . . . . ***Varuna litterata***

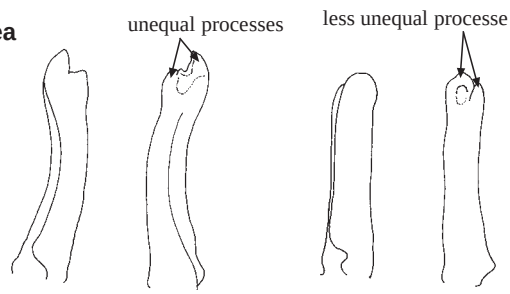


Fig. 12 male first gonopod

List of species of interest to fisheries occurring in the area

The symbol is given when species accounts are included.

Subfamily GRAPSINAE

Grapsus albolineatus Lamarck, 1818
Grapsus tenuicrustatus (Herbst, 1783)

Subfamily PLAGUSIINAE

Plagusia tuberculata Lamarck, 1818

Subfamily SESARMINAE

Episesarma mederi (A. Milne Edwards, 1854)
Episesarma chengtongense (Serène and Soh, 1967)
Episesarma palawanense (Rathbun, 1914)
Episesarma singaporense (Tweedie, 1936)
Episesarma versicolor (Tweedie, 1940)

Subfamily VARUNINAE

Varuna litterata (Fabricius, 1798)
Varuna yui Hwang and Takeda, 1984

References

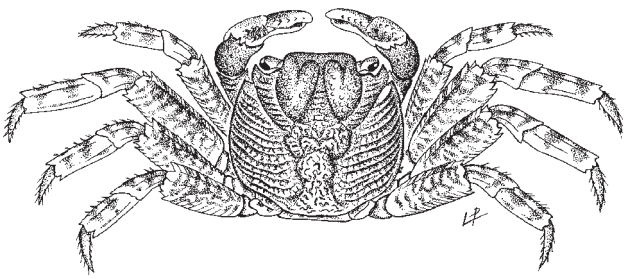
Alcock, A. 1900. Materials for a carcinological fauna of India. No. 6. The Brachyura Catometopa or Grapsoidea. *J. Asiat. Soc. Bengal*, 69, pt. 2(3):279-486.

Crosnier, A. 1965. Crustacés Décapodes. Grapsidae et Ocypodidae. *Faune de Madagascar*, 18:1-143.

Grapsus albolineatus Lamarck, 1818

Frequent synonyms / misidentifications: *Grapsus strigosus* (Herbst, 1799) / None.

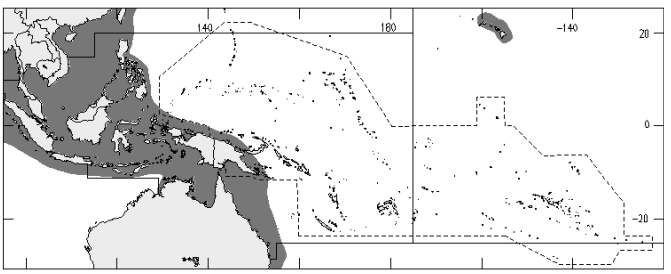
FAO name: En - Mottled Sally-light-foot.



Diagnostic characters: Carapace rounded; front straight, entire; anterolateral margins rounded, each with 1 tooth; lateral regions with numerous oblique striae. Fingertips strongly spooned. **Colour:** carapace with green and white transverse markings.

Size: Maximum carapace width 5 cm.

Habitat, biology, and fisheries: Found out of the water, on rocks in the splash zone. Collected only incidentally and consumed by local residents only. Usually caught by hand or with special nets.



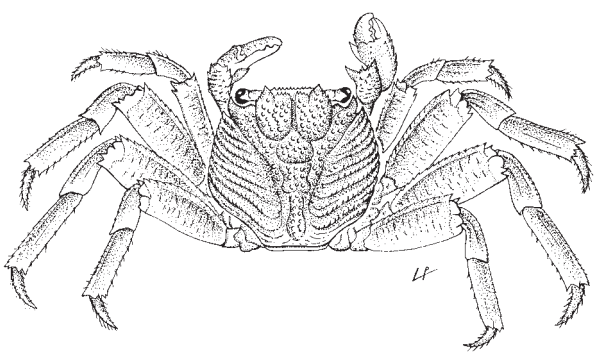
Distribution: Indo-West Pacific.

Remarks: Several other *Grapsus* species live in the region, but the most common are *G. albolineatus* and *G. tenuicrustatus* (see below). These 2 species, however, can easily be separated (see key).

Grapsus tenuicrustatus (Herbst, 1783)

Frequent synonyms / misidentifications: None / None.

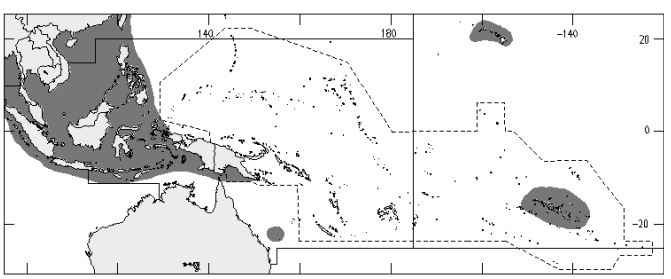
FAO name: En - Natal Sally-light-foot.



Diagnostic characters: Carapace rounded; front straight, finely serrated; anterolateral margins rounded, each with 1 tooth; lateral regions with numerous oblique striae. Fingertips slightly spooned. **Colour:** carapace with green and white transverse markings.

Size: Maximum carapace width 8 cm.

Habitat, biology, and fisheries: Found out of the water, on rocks in the splash zone. Collected only incidentally and consumed by local residents. Usually caught by hand or with special nets. Probably the most common representative of *Grapsus* among several species occurring in the area.

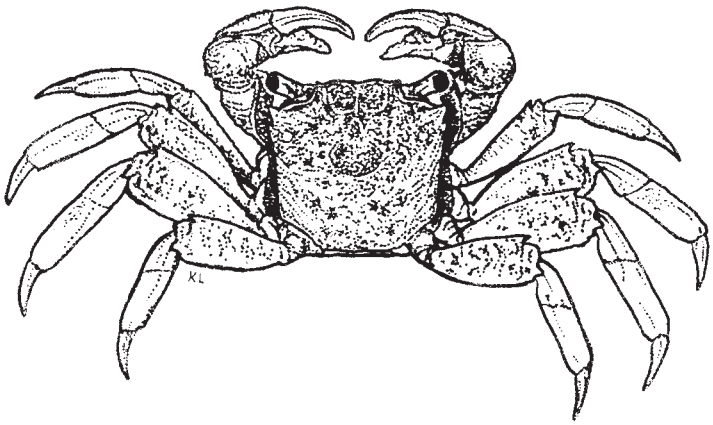


Distribution: Indo-West Pacific, including French Polynesia and Hawaii.

Episesarma versicolor (Tweedie, 1940)

Frequent synonyms / misidentifications: None / None.

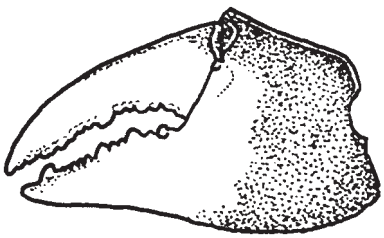
FAO name: En - Violet vinegar crab.



Diagnostic characters: Carapace squarish, with 1 small anterolateral tooth; dorsal surface relatively flat; regions well defined, covered with short, stiff setae. Dorsal margin of dactylar finger with numerous (40 to 48) tubercles, forming a stridulatory organ. **Colour:** carapace brown to brownish grey; outer surface of palm with proximal parts violet, distal parts and fingers white.

Size: Maximum carapace width 5 cm (for *Episesarma* spp.).

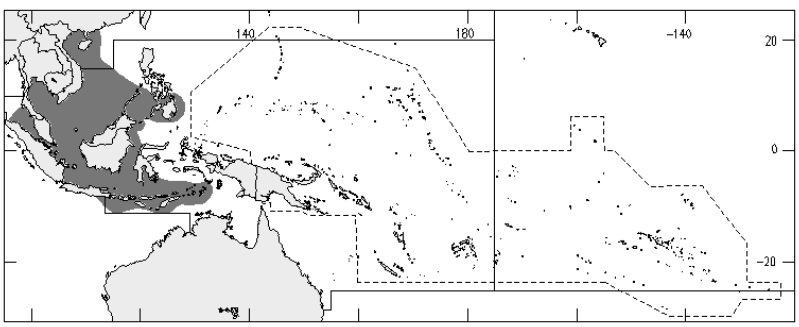
Habitat, biology, and fisheries: All members of *Episesarma* are mangrove crabs, digging burrows at the base of trees or at mud lobster (*Thalassina*) mounds, and are predominantly herbivorous. There are several species of *Episesarma* known from Southeast Asia, all of which are harvested to varying degrees. They are collected in large numbers for food in many Southeast Asian countries and some southern Chinese communities. The crabs are collected by hand, often pickled in vinegar and/or salt solutions and are then eaten as they are with rice, or deep fried. In northern Australia, an undescribed species of *Episesarma* is eaten by the aborigines (P. Davie, pers. comm.).



outer surface of chela

Distribution: Southeast Asia and southern China.

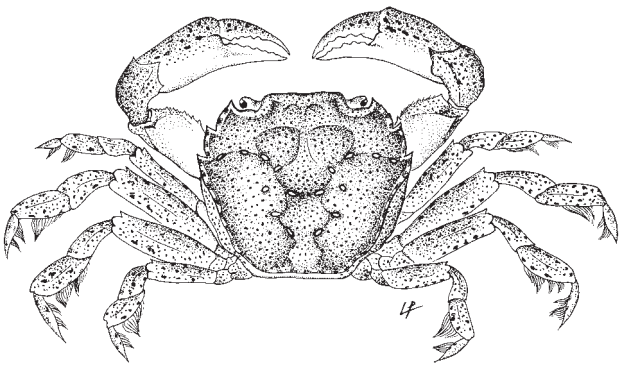
Remarks: Four other species of *Episesarma* in Southeast Asia are large and common enough to be collected for food. These are *E. singaporense*, *E. mederi*, *E. chengtongense*, and *E. palawanense* (see abbreviated species accounts below). They are easily distinguished by various carapace and cheliped characters, and on the basis of live colours.



Varuna litterata (Fabricius, 1798)

Frequent synonyms / misidentifications: None / None.

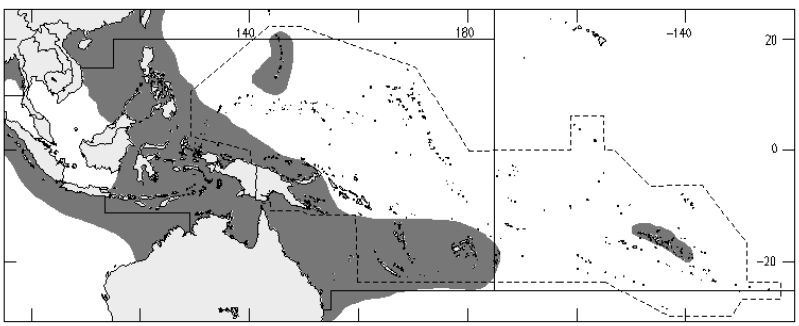
FAO name: En - Oceanic paddler crab.



Diagnostic characters: Carapace squarish, surface smooth; front straight; anterolateral margins each with 3 very broad, low but sharp teeth. Dactylus, propodus, and carpus of legs laterally flattened, fringed with long, closely packed setae. **Colour:** light brown to brownish grey on dorsal surfaces.

Size: Maximum carapace width 5 cm (males).

Habitat, biology, and fisheries: *Varuna litterata* prefers areas faced by more oceanic waters whereas *V. yui* is only known from the continental shelf waters of Southeast Asia and neighbouring areas. Both species occur together in the Philippines. *V. litterata* and *V. yui* are generally estuarine crabs that usually prefer slow-moving or almost stagnant bodies of water. Both species, however, can be found up to 20 km from the sea in completely fresh water. Large or ovigerous specimens can be found in intertidal areas, frequently associated with floating clumps of brown algae, *Sargassum* spp. Collected in good numbers in most Southeast Asian countries for food. Usually collected by hand, but also caught by traps, seines, and fish corrals. Like *Episesarma*, the species of *Varuna* in the area are usually pickled in vinegar and/or salt solutions. They are then eaten as such or deeply fried. They are also collected for their tasty ovaries and are especially common in markets during their breeding period.



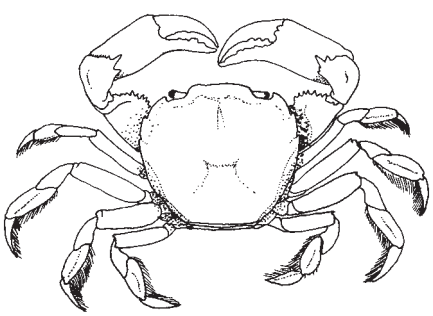
Distribution: Widely distributed in the Indo-West Pacific.

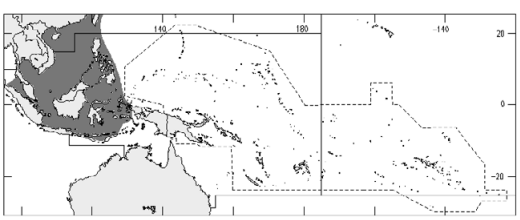
Remarks: The 2 species of *Varuna* in the area, *V. litterata* and *V. yui* (see abbreviated species account below), are very similar externally, and can only be distinguished effectively by means of their male gonopods.

Varuna yui Hwang and Takeda, 1984

En - Sundaic paddler crab.

Maximum carapace width 5 cm. In estuarine waters up to 20 km inland in completely fresh water. Collected in large numbers in most Southeast Asian countries for local consumption. Usually collected by hand, but also caught by traps, seines, and fish corrals. In continental shelf waters of the Sunda Shelf up to southern China and Philippines, occurring together with *Varuna litterata* in the latter 2 localities. *V. yui* is the dominant species of the genus in the Sunda Shelf.

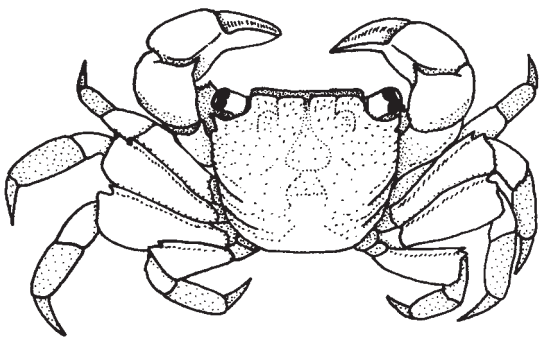


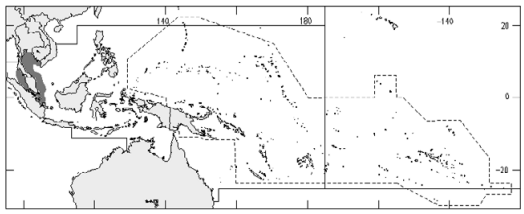


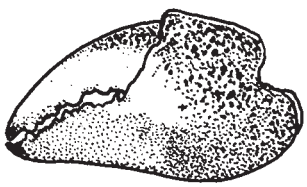
Episesarma chengtongense (Serène and Soh, 1967)

En - Pinkfingered vinegar crab.

Maximum carapace width 5 cm. Found only in mangroves. Collected by hand for food, and usually sold fresh or pickled in vinegar. Occurs in southern China and various parts of Southeast Asia.





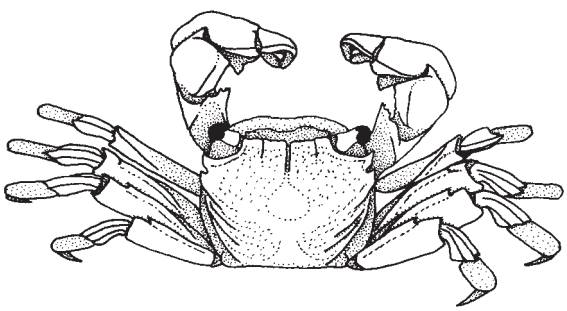


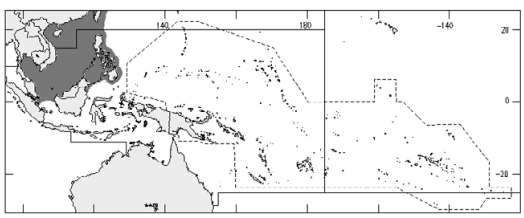
outer surface of chela

Episesarma mederi (A. Milne Edwards, 1854)

En - Thai vinegar crab.

Maximum carapace width 4 cm. Inhabits mangroves and forested muddy habitats. Collected by hand in large numbers for food, and usually sold fresh or pickled in vinegar. Occurs in southern China and various parts of Southeast Asia.

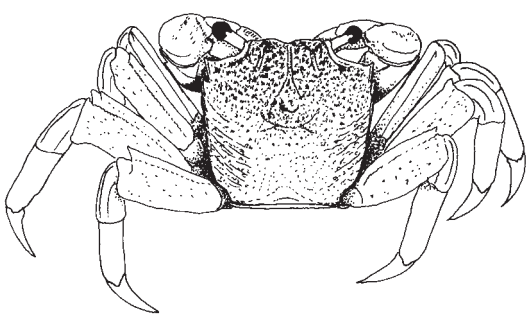


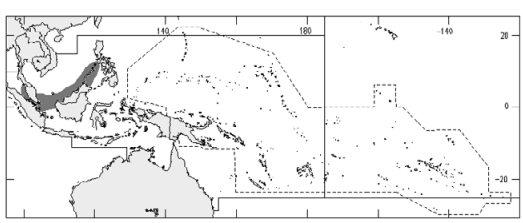


Episesarma palawanense (Rathbun, 1914)

En - Rathbun's vinegar crab.

Maximum carapace width 4 cm. Inhabits mangroves. Collected by hand for food, and usually sold fresh. Occurs in various parts of Southeast Asia.

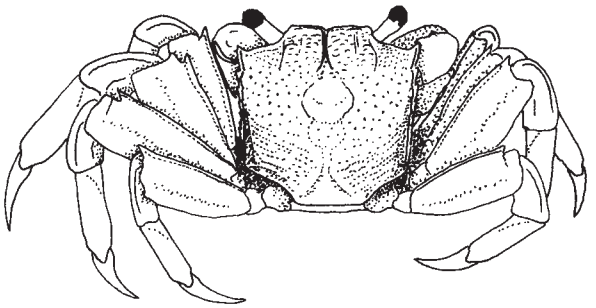


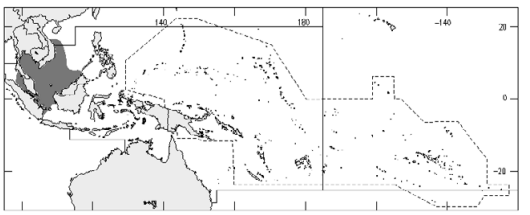


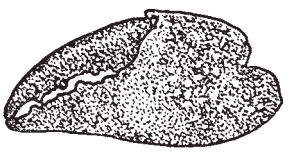
Episesarma singaporense (Tweedie, 1936)

En - Singapore vinegar crab.

Maximum carapace width 4 cm. Inhabits mangroves. Collected by hand in good numbers for food, and is usually sold fresh in markets or pickled in vinegar. Occurs in parts of Southeast Asia.





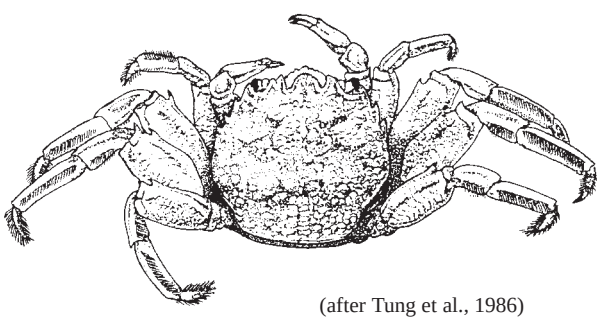


outer surface of chela

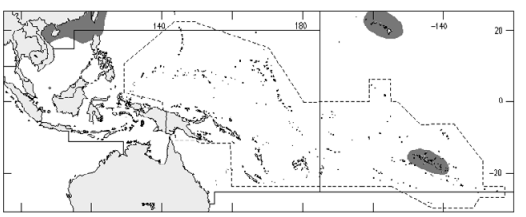
Plagusia tuberculata Lamarck, 1818

En - Tuberculated Sally-light-foot.

Maximum carapace width about 4 cm. On rocks just above the splash zone. Collected by hand and traps for food in rural communities, and usually pickled in vinegar or sauce as a food supplement. Indo Pacific in distribution, reaching New Zealand, Hawaii, French Polynesia, and California in the eastern Pacific.



(after Tung et al., 1986)



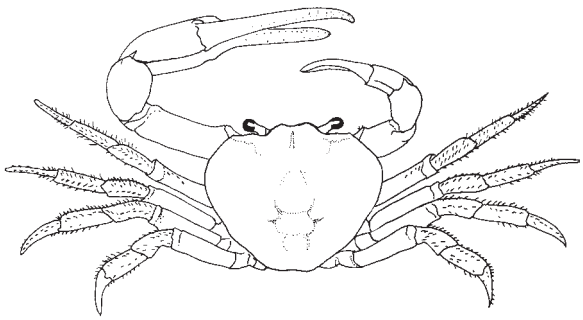
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GECARCINIDAE

Land crabs

Diagnostic characters: Carapace circular to transversely ovate; dorsal surface smooth, strongly convex longitudinally and transversely; frontal margin entire; anterolateral margins unarmed or each with a single tooth. **Rhomboidal gap present between third maxillipeds**. Legs stout, dactylus longitudinally ridged, often with dense, stiff setae, margins with spines. All male abdominal segments distinct, movable.



Habitat, biology, and fisheries: Terrestrial crabs. Although gercarcinids can be found many kilometres inland, they must return to the sea to spawn and release their planktonic larvae. The most frequently collected food species in the area is *Cardisoma carnifex*.

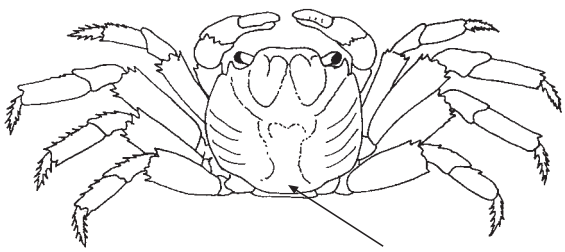
Similar families occurring in the area

The swollen carapace and terrestrial habitats of the gecarcinids make them a very distinctive group. In this respect they may be confused with several fresh-water and terrestrial genera of Gecarcinucidae, Potamidae, and Parathelphusidae (species of the latter 2 are collected for food in many parts of Southeast Asia and Indo-China).

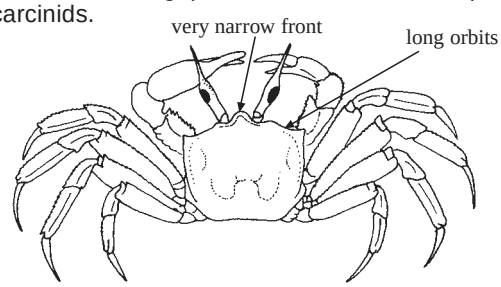
Potamidae, Gecarcinucidae, Parathelphusidae (= Sundathelphusidae): several genera of these exclusive fresh-water families may resemble gecarcinids, but are readily distinguished by the lack of a rhomboidal gap between the third maxillipeds.

Grapsidae: also have a rhomboidal gap between the third maxillipeds, but most species possess a much flatter dorsal carapace surface compared to gecarcinids.

Ocypodidae: also have many terrestrial members, but lack a rhomboidal gap between the third maxillipeds and generally do not have as thick a shell as seen in gecarcinids.



Grapsidae

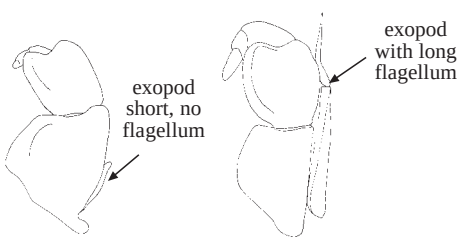


Ocypodidae

Key to species of interest to fisheries occurring in the area

1a. Exopod of third maxilliped without flagellum (Fig. 1a); orbits oblique, eyes small, never reaching first anterolateral tooth (Fig. 2). . . . . ***Gecarcoidea lalandii***

1b. Exopod of third maxilliped with long flagellum (Fig. 1b); orbits horizontal, eyes well developed, reaching to just before first anterolateral tooth. . . . . → *2*



a) ***Gecarcoidea lalandii*** b) ***Cardisoma* spp.**

Fig. 1 third maxilliped

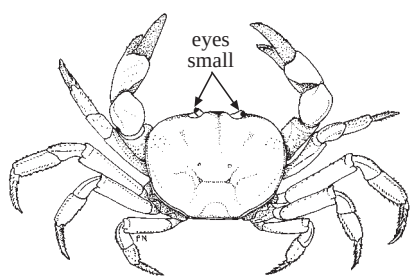


Fig. 2 *Gecarcoidea lalandii*

2a. Legs very long (Fig. 3) . . . . . ***Cardisoma longipes***
2b. Legs of normal length . . . . . → ***3***

3a. Surface of carapace with numerous scattered flattened to rounded granules (Fig. 4) . . . . . ***Cardisoma rotundum***
3b. Surface of carapace smooth . . . . . → ***4***

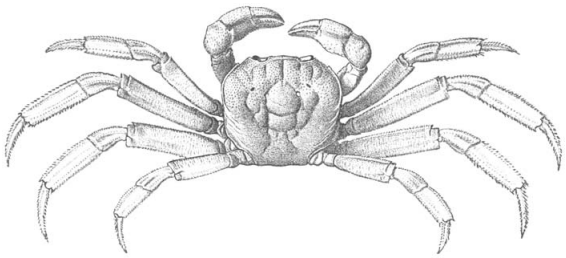


Fig. 3 ***Cardisoma longipes***
(from A. Milne Edwards, 1873)

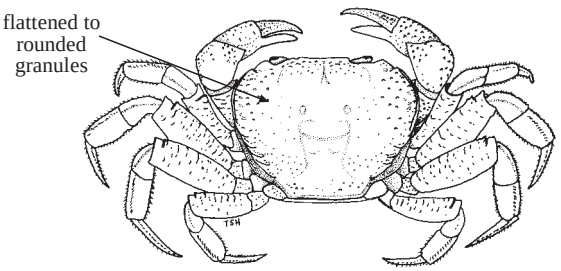


Fig. 4 ***Cardisoma rotundum***

4a. Carapace transversely ovate; face (pterygostomial and sub-branchial regions) with large setose area which covers anterior part of the branchiostegal region; stiff setae present on merus of legs; males with 2 equally enlarged chelae; carapace bluish brown to blue coloration in life (Fig. 5) . . . . . ***Cardisoma hirtipes***
4b. Carapace circular; face (pterygostomial and sub-branchial regions) with small setose area which does not reach branchiostegal region; short (or no) setae on merus of legs; males with 1 cheliped several times size of other; carapace brown in life (Fig. 6) . . . . . ***Cardisoma carnifex***

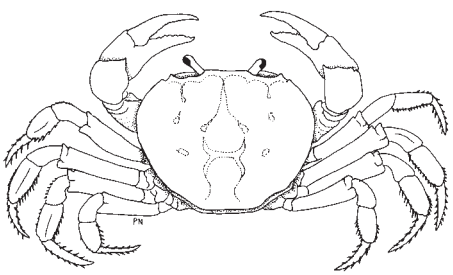


Fig. 5 ***Cardisoma hirtipes***

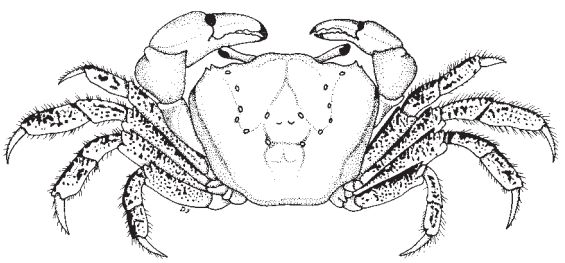


Fig. 6 ***Cardisoma carnifex***

List of species of interest to fisheries occurring in the area

The symbol 🕷 is given when species accounts are included.

🕷 *Cardisoma carnifex* (Herbst, 1794)
🕷 *Cardisoma hirtipes* Dana, 1852
🕷 *Cardisoma longipes* (A. Milne Edwards, 1873)
🕷 *Cardisoma rotundum* (Quoy and Gaimard, 1824)
🕷 *Gecarcoidea lalandii* (H. Milne Edwards, 1837)

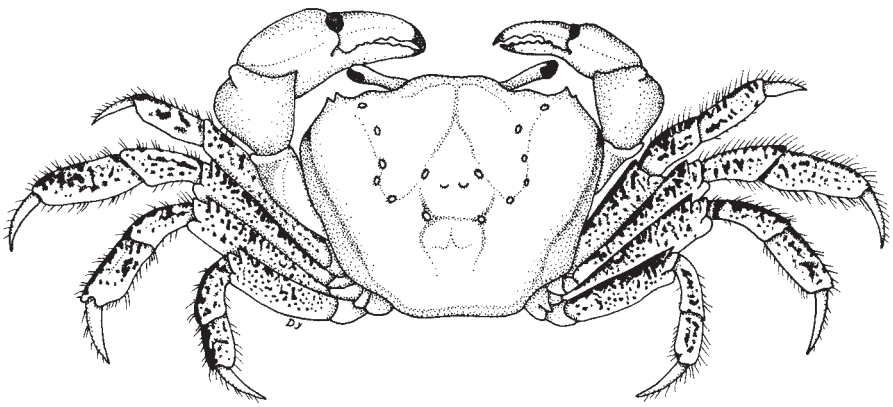
References

Burggren, W.W. and B.R. McMahon (eds). 1988. *The biology of land crabs*. Cambridge University Press, 479 p.
Türkay, M. 1974. Die Gecarcinidae Asiens und Ozeaniens (Crustacea: Decapoda). *Senckenb. Biol.*, 55:223-259.

Cardisoma carnifex (Herbst, 1794)

Frequent synonyms / misidentifications: *Cardisoma urvillei* H. Milne Edwards, 1853; *C. obesum* Dana, 1851 / None.

FAO name: En - Brown land crab.

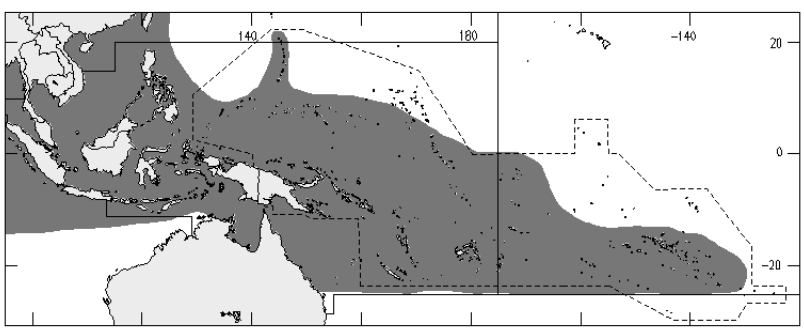


Diagnostic characters: Carapace subovate, swollen, surface smooth; setose area on pterygostomial and subbranchial regions small, not extending to branchiostegal region. Third maxilliped with well-developed flagellum on exopod, entirely covered by setae. Adult males with one chela greatly enlarged. Merus of legs not distinctly lined with stiff setae. **Colour:** brown to brownish grey.

Size: Maximum carapace width 12 cm (males).

Habitat, biology, and fisheries: In back mangroves or similar brackish-water habitats. Completely terrestrial crabs, living near the sea and excavating deep burrows. The larvae are released into the sea and return back to land upon completion of their development. *Cardisoma carnifex* is collected in substantial numbers whenever it is common, but has a comparatively low market value. It is usually caught by hand at night, or with special traps placed at the mouth of its burrow. The crabs are sold live. There have been reports that some land crabs are poisonous but this is almost certainly associated with their diet, as these herbivorous crabs sometimes consume poisonous plants. Once they are kept for short periods and their guts are empty however, they are safe for human consumption. Three other species of *Cardisoma* are found in the area, *C. hirtipes* Dana, 1852, *C. rotundum* and *C. longipes* (A. Milne Edwards, 1873) (see abbreviated species accounts below), but these are only of minor food value, being much less common than *C. carnifex*.

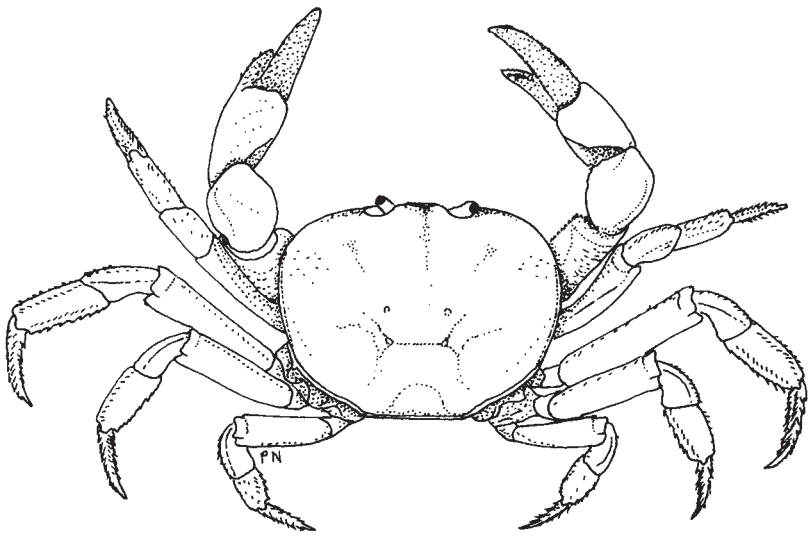
Distribution: Indo-West Pacific.



Gecarcoidea lalandii (H. Milne Edwards, 1837)

Frequent synonyms / misidentifications: *Hylaeocarcinus humei* Wood Mason, 1873; *Pelocarcinus marchei* A. Milne Edwards, 1890; *P. cailloti* A. Milne Edwards, 1890; *Limnocarcinus intermedius* De Man, 1879 / None.

FAO name: En - Purple land crab.



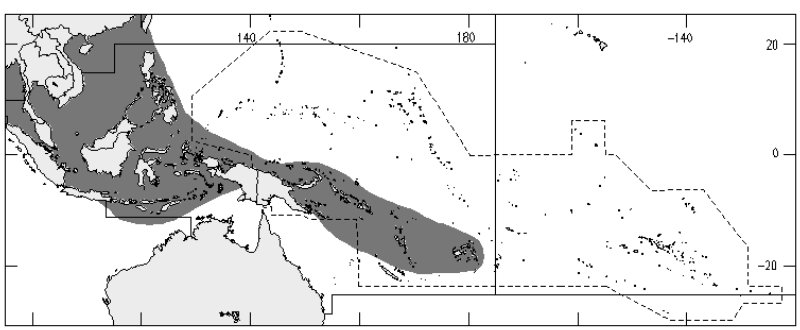
Diagnostic characters: Carapace distinctly transversely ovate, swollen, surfaces smooth; orbits relatively small, eyes slanted obliquely in adults; third maxilliped without any flagellum on exopod. **Colour:** purplish brown to purple and reddish purple.

Size: Maximum carapace width 13 cm (males).

Habitat, biology, and fisheries: Fully terrestrial, can be found many kilometres away from the sea. Normally inhabits shallow burrows or under trees and rocks in undisturbed forests in isolated islands, where they may be very common. The crabs release their larvae into the sea, which return to land upon completion of their development. *Gecarcoidea lalandii* is only occasionally collected for food, much the same as *Cardisoma carnifex*. Caught by hand or traps throughout their range, and sold live. Its market value, however, is comparatively low.

Distribution: Throughout Indo-West Pacific.

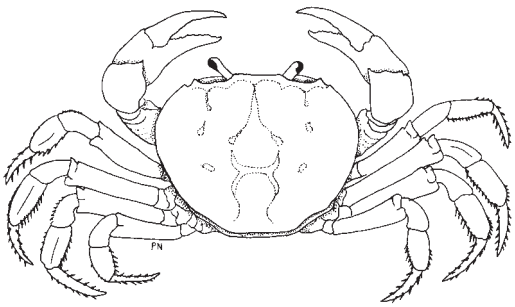
Remarks: Another species of the genus occurs in the area, *G. natalis* (Pocock, 1898), known only from Christmas and Cocos-Keeling islands. The 2 species are easily distinguished by their coloration: *G. lalandii* is purple whereas *G. natalis* is bright red.

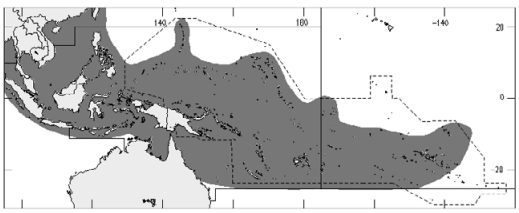


Cardisoma hirtipes Dana, 1852

En - Blue land crab.

Maximum carapace width 12 cm. On more sandy areas behind beaches, usually near the sea. Occasionally collected for food by hand or traps, when common. Widely distributed in the Indo-West Pacific.

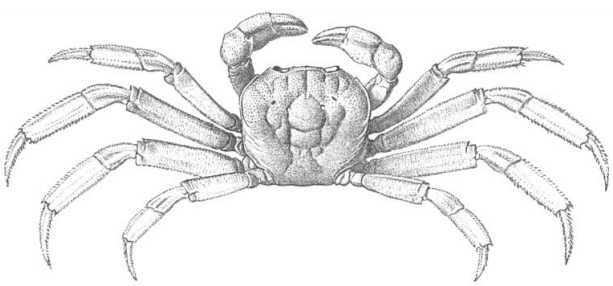




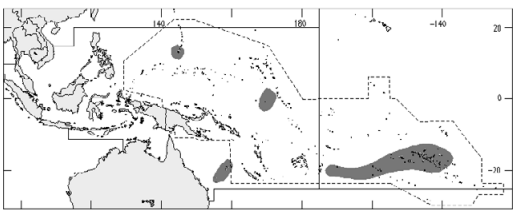
Cardisoma longipes (A. Milne Edwards, 1873)

En - Longlegged land crab.

Maximum carapace width 6 cm. On small isolated islands, in caves or holes. Rarely collected for food, due to its small size and general scarcity. Guam, New Caledonia, Niue, Cook Islands, Tuamotu, Ocean Island, and Kandavu.



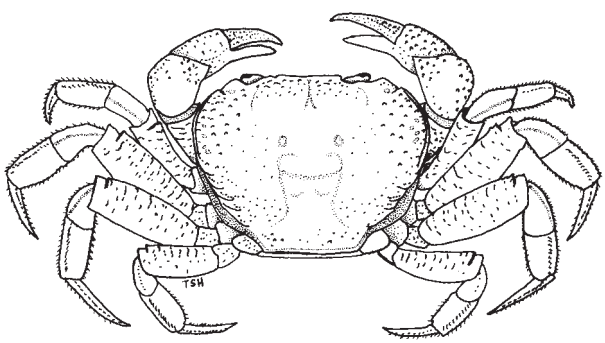
(from A. Milne Edwards, 1873)

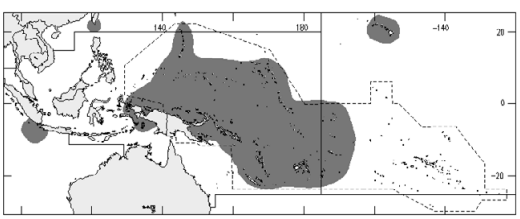


Cardisoma rotundum (Quoy and Gaimard, 1824)

En - Rugose land crab.

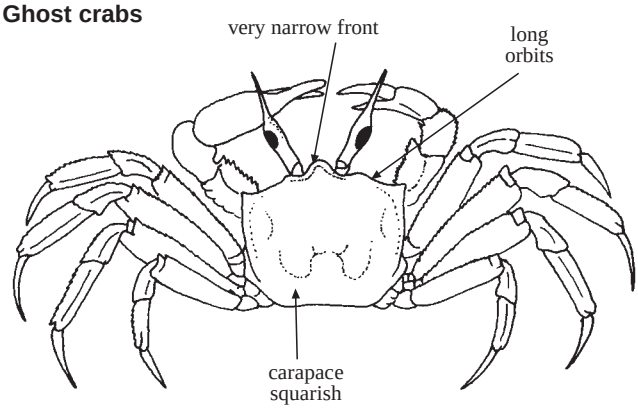
Maximum carapace width 7.5 cm. On more sandy areas adjacent to reefs. A relatively small, not common species, rarely collected for food. Occurs mainly in islands of the South Seas, reaching to southern Taiwan Province of China and southern Japan, and the eastern Indian Ocean.





OCYPODIDAE

Ghost crabs



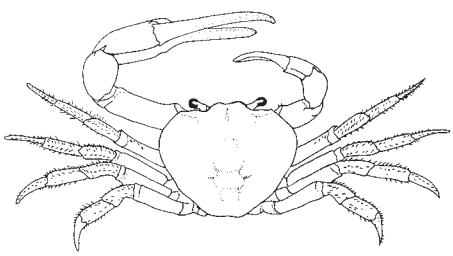
Diagnostic characters: Carapace squarish, transversely rectangular, trapezoidal or transversely ovate; dorsal surface gently convex, usually smooth or with grooves; **frontal margin entire, relatively narrow; orbits broad, occupying almost entire anterior border** (excluding the front), antero- and posterolateral margins of carapace usually not clearly demarcated, lateral margins appearing almost straight or gently convex, lateral margins unarmed. **Eyestalks long, longer than width of orbit**. No rhomboidal gap between third maxillipeds. Dactylus of legs with numerous stiff setae. **Ventral surface of abdomen or base of legs may have tufts of fine setae**. All male abdominal segments distinct, movable.

Habitat, biology, and fisheries: Terrestrial crabs. Most species are very small and are generally of minor importance to fisheries. Two larger species of *Ocypode* are occasionally caught for food, with *O. ceratophthalma* being most often collected.

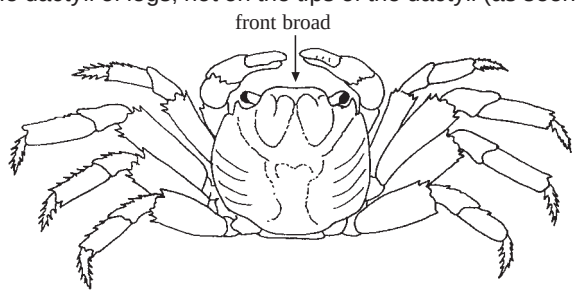
Similar families occurring in the area

Gecarcinidae: a rhomboidal gap present between third maxillipeds (no rhomboidal gap in ocypodids).

Grapsidae: a rhomboidal gap usually present between the third maxillipeds; frontal margin of carapace less narrow as in ocypodids; crabs walk on the sides of the dactyli of legs, not on the tips of the dactyli (as seen in ocypodids).



Gecarcinidae

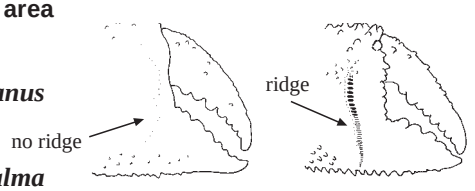


Grapsidae

Key to species of interest to fisheries occurring in the area

1a. Inner surface of palm without stridulating (sound-producing) ridge (Fig. 1a); eyes rounded . . . . . ***Ocypode cordimanus***

1b. Inner surface of palm with stridulating ridge (Fig. 1b); eye with long process above tip . . . . . ***Ocypode ceratophthalma***



a) *Ocypode cordimanus* **b) *Ocypode ceratophthalma***

Fig. 1 distal end of cheliped (inner surface)

List of species of interest to fisheries occurring in the area

The symbol 🕷 is given when species accounts are included.

🕷 *Ocypode ceratophthalma* (Pallas, 1872)

🕷 *Ocypode cordimanus* Desmarest, 1825

References

Alcock, A. 1900. Materials for a carcinological fauna of India. No. 6. The Brachyura Catometopa or Grapsoidea. *J. Asiat. Soc. Bengal*, 69, pt. 2 (3):270-486.

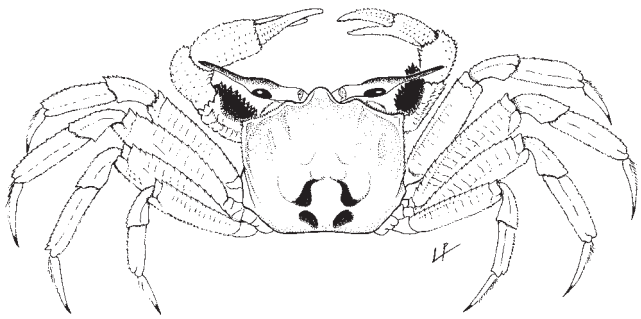
Crosnier, A. 1965. Crustacés Décapodes. Grapsidae et Ocypodidae. *Faune de Madagascar*, 18:1-143.

Ocypode ceratophthalma (Pallas, 1872)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Horned ghost crab.

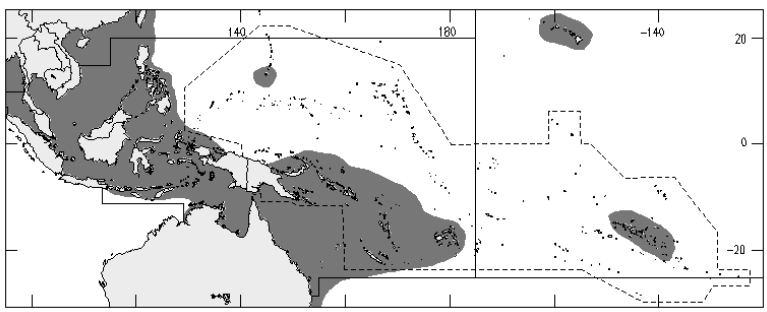
Diagnostic characters: Carapace squarish; anterolateral margins unarmed; eyes in adults with long projection above cornea; inner surface of palm with transverse stridulatory ridge. **Colour:** carapace bluish grey, with median parts brown; chelipeds and distal half of legs white.



Size: Maximum carapace width 5 cm.

Habitat, biology, and fisheries: A terrestrial species that lives in the lower part of the supralittoral zone, on sandy beaches. Excavates deep burrows. Caught mainly by hand, often at night when the crabs are more active. It is sometimes dug up. Only of local economic importance, rarely sold in markets. Usually fried for human consumption.

Distribution: Indo-West Pacific.

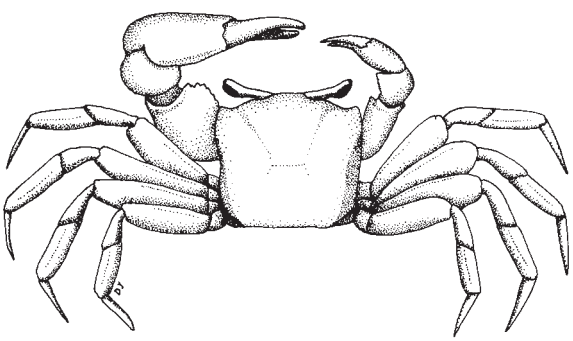


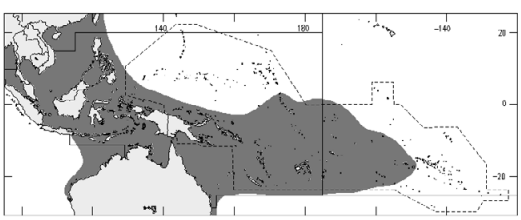
Remarks: The only other species in the area of similar size is *Ocypode cordimanus* Desmarest, 1825 (see below), readily distinguishable from *O. ceratophthalma* by lacking the "horned" eyes, lacking the stridulatory ridge on the palm, and the generally paler coloration.

Ocypode cordimanus Desmarest, 1825

En - Common ghost crab.

Maximum carapace width 4.5 cm. Inhabits higher supralittoral habitats not exposed to the sea, where it digs deep burrows. Collected by hand for human consumption in some places, but rarely seen in markets. Indo-West Pacfic, from South Africa to French Polynesia.



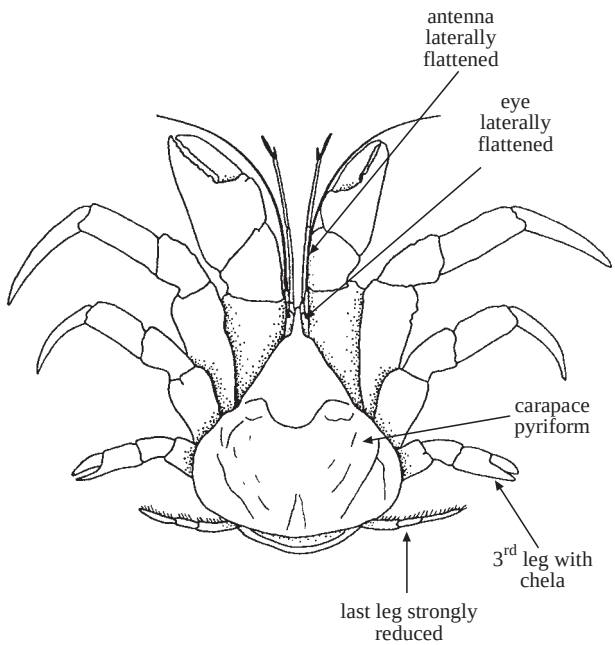


Infraorder ANOMURA

COENOBITIDAE

Land hermit crabs and coconut crabs

Diagnostic characters: Carapace relatively well calcified; eyestalk laterally flattened; eyes usually held subparallel to each other. Antennae laterally flattened. **Coxae of third maxillipeds close to each other, without distinct gap between them**. Chelipeds short, stocky, equal or unequal; when unequal, left chela larger. First 2 pairs walking legs, last 2 pairs reduced, chelate. **Abdomen bilaterally asymmetrical, not clearly divided into segments**. Either hermit crabs or distinctly crab-like animals with abdomen tucked under carapace; **uropods modified into a "rasp" used for clinging interior of gastropod shells (except in adult *Birgus latro*)**.



Habitat, biology, and fisheries: All members of the Coenobitidae are fully terrestrial, but they must return to the sea to release their larvae. Most species live in gastropod shells. None of the species, other than the "coconut crab" *Birgus latro*, have any fishery value, although many species of land hermit crabs (genus *Coenobita*) are regularly collected for the pet trade.

Similar families occurring in the area

Only the hermit crabs of the families Diogenidae and Paguridae may be confused with coenobitids, but their habitats are exclusively aquatic, not terrestrial. In addition, the laterally flattened antennae are highly diagnostic for the Coenobitidae.

References

Brown, I. W. and D. R. Fielder (eds). 1991. *The coconut crab: aspects of Birgus latro biology and ecology in Vanuatu*. Canberra, Australian Centre for International Agricultural Research (ACIAR), Monograph Number 8:i-x, 128 p.

Miyake, S. 1965. *The Crustacea Anomura of Sagami Bay*. Tokyo, Biological Laboratory of the Imperial Household, 161 p.

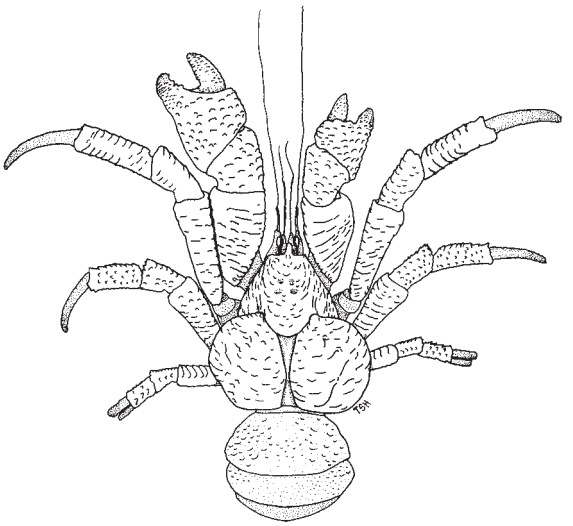
A single species of interest to fisheries occurring in the area.

Birgus latro (Linnaeus, 1767)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Coconut crab.

Diagnostic characters: Surface of carapace with numerous scale-like ridges. Antennae laterally flattened. Eyes laterally flattened. Abdomen large, tucked underneath carapace. First 2 pairs legs; third pair of legs short, chelate; last pair of legs very small, chelate, tucked underneath the swollen abdomen; surfaces of chelipeds and legs with numerous distinct transverse ridges. **Colour:** carapace bluish grey to purplish brown.

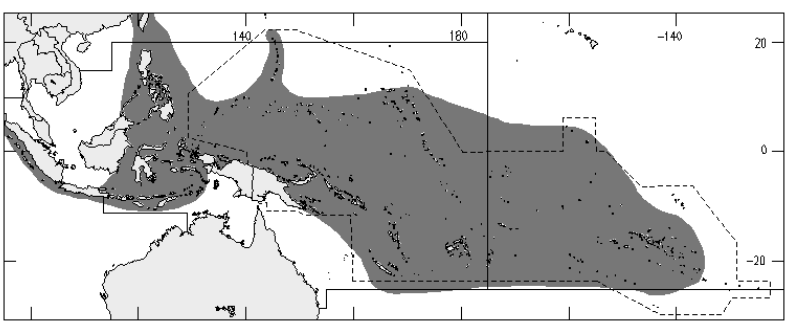


Size: Maximum carapace length 15 cm (or 35 cm, if the outstretched chelipeds are included in the measurement); weight up to 2.5 kg.

Habitat, biology, and fisheries: *Birgus latro* is actually a highly modified, fully terrestrial hermit crab, and young crabs do in fact inhabit gastropod shells, as seen in other members of the family Coenobitidae. As they grow, they discard the shell and tuck their hardended abdomen (normally soft in hermit crabs) under their carapace. Adults are fully terrestrial and breathe by means of a special "pseudo-lung". They must, however, return to the sea to release their planktonic zoeae. The coconut crab tends to occur on small isolated islands, in areas washed by oceanic waters. It is generally a scavenger, but also has a preference for coconuts and fruits. One of its common names ("palm thief") is derived from its habit of stealing shiny objects from human habitations. *Birgus latro* is the largest known land arthropod.

The coconut crab is a very valuable species and is sold live in markets, where large specimens may command prices of up to US$100. It has always been eaten throughout its wide Indo-West Pacific range, but its population has nowadays seen a very sharp decline where demand for the species skyrocketed in countries like Taiwan and Hong Kong. The very high price it commands in these markets has contributed to the serious decline of the species, which has been exterminated from many islands. It is now gradually becoming protected throughout much of its range. The species is collected by hand or with baited traps.

Distribution: Indo-West Pacific, reaching eastwards to French Polynesia. The only widely distributed species in the genus.



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HOLOTHURIANS

(Sea cucumbers, Class Holothuroidea)

by C. Conand

GENERAL REMARKS

Notes on the phylum Echinodermata

The holothurians or sea cucumbers belong to the Echinodermata which form a very distinct phylum in the animal kingdom. Echinoderms are characterized by the possession of a radial symmetry (generally **pentamerous)**, an intradermic skeleton consisting of closely fitted plates, articulated plates, or **ossicles**, and a peculiar water vascular system of tubes filled with fluid. The phylum is divided into 5 classes of very different appearance (Fig. 1): the crinoids (or feather stars), holothuroids (or sea cucumbers), echinoids (or sea urchins), asteroids (or sea stars), and ophiuroids (or brittle stars). Echinoderms are almost exclusively marine, although a few species are found in brackish water.

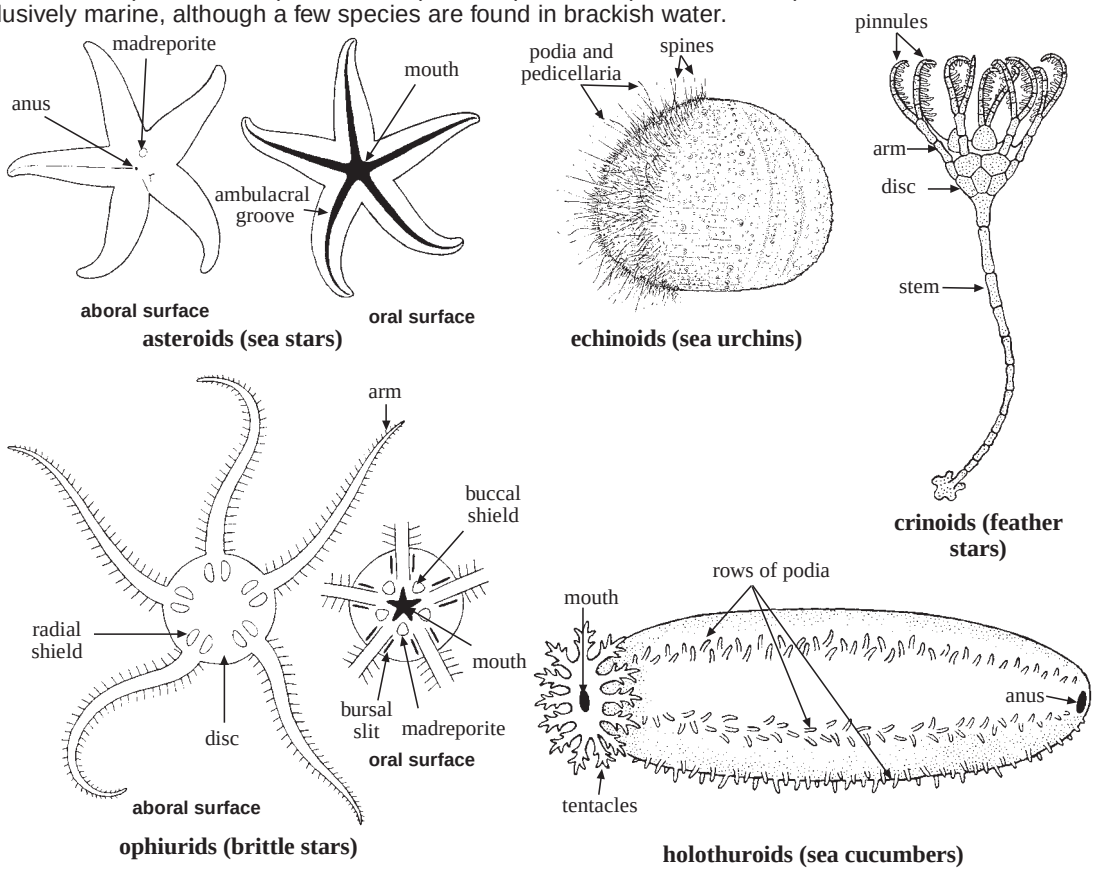


Fig. 1 the five classes of echinoderms

The body is of variable shape, rounded to cylindrical, or star-like, and subdivided into 10 areas (Fig. 2): 5 **radii** (or ambulacra) alternating with 5 **interradii** (or interambulacra). The radii correspond to the arms of the asteroids, ophiuroids, and crinoids, and to the rows of podia or papillae found in sea urchins and sea cucumbers. Some groups show a secondary bilateral symmetry. The holothurians are elongate orally-aborally and lie upon one side. Asteroids, echinoids, and ophiurids have the oral surface on the underside of body.

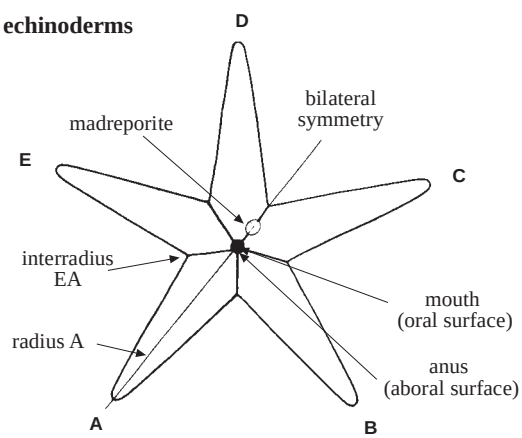


Fig. 2 schematic presentation of an echinoderm (following the Carpenter system for orientation)

The endoskeleton is produced by the dermis. It may be composed of closely fitted plates forming a rigid test or shell as in most echinoids, or articulated plates giving flexibility as in asteroids, ophiuroids, and crinoids, or consisting of calcareous spicules dispersed in the body wall, as seen in holothuroids. Spines and tubercules are parts of the endoskeleton and are covered by the epidermis. In addition, the body wall is composed of extracellular collagen-based material, the viscosity of which is controlled and provides rigidity or flexibility.

The general cavity (or coelomic cavity) contains the viscera. The water vascular system or **aquiferous system**, consists of a circumoral ring, from which arise radially water canals forming many extensions, the tube feet or **podia**. The **madreporite** is a plate with tiny pores which allows the communication with the environment. It is always situated in an interradial position and serves for the orientation: the opposite radius is called A and is followed, in a clockwise direction, by radii named B, C, D, and E (according to the "Carpenter system" for orientation, see Fig. 2).

Despite the differences between the classes, there are several common features in the digestive system of echinoderms. This system is conspicuously developed and attached by mesenteries to the body wall. Its shape is simple, either bag-like as in ophiuroids, or tube-like, looping in the general cavity as in crinoids, echinoids, and holothuroids. In asteroids, it forms conspicuous specialized organs. Structural variations appear progressively along the gut. A hemal system is associated with the digestive system. Its importance varies among the different classes.

The respiratory exchange partly occurs by means of the podia, and partly by specialized organs that differ among the classes.

The genital system is composed of a single gonad in holothuroids, a genital cord sending extensions to the pinnules of the arms in crinoids, and 5 gonads in the other classes. Sexes are generally separated, but cannot be distinguished externally. In most species, mature gametes are released into the sea. After fertilization, the development often passes planktonic larval stages with a bilateral symmetry, until the larvae metamorphose into benthic juveniles.

Species identification is done by examination of preserved specimens, mostly based on characters of the skeleton. Echinoderms should be preserved in alcohol, as formalin may dissolve the calcareous skeleton. In addition to the morphological characters, the colour, size, and ecology of live specimens can be useful for identification.

To date, approximately 6 000 described echinoderm species are known worldwide, living in all kinds of marine bottoms where they represent an important component of the benthic biomass. About 1 000 littoral species are known to occur in the Indo-West Pacific.

Among the 5 classes of echinoderms, only echinoids and holothuroids are of interest to fisheries. The holothurian fishery of the Western Central Pacific is the largest of the world (Conand, 1997).

External morphology of holothurians

Holothurians have an orally-aborally elongated body (Fig. 1). The body is formed like a short or long cylinder, with the mouth (at the anterior end) encircled by **tentacles**, and the **anus (**at the posterior end) often edged by papillae. The pentamerous symmetry is sometimes recognizable by the presence of 5 meridional **ambulacra** bearing **podia**. Holothurians often lay on the substrate with their ventral surface or **trivium**, formed by the radii A, B, and E in the Carpenter system for orientation. This creeping sole bears the locomotory podia, while on the dorsal surface, or **bivium**, the podia are often represented by papillae. Consequently, a secondary bilateral symmetry is evident. The body shape is different in the orders Apoda, members of which are vermiform, and Molpadida, members of which have a tail-like region bearing the anus. In the order Elasipoda, some extraordinary forms are found, with modified papillae making up sails.

The **mouth** is terminal or displaced dorsally, surrounded by a thin buccal membrane, and generally bordered by a circle of **tentacles** (Fig. 1). Tentacles are buccal podia containing extensions from the water vascular system. Their number varies between 10 and 30, generally being a multiple of 5. In the **Aspidochirotida** all tentacles are of the same size, but in the **Dendrochirotida** some tentacles are generally smaller. The shape of the tentacles differs among the various orders and is used as a key character (Fig. 3). In the Dendrochirotida they are **dendritic** (branching in an arborescent manner) and can reach a large size when extended. The Aspidochirotida and most Elasipoda have **peltate** tentacles, each with a central stalk. The Apoda have **pinnate** tentacles, with a central axis bearing series of digitations. The Molpadida have **digitate** tentacles, consisting of short projections with small terminal fingers. In all cases they are very retractile, particularly in the Dendrochirotida which have an **introvert** where the tentacles insert. The tentacles and the introvert can be contracted into the interior by a set of retractor muscles. These muscles also occur in a few Apoda and Molpadida, but not in the other orders.

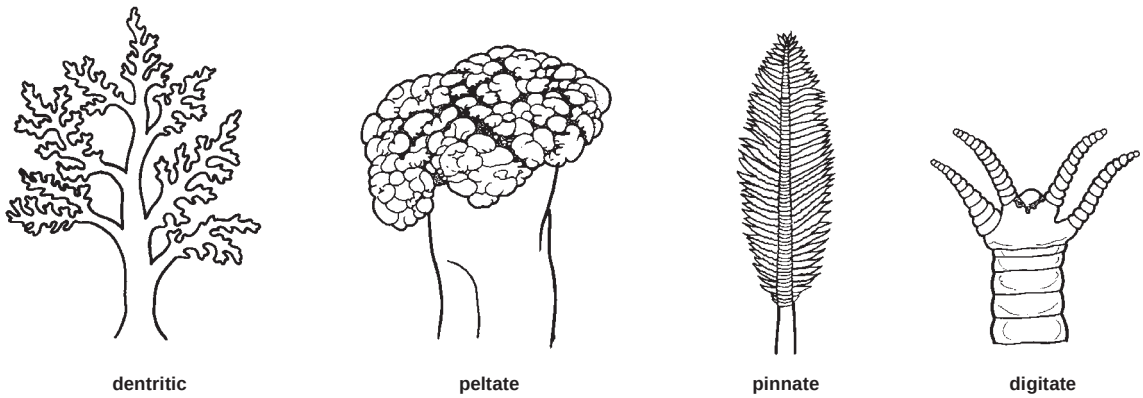


Fig. 3 basic types of tentacles

The body surface is thick, slimy in many species and wears warts, tubercules, or **papillae**. **Podia** appear on the body wall in 3 orders, but they are lacking in the Apoda and rare in the Molpadida. They typically have the form of locomotory tube feet: hollow tubular projections from the body wall form a stem, which allows the podium to lengthen, flex, or retract. It contains a branch of the water-vascular system and generally does not terminate in a concave sucker (as it is still often called), but in a flat disc, which allows the podium to adhere to the substratum during locomotion. Epidermal cells produce adhesive secretions. Internally the disc is supported by a large skeletal ossicle. Podia also can have the shape of papillae. The tube feet are rarely arranged in 5 regular rows, but generally they loose the discs on the dorsal surface and spread into the interradial areas. The **anus** is often displaced dorsally, encircled by small papillae or **anal teeth**. The coloration varies between species and sometimes also between individuals of the same species. The creeping sole is often brighter and lighter than the dorsal surface.

Body wall

The body wall is thin in Apodida and Molpadida, but thicker in the other orders, particularly in the Aspidochirota. It constitutes the part of the body that is processed for human consumption and therefore commercial species are characterized by a thick body wall. Its structure consists of a thin cuticle over the epidermis and a thick dermis underneath. The dermis is composed of connective tissue, enclosing the endoskeletal spicules or ossicles (see next paragraph). Below the dermis, a layer of circular muscles form a cylinder generally interrupted by 5 longitudinal muscle bands situated in the radial positions.

Spicules

Also called ossicles or deposits, spicules (Fig. 4) are characteristic of the class and of primary importance for identification. These are fenestrated (or perforated) calcareous bits of microscopic size. There is a wide variety of simple to complex shapes. **Rods** can be simple or branching, smooth, warty, or spiny. They can bear knobs at their ends, or are a characteristic C- or S-shape. Fenestrated **plates** also come in various forms. **Buttons** are oval ossicles, perforated with a varying number of holes arranged in 2 rows. **Tables** are more complicated. They appear as a perforated disc, bearing an erect **spire** (or tower) and show many variations according to the arrangement of its constituents. **Rosettes** are short rods subdivided into short branches. **Baskets** are concave, perforated plates. **Anchors** are peculiar of the family Synaptidae (order Apoda). They are orientated in the body wall, so that they support the attachment to the substrate during crawling, in the absence of podia. They are attached to an accompanying perforated plate. **Wheels** are characteristic of the family Chirodotidae (order Apoda) and are also found in the Elasipoda, which are best characterized by the presence of special spiny branched spicules. Miliary bodies (**grains**) are very tiny spicules found in some Stichopodidae. Apart from the body wall, spicules are found in the tentacles, the podia, and also in the mesenteries or other internal organs. Their developmental stages can differ from the definitive shapes in the adults and thus can make species identification difficult.

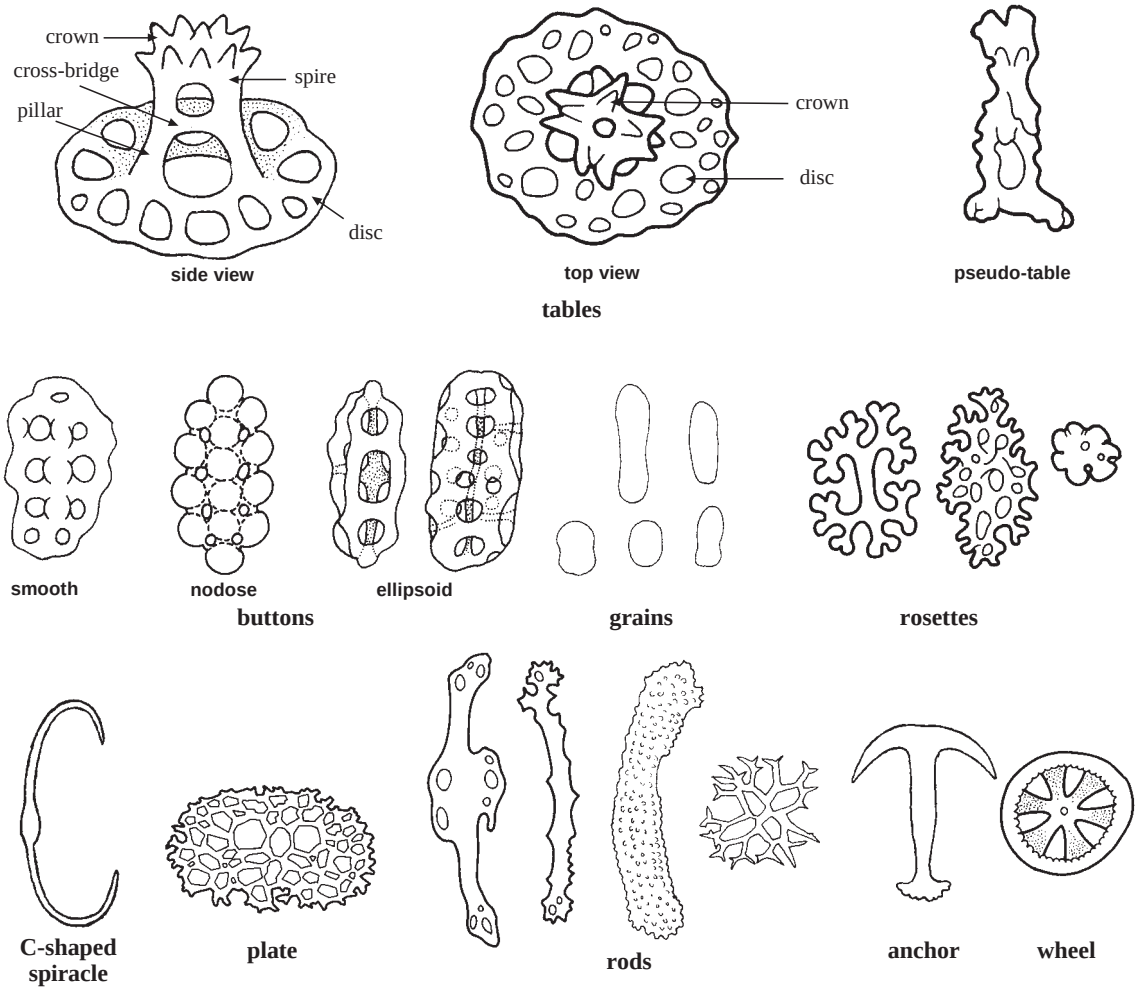


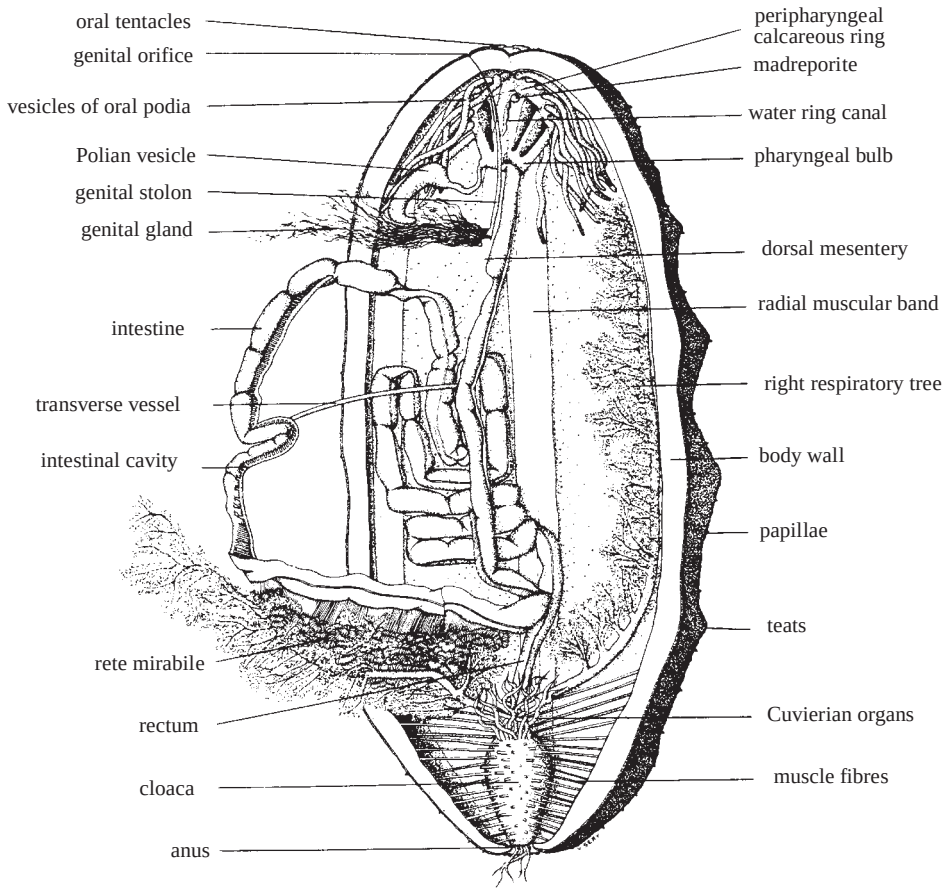
Fig. 4 basic types of spicules

Calcareous ring

A ring of usually 10 calcified plates encircles the pharynx. It is composed of alternating larger radial plates, opposite to the ambulacra, and smaller interradial plates. The plates may be simple or composed of smaller pieces. Longitudinal muscles attach to the radial plates.

Digestive system and connected organs

The gut is composed of a pharynx, an esophagus, a stomach, all of which are short structures, and a very long intestine (Fig. 5). The intestine consists of 3 portions, a descending, an ascending, and finally a descending loop which connects to both the rectum and the **cloaca** opening outwards through the anus. When present, **respiratory trees** are connected to the cloaca. The oxygenated water enters the body by these water lungs, which are found in all orders except the Apoda. **Cuvierian tubules**, present in several species of Aspidochirota, are generally considered as defensive structures. They are composed of sticky tubules attached to the base of the respiratory trees and can be expelled in some *Holothuria* and *Bohadschia* species through the cloaca towards the source of irritation.



(from Conand, 1986)

Fig. 5 anatomy of a holothuroid (*Holothuria nobilis*)

Reproductive system

In contrast to other echinoderms, the reproductive system of holothurians consists of a single **gonad** or genital gland (Fig. 5). The gonad is situated dorsal (interambulacrum CD) and composed of either 2 tufts of tubules, or only 1 tuft in many species of the family Holothuriidae. The sexes are generally separated and show little dimorphism unless in the period of maturing. The gonad is attached to the dorsal mesentery through which the **gonoduct** or genital stolon opening passes, leading to the outside by the **gonopore** (genital orifice) or a genital papilla. In most species, the mature gametes are freely released into the sea water. The spawning behaviour, observed in many Aspidochirota species, involves an upright posture of males and females followed by a swaying back and forth, while the gametes are being released.

Water vascular system, perivisceral coelom, and hemal system

The **water vascular system** (Fig. 5) is a coelomic space bordered by a mesothelium. It consists of the lumen of the buccal tentacles and the tube feet, a **water ring** around the esophagus, the **radial canals**, the **madreporic canal**, and the **Polian vesicles**. The perivisceral coelom is a large cavity containing watery proteinaceous coelomic fluid and different forms of cells (coelomocytes). The hemal system is well developed and composed of large hemal vessels along the gut, sinus, and lacunae. The hemal vessels associated with the gut can form a complex meshwork with the left respiratory tree, the **rete mirabile**, suggesting different functions of nutrient and gas transfers.

Habitat and biology

Holothurians are found throughout all oceans, at all latitudes, from the shore down to abyssal plains. They are usually benthic (living on the bottom); some species live on hard substrates, rocks, coral reefs, or as epizoites on plants or invertebrates; most of the species inhabit soft bottoms, on their surface or in the sediment. Among the commercial coastal holothurians, the Aspidochirota are predominant in the tropics, while the Dendrochirota are more common in temperate areas. The Aspidochirota from the tropical western

Pacific generally show a distribution reflecting the organization of the reef and lagoonal systems. Six different categories of species have therefore been defined, being characteristic of the main biotopes in which they occur: coral slopes (and passages), inner lagoons, inner reef flats, outer reef flats, outer lagoons, and coastal bays. The density and biomass increase from the outer reef slopes to the inner reef flats and coastal areas. Although there is much variation between the different sites, coral-slope species generally show lower densities and relatively large individual sizes, while species occurring on inner reef flats and inner lagoons show intermediate values, and those living on outer reef flats come in higher densities of smaller individuals. Most Aspidochirota species have comparatively few animal predators and their major effects in the reef communities are related to their deposit-feeding habits, as they are able to rework large amounts of sediments (bioturbation).

Fisheries

Holothurians have been harvested commercially for at least a thousand years, occasionally for the raw body wall or viscera, but mostly in order to be processed into a dry product called **bêche-de-mer**, **trépang**, or hai-sum, which is considered a delicacy by the Chinese. Harvesting in the tropics is usually done by hand, while collecting at low tide or by free-diving from small boats. The processing methods for bêche-de-mer include different stages of boiling, gutting, and drying, with variable procedures according to the species. Bêche-de-mer is then exported from the producer country to a central market such as Hong Kong, and then re-exported to the Chinese consumers. The economic significance of these artisanal fisheries is particularly important in less developed countries. The recent developments of these activities have led to a global increase of the catches, especially with a strong increase of the Hong Kong and Chinese markets, and the participation of new producer countries, with a shift of the exploited species, probably due to overcollecting.

Around 300 shallow-water species of holothurians are known to occur in the area, but only a few of them are of commercial interest. From 1990 to 1995, the reported yearly production of sea cucumbers in the Western Central Pacific ranged from around 6 800 to 9 000 t (FAO Yearbook of Fishery Statistics).

Identification note

As in other echinoderms, species identification is mostly done by examination of the skeletal parts of preserved specimens. Holothurians should be preserved in alcohol (70 %), as formalin may dissolve the calcareous skeleton. The calcareous ring can be readily observed after dissection.

The spicules, which are deeply hidden in the body wall, can be obtained by the following method:

1. Small pieces of body-wall tissue are removed from the bivium and the trivium, as well as the oral tentacles and podia, and dissected and macerated in sodium hypochlorite (bleach), or sodium hydroxide, in order to dissolve the organic material.
2. After washing in distilled water, the spicules are rinsed in alcohol and can be processed with a drop of a mountant (Canada balsam).
3. After processing, the spicules can be observed either on permanent slides with a light microscope, or prepared for scanning electron microscope.

GLOSSARY OF TECHNICAL TERMS

Anal teeth - radial calcareous papillae encircling the anus.

Bêche-de-mer - term used in the tropical Pacific for the processed product of sea cucumbers (see also **trepang**).

Bivium - the dorsal part of the body in the pentaradiate symmetry, with 2 radii.

Calacareous ring - internal collar of plates, generally 10, surrounding the pharynx.

Cloaca - anal cavity where the intestine ends.

Cuvierian tubules - threads becoming sticky when thrown out of the anus; used as a defense mechanism.

Dendritic - branching in an arborescent manner; used as descriptive term for the shape of tentacles in Dendrochirotida.

Digitate - finger-like.

Digitations - finger-like structures.

Fenestrated - having small window-like openings or holes.

Interradii (or interambulacra) - in the pentaradiate symmetry, the 5 areas between the rows of podia or papillae (Fig. 2).

Papillae - conical lumps on the surface of the body wall.

Pentamerous - having 5 radiating parts, resulting in a **pentaradiate symmetry**.

Peltate - with a central stalk.

Pinnate - feather-like.

Podia (or tube feet) - water-filled tubes used for locomotion.

Radii (or ambulacra) - in the pentaradiate symmetry, the 5 areas with podia or papillae.

Respiratory tree - arborescent organ (1 pair), opening in the cloaca.

Spicules - or ossicles, microscopic carbonate skeleton particles in the body wall, useful for species identification; they come in various shapes (Fig. 4).

Teats - large papillae.

Tentacles - buccal podia (Fig. 3).

Trépang - Malaysian name for sea cucumber, also used for the processed product (see also **bêche-de-mer**)

Trivium - the ventral surface of body in the pentaradiate symmetry, with 3 radii.

KEY TO THE SHALLOW-WATER ORDERS OF THE CLASS HOLOTHUROIDEA

1a. Podia absent; body vermiform; body wall thin, often translucent; dominant spicules in form of anchors with associated anchor plates tentacles pinnate; pharynx without retractor muscle; no respiratory tree . . . . . **Apodida**

1b. Podia present; body-wall moderately thick; body wall with dominant spicules in form of tables, perforated plates, buttons, rods, or rosettes . . . . . → **2**

2a. Tentacles peltate or pelyo-digitate; anterior end of body not introverted and associated with retractor muscles . . . . . **Aspidochirotida**
(the only order with commercial species in the area)

2b. Tentacles branched (dendritic); anterior end of body introverted, associated with retractor muscles . . . . . **Dendrochirotida**

ORDER ASPIDOCHIROTIDA

Diagnostic characters: Tentacles peltate, constituting a short stem ending in a disc covered by small digitations. Body wall bearing podia and/or papillae. Calcareous ring without posterior prolongation. Pharynx without special retractor muscles, but can be retracted within a fold of skin. Tentacle ampullae present. Respiratory trees well developed. Cuvierian organs present or absent. Dominant spicules in form of tables, buttons, rods, rosettes, or grains.

Key to the shallow-water families of Aspidochirotida occurring in the area

1a. Body with trivium (sole) usually flattened and dorsal bivium convex; gonads forming a single tuft appended to the left dorsal mesentery; Cuvierian organs present or absent; dominant spicules of form of tables, buttons (simple or modified), and rods (excluding C- and S-shaped rods) . . . . . **Holothuriidae** (p. 1165)

1b. Body square-shaped or trapezoidal in cross-section; Cuvierian organs always absent; gonads forming 2 tufts appended on each side of the dorsal mesentery; dominant spicules in form of branched rods and C-and S-shaped rods . . . . . **Stichopodidae** (p. 1185)

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HOLOTHURIIDAE

Diagnostic characters: Body dome-shaped in cross-section, with trivium (or sole) usually flattened and dorsal bivium convex and covered with papillae. Gonads forming a single tuft appended to the left dorsal mesentery. Tentacular ampullae present, long, and slender. Cuvierian organs present or absent. Dominant spicules in form of tables, buttons (simple or modified), and rods (excluding C-and S-shaped rods).

Key to the genera and subgenera of Holothuriidae occurring in the area (after Clark and Rowe, 1971)

1a. Body wall very thick; podia and papillae short, more or less regularly arranged on bivium and trivium; spicules in form of rods, ovules, rosettes, but never as tables or buttons . . . . . → ***2***

1b. Body wall thin to thick; podia irregularly arranged on the bivium and scattered papillae on the trivium; spicules in various forms, with tables and/or buttons present . . . **(*Holothuria*)** → ***4***

2a. Tentacles 20 to 30; podia ventral, irregularly arranged on the interradii or more regularly on the radii; 5 calcified anal teeth around anus; spicules in form of spinose rods and rosettes . . . . . ***Actinopyga***

2b. Tentacles 20 to 25; podia ventral, usually irregularly arranged, rarely on the radii; no calcified anal teeth around anus, occasionally 5 groups of papillae; spicules in form of spinose and/or branched rods and rosettes . . . . . → ***3***

3a. Podia on bivium arranged in 3 rows; spicules comprise rocket-shaped forms . . . . ***Pearsonothuria***

3b. Podia on bivium not arranged in 3 rows; spicules not comprising rocket-shaped forms . . . ***Bohadschia***

4a. Spicules in form of well-developed tables, rods and perforated plates, never as buttons . . . . . → **5**

4b. Spicules in form of tables, occurring alone or along with buttons, rods, or rosettes . . . . . → **7**

5a. Spicules never in form of rosettes; tables with no or reduced disc, bearing spines terminating in form of a maltese cross; body cylindrical; body wall soft . . . . . ***Holothuria* (*Semperothuria*)**

5b. Spicules in form of rosettes . . . . . → ***6***

6a. Podia in 3 rows on trivium; small papillae dispersed on bivium; spicules in form of rosettes, and tables with reduced disc, bearing a spine ending in a maltese cross (when viewed from above) . . . . . ***Holothuria* (*Halodeima*)**

6b. Podia not very numerous, irregularly arranged in 10 rows (radial and interradial); papillae on bivium irregularly arranged in 10 rows; spicules in form of rosettes, and tables with disc in a "cup and saucer form", bearing a low, wide spire ending in a spinose crown . . . . . ***Holothuria* (*Acanthotrapeza*)**

7a. Spicules in form of smooth buttons or pseudo-buttons; tables variously developed . . . . . → ***8***

7b. Spicules in form of buttons, always knobby, occasionally in form of ellipsoids; tables strongly developed . . . . . → ***10***

8a. Tables well developed, their disc usually squarish with smooth rim and 8 holes, occasionally strongly perforated . . . . . ***Holothuria* (*Thymiosycia*)**

8b. Tables moderately developed, their disc with usually notched rim; buttons of variable shape . . . . . → ***9***

9a. Tentacles 16 to 30; tables with notched rim and a low spire terminating in a ring of irregular spines; pseudo-buttons abundant, irregular; collar of papillae present around base of tentacles and anus . . . . . ***Holothuria* (*Lessonothuria*)**

9b. Tentacles 18 to 20; some tables often with narrow disc, spire reduced; other tables having a well-developed disc and spire with 4 columns; buttons irregular; no collar of papillae around base of tentacles . . . . . ***Holothuria* (*Mertensiothuria*)**

10a. Buttons never modified to form fenestrated ellipsoids . . . . . → ***11***

10b. Buttons modified to form fenestrated ellipsoids, and buttons . . . . . → ***12***

11a. Tables with wavy disc, bearing a small spire ending in small spines, giving the table a tack-like shape, with a large central hole surrounded by peripheral holes variable in number; presence of buttons, pseudo-buttons, and small irregular C-, S-, or O-shaped spicules . . . . . ***Holothuria* (*Stichothuria*)**

11b. Tables well developed, with smooth disc, spire ending in a cluster of small spines, never giving the table a tack-like shape; presence of buttons with irregular knobs . . ***Holothuria* (*Metriatyla*)**

12a. Calcified anal papillae absent; collar of papillae around base of tentacles present or absent . . . . . → ***13***

12b. Calcified anal papillae present; no collar of papillae around base of tentacles; body wall very thick and rigid; tables with wavy disc, bearing a low and massive spire ending in a very spinose crown . . . . . ***Holothuria* (*Microthele*)**

13a. Collar of papillae around base of tentacles; anal teeth present or absent; tables with notched disc and a low to moderate spire, ending in a cluster of very small, or numerous spines; a fringe of rather large papillae between bivium and trivium . . . ***Holothuria* (*Theelothuria*)**

13b. No collar of papillae around base of tentacles; anal teeth absent; tables with knobby disc and low spire, ending in a cluster of spines; buttons knobby, occasionally modified to fenestrated ellipsoids. . . . . ***Holothuria* (*Cystipus*)**

List of species of interest to fisheries occurring in the area

The symbol ⟿ is given when species accounts are included.

⟿ *Actinopyga echinites* (Jaeger, 1833)
⟿ *Actinopyga mauritiana* (Quoy and Gaimard, 1833)
⟿ *Actinopyga miliaris* (Quoy and Gaimard, 1833)
⟿ *Actinopyga palauensis* Panning, 1944
⟿ *Actinopyga spinea* Cherbonnier, 1980

⟿ *Bohadschia argus* Jaeger, 1833
⟿ *Bohadschia similis* (Semper,1868)
⟿ *Bohadschia vitiensis* (Semper, 1868)

⟿ *Holothuria (Acanthotrapeza) coluber* Semper, 1868
⟿ *Holothuria (Halodeima) atra* Jaeger, 1833
⟿ *Holothuria (Halodeima) edulis* Lesson, 1830
⟿ *Holothuria (Mertensiothuria) leucospilota* (Brandt, 1835)
⟿ *Holothuria (Metriatyla) scabra* Jaeger, 1833 [including *H. (M.) scabra* var. *versicolor* (Conand, 1986)]
⟿ *Holothuria (Microthele) fuscogilva* Cherbonnier, 1980
⟿ *Holothuria (Microthele) fuscopunctata* Jaeger, 1833
⟿ *Holothuria (Microthele) nobilis* (Selenka, 1867)

⟿ *Pearsonothuria graeffei* (Semper, 1868)

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Conand, C. 1997. Are holothurian fisheries for export sustainable? *Intern. Cong. Reefs Panama*, 2:2021-2026.

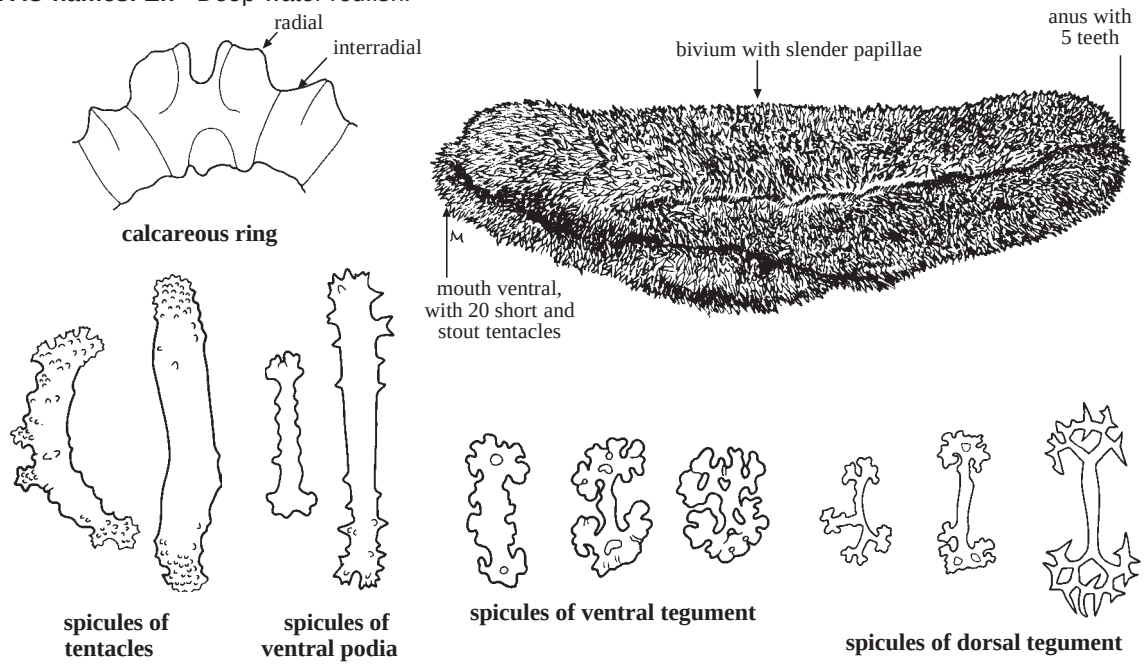
Feral, J.P. and G. Cherbonnier. 1986. Les holothurides. In *Guide des étoiles de mer, oursins et autres échinodermes du lagon de Nouvelle-Calédonie*, edited by Guille, Laboute, and Menou. Paris, ORSTOM, pp. 56-107.

Tan Tiu, A. 1981. The intertidal Holothurian fauna (Echinodermata: Holothuroidea) of Mactan and the neighbouring islands, Central Philippines. *Philipp. Sci.*, 18:45-119.

Actinopyga echinites (Jaeger, 1833)

Frequent synonyms / misidentifications: None / *Actinopyga mauritiana* (Quoy and Gaimard, 1833).

FAO names: En - Deep-water redfish.

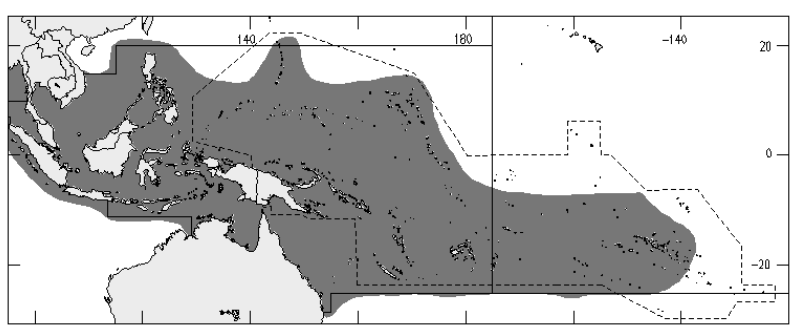


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body elongate, arched dorsally (bivium) and flattened ventrally (trivium). Bivium sometimes wrinkled and covered by sediment, wider in the middle and tapering towards both ends. **Papillae on bivium long and slender**; podia on trivium arranged more or less regularly in 3 rows; calcareous disc of podia around 350 µm in diameter. **Mouth** ventral, **surrounded by 20 short, stout tentacles**. Anus surrounded by **5 anal teeth**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules few (10), short, pink, and never expelled. **Colour:** bivium brown, varying from light to dark among specimens; trivium lighter, sometimes orange, with yellow podia. **Spicules:** ventral tegument with a variety of small rosettes and rods, occasionally perforated; dorsal tegument with larger rosettes and branched plates; ventral podia with some straight, spinous rods; tentacles with rods large, straight, or curved, and very spiny at their extremities.

Size: Maximum length about 35 cm, commonly to about 20 cm; mean live weight 0.3 kg (up to 1 kg); body-wall thickness about 7 mm.

Habitat, biology, and fisheries: Dwelling in moderately shallow waters (despite its English common name), rarely found in depths of more than 12 m; mostly on reef flats of fringing and lagoon-islet reefs. Abundant in seagrass beds, on rubble reef flats, and compact flats where populations can reach high densities (up to 1/m^2). Sexual reproduction during the warm season. A species with a high potential fecundity and early sexual maturity. Harvested in artisanal fisheries throughout the area. Collected by hand while wading on the reefs at low tide. The processed product is not distinguished from those of other *Actinopyga* species and has a moderate commercial value.

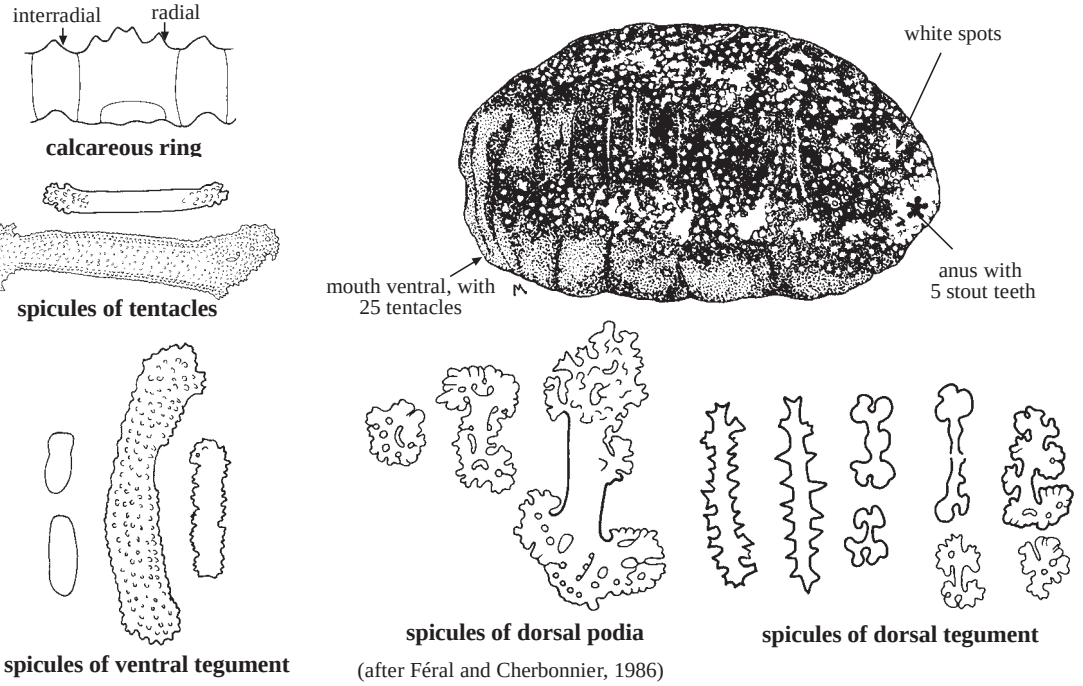


Distribution: Widespread in the tropical Indo-Pacific, including the Red Sea, but excluding the Persian Gulf and Hawaii.

Actinopyga mauritiana (Quoy and Gaimard, 1833)

Frequent synonyms / misidentifications: None / *Actinopyga echinites* (Jaeger, 1833).

FAO names: En - Surf redfish; **Fr** - Holothurie brune des brisants.

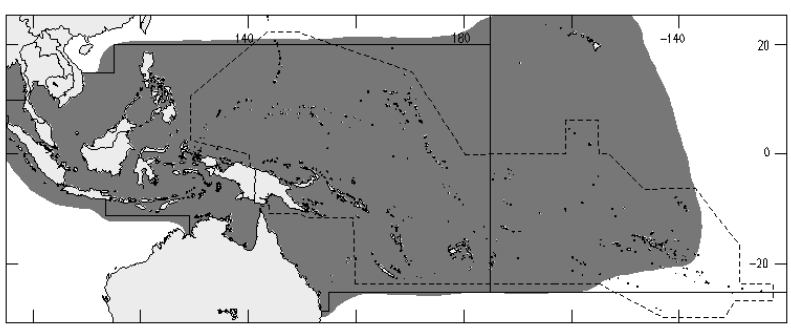


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body elongate, arched dorsally (bivium) and flattened ventrally (trivium). Bivium sometimes wrinkled, wider in the middle and tapering towards both ends. Papillae on bivium long and slender; podia numerous on trivium, stout and crowded on the radii and interradii; calcareous disc of podia around 500 µm in diameter. **Mouth** ventral, **surrounded by 25 short and stout tentacles**, with a large collar of long papillae at their base. Anus surrounded by **5 stout anal teeth**. Calcareous ring showing large radial pieces and interradials with a triangular top. Cuvierian tubules few (10), short, pink and never expelled. **Colour:** bivium variable, usually dark brown, **with more or less distinct whitish spots**; trivium lighter, occasionally white to pink, with yellow podia. **Spicules:** ventral tegument with round and biscuit-like grains, rods bearing small spines, and denticulate pseudo-plates; dorsal tegument without grains, but with rosettes and denticulate rods; podia with some spinous rods and large rosettes; tentacles with large rods bearing small spines.

Size: Maximum length about 35 cm, commonly to 20 cm; mean live weight about 0.3 kg (up to 1 kg); body-wall thickness about 6 mm.

Habitat, biology, and fisheries: Dwelling in very shallow waters, rarely found in depths of more than 20 m; mostly on outer reef flats of barrier reefs and fringing reefs exposed to strong hydrodynamism. Most abundant in the surf zone where populations can reach high densities (more than 1/m^2). Sexual reproduction takes place during the warm season. A species with a high potential fecundity and early sexual maturity. Harvested in artisanal fisheries throughout the area, but probably less frequently than other species of *Actinopyga*. Collected by hand while wading on the reef at low tide. The processed product is not distinguished from those of other *Actinopyga* species and has a moderate commercial value.

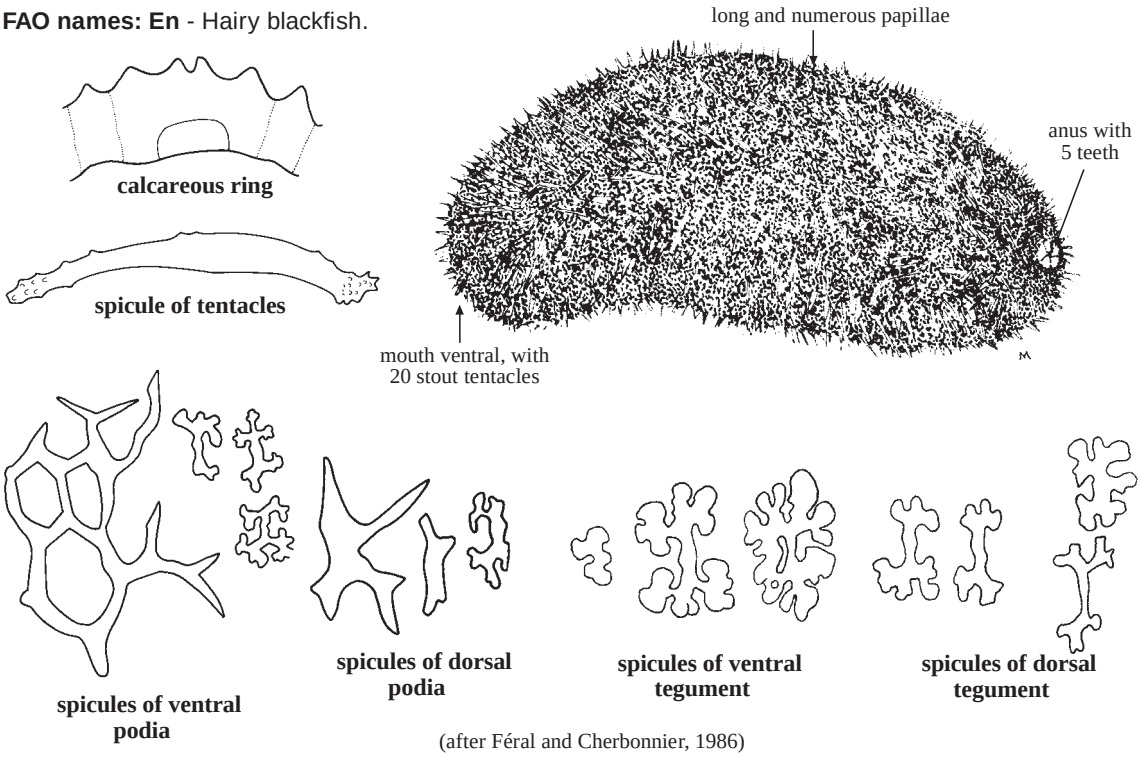


Distribution: Widespread in the tropical Indo-Pacific.

Actinopyga miliaris (Quoy and Gaimard, 1833)

Frequent synonyms / misidentifications: None / *Actinopyga palauensis* Panning, 1944; *A. spinea* Cherbonnier, 1980; other black species of *Actinopyga*.

FAO names: En - Hairy blackfish.



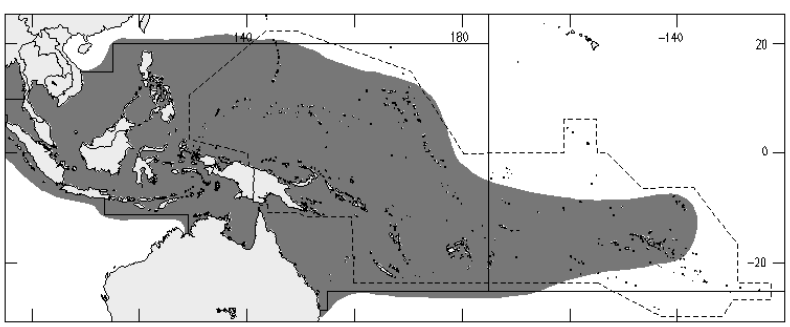
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body elongate, cylindrical, slightly arched dorsally (bivium) and flattened ventrally (trivium). Bivium generally covered by mucus and fine sediment. **Papillae on bivium numerous, long and slender**; long and thick podia on trivium arranged more or less regularly in tight rows on the radii; calcareous disc of podia around 700 µm in diameter. **Mouth** ventral, **surrounded by 20 stout tentacles**. Anus surrounded by 5 strong, triangular **anal teeth**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. **Colour:** bivium black; trivium lighter, dark brown. **Spicules:** ventral tegument with a variety simple or more complicated rosettes; dorsal tegument with rosettes; ventral and dorsal podia with some rosettes; podia and papillae containing large spicules; tentacles with large rods.

Size: Maximum length about 35 cm, commonly to about 25 cm; mean live weight about 0.4 kg (up to 1 kg); body-wall thickness about 6 mm.

Habitat, biology, and fisheries: Dwelling in moderately shallow waters, rarely found in depths of more than 10 m; mostly on reef flats of fringing and lagoon-islet reefs, never on barrier reefs. Abundant in seagrass beds and on rubble reef flats where populations can reach high densities (up to 1/m^2). Known to feed on epiphytes and seagrass leaves. Biology poorly known. Harvested in artisanal fisheries throughout the area. Collected by hand while wading on the reefs at low tide, or by divers. The processed product is not distinguished from those of other *Actinopyga* species and and has a moderate commercial value.

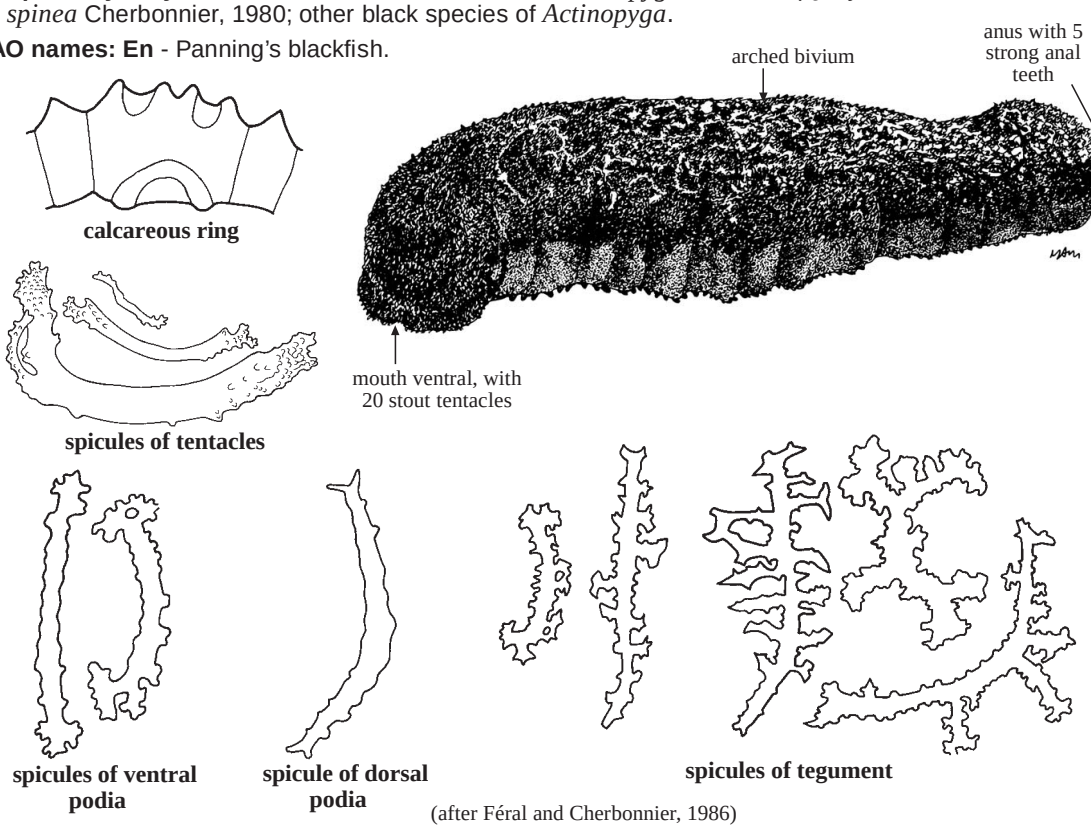
Distribution: Widespread in the tropical Indo-Pacific, including the Red Sea, but excluding the Persian Gulf and Hawaii.



Actinopyga palauensis Panning, 1944

Frequent synonyms / misidentifications: None / *Actinopyga miliaris* (Quoy and Gaimard, 1833); *A. spinea* Cherbonnier, 1980; other black species of *Actinopyga*.

FAO names: En - Panning's blackfish.

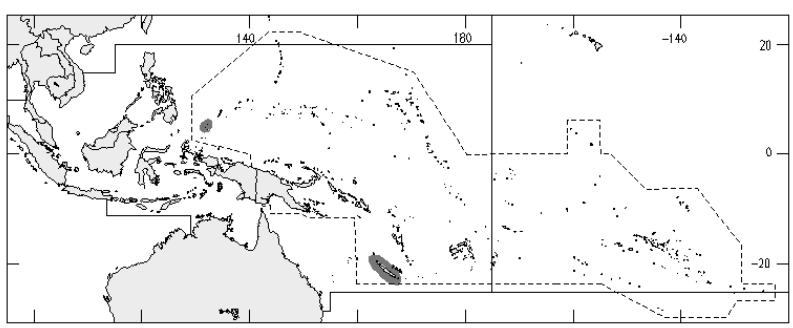


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body elongate, cylindrical, **slightly arched dorsally** (bivium) and flattened ventrally (trivium). Bivium generally covered by mucus and fine sediment. Papillae on bivium small and conical; long and thick podia on bivium arranged more or less regularly in tight rows on the radii; calcareous disc of podia around 350 µm in diameter. **Mouth** ventral, **surrounded by 20 stout tentacles**. Anus surrounded by **5 strong, triangular anal teeth**. Calcareous ring with large radial pieces showing an arch at their base, and narrow interradials. **Colour:** bivium black; trivium lighter, dark brown. **Spicules:** ventral and dorsal tegument with a variety of shredded rods and X-shaped spicules; ventral podia and dorsal papillae with spiny rods; tentacles with large rods (up to 700 µm).

Size: Maximum length about 40 cm, commonly to about 30 cm; mean live weight 0.5 kg (up to 1.2 kg); body-wall thickness about 6 mm.

Habitat, biology, and fisheries: Occurs in moderately shallow waters, rarely in depths of more than 25 m; never found on reef flats, but on flagstones of reef slopes. Populations reach medium densities (up to 0.1/m^2). A poorly known species. Probably collected by divers for artisanal fisheries, but not intensively so, as it is found in lower densities and has a deeper distribution than other "blackfish" species. The processed product is not distinguished from those of other *Actinopyga* species and has a moderate commercial value.

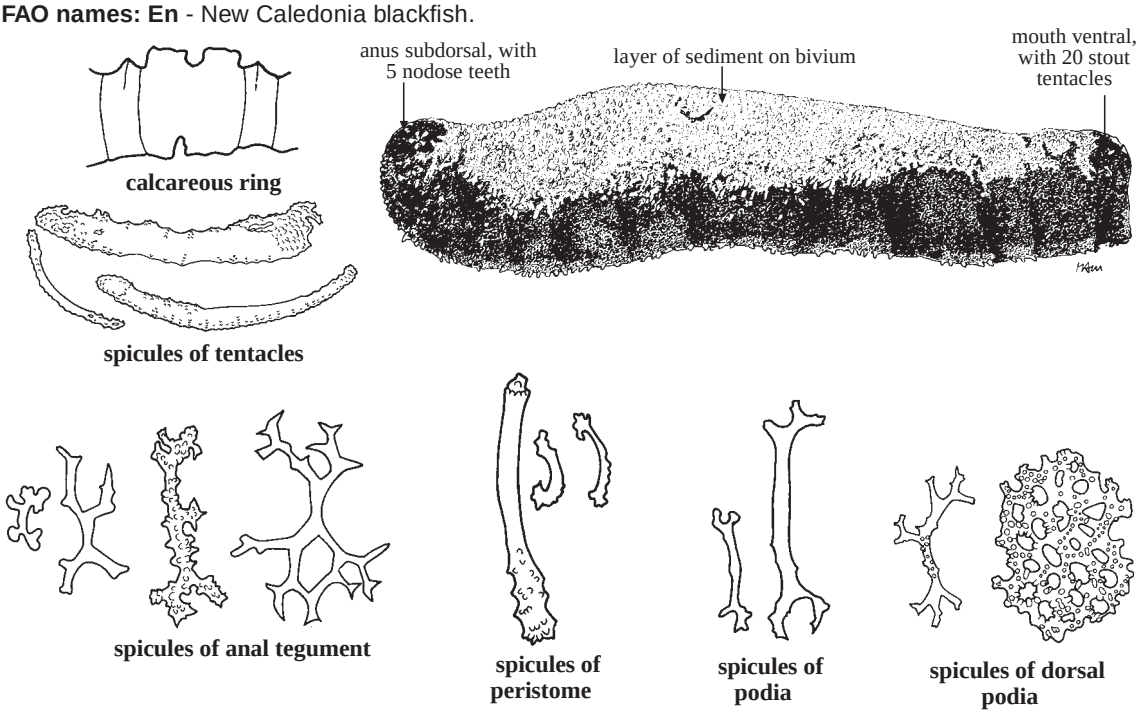


Distribution: Known only from Palau and New Caledonia.

Actinopyga spinea Cherbonnier, 1980

Frequent synonyms / misidentifications: None / *Actinopyga miliaris* (Quoy and Gaimard, 1833); *A. palauensis* Panning, 1944; other black species of *Actinopyga*.

FAO names: En - New Caledonia blackfish.



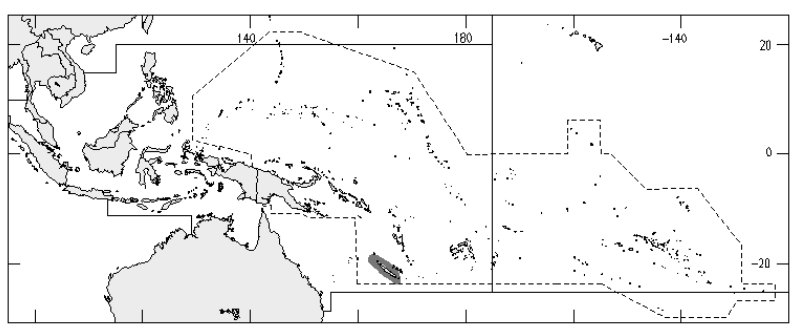
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body elongate, cylindrical, slightly arched dorsally (bivium) and flattened ventrally (trivium). **Bivium generally covered by fine sediment**. Papillae on bivium small, slender, and conical; cylindrical and thick podia on trivium arranged irregularly on the radii and interradii; calcareous disc of podia around 700 µm in diameter. **Mouth** ventral, **surrounded by 20 stout tentacles**. Anus subdorsal, surrounded by **5 strong, triangular, and nodose anal teeth**. Calcareous ring thick, with large radial pieces and narrow interradials. Cuvierian tubules absent. **Colour:** bivium black; trivium dark brown. **Spicules:** sparse in the ventral and dorsal tegument, abundant only near the mouth, anus, and tentacles; a few rods in the dorsal tegument give rise to numerous rosettes, rods, and various plates; small to large plates provided with holes and spines near the anus; tentacles with rods straight or arched, bearing small spines.

Size: Maximum length about 38 cm, commonly to about 27 cm; mean live weight about 0.7 kg (up to 1.2 kg); body-wall thickness about 5 mm.

Habitat, biology, and fisheries: In moderately shallow water from depths of 5 to 30 m, on the lagoon floor, sometimes burrowed in sandy-muddy sediments. Populations reach medium densities (up to 0.1/m^2). A poorly known species. May be collected by divers for artisanal fisheries along with other "blackfish" species, but not intensively so, since it is found in comparatively low densities and has a deeper distribution. The processed product is not distinguished from those of other *Actinopyga* species and probably has a moderate commercial value.

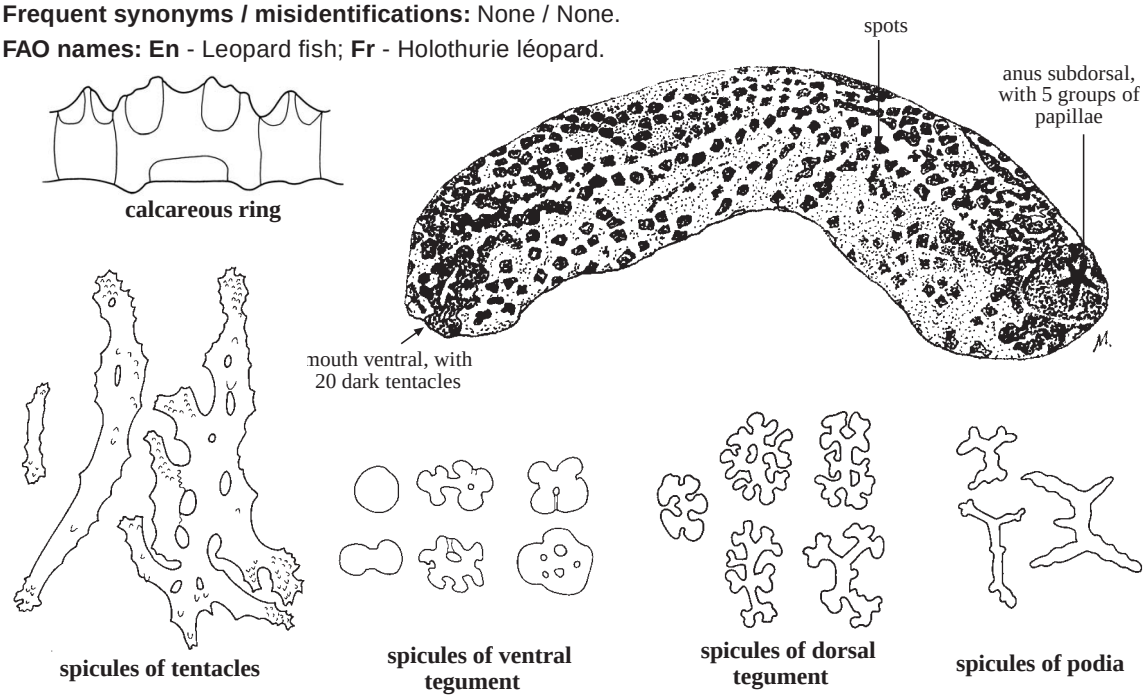
Distribution: Known only from New Caledonia.



Bohadschia argus Jaeger, 1833

Frequent synonyms / misidentifications: None / None.

FAO names: En - Leopard fish; **Fr** - Holothurie léopard.

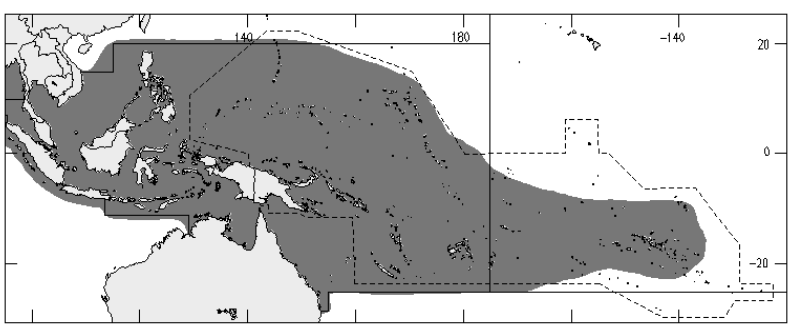


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, arched dorsally (bivium) and flattened ventrally (trivium). Bivium smooth. Podia on bivium small, conical, and irregularly arranged; podia on trivium numerous, short, and arranged on the radii and interradii; calcareous disc of podia around 400 µm in diameter. **Mouth** ventral, **surrounded by 20 short, dark tentacles**. **Anus nearly dorsal, surrounded by 5 groups of papillae**. Calcareous ring with large radial pieces and narrow interradials. **Cuvierian tubules numerous and large**. **Colour:** bivium whitish to brown, variable among specimens and showing **characteristic dark eye-like spots**, with a podia placed in their middle and encircled with a light colour; trivium lighter, yellow to brown; some specimens uniformly brown with yellow spots. **Spicules:** ventral tegument with various simple rosettes and biscuit-like nodules, occasionally with small holes; dorsal tegument with rosettes only; ventral podia with short rods; dorsal podia with X-shaped rods; tentacles with spiny rods and large irregular plates.

Size: Maximum length about 60 cm, commonly to about 36 cm; mean live weight about 1.8 kg (up to 2.2 kg); body-wall thickness about 10 mm.

Habitat, biology, and fisheries: Found in shallow waters, rarely in depths of more than 30 m; a typical reef species, generally on barrier reef flats and slopes, or outer lagoons on white sand. Populations never reach high densities (generally between 0.001 and 0.01/m^2). Symbiotic pearlfish (Carapidae, Ophidiiformes) are often found in the respiratory tree or the general cavity. Biology poorly known. Sexual reproduction probably takes place during the warm season. Occasionally collected in artisanal fisheries, although the sticky Cuvierian tubules make the collection and processing disagreeable. Collected by divers. The processed product is not distinguished from those of other *Bohadschia* species and is of little commercial value.

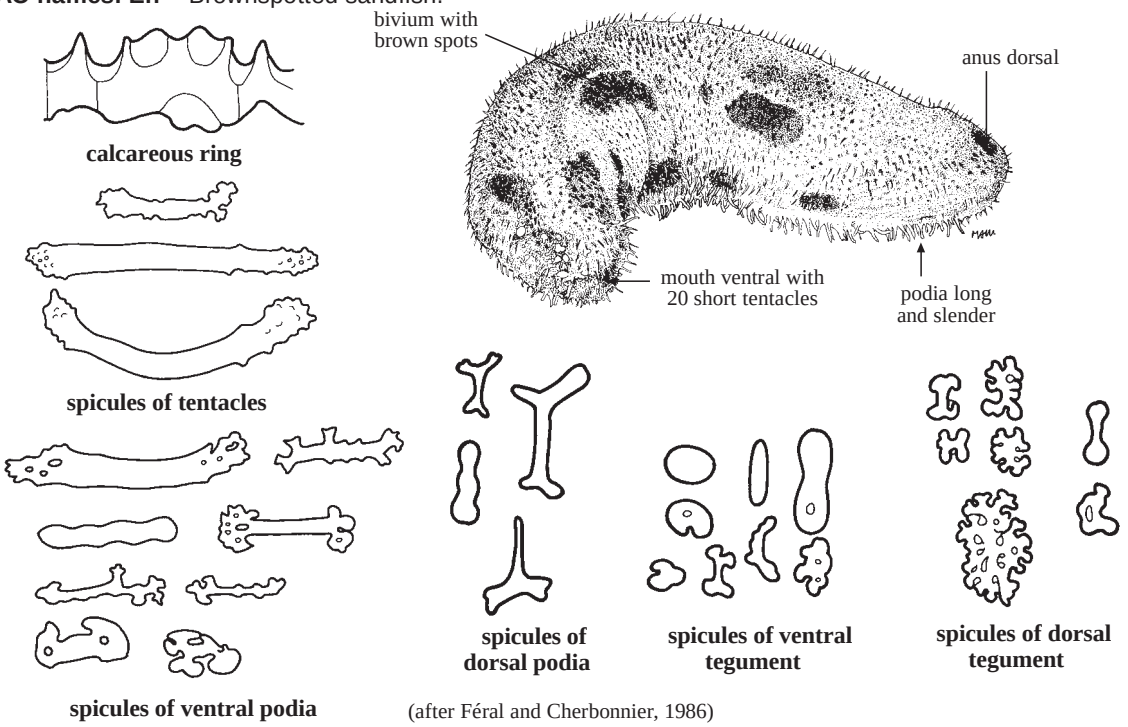


Distribution: Widespread in the tropical Indo-Pacific, including the Red Sea, but excluding Hawaii.

Bohadschia similis (Semper,1868)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Brownspotted sandfish.



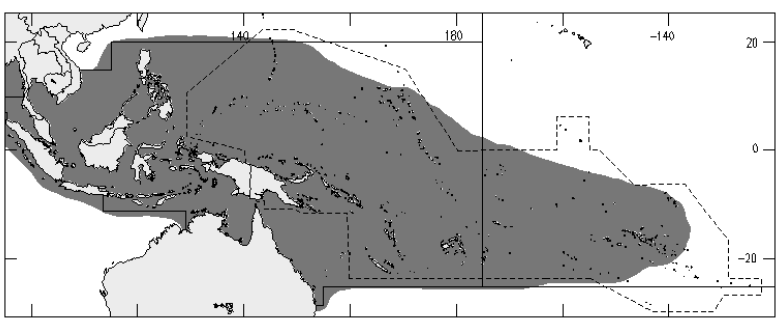
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, flattened ventrally (trivium). Bivium smooth and rigid. **Podia on bivium long, slender**, conical, and irregularly arranged; podia on trivium more numerous, shorter and irregularly arranged on the radii and interradii; calcareous disc of podia around 400 µm in diameter. **Mouth** ventral, **surrounded by 20 short tentacles. Anus nearly dorsal, surrounded by 5 groups of radial papillae**. Calcareous ring with large radial pieces and narrow interradials having sharp tops. Cuvierian tubules long and large. **Colour:** variable among specimens and localities; bivium beige to light brown, showing characteristic brown spots; trivium lighter, yellowish. **Spicules:** ventral tegument with simple nodules with or without holes and sparse rods giving rise to rosettes; dorsal tegument with rosettes and small biscuit-like plates; ventral podia with variable rods; dorsal podia with X-shaped rods; tops of tentacles with spiny rods.

Size: Maximum length about 26 cm, commonly to about 18 cm; mean live weight about 0.3 kg (up to 0.8 kg); body-wall thickness about 4 mm.

Habitat, biology, and fisheries: Found in very shallow waters, rarely in depths of more than 3 m; occurs in coastal lagoons or inner reef flats, generally burrowing in sandy-muddy bottoms. Populations can reach densities of 0.03/m^2. Biology poorly known. May be harvested along with other reef flat species, such as *Holothuria scabra*, when they occur together, but the sticky Cuvierian tubules make the collection and processing disagreeable. Collected by divers. The processed product is not distinguished from those of other *Bohadschia* species and is of little commercial value.

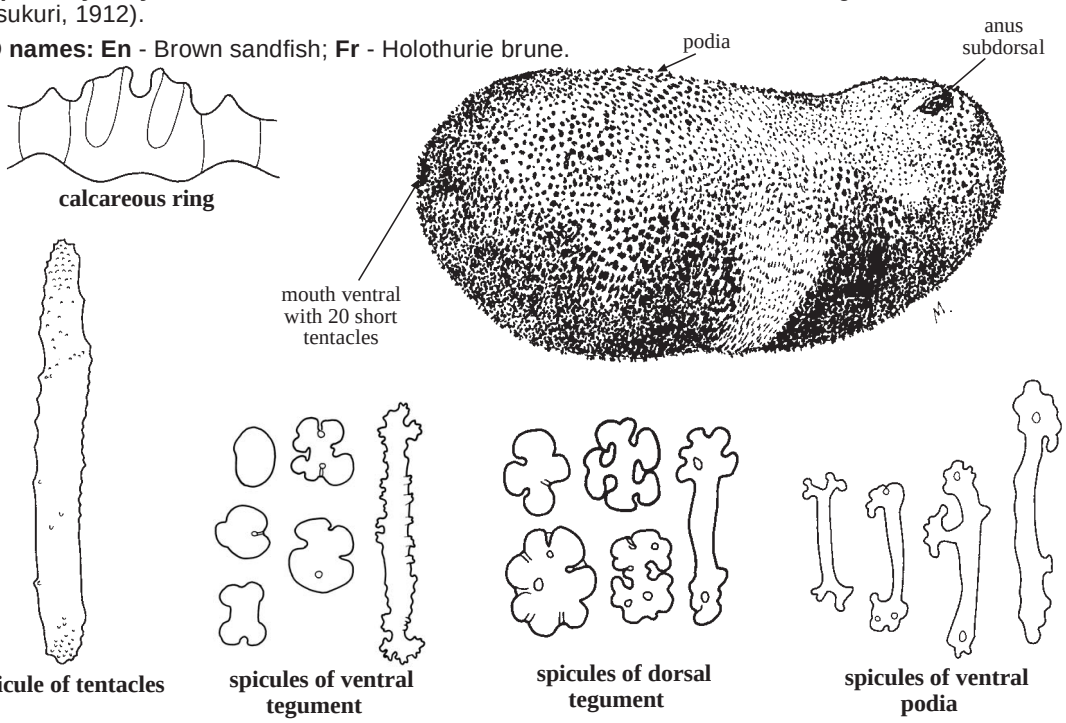
Distribution: Widespread in the tropical Pacific, excluding Hawaii; reported from the Mascarene Islands, but not from elsewhere in the Indian Ocean.



Bohadschia vitiensis (Semper, 1867)

Frequent synonyms / misidentifications: None / *Bohadschia marmorata* Jaeger, 1833; *B. bivittata* (Mitsukuri, 1912).

FAO names: En - Brown sandfish; **Fr** - Holothurie brune.



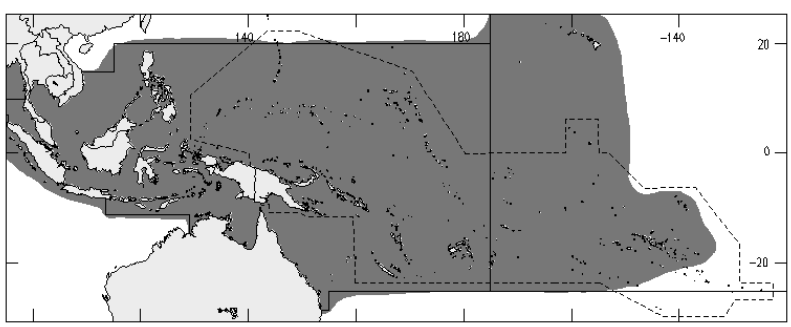
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, arched dorsally (bivium) and flattened ventrally (trivium); calcareous disc of podia around 300 µm in diameter. Mouth ventral, **surrounded by 20 small, short and yellowish tentacles**. **Anus nearly dorsal**. Calcareous ring with large radial pieces and narrow interradials. **Cuvierian tubules numerous and thick**. **Colour:** bivium yellow with brown bands; trivium lighter; **podia on bivium and trivium encircled by a characteristic brown spot**. **Spicules:** ventral tegument with a variety of pseudo-rosettes and biscuit-like nodules; dorsal tegument with rosettes and a few rods; ventral podia with various rods; tentacles with rods, straight or slightly curved and very spiny.

Size: Maximum length about 40 cm, commonly to about 32 cm; mean live weight about 1.2 kg (up to 1.6 kg); body-wall thickness about 7 mm.

Habitat, biology, and fisheries: Found in moderately shallow waters, rarely in depths of more than 20 m; mostly on coastal lagoons and inner reef flats; abundant in sandy-muddy sediments where it burrows most of the time. Population densities generally less than 0.02/m^2. May be harvested with other reef flat species, such as *Bohadschia similis* and *Holothuria scabra*, when they occur together, but the sticky Cuvierian tubules make the collection and processing disagreeable. Collected by hand at low tide, or by divers. The processed product is not distinguished from those of other *Bohadschia* species and is of little commercial value.

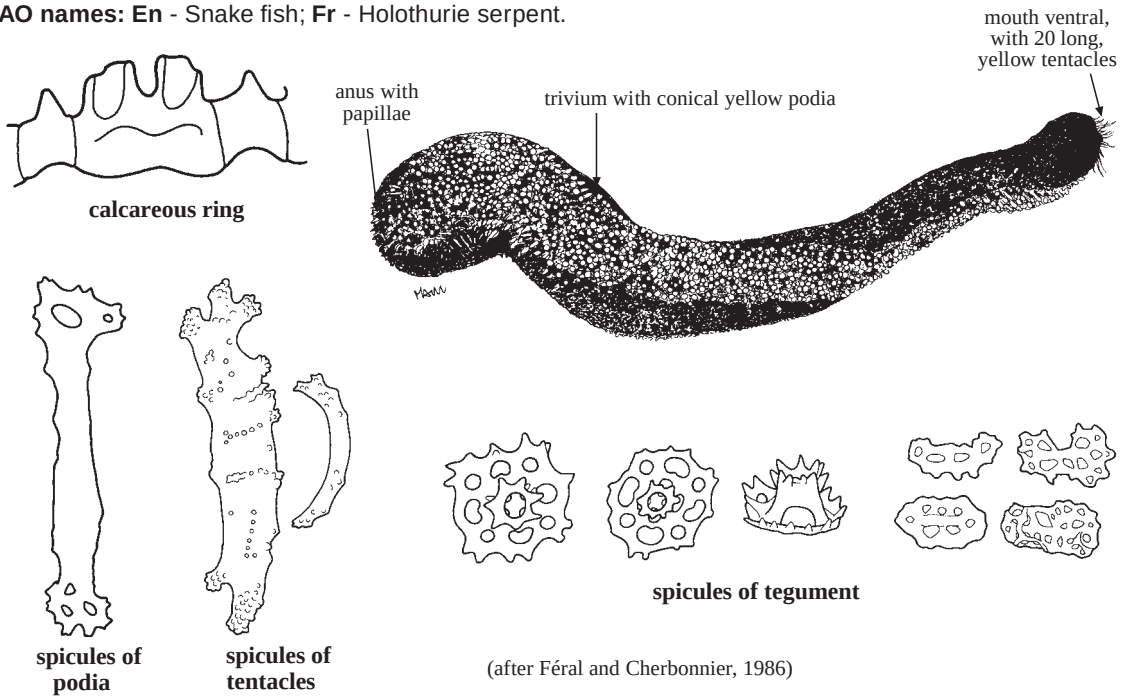
Distribution: Widespread in the tropical Indo-Pacific.



Holothuria (Acanthotrapeza) coluber Semper, 1868

Frequent synonyms / misidentifications: None / None.

FAO names: En - Snake fish; **Fr** - Holothurie serpent.



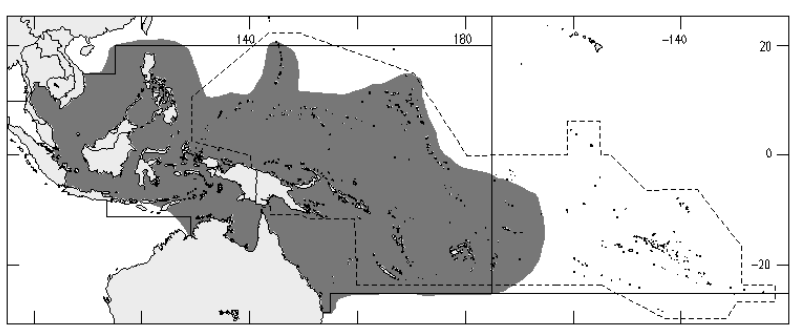
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, very elongate, larger near the posterior end. Tegument very tough. Short papillae on bivium emerging from warts; **podia on trivium conical, stout, yellow**, arranged in 10 rows on the radii and interradii; calcareous disc of podia around 400 µm in diameter. **Mouth** ventral, **surrounded by 20 very long, stout tentacles of characteristic yellow colour**; mouth also surrounded by a collar of small papillae. **Anus surrounded by 5 groups of 3 small papillae**. Calcareous ring with large and high radial pieces and narrow interradials. Cuvierian tubules absent. **Colour:** black, with yellow podia. **Spicules:** tegument with tables and pseudo-buttons; tables with circular disc showing 8 holes, bearing a spire of 4 pillars, with spiny crown, hollow in the middle; pseudo-buttons plate-like with denticulate border; rods in the podia and papillae smooth, with holes at their ends; tentacles with nodulous rods.

Size: Maximum length about 60 cm, commonly to about 40 cm; mean live weight about 0.3 kg (up to 1 kg); body-wall thickness about 4 mm.

Habitat, biology, and fisheries: Dwelling in moderately shallow water, rarely found in depths of more than 15 m; mostly on inner reef flats of fringing and lagoon-islet reefs and shallow coastal lagoons; abundant on sandy-muddy grounds with rubble or coral patches, where it hides the posterior part of body. Population densities between 0.01 and 0.2/m^2. Biology very poorly known. Not known to be traditionally harvested, but in recent times, due to increasing demand, this species also appears in the processed products of some Pacific Islands. Collected by hand while wading on the reefs at low tide, or by divers. The processed product is of low commercial value.

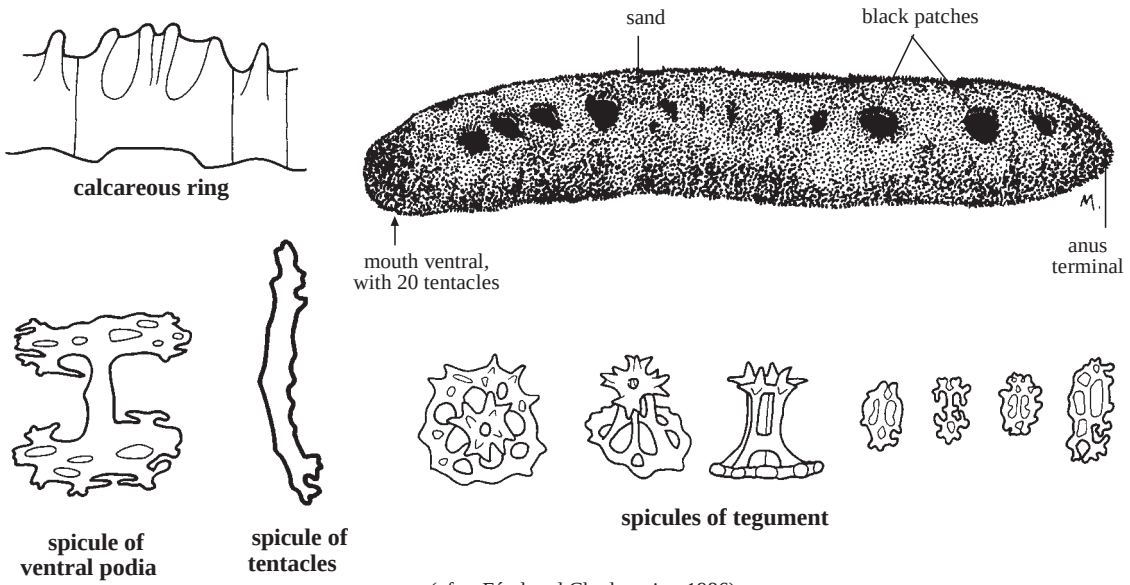
Distribution: Widespread in the tropical Pacific, excluding Hawaii; not recorded in the Indian Ocean.



Holothuria (Halodeima) atra Jaeger, 1833

Frequent synonyms / misidentifications: None / *Holothuria leucospilota* (Brandt, 1835).

FAO names: En - Lollyfish.

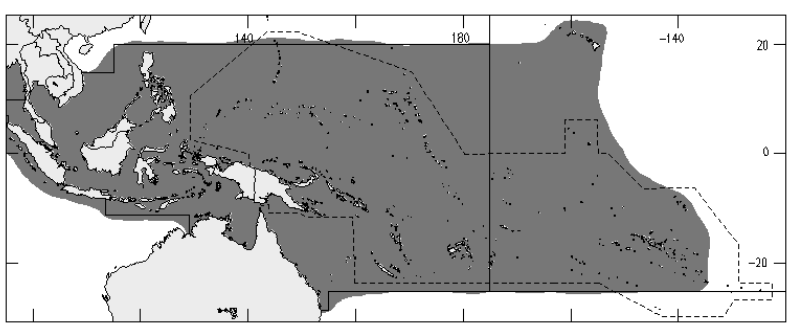


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, elongate, with rounded ends. Tegument smooth**, often covered by sand, but also showing round patches lacking sand**. A red toxic fluid is secreted upon rubbing the body surface vigorously. Podia on bivium sparsely distributed, ending in a small disc around 150 µm in diameter; podia on trivium numerous, short and stout, distributed on the radii and the interradii, their calcareous disc around 500 µm in diameter. **Mouth** ventral, **surrounded by 20 black tentacles. Anus terminal**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. **Colour: entirely black**. **Spicules:** tegument with tables and rosettes; tables with circular disc showing 8 holes (4 central and 4 smaller holes in between) and a spire of 4 pillars, ending in a maltese crown; rosettes small and simple, more abundant in ventral tegument; ventral podia without rods, but with pseudo-plates; dorsal podia and papillae with short rods, showing denticulate borders.

Size: Maximum length about 45 cm, commonly to about 20 cm; mean live weight about 0.2 kg (up to 1 kg); body-wall thickness about 4 mm.

Habitat, biology, and fisheries: The most common shallow-water species in the area, rarely found in depths of more than 20 m; mostly on inner and outer reef flats and back reefs or shallow coastal lagoons; abundant on sandy-muddy grounds with rubble or coral patches and in seagrass beds. The mean population density is around 0.5/m^2, but can exceed 4/m^2. Inshore shallow-water populations are denser, composed of smaller individuals, and reproduce mostly by transversal fission, while in deeper or outer reef populations the individuals are more scattered, larger, and reproduce sexually. Traditionally harvested, but the processed product is of low commercial value. In recent times, due to increasing demand, this species also appears in the processed products of many Pacific Islands. Collected by hand at low tide while wading on the reefs, or by divers.

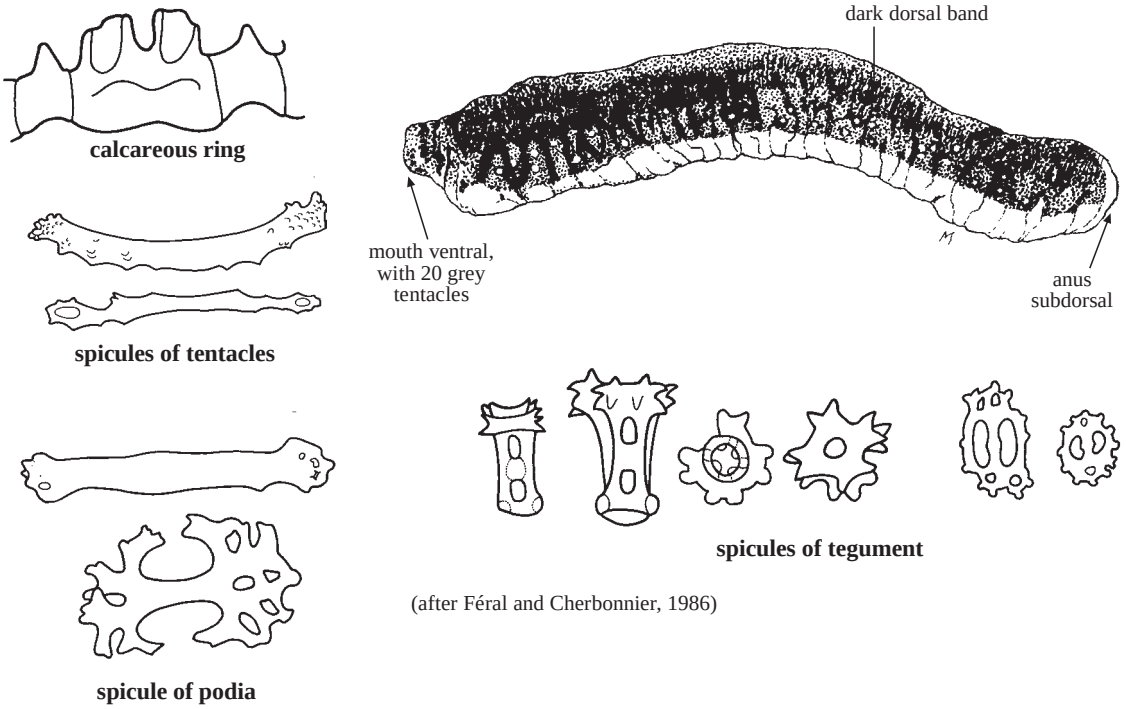


Distribution: Widespread in the tropical Indo-Pacific.

Holothuria (Halodeima) edulis Lesson, 1830

Frequent synonyms / misidentifications: None / None.

FAO names: En - Pinkfish; **Fr** - Trépang rose.



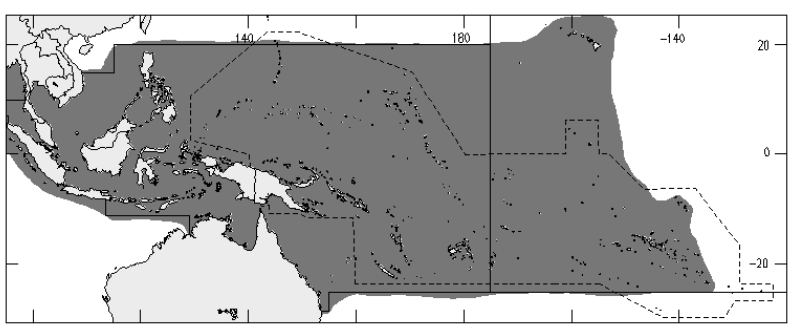
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, elongate, with rounded ends. Tegument rough. Podia sparse on bivium, ending in a small disc of around 100 µm diameter; podia on trivium numerous, short and stout, distributed on the radii and interradii, their calcareous disc around 460 µm in diameter. **Mouth** ventral, **surrounded by 20 grey tentacles. Anus subdorsal.** Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. **Colour:** a **characteristic black or dark medio-dorsal band**; coloration lighter laterally; trivium lighter, with small, dark dots. **Spicules:** tegument with tables and rosettes; tables with circular small disc, having a single hole in the middle, and bearing a spire ending in spines which may form a maltese crown; presence of rosettes with 4 holes (2 small and 2 larger holes); a second form of rosettes with 6 holes and small perforated plates mostly found in the dorsal tegument; ventral podia with large plates and rods; dorsal podia with nodose rods or showing holes at their ends.

Size: Maximum length about 35 cm, commonly to about 20 cm; mean live weight about 0.2 kg (up to 0.3 kg); body-wall thickness about 3 mm.

Habitat, biology, and fisheries: A common shallow-water species in the area, rarely found in depths of more than 30 m; mostly on inner and outer flats of coastal reefs, back reefs, or shallow coastal lagoons. Specimens from barrier reefs have been reported to have a brown bivium and a whitish trivium. Most abundant on sandy-muddy grounds with rubble or coral patches and in seagrass beds. Mean population density around 0.01/m^2 (not exceeding 0.1/m^2). Not traditionally harvested. The processed product looks similar to that of *Holothuria atra* and is of low commercial value.

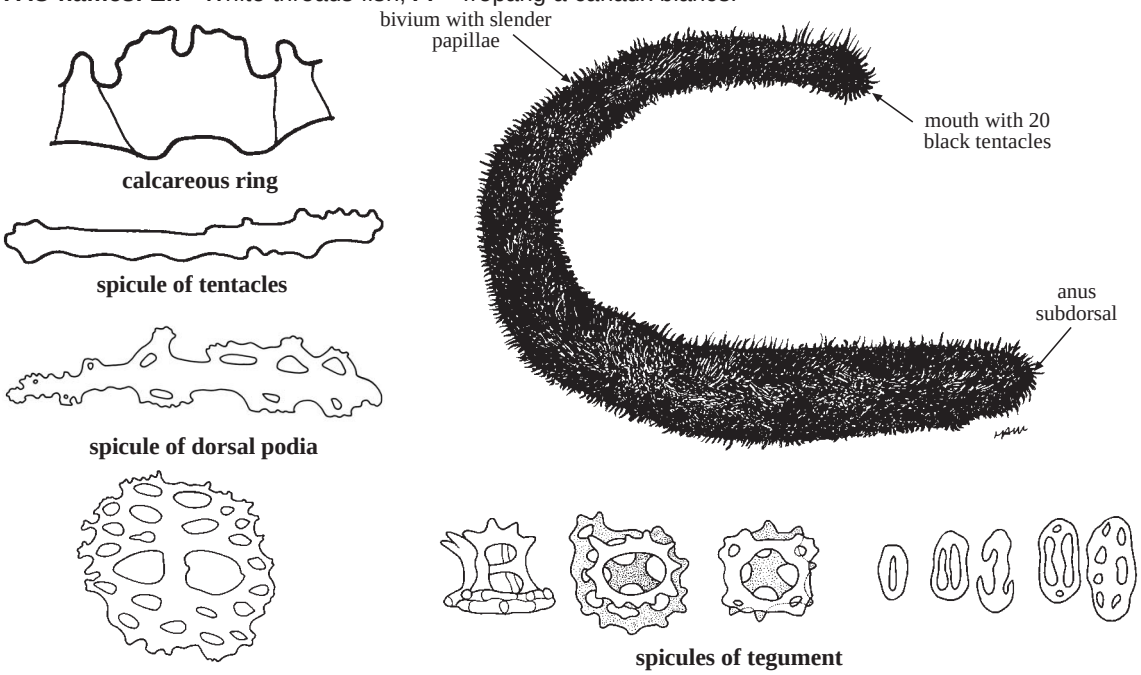
Distribution: Widespread in the tropical Indo-Pacific.



Holothuria (Mertensiothuria) leucospilota (Brandt, 1835)

Frequent synonyms / misidentifications: None / *Holothuria atra* Jaeger, 1833; *H. coluber* Semper, 1868.

FAO names: En - White threads fish; **Fr** - Trépang à canaux blancs.

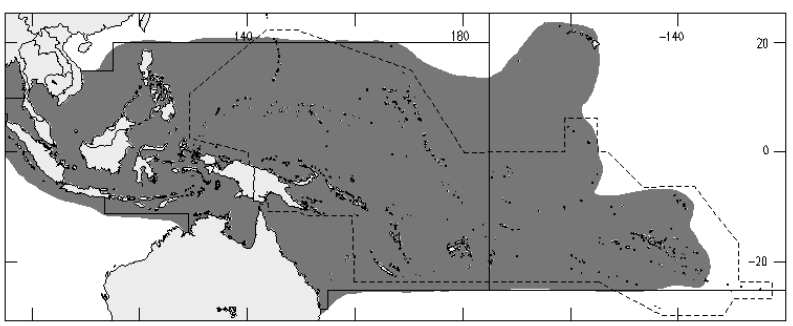


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body very elongate, narrower anteriorly than posteriorly. Tegument very smooth. Podia and papillae randomly distributed on bivium, the podia ending in a disc of around 480 µm diameter; podia on bivium numerous, short and stout, distributed on the radii and interradii, their calcareous disc around 700 µm in diameter. **Mouth** ventral, **surrounded by 20 black tentacles**. **Anus subdorsal**. Calcareous ring with large radial pieces and triangular interradials. **Cuvierian tubules very thin and long**. **Colour: entirely black**. **Spicules:** dorsal and ventral tegument with tables and buttons; tables with circular large disc, having 8 holes (or more), spire with 4 pillars, and ending in a crown with large central hole; buttons regular, with 6 or 8 holes, or irregular; plates large in ventral podia, with many holes; dorsal podia also with long rods; tentacles containing few rods.

Size: Maximum length about 55 cm, commonly to about 35 cm; mean live weight about 0.3 kg (up to 8 kg); body-wall thickness about 3 mm.

Habitat, biology, and fisheries: A common shallow-water species in the area, rarely found in depths of more than 10 m; mostly on outer and inner reef flats, back reefs, and shallow coastal lagoons. Abundant in seagrass beds, sandy-muddy grounds with rubble or coral patches where it hides the posterior part of body. Mean population density around 0.05/m^2 (can exceed 0.5/m^2). Inshore, shallow-water populations are denser, composed of smaller individuals and reproduce mostly by transversal fission, while in deeper or outer reef populations the individuals are more scattered, larger, and reproduce sexually. Not traditionally harvested, due to the thin tegument and the presence of Cuvierian tubules, but may be confused with other commercial black species of *Holothuria*.

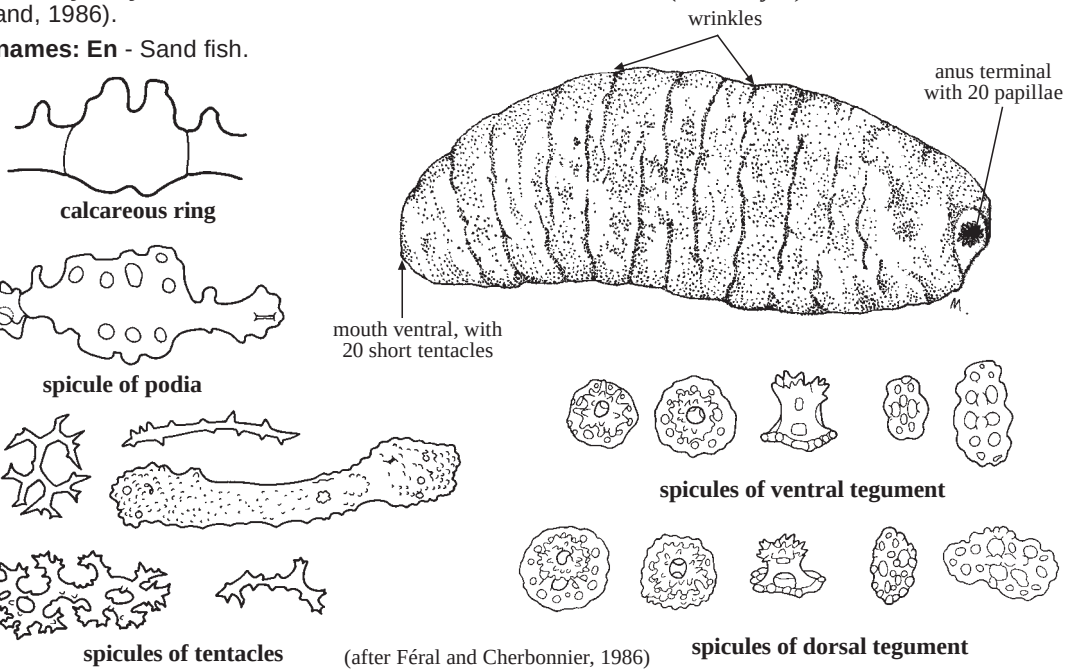


Distribution: Widespread in the tropical Indo-Pacific.

Holothuria (Metriatyla) scabra Jaeger, 1833

Frequent synonyms / misidentifications: None / *Holothuria (Metriatyla) scabra* var. *versicolor* (Conand, 1986).

FAO names: En - Sand fish.

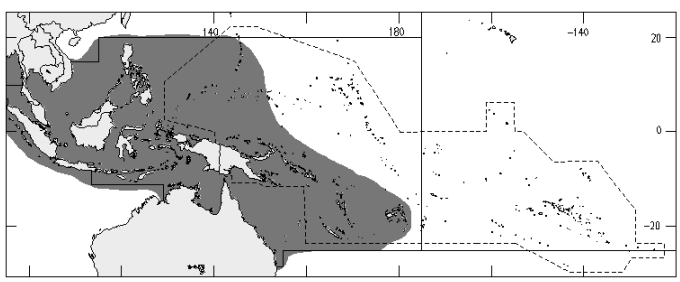


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body oval, arched dorsally (bivium) and flattened ventrally (trivium). **Bivium with characteristic wrinkles**, covered by sediment when the animal is coming out of the bottom. **Bivium with small papillae within black dots**, and black podia ending in a disc of around 220 µm diameter; podia on trivium arranged irregularly, their calcareous disc around 350 µm in diameter. **Mouth** ventral, **surrounded by a collar of papillae and 20 grey, short and stout tentacles**. **Anus terminal, surrounded by a circle of 5 groups of radial papillae**. Calcareous ring with a large medio-ventral radial piece. Cuvierian tubules absent. **Colour:** highly variable; bivium whitish to dark brown, occasionally with dark transverse markings; trivium lighter, generally whitish. **Spicules:** very numerous; ventral tegument with tables and buttons, the tables having a moderately small disc, perforated by a varying number of holes of variable size, the spire with 4 pillars and a cross-like bridge, ending in a spiny crown with a hole in the middle; knobby buttons generally have 6 holes, occasionally more; small rods and denticulate plates also present; tables and buttons in dorsal tegument: tables with a nodose disc, much larger than in ventral tegument; buttons variable, larger, and more perforated than those in ventral tegument; ventral and dorsal podia with long and large spinose rods; tentacles with long spiny rods, small smooth rods, and large denticulate plates.

Size: Maximum length about 35 cm, commonly to about 22 cm; mean live weight about 0.3 kg (up to 1 kg); body-wall thickness about 6 mm.

Habitat, biology, and fisheries: Found in shallow waters, rarely in depths of more than 10 m; mostly on inner reef flats of fringing and lagoon-islet reefs, coastal areas under terrigenous influence, and near mangroves. Burrows in mud and sandy-muddy bottoms where the populations can reach high densities (up to 1/m^2). Sexual reproduction takes place during the warm season. A species with a high potential fecundity and early sexual maturity. Provides the principal share of the tropical Indo-Pacific production of bêche-de-mer and is harvested throughout the area in artisanal fisheries. Collected by hand while wading on the reefs at low tide. The processing method is particular of this species: the sea cucumbers are buried overnight, and the next day the numerous spicules are removed by brushing the tegument. The processed product is of major commercial value and at present highly demanded.

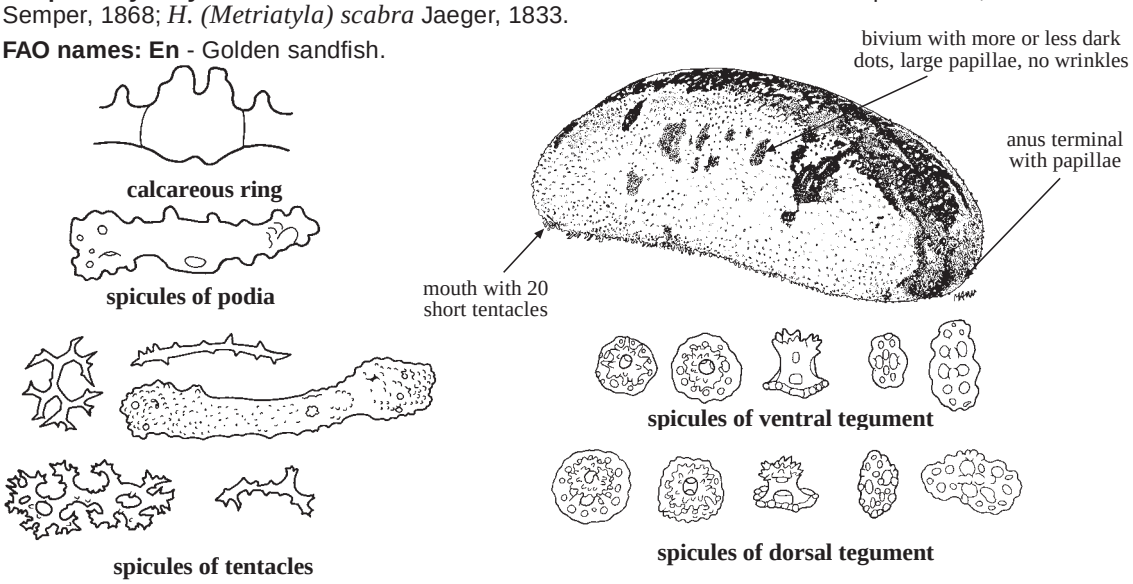


Distribution: Widespread in the tropical Indo-Pacific, excluding Hawaii.

Holothuria (Metriatyla) scabra* var. *versicolor (Conand, 1986)

Frequent synonyms / misidentifications: None / *Holothuria albiventer* Semper, 1868; *H. acculeata* Semper, 1868; *H. (Metriatyla) scabra* Jaeger, 1833.

FAO names: En - Golden sandfish.

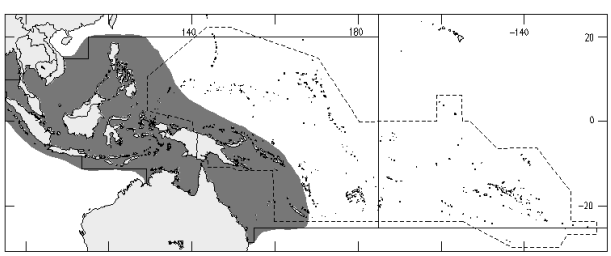


Diagnostic characters: Body oval, arched dorsally (bivium) and flattened ventrally (trivium). **Bivium without characteristic wrinkles** (as in the typical *Holothuria scabra*), sometimes covered by sediment when the animal is coming out of the bottom. **Bivium with large papillae** as well as black podia ending in a disc of around 220 µm diameter; podia on trivium arranged irregularly, their calcareous disc around 350 µm in diameter. **Mouth** ventral, **surrounded by a collar of papillae and 20 grey, short and stout tentacles. Anus terminal, surrounded by a circle of 5 groups of radial papillae.** Calcareous ring with a large medio-ventral radial piece. Cuvierian tubules absent. **Colour:** variable; 3 main patterns can be recognized: speckled, with moderate black areas, or black overall. **Spicules:** very numerous; ventral tegument with tables and buttons, the tables having a moderately small disc, perforated by a various number of holes of variable size, the spire with 4 pillars and a cross-like bridge, ending in a spiny crown with a hole in the middle; knobby buttons generally have 6 holes, occasionally more; small rods and denticulate plates also present; tables and buttons in dorsal tegument: tables with a nodose disc, much larger than in ventral tegument; buttons variable, larger, and more perforated than those in ventral tegument; ventral and dorsal podia with long and large spinose rods; tentacles with long spiny rods, small smooth rods, and large denticulate plates.

Size: Maximum length about 45 cm, commonly to about 30 cm; mean live weight about 1.1 kg (up to 2.8 kg); body-wall thickness about 7 mm.

Habitat, biology, and fisheries: Generally inhabits shallow waters, but often found in depths of more than 20 m (deeper than the typical *H. scabra*); on inner reef flats and coastal lagoons, frequently on flagstones; burrows in mud and sandy-muddy bottoms. Population densities are less than in the typical *H. scabra*, with a mean of around 0.01/m^2. Sexual reproduction takes place during the warm season. It has a high potential fecundity. Harvested in some artisanal fisheries throughout the area, in places where its habitat occurs. Collected by hand at low tide while wading on the reefs. Processed with the same method used with the typical *H. scabra*: the sea cucumbers are buried overnight and the next day the numerous spicules are removed by brushing the tegument. The processed product is different in appearance from the typical *H. scabra*, having a golden colour. Of major commercial value, the processed product is at present highly demanded.

Distribution: Widespread in the tropical Pacific, excluding coral reef islands.

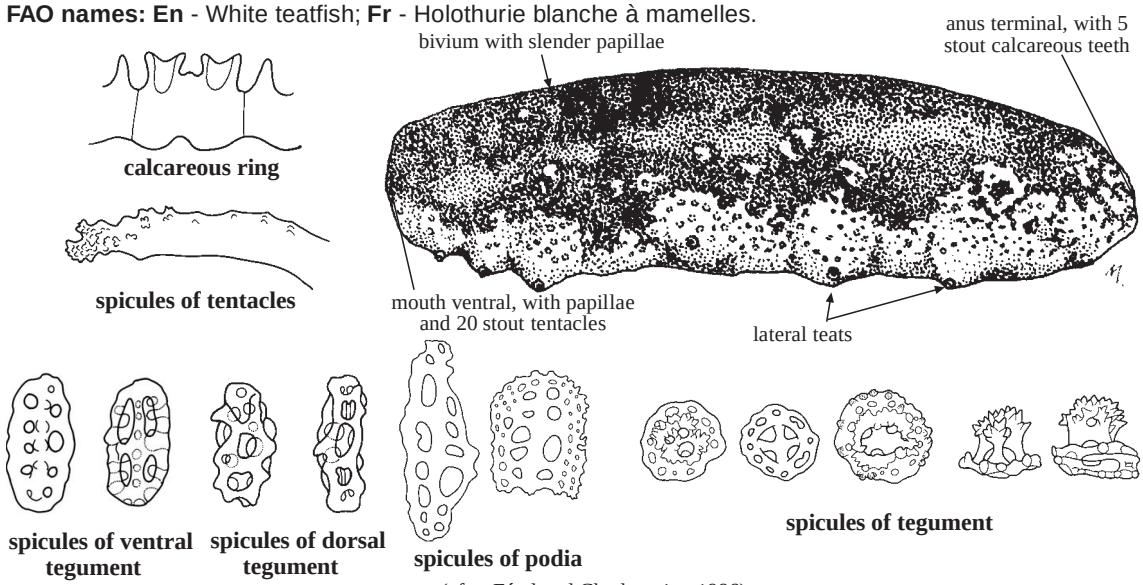


Remarks: Despite distinct differences in its ecology and biology, when compared to the typical *H. scabra*, this form is currently considered a variety, due to the lack of known differences in the spicules and internal anatomy. The name of this variety, *versicolor*, is due to the dorsal tegument which shows various colour patterns. Generally grows larger than the typical *H. scabra*.

Holothuria (Microthele) fuscogilva Cherbonnier, 1980

Frequent synonyms / misidentifications: None / *Holothuria nobilis* (Selenka, 1867); *H. maculata*.

FAO names: En - White teatfish; **Fr** - Holothurie blanche à mamelles.



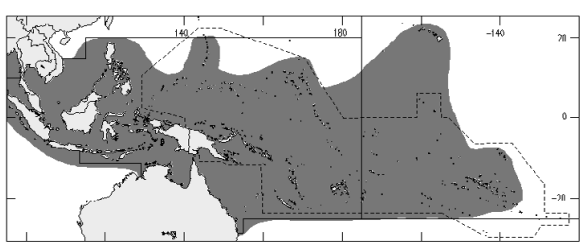
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body suboval, stout, firm and rigid, arched dorsally (bivium) and flattened ventrally (trivium). **Bivium with characteristic large lateral papillae (teats)** and often covered by sand. Bivium with small papillae as well as podia ending in a disc of around 450 µm diameter; podia on trivium stout, arranged irregularly, their calcareous disc around 600 µm in diameter. **Mouth** ventral, **surrounded by a collar of long yellowish papillae and 20 grey, stout tentacles**. **Anus surrounded by 5 stout calcareous teeth**. Calcareous ring with large radial pieces (slightly different from *Holothuria nobilis*). **Cuvierian tubules absent**. **Colour:** variable; **bivium brown with more or less distinct whitish spots**, becoming larger on sides; trivium lighter, generally whitish. **Spicules:** in form of tables and buttons; dorsal and ventral tegument with 2 kinds of tables; one form of table having an undulated disc with 10 to 15 irregular holes, supporting a massive spire with 4 pillars, ending in a very large, spiny, perforated crown; the other form of table, more frequent in the dorsal tegument, have a larger disc, with more holes and a spire ending in a crown composed of 2 or 3 rows of stout spines and 5 or 6 spiny pillars; ventraltegument buttons simple, with 8 holes or more complicated as fenestrated ellipsoids; dorsal-tegument buttons only as fenestrated ellipsoids; ventral and dorsal podia with large plates, multiperforated; tentacles with spiny ending rods (up to 700 µm).

Size: Maximum length about 57 cm, commonly to about 42 cm; mean live weight about 2.4 kg (up to 4 kg); body-wall thickness about 12 mm.

Habitat, biology, and fisheries: With a deeper distribution than *H. nobilis*, mostly found in depths between 10 and 40 m; generally occurs on outer barrier reefs and passes, but also known to inhabit shallow seagrass beds. Populations do not reach densities as high as *H. nobilis*, with medium densities around 0.001/m^2. Sexual reproduction takes place during the warm season. A species with a low potential fecundity and late sexual maturity. Harvested in artisanal fisheries throughout the area, in places where its habitat occurs. Collected by skin diving or using diving gear (if not banned), making the populations vulnerable due to overexploitation. The processed product is of major commercial value and very highly demanded at present, even though the stocks have declined within the area.

Distribution: Widespread in the tropical Indo-Pacific.

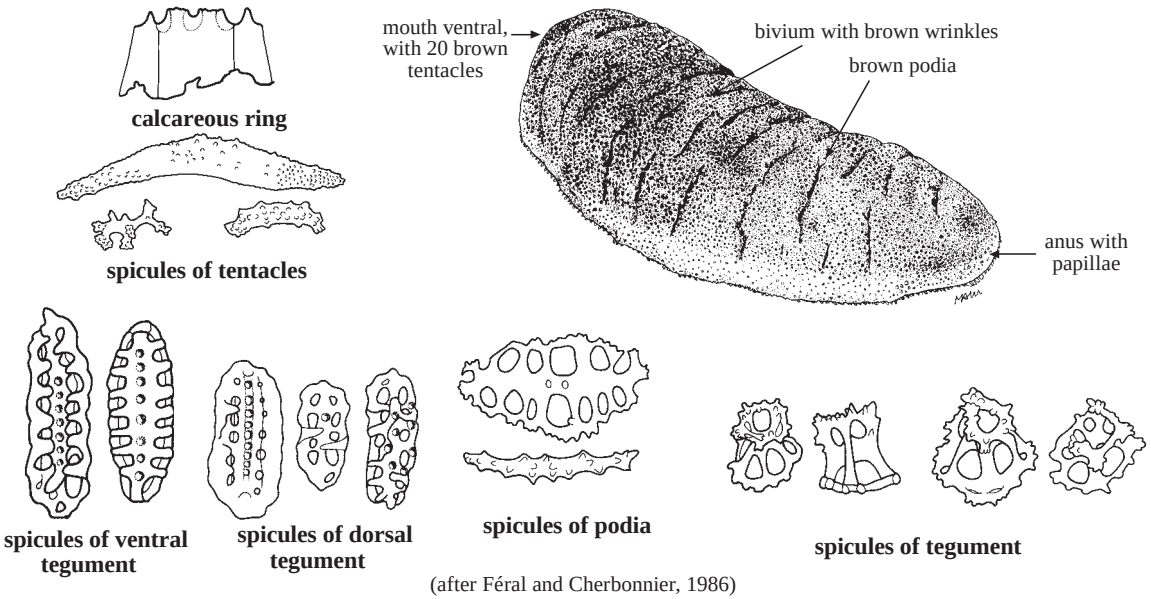


Remarks: Although described only some years ago, this species, previously considered to be identical to *H. nobilis*. However, for a long time it was well known by fishermen from various Pacific islands, which give it a different name than *H. nobilis*, based on the colour. It differs from *H. nobilis* by the colour of the tegument, the absence of Cuvierian tubules, and the shape of spicules. Their habitats are also different.

Holothuria (Microthele) fuscopunctata Jaeger, 1833

Frequent synonyms / misidentifications: *Holothuria axiologa* H.L. Clark, 1921 / None.

FAO names: En - Elephant trunkfish; **Fr** - Holothurie trompe d'éléphant.

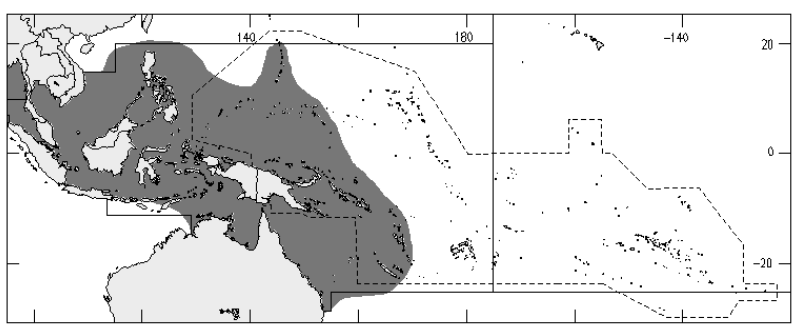


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body suboval, stout, firm and rigid, arched dorsally (bivium) and flattened ventrally (trivium); **bivium with characteristic brown wrinkles**. **Podia on bivium small, brown**, with a disc of around 200 µm diameter; podia on trivium more densely distributed on the median radius and more sparsely distributed on the other radii and interradii, with their calcareous disc around 300 µm in diameter. Mouth ventral, with 20 brown, stout tentacles. **Anus surrounded by 5 radial groups of 3 or 4 papillae** and a black band. Calcareous ring with large radial pieces and narrower interradials. **Cuvierian tubules absent**. Cloaca large and black. **Colour: bivium golden brown, with numerous brown spots; trivium whitish**; mature gonads bright yellow. **Spicules:** in form of tables and buttons; tables of dorsal and ventral tegument similar in shape and moderately sparse, disc small, irregular, with 4 to 6 irregular holes, supporting a short spire, ending in an irregular crown of smooth spines; ventral-tegument buttons elongated ellipsoids, with 12 to 16 holes and median nodules; dorsal-tegument buttons generally more regular and less perforated; ventral and dorsal podia with large plates, multiperforated and indentated; tentacles containing both large very spiny rods and short nodose rods.

Size: Maximum length about 70 cm, commonly to about 36 cm; mean live weight about 1.5 kg (up to 4.5 kg); body-wall thickness about 10 mm.

Habitat, biology, and fisheries: Commonly found in reef slopes and lagoons, also seen in shallow seagrass beds; mostly in depths of less than 25 m. Population densities around 0.005/m^2. Sexual reproduction takes place during the warm season. A species with a low potential fecundity and late sexual maturity. Occasionally harvested in artisanal fisheries throughout the area. Collected by skin diving or using diving gear (if not banned), making the populations very vulnerable, due to overexploitation. The processed product is of minor commercial value.

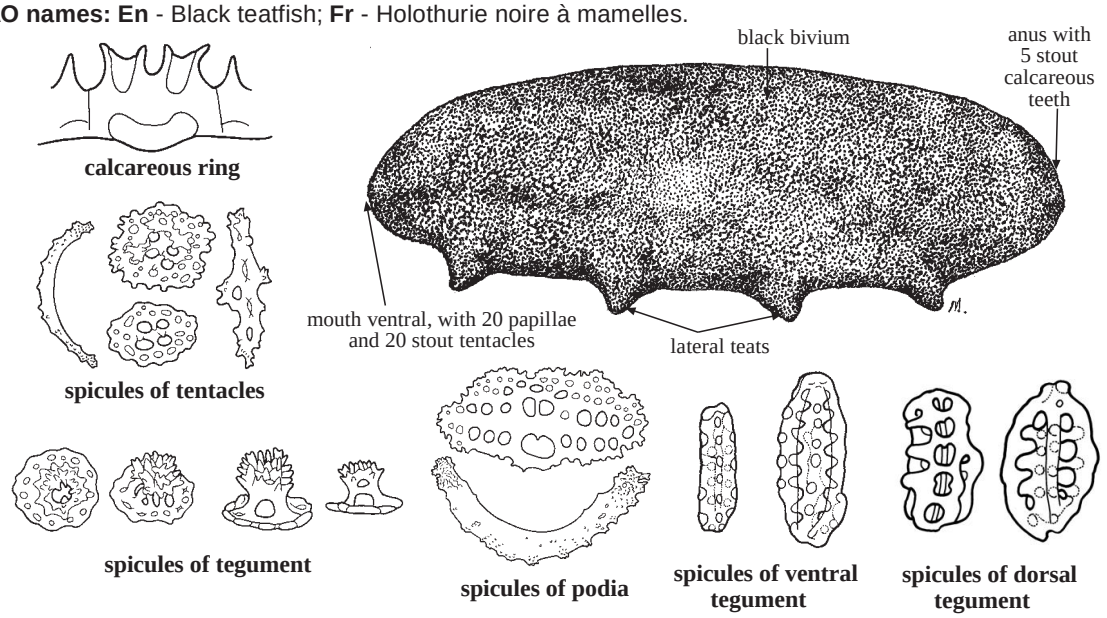


Distribution: In the tropical Indian Ocean known only from Madagascar; in the tropical Pacific, in the west from Australia and Sulawesi eastwards to Marianna Islands, Palau, and New Caledonia.

Holothuria (Microthele) nobilis (Selenka, 1867)

Frequent synonyms / misidentifications: *Holothuria guamensis* Quoy and Gaimard, 1833 / *Holothuria fuscogilva* Cherbonnier, 1980.

FAO names: En - Black teatfish; **Fr** - Holothurie noire à mamelles.

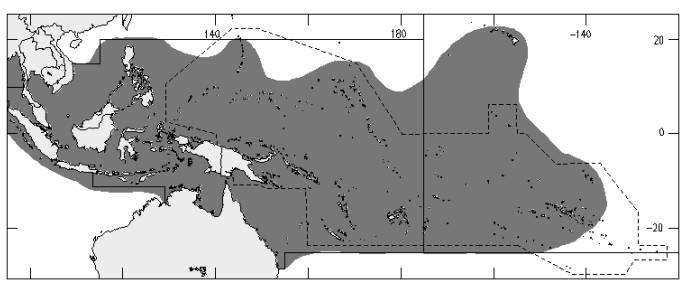


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body suboval, stout, firm and rigid, arched dorsally (bivium), and flattened ventrally (trivium). **Bivium with characteristic large lateral papillae (teats)** and often covered by sand. Bivium with small papillae as well as podia ending in a disc around 220 µm in diameter; podia on trivium stout, arranged irregularly, their calcareous disc around 700 µm in diameter. **Mouth** ventral, **surrounded by 2 rows of black papillae and 20 grey, stout tentacles**. **Anus surrounded by short papillae and 5 stout calcareous teeth**. Calcareous ring with large wing-shaped radial pieces and narrow sharp interradials (slightly different from *Holothuria fuscogilva*). **Cuvierian tubules** present, but never expelled. **Colour:** less variable than in *H. fuscogilva*; **bivium dark brown to black**; trivium lighter, generally greyish. **Spicules:** in form of tables and buttons; only one kind of tables in the dorsal and ventral tegument; tables with undulated, circular disc with 12 to 16 holes, supporting a massive spire with 4 pillars and a cross bridge, ending in a large, spiny crown; ventral-tegument buttons in form of fenestrated ellipsoids; dorsal-tegument buttons shorter, larger, and less fenestrated; ventral podia with numerous spiny rods and large multiperforated plates; tentacles with spiny rods, large plates, small plates, and pseudo-plates.

Size: Maximum length about 55 cm, commonly to about 37 cm; mean live weight about 1.7 kg (up to 4 kg); body-wall thickness about 12 mm.

Habitat, biology, and fisheries: Inhabits shallower waters than *H. fuscogilva*, mostly found from the surface to a depth of 20 m; generally occurs on reef flats, slopes, and in shallow seagrass beds. Populations reach higher densities than *H. fuscogilva*, with medium densities of around 0.002/m^2. Characterized by a sexual reproduction that takes place during the cold season. It has a medium potential fecundity. Harvested in artisanal fisheries throughout the area, in places were its habitat occurs. Collected by hand at low tide, by skin diving or using diving gear (if not banned), making the populations very vulnerable, due to overexploitation. The processed product is of major commercial value and very highly demanded at present, even though the stocks have declined within the area.



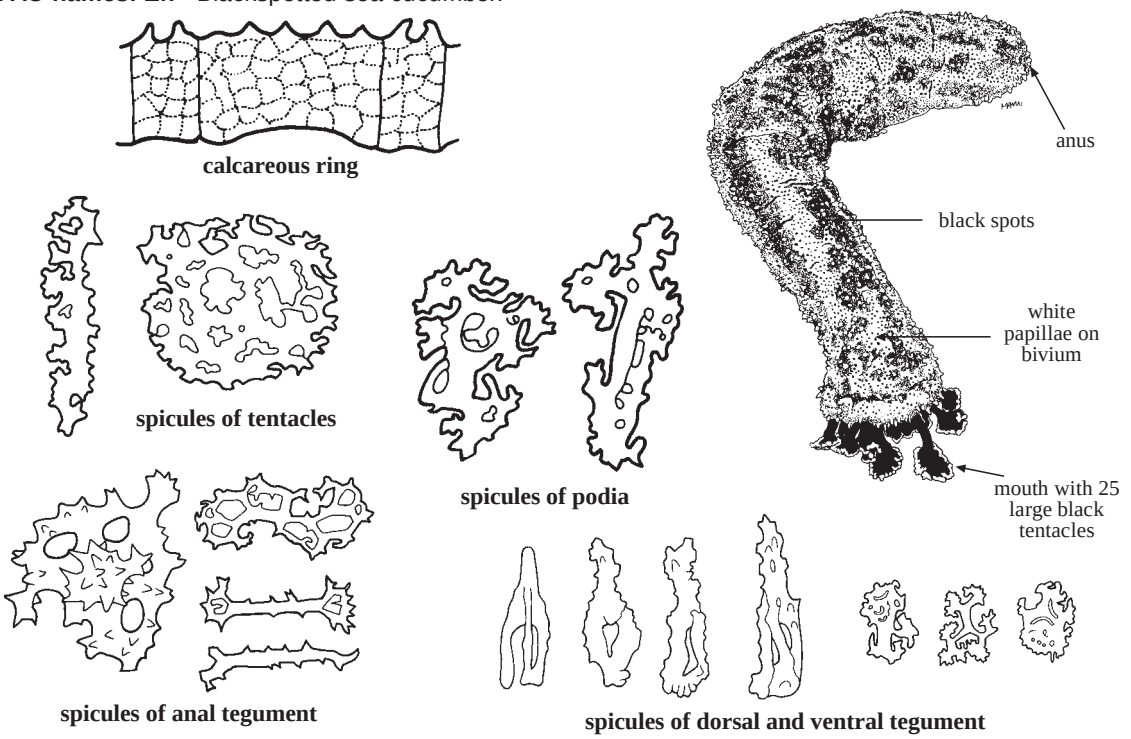
Distribution: Widespread in the tropical Indo-Pacific.

Remarks: Differs from *H. fuscogilva* by the colour of the tegument, the presence of Cuvierian tubules, and the shape of spicules. Their habitats are also different.

Pearsonothuria graeffei (Semper, 1868)

Frequent synonyms / misidentifications: *Bohadschia graeffei* (Semper, 1868) / None.

FAO names: En - Blackspotted sea cucumber.

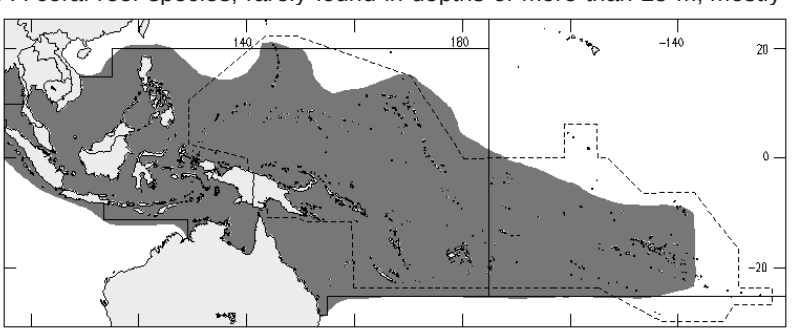


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body subcylindrical, arched dorsally (bivium) and slightly flattened ventrally (trivium). **White conical papillae sparsely distributed on bivium**; podia on trivium long and large, their calcareous disc around 240 µm in diameter. **Mouth** ventral, **surrounded by 25 large, black tentacles. Anus nearly dorsal**. Calcareous ring with irregular pieces. Cuvierian tubules numerous, but never expelled. **Colour:** bivium whitish with large, brown dots and **numerous small black spots**; trivium grey, also with small black spots. **Spicules:** dorsal and ventral tegument with pseudo-tables and rosettes; pseudo-tables consisting of large base with a large hole, and a spiny spire; rosettes numerous, those in the tegument simple, but more complicated in the dorsal papillae and ventral podia; also present around the anus are rods, small plates, and tables with a very spiny crown; tentacles containing a few rods and large plates derived from rosettes.

Size: Maximum length about 45 cm, commonly to about 35 cm; mean live weight about 0.7 kg (up to 1.3 kg); body-wall thickness about 4 mm.

Habitat, biology, and fisheries: A coral reef species, rarely found in depths of more than 25 m; mostly found on reef slopes, close to the coast; abundant on corals mixed with calcareous red algae. Population densities generally less than 0.005/m^2. Not harvested for bêche-de-mer production.



Distribution: Widespread in the tropical Indo-Pacific, excluding the Persian Gulf and Hawaii.

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STICHOPODIDAE

Diagnostic characters: Body square-shaped or trapezoidal in cross-section. Cuvierian organs absent. Gonads forming 2 tufts appended on each side of the dorsal mesentery. Dominant spicules in form of branched rods and C-and S-shaped rods.

Key to the genera of Stichopodidae occurring in the area (after Clark and Rowe, 1971)

1a. Bivium covered with large papillae, leaf-shaped, simple or branched, and without podia regularly arranged longitudinally; spicules never developod as tables, but numerous grains, dichotomously branched rods . . . . . ***Thelenota***

1b. Bivium covered with tubercules and papillae, at least on sides; trivium more or less covered by podia; spicules developod as tables, branched rods, and C-and S-shaped rods . . . . . ***Stichopus***

List of species of interest to fisheries occurring in the area

The symbol ⁂ is given when species accounts are included.

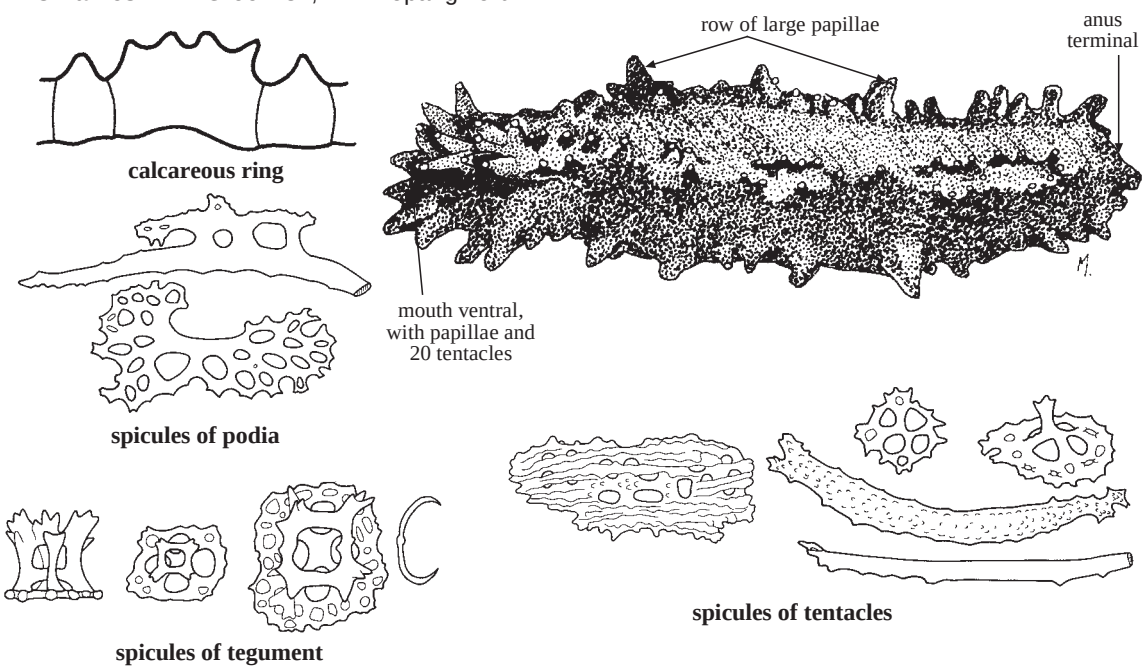
⁂ *Stichopus chloronotus* Brandt, 1835
⁂ *Stichopus horrens* Selenka, 1867
⁂ *Stichopus variegatus* Semper, 1868

⁂ *Thelenota ananas* (Jaeger, 1833)
⁂ *Thelenota anax* Clark, 1921

Stichopus chloronotus Brandt, 1835

Frequent synonyms / misidentifications: None / None.

FAO names: En - Greenfish; **Fr** - Trépang vert.



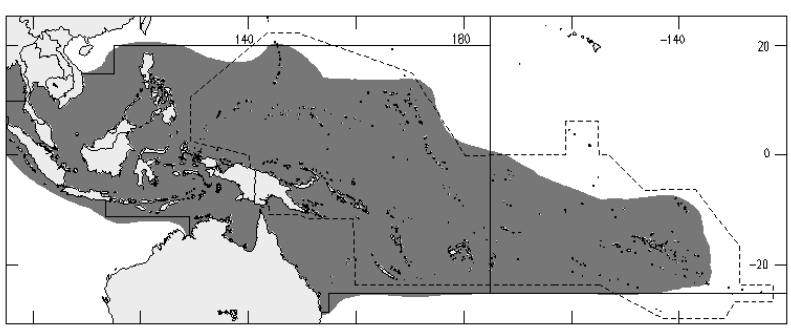
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body firm, rigid with quadrangular section, flattened ventrally (trivium); body wall easily disintegrates outside sea water. **Radii of bivium with characteristic double row of large papillae**, each radius ending in a small red or orange papilla. Trivium delimited by characteristic double row of large papillae; stout podia arranged regularly on 3 radial bands, with 10 rows in the medio-ventral band and 5 in the lateral. **Mouth** ventral, **surrounded by a row of papillae and 20 green, stout tentacles. Anus terminal**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. Cloaca large and greenish. **Colour:** bivium dark green to black; trivium lighter. **Spicules:** presence of very characteristic tables with a narrow disc showing 4 holes, bearing a spire generally ending in a moderately spiny crown; tables with larger disc and simpler crown also present; presence of many C-shaped spicules; rosettes absent; tables in dorsal with have a large multiperforated disc, bearing a large spire; ventral papillae with long, smooth rods; ventral podia with denticulate rods and large multiperforated plates; tentacles with smooth and granular rods.

Size: Maximum length about 35 cm, commonly to about 18 cm; mean live weight about 0.1 kg (up to 0.4 kg); body-wall thickness about 2 mm.

Habitat, biology, and fisheries: A reef species, mostly found in shallow areas from near the surface to a depth of 15 m; generally occurs on reef flats and upper slopes. Populations reaching high densities on hard substrates, with a mean of around 0.04/m^2. Shallow-water populations are generally smaller in size than those found in deeper waters. Biology poorly known. Probably harvested in some artisanal fisheries of the area. Collected by hand at low tide, or by divers. The processed product is of low commercial value.

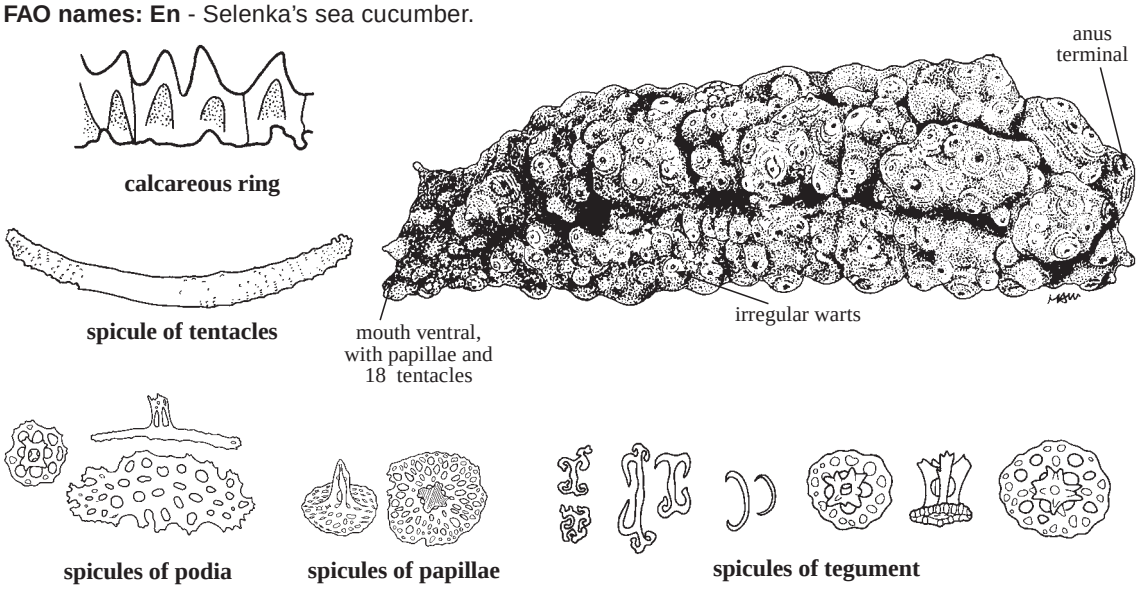
Distribution: Widespread in the tropical Indo-Pacific, excluding the Persian Gulf and Hawaii.



Stichopus horrens Selenka, 1867

Frequent synonyms / misidentifications: *Stichopus godeffroyi* Semper, 1868 / None.

FAO names: En - Selenka's sea cucumber.

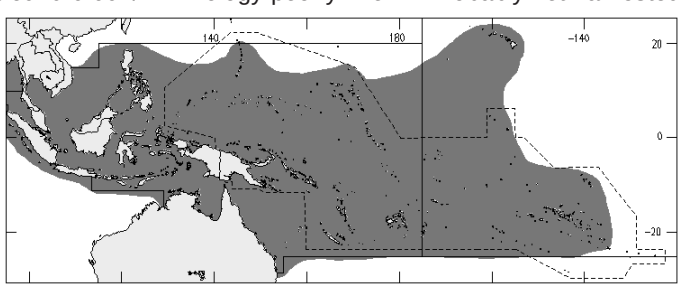


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body firm, rigid, squarish in cross-section, flattened ventrally (trivium); body wall easily disintegrates outside sea water. **Bivium covered with irregular warts**, arranged in 10 longitudinal rows; warts larger near mouth. Trivium delimited by a characteristic double row of large papillae (4 to 5 mm); stout podia arranged in 4 rows, on 3 radial bands, their disc about 350 µm in diameter. **Mouth** ventral, **surrounded by a half row of papillae and 18 brown, short tentacles. Anus terminal**. Calcareous ring with a deeply indented radial pieces and triangular interradials. Cuvierian tubules absent. **Colour:** bivium whitish to grey, with brown irregular dots; trivium lighter. **Spicules:** very characteristic rosettes, X-shaped, or elongate, numerous in the tegument; presence of numerous C-shaped spicules of 3 sizes; ventral tegument with tables of 2 sizes; some tables have a circular disc with 4 central and about 15 peripheral holes, bearing a spire with 4 pillars ending in a moderately spiny and cross-shaped crown; tables with a larger disc also present, more perforated, with a higher, spiny crown; only the first kind of table found in the dorsal tegument; tables in papillae provided with large multiperforated disc, with a long, conical, smooth spire, ending in a single point; ventral papillae containing long, smooth rods; ventral podia have long rods, with a central apophysis, and large, elongate, multiperforated plates; tentacles with large rods, either curved with few spines, or straight and very spiny.

Size: Maximum length about 40 cm, commonly to about 20 cm; mean live weight about 0.2 kg (up to 0.5 kg); body-wall thickness about 2 mm.

Habitat, biology, and fisheries: A reef species, mostly found in shallow areas from near the surface to a depth of 15 m; generally occurs in rubbles, or hidden in reef flats. A nocturnal species. Populations not reaching high densities, with a mean of around 0.007/m^2. Biology poorly known. Probably not harvested, as the tegument disintegrates too quickly. An aquaculture programme for this species is presently being carried out, for stock enhancement purposes.

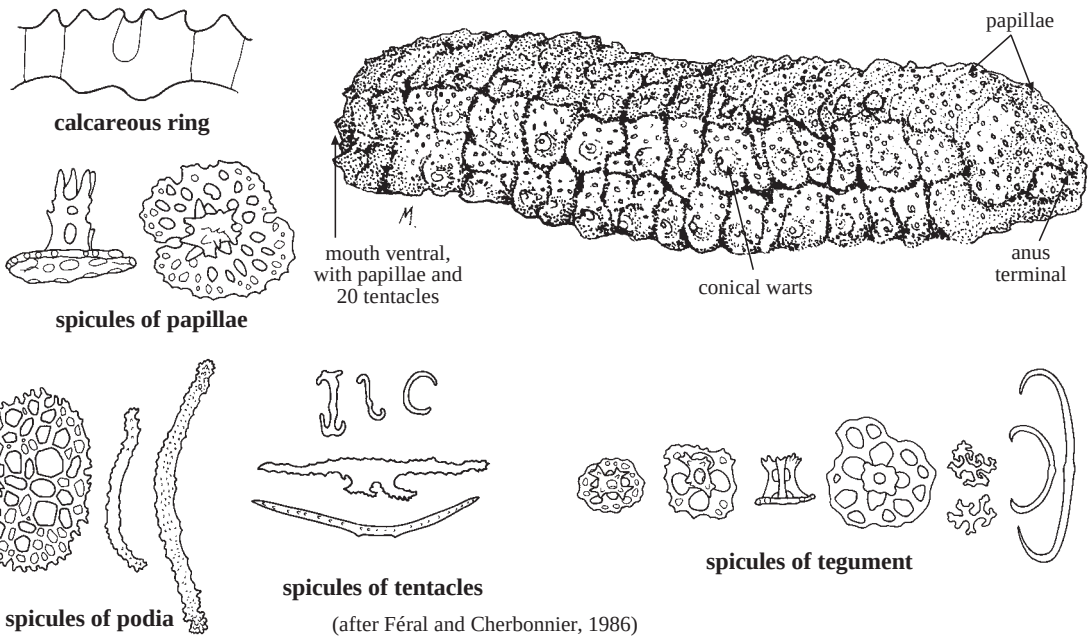


Distribution: Widespread in the tropical Indo-Pacific.

Stichopus variegatus Semper, 1868

FAO names: En - Curryfish; **Fr** - Trépang curry.

Frequent synonyms / misidentifications: None / None.



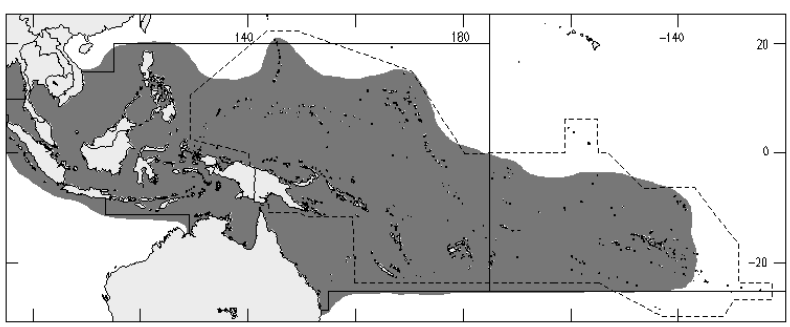
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body firm, rigid, squarish in cross-section, flattened ventrally (trivium). Body wall easily disintegrates outside sea water. **Bivium covered with irregular conical warts, arranged in 8 longitudinal rows, with smaller papillae in between**. Trivium with yellow to pink podia, arranged in rows on the radii, their disc about 380 µm in diameter. **Mouth** ventral, **surrounded by a circle of conical papillae and 20 yellowish tentacles. Anus terminal**. Calcareous ring with a deeply indented radial pieces and small interradials. Cuvierian tubules absent. **Colour:** variable on bivium, yellow to greenish, with black spots; trivium lighter. **Spicules:** tables in the tegument with 2 forms of discs, some being undulated, with 8 to 20 holes, while others form a denticulate disc with 4 central holes and a variable number of peripheral holes; spire of tables with 4 pillars ending in a moderately spiny and perforated crown; some tables with large disc and irregular crown also present; tables in papillae have a very large multiperforated disc; rosettes cross-shaped, branching; X-shaped spicules occur in 3 different sizes; ventral podia with spiny rods and large multiperforated plates showing pentagonal holes; tentacles with long, narrow, and spiny rods and X-, S-, and C-shaped small spicules.

Size: Maximum length about 50 cm, commonly to about 35 cm; mean live weight about 1 kg (up to 2.5 kg); body-wall thickness about 8 mm.

Habitat, biology, and fisheries: A shallow-water species, found in coastal reefs and lagoons, mostly from near the surface to a depth of 25 m. Generally occurs in seagrass beds, rubbles, and muddy-sand bottoms. Populations not reaching high densities, with a mean of around 0.005/m^2. Sexual reproduction takes place during the warm season. A species with a low potential fecundity and late sexual maturity. Probably rarely collected as the tegument disintegrates very easily, resulting in a low commercial value of the species.

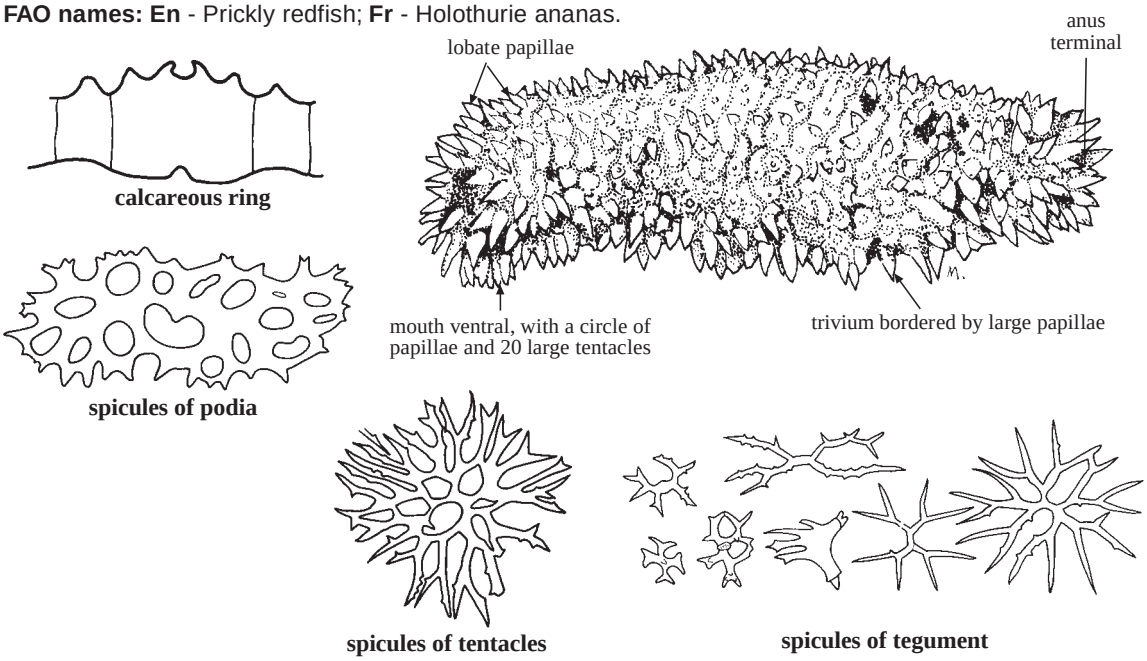
Distribution: Widespread in the tropical Indo-Pacific, excluding Hawaii.



Thelenota ananas (Jaeger, 1833)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Prickly redfish; **Fr** - Holothurie ananas.



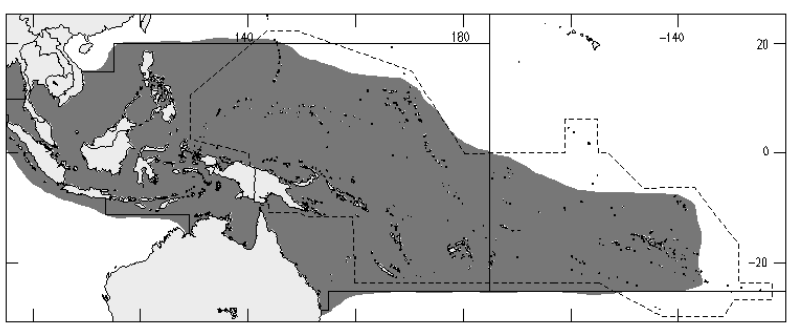
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body firm, rigid, flattened ventrally (trivium). **Bivium entirely covered with characteristic, large, leaf-shaped, lobate papillae**. Trivium with brown to pink podia, more numerous on the radii, their disc about 400 µm in diameter. **Mouth** ventral, **surrounded by a circle of conical papillae** which are larger on dorsal side, **and 20 large, brown tentacles. Anus terminal**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. **Colour:** variable on bivium, reddish orange to brown; trivium generally red; mature gonads deep purple. **Spicules:** tegument with cross-shaped spicules, spiny branched spicules (sometimes with median pillar), perforated plates, pseudo-tables, and grains; branched spicules larger in dorsal tegument and papillae; ventral podia with branched spicules, long rods, and large, multiperforated plates; tentacles with characteristic branched spicules, in form of a "rose-window".

Size: Maximum length about 80 cm, commonly to about 45 cm; mean live weight about 2.5 kg (up to 7 kg); body-wall thickness about 15 mm.

Habitat, biology, and fisheries: A common reef species, mostly found from near the surface to a depth of 25 m; generally occurs on hard bottoms, large rubble and coral patches, on reef slopes and near passes. Populations not reaching very high densities, with a mean of around 0.003/m^2. Sexual reproduction takes place during the warm season. A species with a low potential fecundity and late sexual maturity. Symbiotic pearlfish (Carapidae, Ophidiiformes) are often found in its general cavity. Harvested by hand. Collected by skin diving or using diving gear (if not not banned), making the populations very vulnerable, due to overexploitation. The processed product is of major quality and the demand is still high.

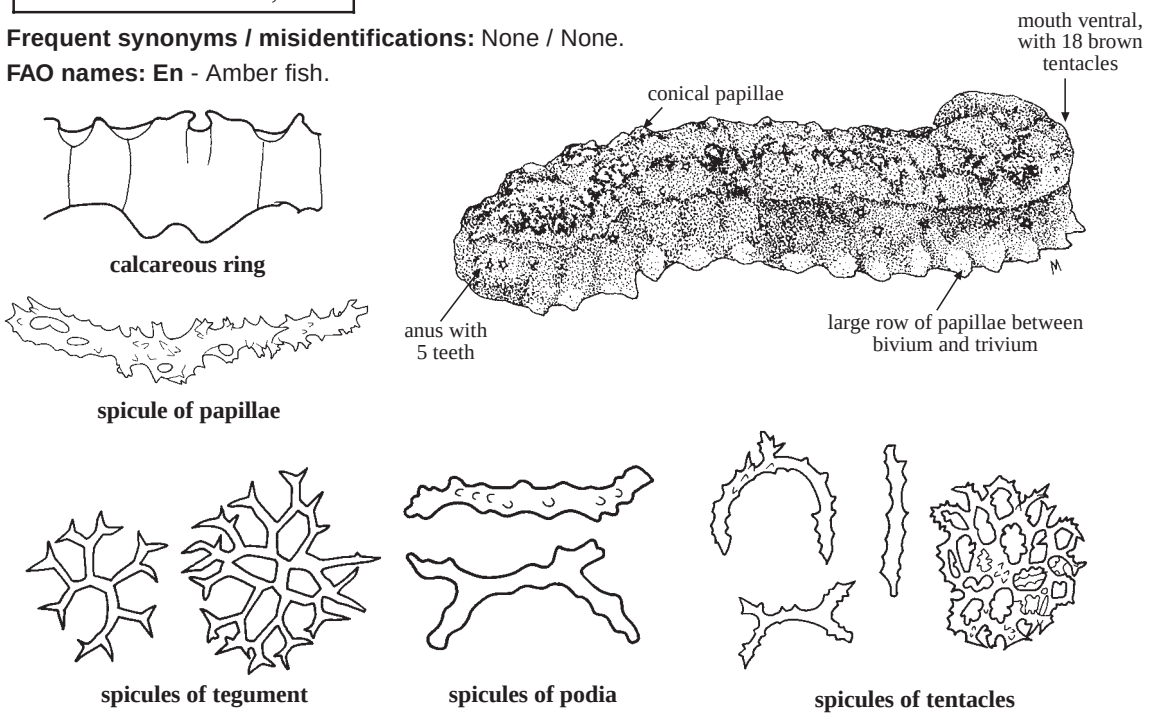
Distribution: Widespread in the tropical Indo-Pacific, excluding Hawaii.



Thelenota anax Clark, 1921

Frequent synonyms / misidentifications: None / None.

FAO names: En - Amber fish.



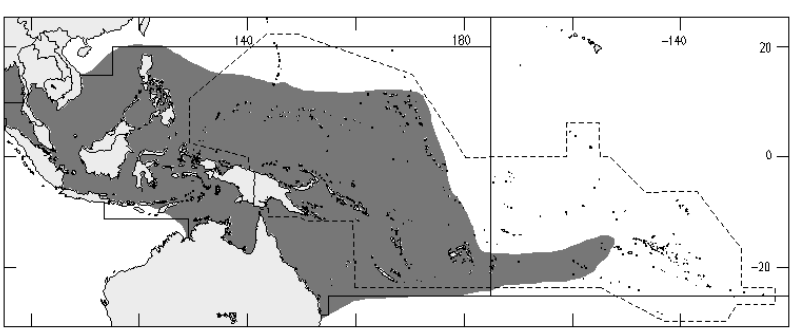
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body firm, rigid, squarish in cross-section, flattened ventrally (trivium). **Bivium entirely covered with numerous characteristic, conical papillae** and minute podia; **bivium demarcated from the trivium by a row of large papillae**. Podia numerous on trivium, with large disc, about 600 µm in diameter. **Mouth** ventral, **surrounded by a circle of 18 large brown tentacles. Anus terminal**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. Cloaca large. **Colour:** bivium cream, with large beige dots; trivium generally beige; mature gonads deep purple. **Spicules:** tegument with branched spicules showing polygonal holes, and spicules in form of a "rose window", mostly abundant in the tentacles; tentacles also with straight, curved, or X-shaped rods; ventral podia with short, smooth rods; dorsal papillae with sparse, very long, spiny rods.

Size: Maximum length about 80 cm, commonly to about 55 cm; mean live weight about 3.5 kg (up to 6 kg); body-wall thickness about 15 mm.

Habitat, biology, and fisheries: A rare reef species, mostly found at depths between 10 and 30 m; generally occurs on hard grounds, large rubbles and sand patches, on reef slopes, outer lagoon and near passes. Populations not reaching high densities, with a mean of around 0.001/m^2. Biology poorly known. Rarely harvested until few years ago, being generally found in low densities. Collected by skin diving or using diving gear (if not banned), making the populations presently very vulnerable, due to overexploitation. The processed product is probably of low to moderate commercial value and the exploitation of this species should be avoided.

Distribution: In the tropical Indian Ocean known from the Glorieuses Islands; in the tropical Pacific, from northern Australia to Enewetok, Guam, the China Sea, and the Ryukyu Islands southwards to New Caledonia, Fiji, and the Society Islands.



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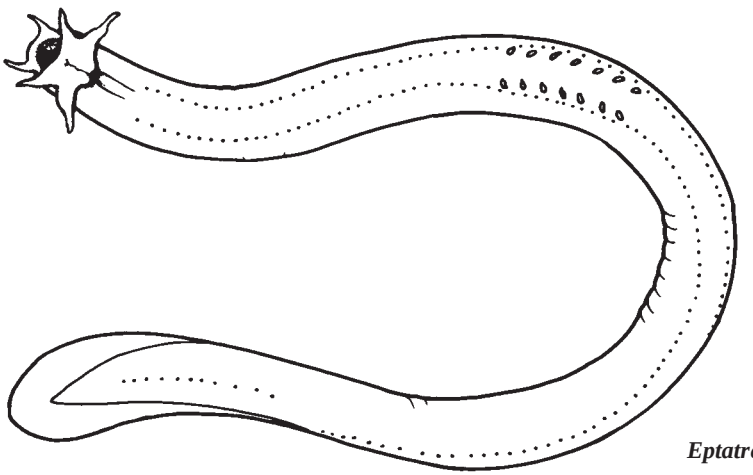
HAGFISHES

by B. Fernholm and J.R. Paxton

MYXINIDAE

Hagfishes

Diagnostic characters: Moderate-sized to large (to 100 cm), **very elongate with eel-shaped body. Mouth with laterally biting horny teeth; no jaws. Eye reduced. Anterior single nostril surrounded by 4 tentacles. No operculum; 1 to 16 pairs of external gill openings. Two ventrolateral rows of slime glands. No paired fins; median fins without rays. No scales. Skeleton cartilaginous.** **Colour:** pink to brown.



Eptatretus cirrhatus

Habitat, biology, and fisheries: Benthic fishes, often burrowing in mud, from inshore to deepsea. Feed as scavengers, mostly on dead or disabled fishes. Rare to common, most efficiently taken in baited traps, of recent commercial interest for skin (eelskin) industry based in Korea.

Remarks: Six genera with about 60 species throughout the world's oceans in tropical and temperate latitudes; tropical species occur in deep water. A revision of the family is needed; the best recent overview is that of Fernholm (1998).

Similar families occurring in the area

None. The laterally biting horny teeth, the separate external gill openings, and the absence of fins with rays are not found, either singly or in combination, in any other fish in the area.

List of species occurring in the area

Eptatretus carlhubbsi McMillan and Wisner, 1984
Eptatretus cirrhatus (Forster, 1801)
Eptatretus strahani McMillan and Wisner, 1984
Eptatretus spp. nov. (to be described by Fernholm from Papua New Guinea and the Philippines)

Reference

Fernholm, B. 1998. Hagfish systematics. In *The biology of hagfishes,* edited by J.M. Jorgensen et al. London, Chapman and Hall, pp. 33-44.

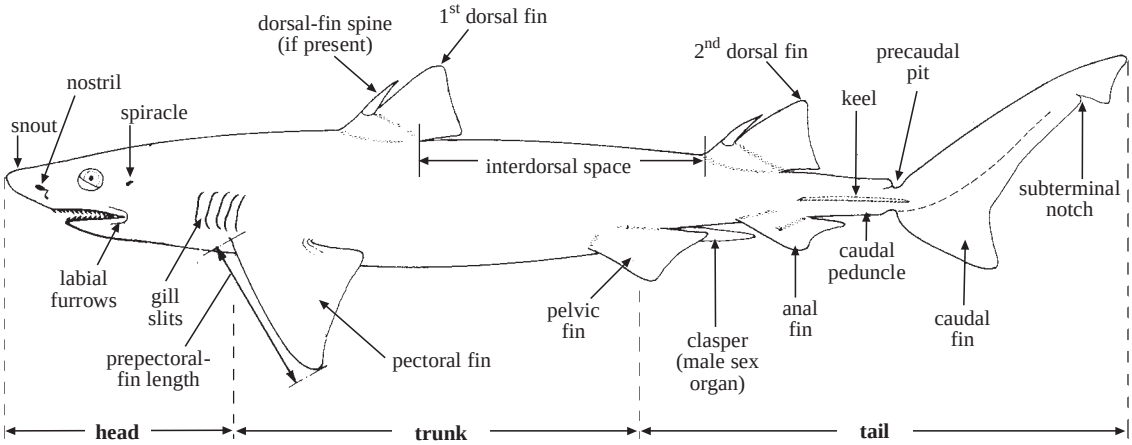
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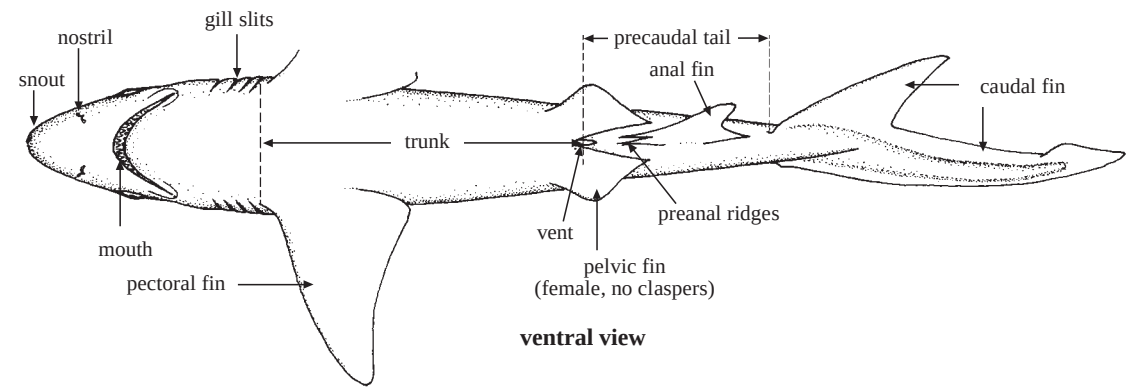
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SHARKS

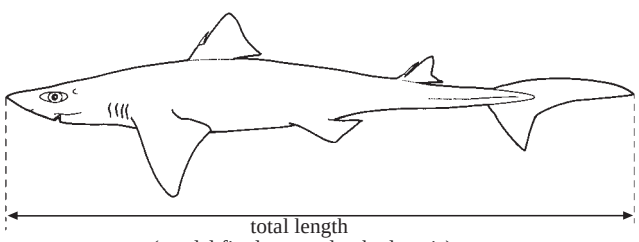
TECHNICAL TERMS AND MEASUREMENTS

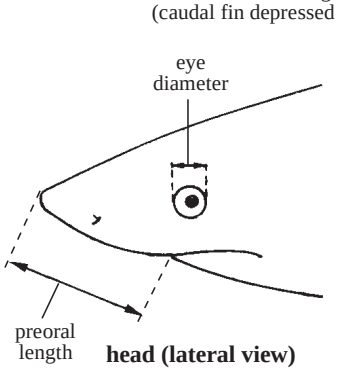
(distance in straight line)



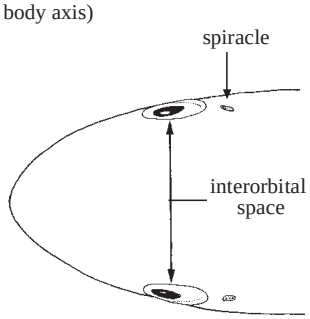


ventral view

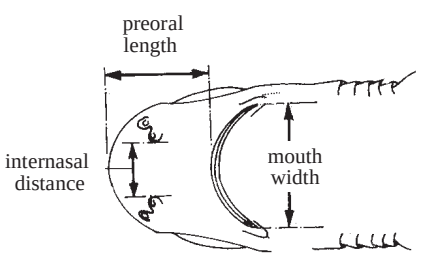




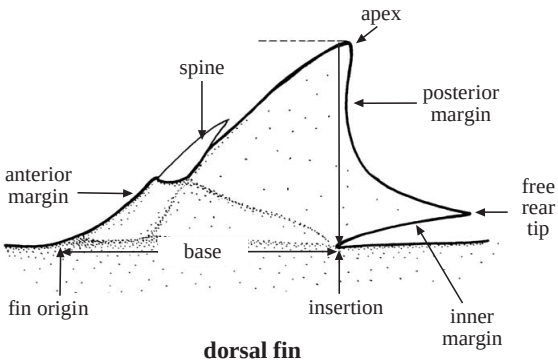
head (lateral view)



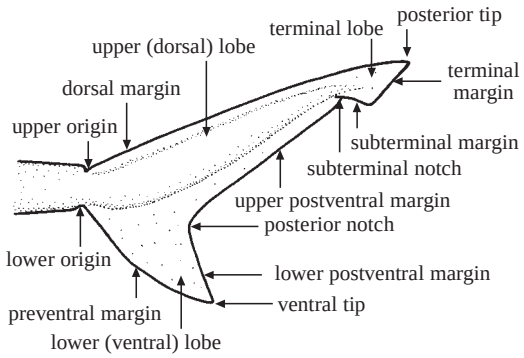
head (dorsal view)



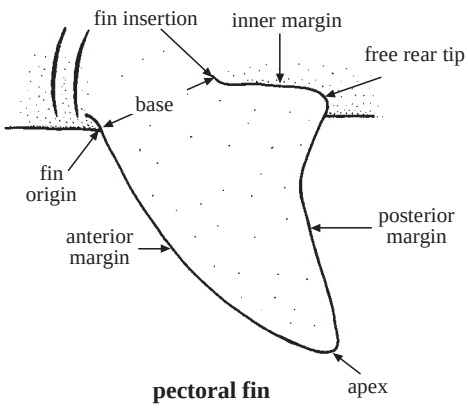
head (ventral view)



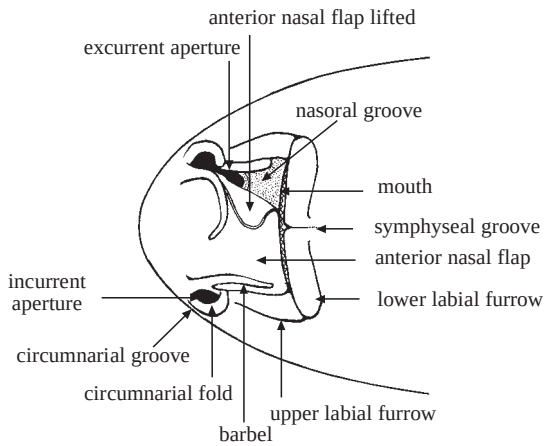
dorsal fin



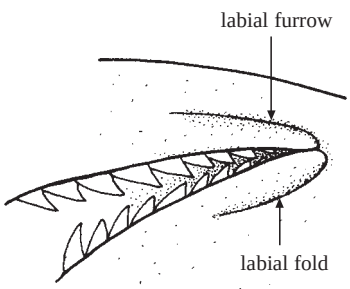
caudal fin



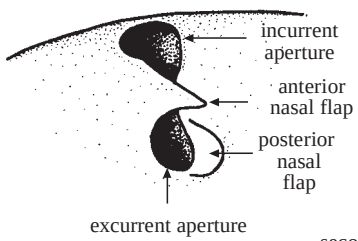
pectoral fin



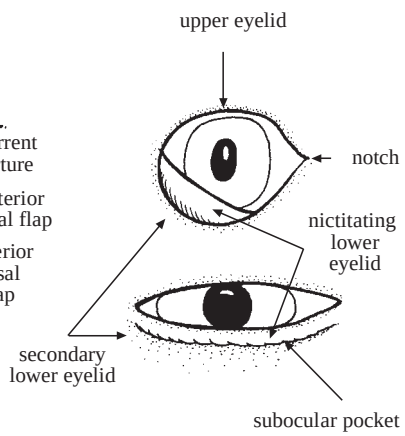
head of an orectoloboid shark (ventral view)



mouth corner



nostril



eye

GENERAL REMARKS

by L.J.V. Compagno

Sharks include a variety of usually cylindrical, elongated, or moderately depressed fishes which differ from the closely related rays or batoids in having lateral gill openings (or gill slits) and pectoral fins not fused to the sides of the head over the gill openings. The greatly depressed angelsharks (family Squatinidae) might be mistaken for rays at first sight; they have large, broad, ray-like pectoral fins that extend as triangular lobes alongside the gill openings, but are not connected to the head above them. Sharks have eyes on the dorsal surface or sides of the head and spiracles (when present) on its dorsal or dorsolateral surfaces. The tail and caudal fin are always well developed and serve to propel the animal by lateral undulations; the pectoral fins are mostly not used for propulsion through the water but aid in stabilizing and steering the shark. There are usually 5 gill openings on each side of the head, rarely 6 or 7. The mouth is usually ventral or subterminal on the head, but terminal or nearly so in a few species. Most sharks have 2 (rarely 1) dorsal fins, sometimes with spines on their front edges; an anal fin is usually present, but missing in several families. The teeth on the jaws are set in numerous transverse rows and are constantly replaced from inside the mouth. All shark species are more or less covered by small (occasionally enlarged) tooth-like placoid scales or dermal denticles.

Male sharks have cylindrical copulatory organs or claspers on their pelvic fins, used for internal fertilization of eggs in females; about 1/3 of the species of sharks have females that deposit eggs in rectangular or conical capsules, formed of a horn-like material (oviparity); the remainder are livebearers. Some livebearing sharks, including many houndsharks (Triakidae), most requiem sharks (Carcharhinidae), and all weasel sharks (Hemigaleidae) and hammerheads (Sphyrnidae) are viviparous (placental viviparous), with yolk sacs of fetuses forming a placenta with the maternal uterus for nutrient transfer; other livebearinq sharks are ovoviviparous (aplacental viviparous), without a placenta. Ovoviviparous lamnoid sharks of the families Odontaspididae, Alopiidae, Lamnidae, and Pseudocarchariidae practice uterine cannibalism, in which one or more fetuses in each uterus resorb their yolk sacs and then devour eggs passed down the oviducts for nutriment (oophagy) and grow to considerable size with massive yolk stomachs before birth. In the Odontaspididae (*Carcharias taurus*) the largest fetus kills and eats its siblings (adelphophagy) and only 1 fetus survives in utero, while several young may cohabit the uterus in the other families. Members of 2 families of carcharhinoid sharks (Proscylliidae and Pseudotriakidae) practice oophagy, but fill their yolk sacs with yolk that they consume. Mature sharks vary in total length from about 15 to 19 cm (dwarf species of Squalidae and Proscylliidae) to 12.1 m or more (whale shark, family Rhincodontidae) and range in weight from between 10 and 20 g to several metric tons. Most sharks are of small or moderate size; about 50% are small, between 15 cm and 1 m; 32% between 1 and 2 m; 14% between 2 and 4 m; and only 4% are over 4 m in total length.

All sharks are predators, with their prey ranging widely, from planktonic crustaceans and benthic invertebrates to pelagic cephalopods, small to large bony fishes, other sharks and rays, marine mammals, and other marine and terrestrial vertebrates. Sharks are primarily marine, but a few requiem sharks (Carcharhinidae, members of the genera *Carcharhinus* and *Glyphis*) have broad salinity tolerances, and one species (bull shark, *Carcharhinus leucas*) is wide-ranging in tropical lakes and rivers with sea access as well as shallow inshore waters. No sharks are known to be confined to fresh water, unlike several species of stingrays (families Dasyatidae and Potamotrygonidae). Sharks are widely distributed in all oceans, from the Arctic to subantarctic islands, and from close inshore on reefs, off beaches, and in shallow, enclosed bays to the lower continental slopes, the abyssal plains, sea mounts and ridges, and the high seas. They are most diverse in continental waters of tropical and warm-temperate seas, from inshore waters down to upper continental slopes, but are less so in colder waters, at great depths (below 1 500 to 2 000 m), in the open ocean and off oceanic islands. The richest shark faunas occur in the Indo-West Pacific from South Africa and the Red Sea to Australia and Japan. The Western Central Pacific (Fishing Area 71 and the southwestern part of Fishing Area 77) has one of the most diverse shark faunas in the world, including approximately 23 families, 69 genera, and between 164 and 188 species. Worldwide there are 33 families, 101 genera, and between 379 to 478 species of sharks (estimate as of 8 August 1995). Several genera and families are poorly known and require further taxonomic study. Many species of sharks are endemic to the area and have restricted ranges within it, several species (including inshore species) are known from 1 or a few museum specimens only, and a wealth of new species have been revealed in deep water, offshore continental, and even inshore habitats in the past forty years (many of which are still undescribed). Undoubtedly more new species and many records of described species will be discovered with further collecting in poorly known parts of the area. Knowledge of the coastal shark fauna of Area 71 beyond Australia is very sketchy, and many maritime countries need further surveys to determine which species occur there. The deep-water shark fauna is very poorly known in the area, except for off northern Australia and a few other localities (such as New Caledonia) where systematic deep-water exploration for fisheries resources is proceeding apace. Basic knowledge of the biology of many species is often very deficient or entirely lacking, and can be supplemented by new information gathered by fisheries workers in the area.

The shark attack hazard has been grossly exaggerated in recent years. Large carcharhinids, sphyrnids and lamnids, and less frequently other sharks, pose a potential threat to people in the water or boats. Large gill nets have been regularly set in the vicinity of popular bathing beaches off Queensland, Australia during the past 3 decades to reduce the number of potentially dangerous sharks. This 'shark meshing' has presumably reduced shark attacks there although few attacks were recorded off Queensland prior to the onset of meshing (unlike New South Wales, where the practice originated, and off South Africa). About 9% of known shark species are definitely known to be dangerous (that is, are known to have been implicated in at least 1 shark attack worldwide), and about 10% more are large enough and sufficiently well-armed to be potentially so; the rest are mostly too small and poorly armed to be a hazard to people. 'Dangerous' is highly relative; perhaps less than 100 shark attacks (and less than 20 fatalities) occur worldwide each year. Sharks are not very dangerous compared to any number of other causes of death or injury to people, including drownings and near-drownings and large terrestrial predators. The 3 shark species most frequently implicated in shark attacks (white shark, tiger shark, and bull shark) do not automatically attack when confronted by people in the water. Great white sharks usually do not attack in such situations. And if biting does occur it is usually restricted to single bites delivered with minimal force. 'Man-eating' does not appear to be an important source of nutrients for any shark. Unfortunately, the shark attack issue has tended to obscure the 'human attack' problem and its implications for shark conservation in the face of burgeoning fisheries driven by the expanding world human population and enormous markets for shark products. It was recognized over the past 4 decades that aspects of the life history strategy of sharks (long lives, long maturation times, and low fecundity, plus relatively large size) made them very vulnerable to overexploitation, and that several targeted shark fisheries had suddenly collapsed after recruitment had been impaired by overexploitation of the breeding stocks. However, only in the past 5 years has there been widespread concern about world trends in fisheries for sharks and other cartilaginous fishes. After the second world war world fisheries for chondrichthyan fishes essentially tripled in reported catches to FAO, which has not kept pace with the approximately fourfold increases in total fisheries worldwide. Much of the catch is as bycatch in fisheries driven by larger catches of exploitation-resistant bony fishes with far higher fecundity. World catches of cartilaginous fishes reported to FAO have leveled off in the 5-year period 1988 to 1992 to about 690 thousand metric tonnes, which may indicate that there is little scope for further increases in catches. Some sharks have been accorded limited or total protection in a number of developed countries, yet on a world basis shark exploitation is mostly unregulated and out of control nationally and regionally. In the next decade international agreements, including CITES listings, will likely occur to protect a variety of sharks and other cartilaginous fishes from excessive exploitation.

In the Western Central Pacific, sharks are used mainly for human food; shark meat is marketed fresh, frozen, and especially dried-salted. Sharks are utilized on the oriental market for fins; also for liver oil, fishmeal, and possibly for leather, although details of utilization in the area are sketchy. The total catch of sharks reported from Fishing Area 71 is uncertain; total catches of cartilaginous fishes in the area was approximately 119 000 t in 1995, of which about 59 000 t were reported as rays (batoids), 52 000 t mixed sharks and rays and about 8 000 t were sharks. If the mixed sharks and rays included 55% sharks the 1995 shark catch is roughly 37 000 t; the actual landings of sharks in the area are doubtlessly much higher. Catches in the section of Area 77 included in this work were relatively small and may add roughly 6 000 t of chondrichthyans to the 1995 total. The present area had the second highest catches of cartilaginous fishes worldwide in 1995, being surpassed only by FAO Area 51 (Western Indian Ocean, with 145 000 t). The present area includes Indonesia, which in 1995 had the second highest cartilaginous fish catch of any nation (75 000 t, compared to India with 86 000 t), the next highest countries being Pakistan, Taiwan Province of China, and the USA. Malaysia had a catch of about 19 000 t, Thailand and Philippines had catches of about 9 000 t each, and the Korean Republic took about 10 000 t in the area in 1995. Data on gear used in the area is sketchy, but line gear (including pelagic longlines), fixed and floating gill nets, bottom trawls, fixed fish traps, and purse seines are used to target sharks or take sharks as a bycatch. Sharks are taken in artisanal fisheries, by local inshore and offshore commercial fisheries, and by large fishing fleets in offshore waters. Requiem sharks (Carcharhinidae) are especially important, but considerable numbers of threshers (Alopiidae) and makos (Lamnidae, genus *Isurus* are fished offshore, and a number of other families, including longtailed carpetsharks (Hemiscylliidae), zebra sharks (Stegostomatidae), nurse sharks (Ginglymostomatidae), weasel sharks (Hemigaleidae), and hammerheads (Sphyrnidae) are commonly taken in inshore fisheries. Dogfish (family Squalidae) are important in offshore deep-set longline fisheries targeting sharks for liver oil.

KEY TO FAMILIES OCCURRING IN THE AREA

1a. No anal fin (Figs 1 to 4) . . . . . → **2**

1b. Anal fin present . . . . . → **5**

2a. Body strongly depressed and ray-like; pectoral fins greatly enlarged, with anterior triangular lobes that overlap gill slits; mouth terminal (Fig. 1) . . . . . **Squatinidae** (p. 1235)

2b. Body cylindrical, compressed, or slightly depressed, not ray-like; pectoral fins small, without anterior lobes; mouth ventral . . . . . → **3**

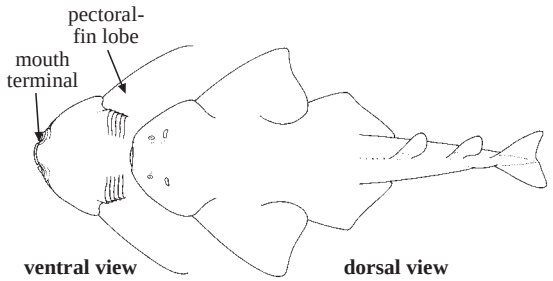


Fig. 1 Squatinidae

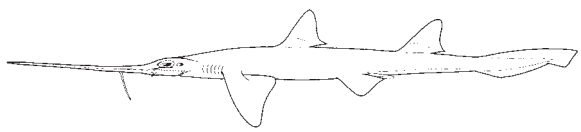


Fig. 2 Pristiophoridae

3a. Snout flattened and elongated, saw-like (Fig. 2) . . . . . **Pristiophoridae** (p. 1233)

3b. Snout normal, not saw-like . . . . . → **4**

4a. First dorsal fin behind pelvic-fin origins; dermal denticles moderately large or very large, thorn-like (Fig. 3) . . . . . **Echinorhinidae** (p. 1211)

4b. First dorsal fin partially or entirely in front of pelvic-fin origins (Fig. 4); dermal denticles small to moderately large, variable in shape . . . . . **Squalidae** (p.1213)

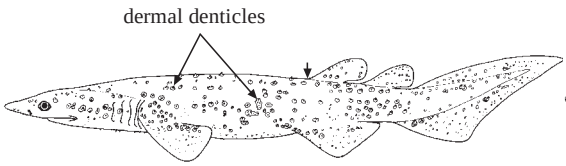


Fig. 3 Echinorhinidae

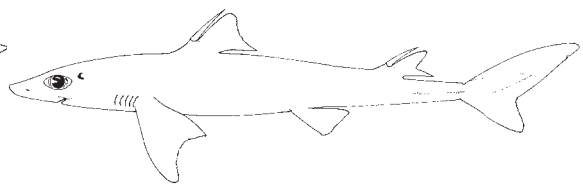


Fig. 4 Squalidae

5a. Only 1 dorsal fin, far posterior on back; 6 or 7 gill slits on each side (Fig. 5) . . . . . **Hexanchidae** (p. 1208)

5b. Two dorsal fins (except the scyliorhinid *Pentanchus profundicolus* with 1 dorsal fin); 5 gill slits on each side . . . . . → **6**

6a. A strong spine on each dorsal fin (Fig. 6) . . . . . **Heterodontidae** (p. 1238)

6b. Dorsal fins without spine . . . . . → **7**

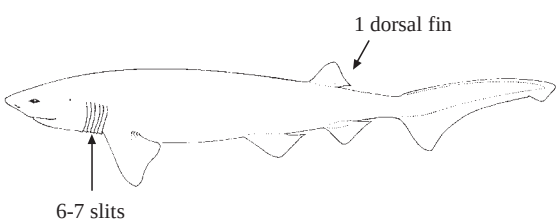


Fig. 5 Hexanchidae

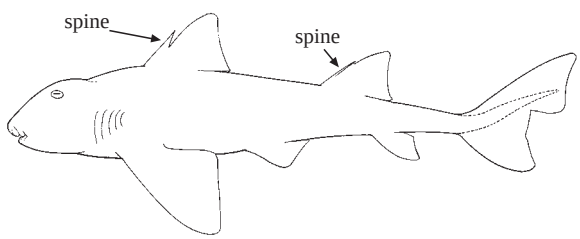


Fig. 6 Heterodontidae

7a. Head with lateral expansions or blades, like a double-edged axe (Fig. 7) . . . **Sphyrnidae** (p. 1361)
7b. Head normal, not expanded laterally . . . . . → **8**

8a. Eyes behind mouth; deep nasoral grooves connecting nostrils and mouth (Fig. 8a) . . . . . → **9**
8b. Eyes partly or entirely over mouth; nasoral grooves usually absent (Fig. 8b), when present (*Atelomycterus* in family Scyliorhinidae) broad and shallow . . . . . → **15**

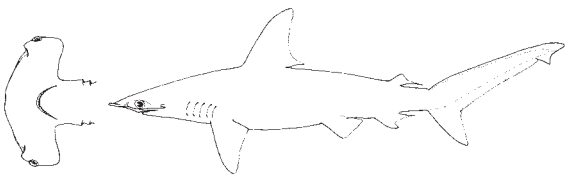


Fig. 7 Sphyrnidae

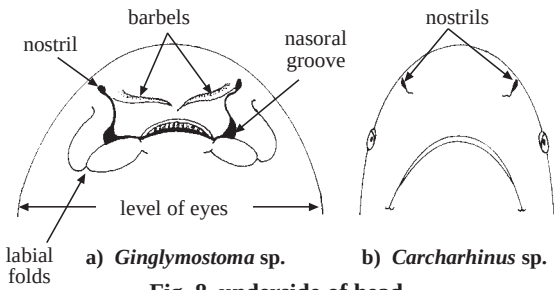


Fig. 8 underside of head

9a. Mouth huge and nearly terminal; external gill slits very large, internal gill slits inside mouth cavity with filter screens; caudal peduncle with strong lateral keels; caudal fin with a strong ventral lobe, but without a strong terminal lobe and subterminal notch (Fig. 9) . . . . . **Rhincodontidae (= Rhiniodontidae)** (p. 1263)
9b. Mouth smaller and subterminal; external gill slits small, internal gill slits without filter screens; caudal peduncle without strong lateral keels; caudal fin with a weak ventral lobe or none, but with a strong terminal lobe and subterminal notch (Fig. 10) . . . . . → **10**

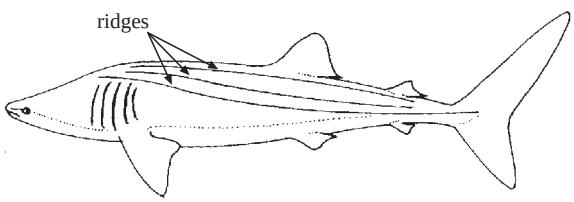


Fig. 9 Rhincodontidae

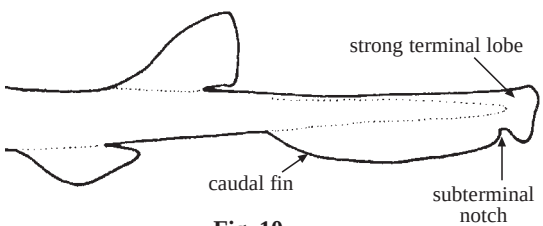


Fig. 10

10a. Caudal fin about as long as rest of shark (Fig. 11) . . . . . **Stegostomatidae** (p. 1262)
10b. Caudal fin much shorter than rest of shark . . . . . → **11**

11a. Head and body greatly flattened, head with skin flaps on sides; 2 rows of large, fang-like teeth at symphysis of upper jaw and 3 in lower jaw (Fig. 12) . . . . . **Orectolobidae** (p. 1245)
11b. Head and body cylindrical or moderately flattened, head without skin flaps; teeth small, not enlarged and fang-like at symphysis . . . . . → **12**

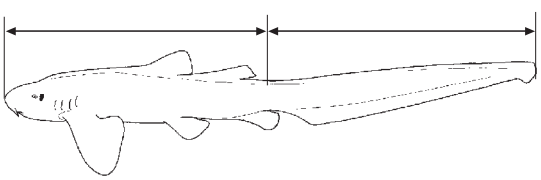


Fig. 11 Stegostomatidae

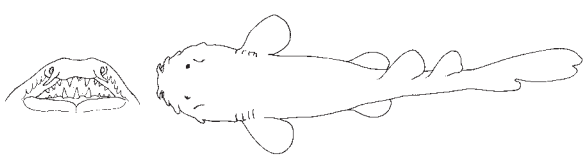


Fig. 12 Orectolobidae

12a. No lobe and groove around outer edges of nostrils (Fig. 13) . . . . **Ginglymostomatidae** (p. 1260)
12b. A lobe and groove around outer edges of nostrils (Fig. 14) . . . . . → **13**

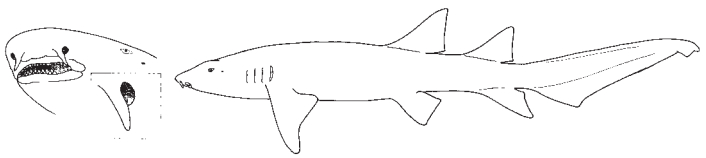


Fig. 13 Ginglymostomatidae

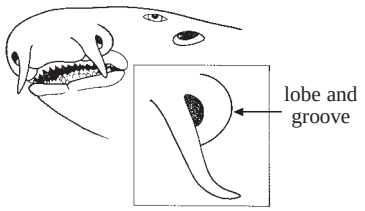


Fig. 14

13a. Spiracles minute; origin of anal fin well in front of second dorsal-fin origin, separated from lower caudal-fin origin by space equal or greater than its base length (Fig. 15) . . . . . **Parascylliidae** (p. 1241)
13b. Spiracles large; origin of anal fin well behind second dorsal-fin origin, separated from lower caudal-fin origin by space less than its base length . . . . . → **14**

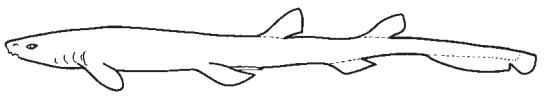


Fig. 15 Parascylliidae

14a. Nasal barbels very large; anal fin high and angular; distance from vent to lower caudal-fin origin shorter than distance from snout to vent (Fig. 16) . . . . **Brachaeluridae** (p. 1243)
14b. Nasal barbels short; anal fin low, rounded and keel-like; distance from vent to lower caudal-fin origin longer than distance from snout to vent (Fig. 17) . . . . . **Hemiscylliidae** (p. 1249)

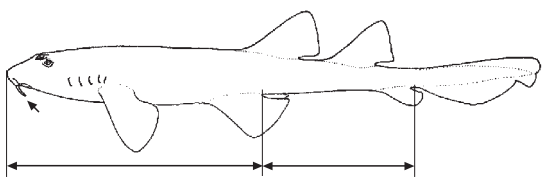


Fig. 16 Brachaeluridae

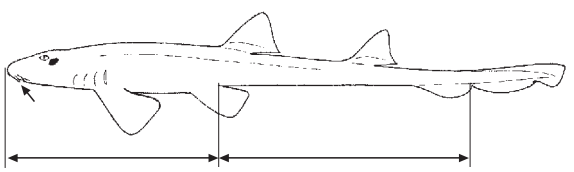


Fig. 17 Hemiscylliidae

15a. A strong keel present on each side of caudal peduncle; caudal fin crescentic and nearly symmetrical, with a long lower lobe (Fig. 18) . . . . . **Lamnidae** (p. 1274)
15b. No keels on caudal peduncle, or weak ones (*Pseudocarcharias* in Pseudocarchariidae, *Galeocerdo* and *Prionace* in Carcharhinidae); caudal fin asymmetrical, not crescentic, with ventral lobe relatively short or absent . . . . . → **16**

16a. Caudal fin about as long as rest of shark (Fig. 19) . . . . . **Alopiidae** (p. 1269)
16b. Caudal fin less than half the length of rest of shark . . . . . → **17**

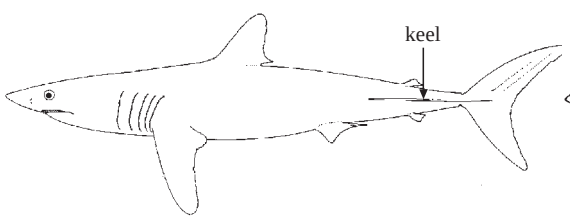


Fig. 18 Lamnidae

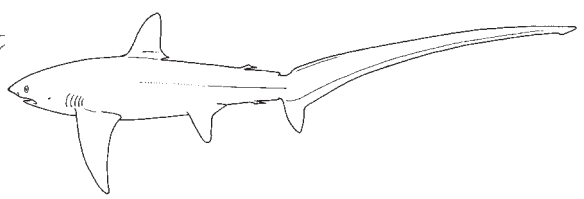


Fig. 19 Alopiidae

17a. No nictitating eyelids (Fig. 20a), largest teeth in mouth are 2 or 3 rows of anteriors on either side of lower jaw symphysis; upper anteriors separated from large lateral teeth at sides of jaw by a gap that may have 1 or more rows of small intermediate teeth (Fig. 20b); all gill slits in front of pectoral fins (Figs 22 and 23) . . . . . → **18**

17b. Nictitating eyelids present (Fig. 21a); largest teeth in mouth are well lateral on dental band, not on either side of symphysis; no gap or intermediate teeth separating large anterior teeth from still larger teeth in upper jaw (Fig. 21b); last 1 or 2 gill slits over pectoral-fin bases . . . . . → **19**

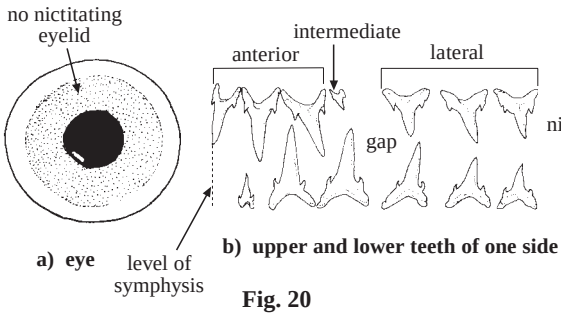


Fig. 20

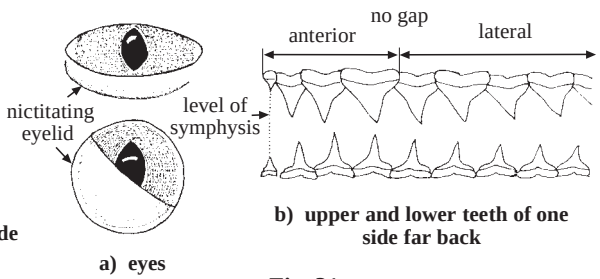


Fig. 21

18a. Eyes very large; gill slits extending onto upper surface of head; both upper and lower precaudal pits present; a low keel on each side of caudal peduncle (Fig. 22) . . . . . **Pseudocarchariidae** (p. 1268)

18b. Eyes smaller; gill slits not extending onto upper surface of head; lower precaudal pit absent; no keels on caudal peduncle (Fig. 23) . . . . . **Odontaspididae** (p. 1264)

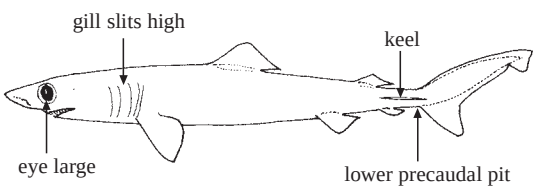


Fig. 22 Pseudocarchariidae

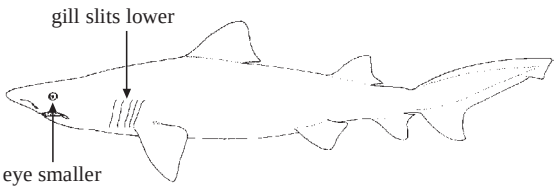


Fig. 23 Odontaspididae

19a. Origin of first dorsal fin over or behind pelvic-fin bases (Fig. 24) . . . . . **Scyliorhinidae** (p. 1279)

19b. Origin of first dorsal fin well ahead of pelvic-fin bases . . . . . → **20**

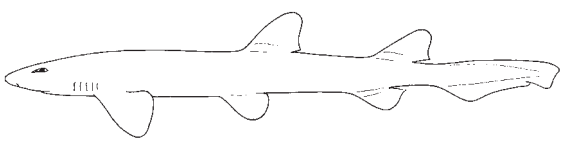


Fig. 24 Scyliorhinidae

20a. No precaudal pits, dorsal caudal-fin margin smooth (Fig. 25) . . . . . → **21**

20b. Precaudal pits and rippled dorsal caudal margin present (ripples sometimes irregular in *Scoliodon* and *Triaenodon* of family Carcharhinidae) (Fig. 26) . . . . . → **23**

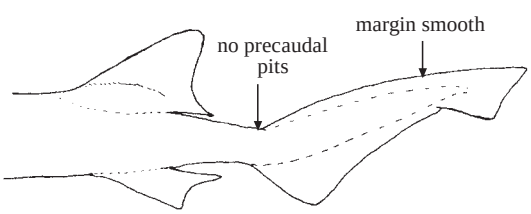


Fig. 25

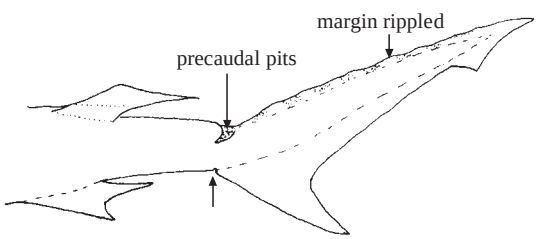


Fig. 26

21a. First dorsal fin long, about the length of caudal fin, and formed as a low, rounded keel; adults with over 200 rows of teeth in each jaw; spiracles nearly or quite as long as eyes (Fig. 27) . . . **Pseudotriakidae** (p. 1296)

21b. First dorsal fin short, about 2/3 of caudal fin or less; subtriangular in shape; adults with less than 110 rows of teeth in each jaw; spiracles much smaller than eyes . . . . . → **22**

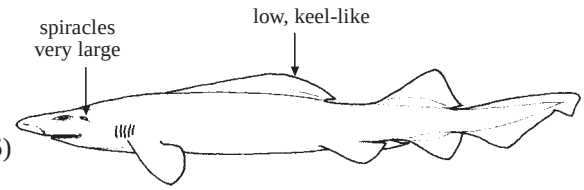


Fig. 27 Pseudotriakidae

22a. Labial furrows very short or absent, confined to extreme mouth corners; posterior teeth comb-like; base of first dorsal fin closer to pelvic-fin bases than to pectoral-fin bases (Fig. 28) . . . . . **Proscylliidae** (p. 1293)

22b. Labial furrows longer, extending anteriorly for a greater or lesser distance on lips; posterior teeth not comb-like; base of first dorsal fin either equidistant between pectoral and pelvic-fin bases or closer to pectoral-fin bases (Fig. 29) . . . . . **Triakidae** (p. 1297)

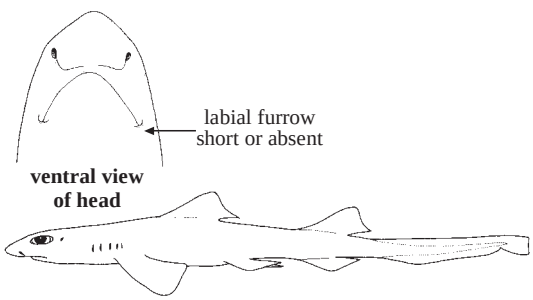


Fig. 28 Proscylliidae

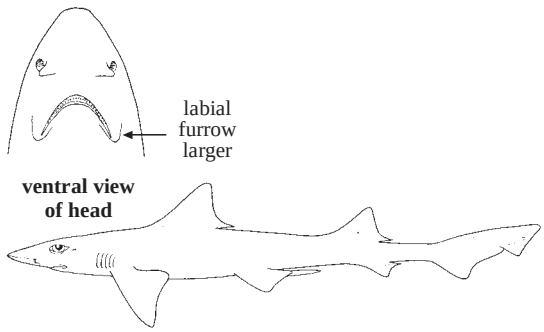


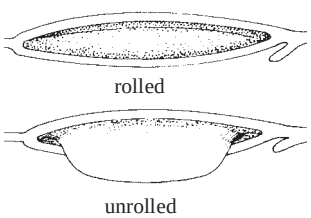
Fig. 29 Triakidae

23a. Intestine with a spiral valve (Fig. 30a) having 4 to 6 turns . . . . . **Hemigaleidae** (p. 1305)

23b. Intestine with a scroll valve (Figs 30b and 32) . . . . . **Carcharhinidae** (p. 1312)



a) spiral valve



b) scroll valve

Fig. 30

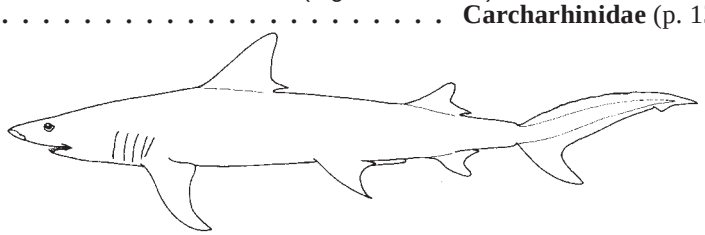


Fig. 31 Hemigaleidae

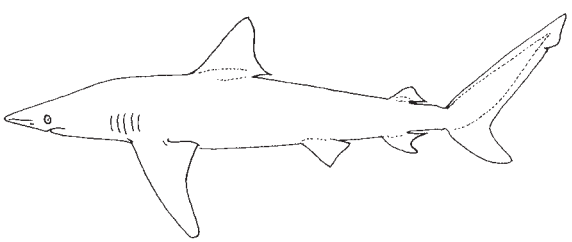


Fig. 32 Carcharhinidae

LIST OF FAMILIES AND SPECIES OCCURRING IN THE AREA

The symbol ✓ is given when species accounts are included. A question mark indicates that presence in the area is uncertain.

HEXANCHIDAE: Sixgill and sevengill sharks, cow sharks
✓ *Heptranchias perlo* (Bonnaterre, 1788)

✓ *Hexanchus griseus* (Bonnaterre, 1788)
✓ *Hexanchus nakamurai* Teng, 1962

ECHINORHINIDAE: Bramble sharks
✓ *Echinorhinus brucus* (Bonnaterre, 1788)
✓ *Echinorhinus cookei* Pietschmann, 1928

SQUALIDAE: Dogfish sharks
✓ *Centrophorus atromarginatus* Garman, 1906
✓ *Centrophorus granulosus* (Bloch and Schneider, 1801)
? *Centrophorus isodon* (Chu, Meng, and Liu, 1981)
? *Centrophorus lusitanicus* Bocage and Capello, 1864
✓ *Centrophorus moluccensis* Bleeker, 1860
✓ *Centrophorus niaukang* Teng, 1959
✓ *Centrophorus squamosus* (Bonnaterre, 1788)
Centrophorus sp. [New Caledonia]

Centroscyllium cf. *kamoharai* Abe, 1966

Centroscymnus coelolepis Bocage and Capello, 1864

✓ *Cirrhigaleus barbifer* Tanaka, 1912

✓ *Dalatias licha* (Bonnaterre, 1788)

? *Deania calcea* (Lowe, 1839)
✓ *Deania profundorum* (Smith and Radcliffe, 1912)
✓ *Deania quadrispinosa* (McCulloch, 1915)

? *Etmopterus baxteri* Garrick, 1957
✓ *Etmopterus brachyurus* Smith and Radcliffe, 1912
? *Etmopterus decacuspidatus* Chan, 1966
? *Etmopterus granulosus* (Günther, 1880)
✓ *Etmopterus lucifer* Jordan and Snyder, 1902
✓ *Etmopterus molleri* Whitley, 1939
? *Etmopterus princeps* Collett, 1904
✓ *Etmopterus splendidus* Yano, 1988
? *Etmopterus unicolor* (Engelhardt, 1912)
? *Etmopterus* sp. C [Last and Stevens, 1994]
✓ *Etmopterus* sp. D [Last and Stevens, 1994]
✓ *Etmopterus* sp. F [Last and Stevens, 1994]

✓ *Euprotomicrus bispinatus* (Quoy and Gaimard, 1824)

✓ *Isistius brasiliensis* (Quoy and Gaimard, 1824)

✓ *Scymnodon squamulosus* (Günther, 1877)

? *Somniosus pacificus* Bigelow and Schroeder, 1944

✓ *Squaliolus aliae* Teng, 1959
✓ *Squaliolus laticaudus* Smith and Radcliffe, 1912

✓ *Squalus japonicus* Ishikawa, 1908
✓ *Squalus megalops* (Macleay, 1881)
✓ *Squalus melanurus* Fourmanoir and Rivaton, 1979
✓ *Squalus mitsukurii* Jordan and Snyder, 1903
✓ *Squalus rancureli* Fourmanoir and Rivanton, 1979
✓ *Squalus* sp. A [Last and Stevens, 1994]
✓ *Squalus* sp. B [Last and Stevens, 1994]
✓ *Squalus* sp. F [Last and Stevens, 1994]

PRISTIOPHORIDAE: Sawsharks
- *Pristiophorus* sp. B [Last and Stevens, 1994] (Australia)
- *Pristiophorus* sp. (Philippines)

SQUATINIDAE: Angelsharks
- *Squatina australis* Regan, 1906
- *Squatina japonica* Bleeker, 1858
- *Squatina* sp. A [Last and Stevens, 1994]

HETERODONTIDAE: Bullhead sharks
- *Heterodontus galeatus* (Günther, 1870)
- *Heterodontus portusjacksoni* (Meyer, 1793)
- *Heterodontus zebra* (Gray, 1831)

PARASCYLLIIDAE: Collared carpetsharks
- *Cirrhoscyllium expolitum* Smith and Radcliffe, 1913
- *Parascyllium collare* Ramsay and Ogilby, 1888

BRACHAELURIDAE: Blind sharks
- *Brachaelurus waddi* (Bloch and Schneider, 1801)
- *Heteroscyllium colcloughi* (Ogilby, 1908)

ORECTOLOBIDAE: Wobbegongs
- *Eucrossorhinus dasypogon* (Bleeker, 1867)
- *Orectolobus japonicus* Regan, 1906
- *Orectolobus maculatus* (Bonnaterre, 1788)
- *Orectolobus ornatus* (de Vis, 1883)
- *Orectolobus wardi* Whitley, 1939

HEMISCYLLIIDAE: Longtail carpetsharks
- *Chiloscyllium griseum* Müller and Henle, 1839
- *Chiloscyllium hasselti* Bleeker, 1852
- *Chiloscyllium indicum* (Gmelin, 1789)
- *Chiloscyllium plagiosum* (Bennett, 1830)
- *Chiloscyllium punctatum* Müller and Henle, 1838
- *Hemiscyllium freycineti* (Quoy and Gaimard, 1824)
- *Hemiscyllium hallstromi* Whitley, 1967
- *Hemiscyllium ocellatum* (Bonnaterre, 1788)
- *Hemiscyllium strahani* Whitley, 1967
- *Hemiscyllium trispeculare* Richardson, 1845

GINGLYMOSTOMATIDAE: Nurse sharks
- *Nebrius ferrugineus* (Lesson, 1830)

STEGOSTOMATIDAE: Zebra sharks
- *Stegostoma fasciatum* (Hermann, 1783)

RHINCODONTIDAE: Whale sharks
- *Rhincodon typus* Smith, 1828

ODONTASPIDIDAE: Sand tiger sharks
- *Carcharias taurus* Rafinesque, 1810
- ? *Odontaspis ferox* (Risso, 1810)

PSEUDOCARCHARIIDAE: Crocodile sharks
- *Pseudocarcharias kamoharai* (Matsubara, 1936)

ALOPIIDAE: Thresher sharks
- *Alopias pelagicus* Nakamura, 1935
- *Alopias superciliosus* (Lowe, 1839)
- *Alopias vulpinus* (Bonnaterra, 1788)

LAMNIDAE: Mackerel sharks
- *Carcharodon carcharias* (Linnaeus, 1758)

- *Isurus oxyrinchus* Rafinesque, 1810
- *Isurus paucus* Guitart Manday, 1966

SCYLIORHINIDAE: Catsharks
- ? *Apristurus acanutus* Chu, Meng, and Li in Meng, Chu, and Li, 1985
- ? *Apristurus gibbosus* Meng, Chu, and Li, 1985
- *Apristurus herklotsi* (Fowler, 1934)
- *Apristurus longicephalus* Nakaya, 1975
- ? *Apristurus macrostomus* Meng, Chu, and Li, 1985
- ? *Apristurus micropterygeus* Meng, Chu, and Li in Chu, Meng, and Li, 1986
- *Apristurus sibogae* (Weber, 1913)
- ? *Apristurus sinensis* Chu and Hu in Chu, Meng, Hu, and Li, 1981
- *Apristurus spongiceps* (Gilbert, 1895)
- *Apristurus verweyi* (Fowler, 1934)

Apristurus sp. A [Last and Stevens, 1994]
Apristurus sp. B [Last and Stevens, 1994]
Apristurus sp. G [Last and Stevens, 1994]
Apristurus sp. [Seret] (New Caledonia)
Apristurus sp. [Seret] (Philippines)
Apristurus sp. [Seret] (Indonesia)

Asymbolus sp. E [Last and Stevens, 1994]
Asymbolus sp. [Seret] (New Caledonia)

- *Atelomycterus fasciatus* Compagno and Stevens, 1993
- *Atelomycterus macleayi* Whitley, 1939
- *Atelomycterus marmoratus* (Bennett, 1830)

- *Aulohalaelurus kanakorum* Seret, 1990

- *Cephaloscyllium fasciatum* Chan, 1966

Cephaloscyllium sp. [Compagno, 1984, 1988]
Cephaloscyllium sp. [J.Randall, pers. comm. 1994] (Papua New Guinea)
Cephaloscyllium sp. [Seret] (New Caledonia)
Cephaloscyllium sp. B [Last and Stevens, 1994]
Cephaloscyllium sp. C [Last and Stevens, 1994]
Cephaloscyllium sp. D [Last and Stevens, 1994]
Cephaloscyllium sp. E [Last and Stevens, 1994]

- *Galeus boardmani* (Whitley, 1928)
- *Galeus eastmani* (Jordan and Snyder, 1904)
- *Galeus gracilis* Compagno and Stevens, 1993
- *Galeus sauteri* (Jordan and Richardson, 1909)
- *Galeus schultzi* Springer, 1979

Galeus sp. B. [Last and Stevens, 1994]

- ? *Halaelurus immaculatus* Chu and Meng, 1982
- *Halaelurus boesemani* Springer and D'Aubrey, 1972
- ? *Halaelurus buergeri* (Müller and Henle, 1838)

- *Parmaturus melanobranchius* (Chan, 1966)

Parmaturus sp. A [Last and Stevens, 1994]
- ? *Parmaturus* sp. [Seret] (Indonesia)

- *Pentanchus profundicolus* Smith and Radcliffe, 1912

- *Scyliorhinus garmani* (Fowler, 1934)
- *Scyliorhinus torazame* (Tanaka, 1908)

PROSCYLLIIDAE: Finback catsharks
- *Eridacnis radcliffei* Smith, 1913

- *Gollum attenuatus* (Garrick, 1954)

- *Proscyllium habereri* Hilgendorf, 1904

PSEUDOTRIAKIDAE: False catsharks
- *Pseudotriakis microdon* Capello, 1968

TRIAKIDAE: Houndsharks
- *Galeorhinus galeus* (Linnaeus, 1758)
- *Gogolia filewoodi* Compagno, 1973
- *Hemitriakis abdita* Compagno and Stevens, 1993
- ? *Hemitriakis japanica* (Müller and Henle, 1839)
- *Hemitriakis leucoperiptera* Herre, 1923
  Hemitriakis sp. [Compagno, 1988] (Philippines)
- *Hypogaleus hyugaensis* (Miyosi, 1939)
- *Iago garricki* Fourmanoir, 1979
- *Mustelus antarcticus* Günther, 1870
- *Mustelus griseus* Pitschmann, 1908
- *Mustelus manazo* Bleeker, 1854
  Mustelus cf. *manazo* [Seret, pers. comm. 1994]
  Mustelus sp. A [Last and Stevens, 1994]
  Mustelus sp. B [Last and Stevens, 1994]
- ? *Triakis scyllium* Müller and Henle, 1839

HEMIGALEIDAE: Weasel sharks
- *Chaenogaleus macrostoma* (Bleeker, 1852)
- *Hemigaleus microstoma* Bleeker, 1852
  Hemigaleus sp. aff. "*microstoma*"
- *Hemipristis elongata* (Klunzinger, 1871)
- *Paragaleus tengi* (Chen, 1963)

CARCHARHINIDAE: Requiem sharks
- *Carcharhinus albimarginatus* (Rüppell, 1837)
- *Carcharhinus altimus* (Springer, 1950)
- *Carcharhinus amblyrhynchos* (Bleeker, 1856)
- *Carcharhinus amboinensis* (Müller and Henle, 1839)
- *Carcharhinus borneensis* (Bleeker, 1859)
- *Carcharhinus brachyurus* (Günther, 1870)
- *Carcharhinus brevipinna* (Müller and Henle, 1839)
- *Carcharhinus cautus* (Whitley, 1945)
- *Carcharhinus dussumieri* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus falciformis* (Bibron in Müller and Henle, 1839)
- *Carcharhinus fitzroyensis* (Whitley, 1943)
- *Carcharhinus galapagensis* (Snodgrass and Heller, 1905)
- *Carcharhinus hemiodon* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus leucas* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus limbatus* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus longimanus* Poey, 1861)
- *Carcharhinus melanopterus* (Quoy and Gaimard, 1824)
- *Carcharhinus obscurus* (LeSueur, 1818)
- *Carcharhinus plumbeus* (Nardo, 1827)
- *Carcharhinus sealei* (Pietschmann, 1916)
- *Carcharhinus sorrah* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus tilstoni* (Whitley, 1950)
- *Carcharhinus* sp. (= "*Carcharhinus porosus*")
- *Galeocerdo cuvier* (Peron and LeSueur in LeSueur, 1822)
- *Glyphis* sp. A [Last and Stevens, 1994] (Queensland)
- *Glyphis* sp. B [Compagno] (Borneo)
- *Glyphis* sp. C [Compagno] (New Guinea, Australia)
- *Lamiopsis temmincki* (Müller and Henle, 1839)

- *Loxodon macrorhinus* Müller and Henle, 1839
- *Negaprion acutidens* (Rüppell, 1837)
- *Prionace glauca* (Linnaeus, 1758)
- *Rhizoprionodon acutus* (Rüppell, 1837)
- *Rhizoprionodon oligolinx* Springer, 1964
- *Rhizoprionodon taylori* (Ogilby, 1915)
- *Scoliodon laticaudus* Müller and Henle, 1838
- *Triaenodon obesus* (Rüppell, 1837)

SPHYRNIDAE: Hammerhead sharks

- *Eusphyra blochii* (Cuvier, 1817)
- *Sphyrna lewini* (Griffith and Smith in Cuvier, Griffith and Smith, 1834)
- *Sphyrna mokarran* (Rüppell, 1837)
- *Sphyrna zygaena* (Linnaeus, 1758)

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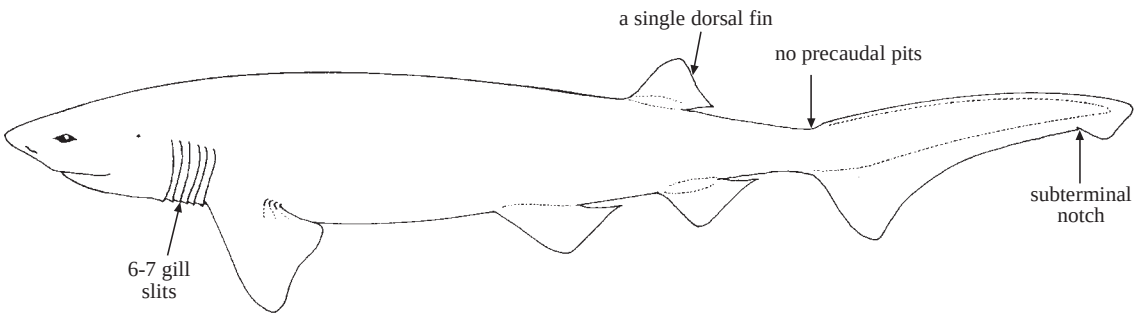
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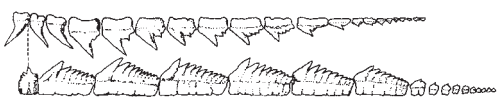
HEXANCHIDAE

Cowsharks, sixgill, and sevengill sharks

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Small to large sharks with slender to stout bodies. Head with **6 or 7 pairs of long gill slits**, the last pair in front of pectoral-fin origins**, the first pair not connected across throat;** short dermal gill rakers present on inner gill slits; spiracles present, small; nostrils without barbels or nasoral grooves; no nictitating lower eyelids; snout short, acutely to bluntly pointed; mouth very long and extending far behind eyes; **teeth of upper and lower jaws unlike at sides of mouth,** uppers small, narrow, with a main cusp and often smaller cusplets, **lowers very large, broad, compressed, and saw-like,** with a series of cusps or large cusplets. A single dorsal fin, posterior to pelvic fins; anal fin present; caudal fin much less than 1/2 the total length, strongly asymmetrical, with a pronounced subterminal notch but lower lobe very short. Caudal peduncle not depressed, without keels; no precaudal pits. Intestinal valve of spiral type. **Colour:** grey, blackish, or brown above, lighter below.





teeth of left side (*Hexanchus griseus*)



intestinal valve of spiral type

Habitat, biology, and fisheries: These are moderately abundant, inshore to deep-water sharks, found in shallow bays down to the continental slopes and submarine canyons, near the bottom or well above it. They feed on a wide variety of bony fishes, other sharks, batoid fishes, marine mammals, cephalopods, and crustaceans. Cow sharks are comparatively unimportant but regular components of shark fisheries and bycatches of other fisheries and are incidentally caught in trawls. They may bite aggressively during capture but only the larger species are potentially dangerous, particularly when provoked.

Similar families occurring in the area

None. No other sharks in the area have a single dorsal fin and 6 or 7 gill slits.

Key to the species of Hexanchidae occurring in the area

1a. Seven gill slits (Fig. 1) . . . . . ***Heptranchias perlo***

1b. Six gill slits (Figs 2 and 3) . . . . . → ***2***

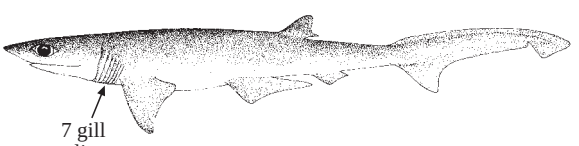


Fig. 1 ***Heptranchias perlo***

2a. Lower jaw with 6 rows of large comb-like teeth on each side; dorsal-fin base separated from upper caudal-fin origin by a distance about equal to, or slightly greater than its length (Fig. 2); size very large, up to 4.8 m . . . . . ***Hexanchus griseus***

2b. Lower jaw with 5 rows of large comb-like teeth on each side; dorsal-fin base separated from upper caudal-fin origin by a distance much greater that its length (Fig. 3); size smaller, up to 1.8 m . . . . . ***Hexanchus nakamurai***

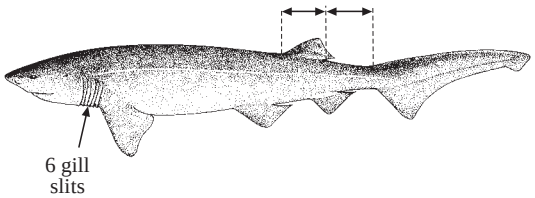


Fig. 2 ***Hexanchus griseus***

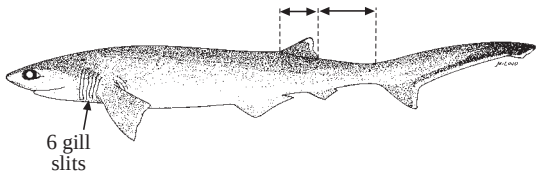


Fig. 3 ***Hexanchus nakamurai***

(after Last and Stevens, 1994)

List of species occurring in the area

The symbol is given when species accounts are included.

Heptranchias perlo (Bonnaterre, 1788)

Hexanchus griseus (Bonnaterre, 1788)

Hexanchus nakamurai Teng, 1962

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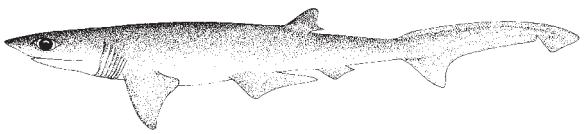
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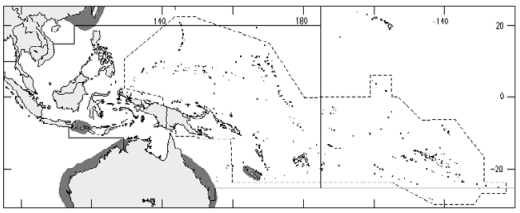
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Heptranchias perlo (Bonnaterre, 1788)

En - Sharpnose sevengill shark; **Fr** - Requin perlon; **Sp** - Cañabota bocadulce.

Maximum total length about 1.37 m. On the bottom of the outer continental and insular shelves and upper slopes in depths of 100 to 400 m, also inshore and down to 1000 m. Feeds on bony fish and squid. Caught as bycatch in bottom trawls, but of minor importance to fisheries. Almost circumglobal in tropical and temperate seas, except for the eastern North Pacific, with a primarily continental distribution.

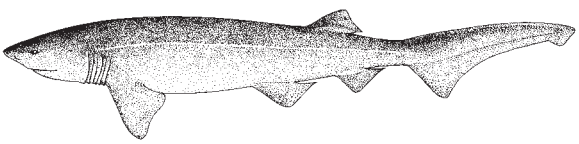


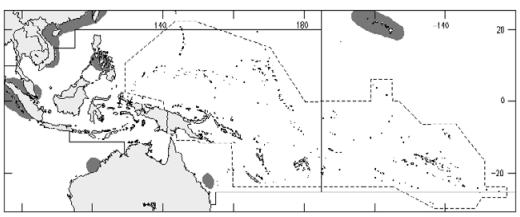


Hexanchus griseus (Bonnaterre, 1788)

En - Bluntnose sixgill shark; **Fr** - Requin grise; **Sp** - Cañabota gris (Cañabota).

Maximum total length about 4.8 m. On the outer continental and insular shelves and upper slopes down to at least 1 875 m. Benthic or pelagic, sluggish, bottom-dwelling; feeds on a wide range of marine organisms. Caught in bottom trawls and with hook-and-line; utilized fresh, frozen, and dried salted, also for fishmeal and oil. Almost circumglobal in tropical and temperate seas, found off continents, oceanic islands, and on sea mounts in the Atlantic, Mediterranean Sea, and Indo-Pacific.

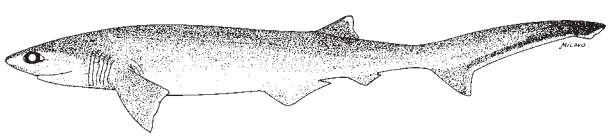




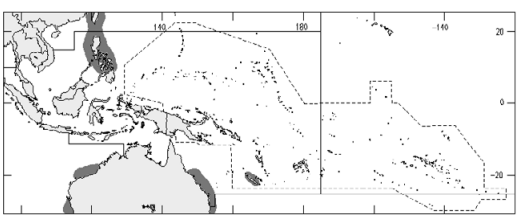
Hexanchus nakamurai Teng, 1962

En - Bigeye sixgill shark.

Maximum total length about 1.8 m. On the continental and insular shelves and upper slopes, usually near the bottom at depths from 90 to 600 m. Probably feeds on bony fish and crustaceans. Eastern Central America and Caribbean Sea, eastern Atlantic from France to Morocco, including the Mediterranean Sea, Indo-West Pacific off eastern and southern Africa and Japan, Taiwan Province of China, Philippines, New Caledonia, and Australia.



(after Last and Stevens, 1994)

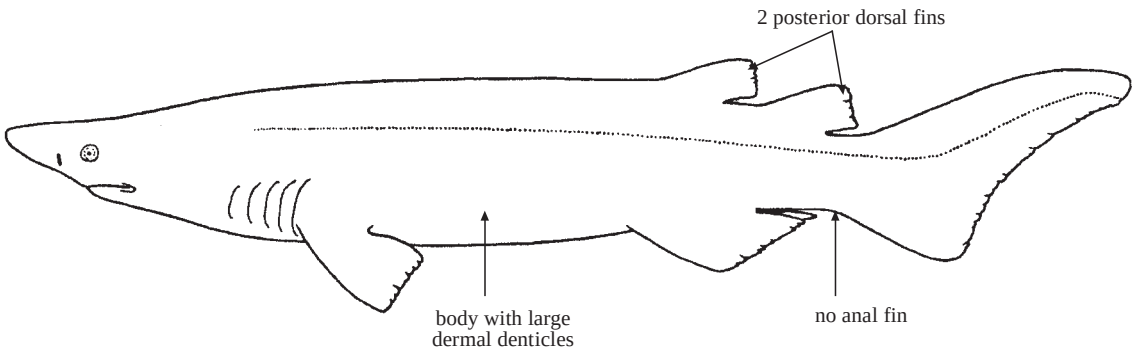


ECHINORHINIDAE

Bramble sharks

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Large sharks with cylindrical bodies without abdominal ridges. Head moderately depressed; last (fifth) gill slits abruptly expanded in width; spiracles present, very small, well behind eyes; nostrils far apart from each other; snout short; mouth broadly arched, with **very short labial furrows** that do not encircle mouth; **teeth alike in both jaws, strongly compressed and blade-like, with a cusp and up to 3 side cusplets in adults**, but with a cusp only in young**. Two small spineless posterior dorsal fins,** both smaller than the pelvic fins, **situated close** together, the origin of the first dorsal fin behind the pelvic-fin origin; **anal fin absent**; caudal fin without a subterminal notch. **Dermal denticles moderately large to very large, thorn-like**. Intestine valve of spiral type. **Colour:** greyish brown dorsally, pale to white below.



Habitat, biology, and fisheries: These are large, poorly known wide-ranging, deep-water sharks, with a spotty but virtually circumglobal distribution on continental and insular shelves and slopes, on or near the bottom. They are ovoviviparous and feed on a variety of benthic and neritic fishes, as well as crabs, octopuses, and squids. The 2 known species are uncommon to rare in most areas where they occur and hence are of minimal interest to fisheries. They generally form a bycatch of other fisheries, including those for other sharks, and are taken on line gear, deepset gill nets, and more commonly in bottom trawls, sometimes caught on rod and reel by sports anglers. Very sluggish harmless sharks, never recorded as attacking people.

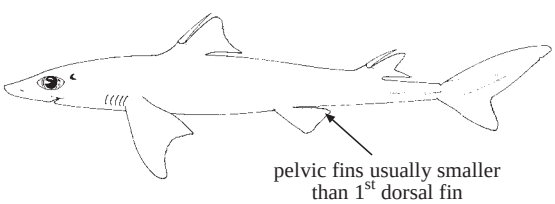
Remarks: This family is sometimes placed as a synonym of Squalidae, but morphological studies indicate that it is very distinct from the Squalidae. It has a single living genus, *Echinorhinus*.

Similar families occurring in the area

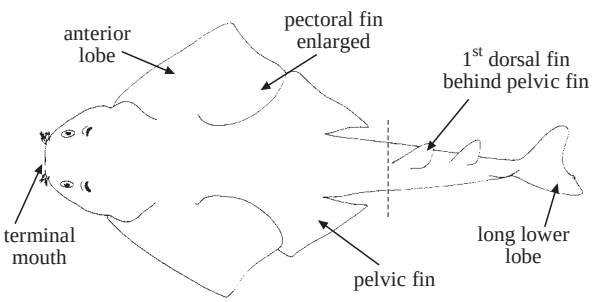
Squalidae and Pristiophoridae: fifth gill slits not abruptly larger than first to fourth; spiracles larger; first dorsal-fin origin well anterior to pelvic-fin origins; pelvic fins usually about as large as second dorsal fin or smaller; Pristiophoridae also with rostral saw and barbels.

Squatinidae: trunk much flattened dorsoventrally; mouth terminal; eyes on upper surface of head; teeth not blade-like, with a single cusp and no cusplets; origin of first dorsal fin posterior to pelvic-fin bases; anterior margins of pectoral fins expanded as triangular lobes past the gill slits and partly concealing them; both the pectoral and pelvic fins very large and wing-like; caudal fin nearly symmetrical, but with lower lobe longer than upper lobe.

All other shark families: anal fin present.



Squalidae

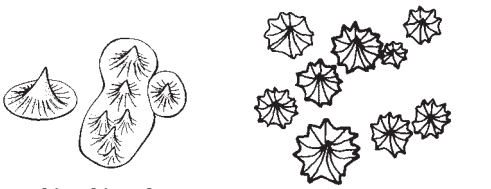


Squatinidae

Key to the species of Echinorhinidae occurring in the area

1a. Denticles on body few, irregulary distributed, relatively large, not stellate, some fused into compound plates with multiple cusps (Fig. 1a) . . . . . ***Echinorhinus brucus***

1b. Denticles on body numerous, regulary distributed, relatively small, stellate, not fused into plates with multiple cusps (Fig. 1b) . . . . . ***Echinorhinus cookei***



a) *Echinorhinus brucus* b) *Echinorhinus cookei*

Fig. 1 dermal denticles

List of species occurring in the area

The symbol is given when species accounts are included.

Echinorhinus brucus (Bonnaterre, 1788)
Echinorhinus cookei Pietschmann, 1928

References

Compagno, L.J.V. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish. Synop.*, (125)Vol.4,Pt.1: 249 p.

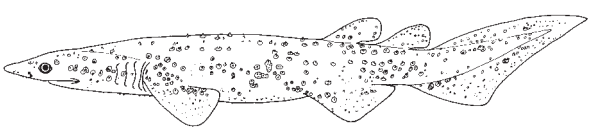
Garrick, J.A.F. 1960. Studies on New Zealand Elasmobranchii. Part 10. The genus "*Echinorhinus*", with an account of a second species, "*E. cookei*". *Trans. R. Soc. N.Z.*, 88(1):105-117.

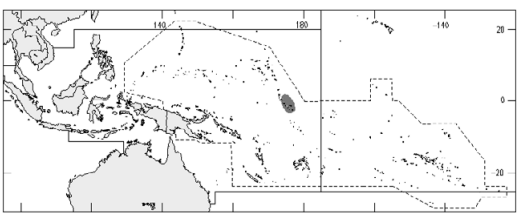
Springer, S. and R.A. Waller. 1969. "*Hexanchus vitulus*", a new sixgill shark from the Bahamas. *Bull. Mar. Sci.*, 19(1):159-174.

Echinorhinus brucus (Bonnaterre, 1788)

En - Bramble shark; **Fr** - Squale bouclé; **Sp** - Tiburón de clavos.

Maximum total length about 3.1 m. A large, sluggish, primarily deep-water shark of the continental and insular shelves and upper slopes at depths from the intertidal to 900 m. Bottom-dwelling; feeds on small bony fishes, other sharks, and crabs. Of minor importance to fisheries in the area; caught in bottom trawls. Wide-ranging in tropical and temperate areas in the Atlantic, Mediterranean Sea, Indian Ocean, and western Pacific.

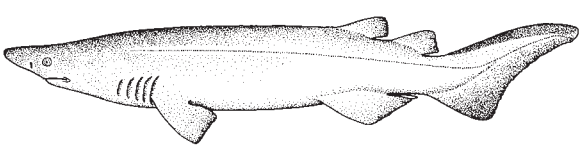


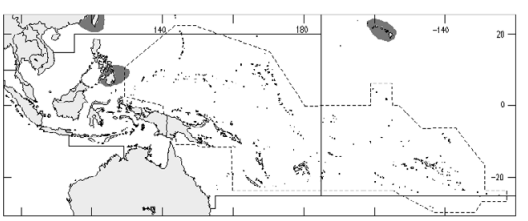


Echinorhinus cookei Pietschmann, 1928

En - Pickly shark; **Fr** - Squale bouclé du Pacifique; **Sp** - Tiburón negro espinoso.

Maximum total length about 4 m. A large, sluggish bottom-living shark, occurring on continental and insular shelves and upper slopes at depths from 11 to least 424 m. Feeds on a variety of fishes, including other sharks, also octopuses and squids. Of minor importance to fisheries; occasionally taken by line gear, gill nets and bottom trawls. Tropical and temperate areas of the western and Central Pacific, also occurring in the eastern Pacific from Oregon to the Gulf of California and in Peru and Chile.





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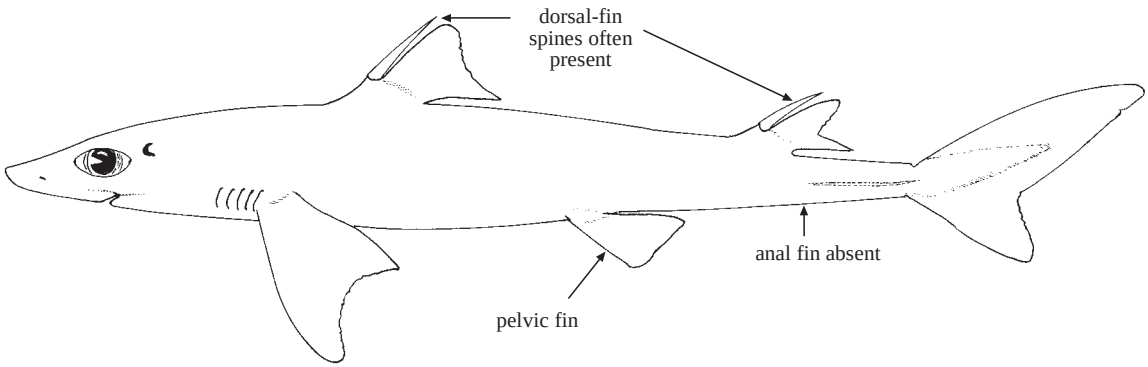
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SQUALIDAE

Dogfish sharks

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Small to moderately large sharks, with cylindrical or slightly compressed bodies, either without ridges between pectoral and pelvic fins or with inconspicuous ridges (*Centroscymnus, Dalatias, Scymnodon*). **Head with 5 gill slits, all anterior to pectoral fins**, the fifth not abruptly longer than the others**; spiracles always present, moderately large; eyes on sides of head, without nictitating eyelids**; nostrils usually well apart from each other; snout short to moderately long, not formed as a rostral saw; no barbels on snout; mouth arched or transverse; teeth strong-cusped, alike or dissimilar in both jaws, with or without cusplets. **Two dorsal fins with a long to very short spine sometimes present** (tip of latter may be concealed by skin), on their anterior margins; origin of first dorsal fin varying in position from a little (*Isistius*) in front of pelvic-fin origins to over pectoral-fin bases; pelvic fins equal to or smaller than second dorsal fin; **no anal fin**; caudal fin strongly asymmetrical to nearly symmetrical, with a lower lobe varying from virtually absent to very strong. Dermal denticles usually close-set, not greatly enlarged and plate-like. Intestinal valve of spiral type. **Colour:** back greyish in shallow-water species, dark to black in those from deep water; several species have light organs (in the area, members of the genera *Etmopterus, Euprotomicrus, Squaliolus,* and *Isistius*).



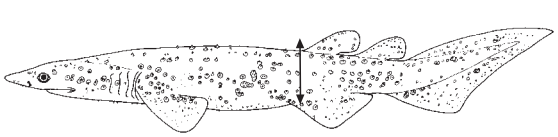
Habitat, biology, and fisheries: Dogfish sharks occurring in warm-temperate and tropical areas are mostly confined to deeper water (50 m and more); those occurring in cold-temperate water are usually shallow-water forms. Dogfish sharks often form schools; they feed mainly on fishes, and may cause damage to fishing gear when preying on the catch. One species in the area, the “cookiecutter shark” (*Isistius brasiliensis*) is semiparasitic, attaching to large fishes, whales and dolphins with its suctorial lips and gouging conical plugs of flesh out of its victims. In the western Pacific, dogfish sharks support important deep-water line fisheries, for their squalene-rich livers. The family has mainly potential importance as a fishery resource for food and liver oil.

Remarks: Ongoing research on the systematics of this family suggests that it should be divided into several families. The traditional arrangement is retained here as a temporary expedient.

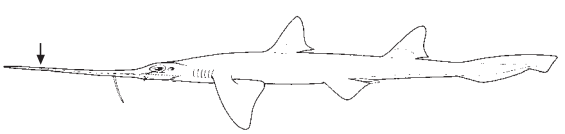
Similar families occurring in the area

Echinorhinidae: body set with sparse, large, plate-like denticles; spiracles small; fifth pair of gill slits abruptly longer than others; first dorsal-fin origin over or posterior to pelvic-fin origins; pelvic fins much larger than second dorsal fin.

Pristiophoridae: snout elongated into a flattened blade, with lateral teeth; barbels present in front of nostrils.



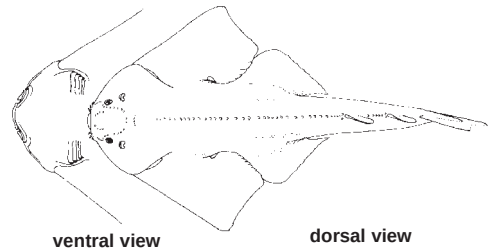
Echinorhinidae



Pristiophoridae

Squatinidae: trunk much flattened dorsoventrally; eyes on upper side of head; anterior margins of pectoral fins extending forward past gill openings and partly concealing them; pelvic fins also very broad, wing-like.

All other shark families: anal fin present.



Squatinidae

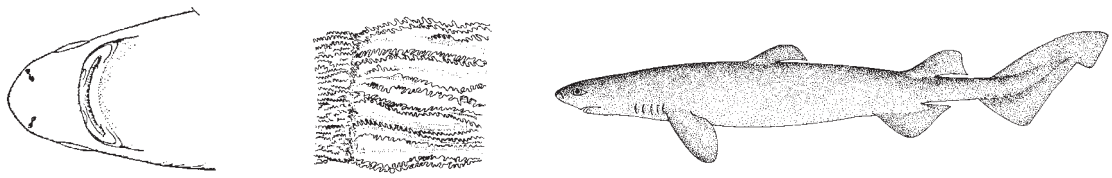
Key to the species of Squalidae occurring in the area

1a. Second dorsal fin, and usually first dorsal fin (except in *Squaliolus*), without a spine . . . . . → ***2***

1b. Spines present on both dorsal fins . . . . . → ***7***

2a. Lips fringed (Fig. 1a); edges of lower teeth serrated (Fig. 2a) . . . . . ***Dalatias licha***

2b. Lips not fringed; edges of lower teeth smooth . . . . . → ***3***

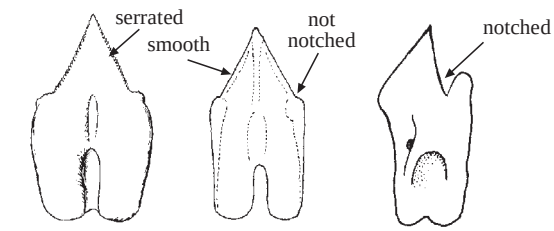


a) ventral view of head **b) fringed lips** **c) lateral view**

Fig. 1 ***Dalatias licha***

3a. Cusps of lower teeth erect, distal edges not notched (Fig. 2b); lips expanded and suctorial; rear end of first dorsal-fin base about over pelvic-fin origins (Fig. 3) . . ***Isistius brasiliensis***

3b. Cusps of lower teeth oblique, distal edges notched (Fig. 2c); lips not expanded and suctorial; rear end of first dorsal-fin base well in front of pelvic-fin origins . . . . . → ***4***



a) ***Dalatias licha*** **b)** ***Isistius brasiliensis*** **c)** ***Euprotomicrus bispinatus***

Fig. 2 lower tooth

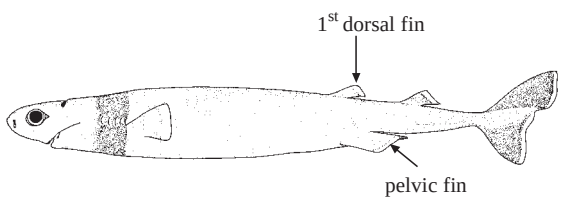


Fig. 3 ***Isistius brasiliensis***

4a. Second dorsal-fin base as long as first dorsal-fin base; upper caudal-fin lobe not shortened, caudal fin not paddle-shaped (Fig. 4); giant benthic sharks, adults to over 4 m total length and possibly born at a size over 35 cm . . . . . ***Somniosus pacificus***
(occurrence in the area uncertain)

4b. Second dorsal-fin base at least twice as long as first dorsal-fin base; upper caudal-fin lobe shortened, caudal fin paddle-shaped (Fig. 5); dwarf oceanic sharks, adults not exceeding 15 to 27 cm total length . . . . . → ***5***

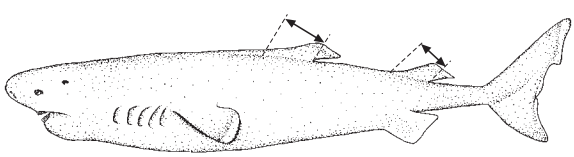


Fig. 4 ***Somniosus pacificus***

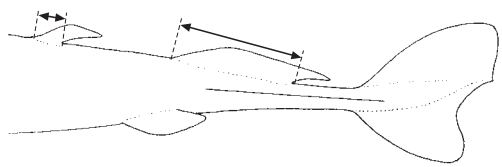


Fig. 5

5a. First dorsal fin without spine; fin length less than 1/3 the length of second dorsal fin; first dorsal-fin base closer to pelvic fins than to pectoral fins; snout bulbously conical, snout length about 2/5 of head length (Fig. 6) . . . . . ***Euprotomicrus bispinatus***

5b. First dorsal fin with a spine, sometimes partly hidden by skin; fin length about 1/2 the length of second dorsal fin; first dorsal-fin base closer to pectoral fins than to pelvic fins; snout pointed, snout length about 1/2 length of head (Fig. 7) . . . . . **(*Squaliolus*)** → ***6***

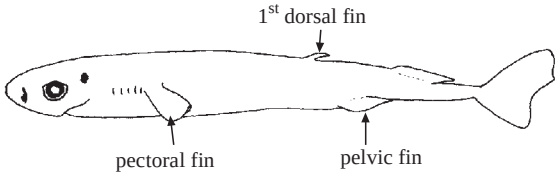


Fig. 6 ***Euprotomicrus bispinatus***

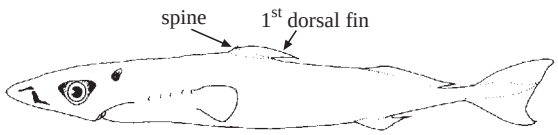


Fig. 7 ***Squaliolus***

6a. Eye large, diameter 73 to 86% of interorbital width; upper margin of eyelid nearly straight; upper lip without papillae . . . . . ***Squaliolus laticaudus***

6b. Eye smaller, diameter 46 to 70 % of interorbital width; upper margin of eye angular, chevron-shaped; upper lip with a pair of prominent lateral papillae (rarely indistinct) . . ***Squaliolus aliae***

7a. Teeth comb-like in both jaws, with a cusp and 1 or more cusplets, not blade-like; skin and muscle of body extremely soft, scabby, semi-gelatinous, and delicate, usually badly damaged by capture . . . . . ***Centroscyllium* cf. *kamoharai***

7b. Teeth compressed and blade-like in lower jaw, with a single erect to oblique cusp, upper teeth comb-like (*Etmopterus)*, blade-like (*Squalus*), or cuspidate and without cusplets; skin and muscle of body more or less firm. . . . . → ***8***

8a. Teeth nearly alike in both jaws, the lowers not greatly enlarged; both with strongly oblique nearly horizontal cusps (Fig. 8); fin spines without grooves on sides, no subterminal notch on caudal fin; caudal peduncle with a strong keel and usually an upper precaudal pit . . . . . **(*Squalus*)** → ***9***

8b. Teeth more or less unlike in both jaws, the lowers much larger than uppers, the latter with erect to oblique cusps; fin spines with grooves on sides; subterminal notch on caudal fin; caudal peduncle without keels or precaudal pits . . . . . → ***16***



Fig. 8 upper and lower tooth (*Squalus*)

9a. Preoral snout greatly elongated, about 2.1 to 2.7 times mouth width (Fig. 9), preorbital snout 2 to 2.5 times eye length in adults . . . . . → ***10***

9b. Preoral snout short to moderately elongated, 1.7 times mouth width or less, preorbital snout less than 2 times eye length in adults . . . . . → ***11***

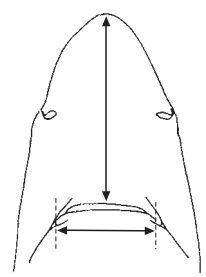


Fig. 9 ventral view of head

10a. Lower caudal-fin lobe with a conspicuous black tip; mouth larger, 2.1 in preoral snout and equal to internarial space (Fig. 10). . . . . ***Squalus melanurus***

10b. Lower caudal-fin lobe with a conspicuous white tip; mouth smaller, 2.7 in preoral snout and about 3/4 of internarial space (Fig. 11) . . . . . ***Squalus rancureli***

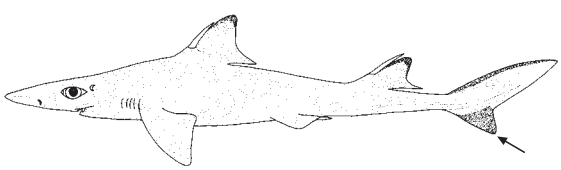


Fig. 10 ***Squalus melanurus***

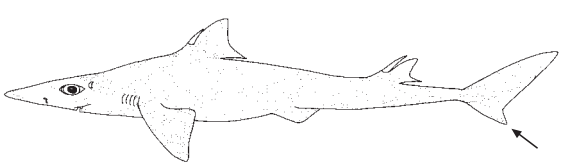


Fig. 11 ***Squalus rancureli***

11a. Diagonal distance from centre of snout tip to inner edge of nostril greater than distance from nostril to upper labial furrow (Fig. 12a) . . . . . → ***12***

11b. Diagonal distance from centre of snout tip to inner edge of nostril less than or about equal to distance from nostril to upper labial furrow (Fig. 12b) . . . . . → ***14***

12a. Snout acutely pointed; eye closer to first gill opening than snout tip (Fig. 13) . . . ***Squalus japonicus***

12b. Snout narrowly parabolic; eye slightly closer to snout tip than first gill opening . . . . . → ***13***

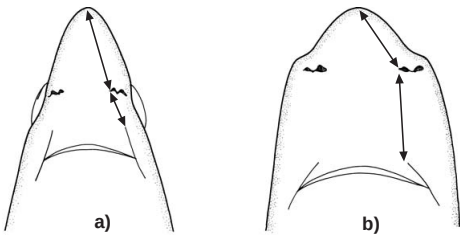


Fig. 12 ventral view of head

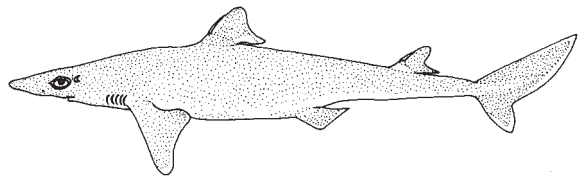


Fig. 13 ***Squalus japonicus***

13a. Head relatively narrow, direct preorbital distance longer than interorbital distance; monospondylous vertebrae 38 to 42 or more (Fig. 14) . . . . . ***Squalus* sp. F**

13b. Head relatively broad, direct preorbital distance shorter than interorbital distance; monospondylous vertebrae 43 to 46 (Fig. 15) . . . . . ***Squalus mitsukurii***

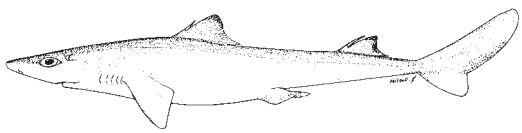


Fig. 14 ***Squalus* sp. F**

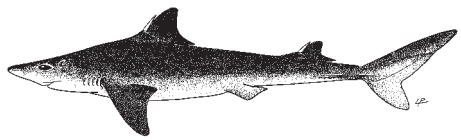


Fig. 15 ***Squalus mitsukurii***

14a. First dorsal fin raked backwards slightly (Fig. 16a); denticles lanceolate (Fig. 17a); precaudal vertebrae 78 to 82 (Fig. 18) . . . . . ***Squalus megalops***

14b. First dorsal fin more upright (Fig. 16b); denticles with 3 posterior cusps (Figs 17b, c); more than 82 precaudal vertebrae . . . . . → ***15***



Fig. 16 first dorsal fin

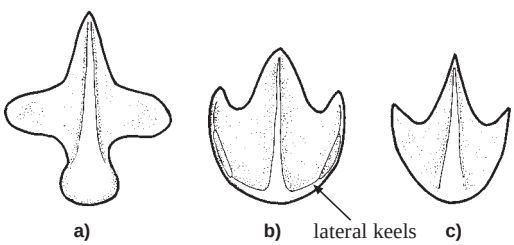


Fig. 17

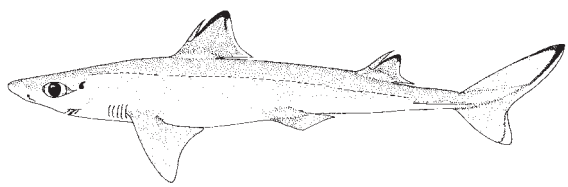


Fig. 18 ***Squalus megalops***

15a. Dorsal-fin spines slender (Fig. 19); a dark bar along base of lower caudal-fin lobe (Fig.19), more prominent in juveniles; denticle crowns without lateral keels (Fig. 17b); precaudal vertebrae mostly 94 to 96 . . . . . ***Squalus* sp. A**

15b. Dorsal-fin spines robust (Fig. 20); no dark bar on base of lower caudal-fin lobe (Fig. 20); denticle crowns with lateral keels (Fig. 17c); precaudal vertebrae 90 to 93 . . . . . ***Squalus* sp. B**

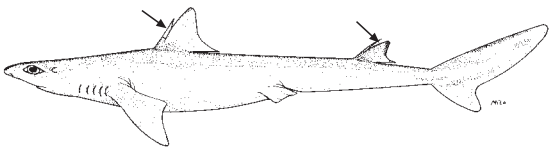


Fig. 19 ***Squalus* sp. A**

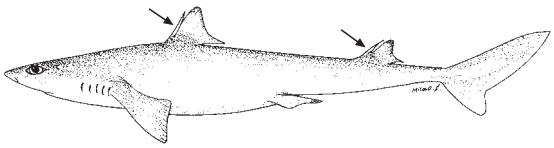


Fig. 20 ***Squalus* sp. B**

16a. Upper teeth with slender primary cusp and 1 or more cusplets on each side (Fig. 21b); second dorsal fin noticably larger than first . . . . . **(*Etmopterus*)** → ***28***

16b. Upper teeth with slender to thick primary cusps but with no cusplets; second dorsal fin as large or noticably smaller than first . . . . . → ***17***

17a. Snout greatly elongated, its length greater than distance from centre of mouth to pectoral-fin origins (Fig. 22a); dermal denticles of back pitchfork-shaped, crowns on tall, slender pedicels (Fig. 22b) . . . . . **(*Deania*)** → ***18***

17b. Snout short to moderately elongated, its length equal or usually less than distance from centre of mouth to pectoral-fin origins; dermal denticles with short pedicels and broad crowns, not pitchfork-shaped . . . . . → ***20***

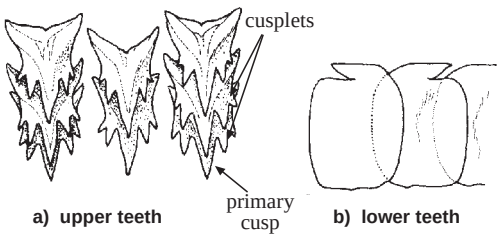


Fig. 21 ***Etmopterus***

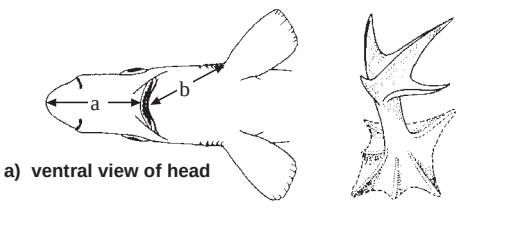


Fig. 22 ***Deania***

18a. A subcaudal keel on the lower surface of the caudal peduncle (Fig. 23) . . . . . ***Deania profundorum***

18b. No subcaudal keel on the lower caudal peduncle (Figs 24 and 25) . . . . . →***19***

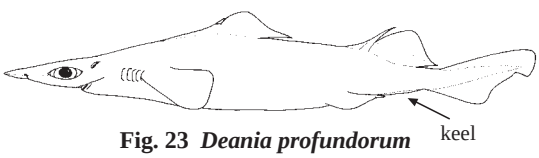


Fig. 23 ***Deania profundorum***

19a. First dorsal fin rather high, angular, and short, distance from its spine origin to its free tip about 2/3 of distance from rear origin of second dorsal-fin spine to free rear tip of its fin (Fig. 24) . . . . . ***Deania quadrispinosa***

19b. First dorsal fin rather low, rounded, and long, distance from its spine origin to its free rear tip greater than distance from origin of second dorsal-fin spine to free rear tip of its fin (Fig. 25) . . . . . ***Deania calcea***

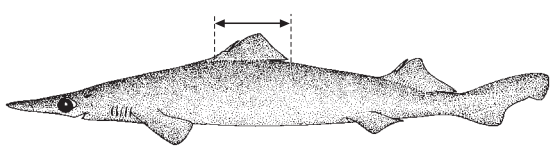


Fig. 24 ***Deania quadrispinosum***

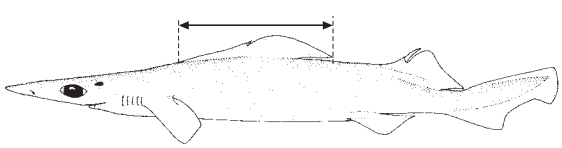


Fig. 25 ***Deania calcae***

20a. Upper teeth relatively broad and low-cusped, the lowers low and wide (Fig. 26); dorsal-fin spines prominent and strong; origin of first dorsal-fin spine over or just posterior to inner margins of pectoral fins; inner corners of pectoral fins angular or greatly elongated (Fig. 26b) . . . . . **(*Centrophorus*)** → ***21***

20b. Upper teeth lanceolate and high; dorsal-fin spines very small, the first dorsal spine well posterior to pectoral fin tips; inner corners of pectoral fins short and broadly rounded on their posterior ends . . . . . → ***27***

21a. Dermal denticles on sides of body with leaf-like, overlapping crowns on elevated narrow pedicels extending above the denticle bases, and with 3 or more medial and lateral cusps on their posterior ends. (Fig. 27) . . . . . ***Centrophorus squamosus***

21b. Dermal denticles on sides of body with flat sessile, not overlapping crowns atop the denticle bases, without separate pedicels and with or without a posterior medial cusp (Fig. 28) . . . . . → ***22***

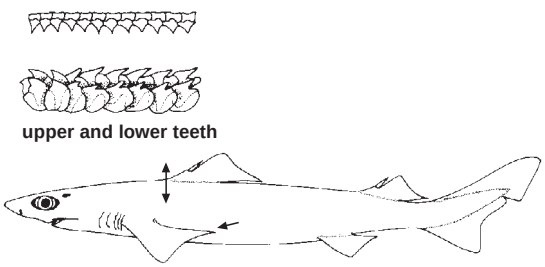


Fig. 26 *Centrophorus*

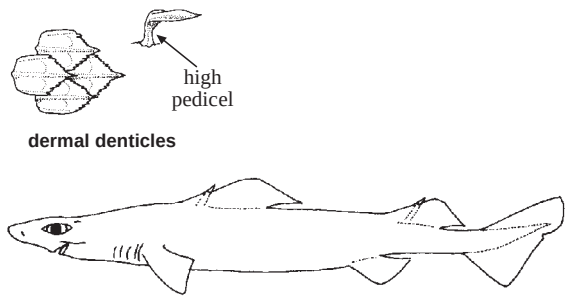
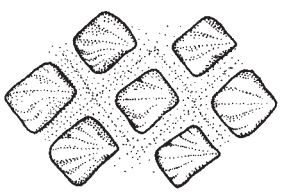
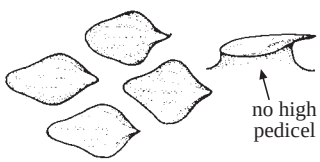


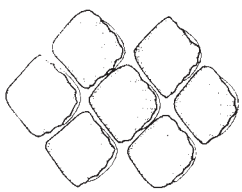
Fig. 27 *Centrophorus squamosus*



a) *Centrophorus moluccensis*



b) *Centrophorus lusitanicus*



c) *Centrophorus granulosus*

Fig. 28 dermal denticles

22a. Second dorsal fin very small, 1/2 height of first dorsal fin or less, with spine origin usually well posterior to pelvic fin rear tips (Fig. 29). . . . . ***Centrophorus moluccensis***

22b. Second dorsal fin larger, nearly or quite as high than first dorsal fin, with spine origin usually over pelvic fin inner margins . . . . . → ***23***

23a. Snout elongated and narrow, preoral length greater than width of head at mouth (Fig. 30) . . . . . ***Centrophorus isodon***

23b. Snout shorter and broadly parabolic, preoral length less than width of head at mouth . . . . . → ***24***
(occurrence in the area uncertain)



Fig. 29 *Centrophorus moluccensis*

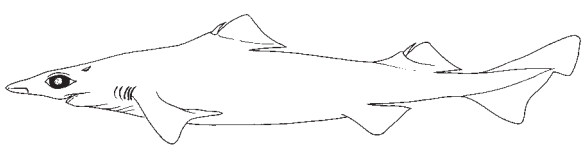


Fig. 30 *Centrophorus isodon*

24a. Free rear tips of pectoral fins moderately elongated and attenuated, not extending behind first dorsal-fin spine; postdorsal space short, about 6% of total length; cusps of lateral trunk denticles acutely angular in adults; body colour dark grey (Fig. 31) . . . . . ***Centrophorus niaukang***

24b. Free rear tips of pectoral fins greatly elongated, usually extending well behind first dorsal spine; postdorsal space longer, about 7.5 to 8% of total length; cusps of lateral trunk denticles obtusely angular to absent in adults; body colour medium to light grey . . . . . → ***25***

25a. First dorsal fin greatly elongated, base about 1.6 to 2 times base of second dorsal fin and over 16% of total length; postventral caudal margin nearly straight in adults (Fig. 32) . . . . . ***Centrophorus lusitanicus***
(occurrence in the area uncertain)

25b. First dorsal fin moderately elongated, base about 1.3 times base of second dorsal fin and less than 16% of total length; postventral caudal margin deeply notched in adults (Figs 33 and 34) . . . . . → ***26***

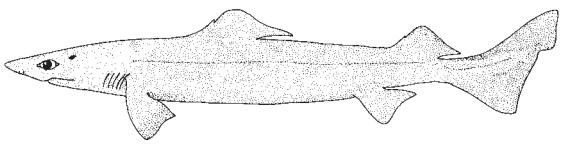


Fig. 31 ***Centrophorus niaukang***

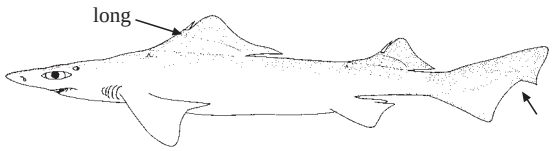


Fig. 32 ***Centrophorus lusitanicus***

26a. Adults with tips of dorsal fins dusky, not prominently marked (Fig. 33) . . ***Centrophorus granulosus***

26b. Adults with tips of dorsal fins black, prominently marked from base of fins (Fig. 34) . . . . . ***Centrophorus atromarginatus***

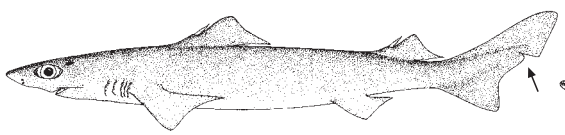


Fig. 33 ***Centrophorus granulosus***

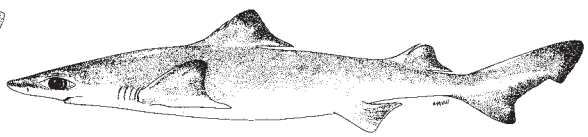


Fig. 34 ***Centrophorus atromarginatus***

27a. Lower teeth with comparatively low, more or less oblique cusps; denticles on sides of body smooth, without ridges (Fig. 35) . . . . . ***Centroscymnus coelolepis***

27b. Lower teeth with comparatively high, more or less erect cusps; denticles on sides of body with cross-ridges as well as transverse ridges (Fig. 36) . . . . . ***Scymnodon squamulosus***

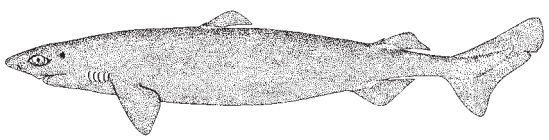


Fig. 35 ***Centrophorus coelolepis***



Fig. 36 ***Scymnodon squamulosus***

28a. Upper teeth with 4 or 5 pairs of cusplets on each side (Fig. 37) . . . . . ***Etmopterus decacuspidatus***
(occurrence in the area uncertain)

28b. Upper teeth usually with 3 or fewer pairs of cusplets on each side . . . . . → ***29***

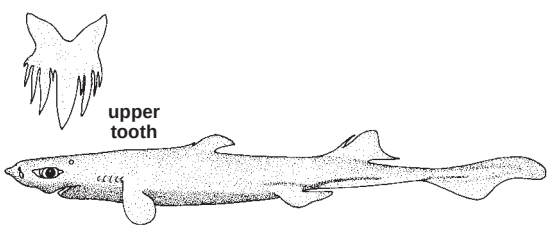


Fig. 37 ***Etmopterus decacuspidatus***

29a. Denticles on sides of body in regular lines . . . . . → ***30***

29b. Denticles on sides of body randomly arranged, not in regular lines . . . . . → ***33***

30a. First dorsal-fin origin well anterior to pectoral fin free rear tip; black flank marking on side of tail base with short, truncated posterior lobe; additional oval dark marking near base of caudal fin, but no transverse marking across midlength of caudal fin (Fig. 38) . . . . . ***Etmopterus splendidus*** and ***Etmopterus*** **sp. C**

30b. First dorsal-fin origin over or posterior to pectoral fin free rear tip; black flank marking on side of tail base with long, narrow posterior lobe with pointed tip; no oval dark marking near base of caudal fin, but with a transverse marking across midlength of caudal fin . . . . . → ***31***

31a. Second dorsal fin with bluntly rounded apex and shallowly concave posterior margin; black flank marking on side of tail with base under second dorsal-fin spine base; posterior branch of flank marking rather broad and short, shorter than anterior branch (Fig. 39) . . . . . ***Etmopterus lucifer***

31b. Second dorsal fin with angular apex and deeply concave posterior margin; black flank marking on side of tail with base anterior to second dorsal-fin spine base; posterior branch of flank marking very narrow and greatly expanded, longer than anterior branch . . . . → ***32***

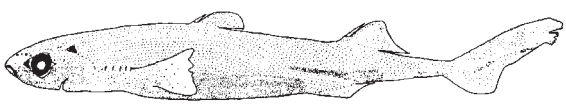


Fig. 38 ***Etmopterus splendidus***

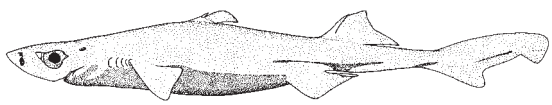


Fig. 39 ***Etmopterus lucifer***

32a. Dermal denticles usually present on outer web of second dorsal fin; black longitudinal marking on caudal-fin base longer than black longitudinal marking along midlength of caudal fin, basal marking with angular rear tip (Fig. 40) . . . . . ***Etmopterus brachyurus***

32b. Dermal denticles absent on outer web of second dorsal fin; black longitudinal marking on caudal-fin base shorter than black longitudinal marking along midlength of caudal fin, basal marking with rounded rear tip (Fig. 41) . . . . . ***Etmopterus molleri***

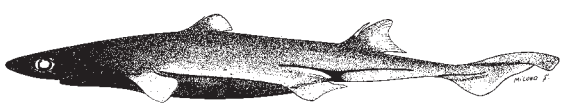


Fig. 40 ***Etmopterus brachyurus***



Fig. 41 ***Etmopterus molleri***

33a. Caudal peduncle long, distance from pelvic-fin insertions to lower caudal-fin origin as long as head (snout to fifth gill openings); flanks with prominent rows of dark dashes (Fig. 42) . . . . . ***Etmopterus*** **sp. F**

33b. Caudal peduncle shorter, distance from pelvic-fin insertions to lower caudal-fin origin shorter than prebranchial head (snout to first gill openings); flanks with or without rows of dark dashes . . . . . → ***34***

34a. Upper surface pale, sharply delineated from dark under surface, flank and caudal markings distinct (Fig. 43) . . . . . ***Etmopterus*** **sp. D**

34b. Upper surface dark, not sharply delineated from dark under surface, flank and caudal markings indistinct or absent . . . . . → ***35***

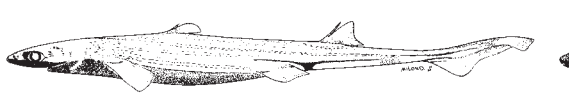


Fig. 42 ***Etmopterus*** **sp. F**

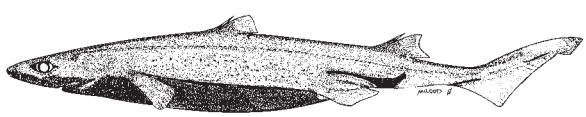


Fig. 43 ***Etmopterus*** **sp. D**

35a. Interdorsal space longer than distance from snout tip to pectoral-fin insertions; distance from second dorsal-fin insertion to upper caudal-fin origin about 1/3 as long as interdorsal space . . . . . ***Etmopterus baxteri*** and ***Etmopterus "granulosus"***

35b. Interdorsal space about equal to head length; distance from second dorsal-fin insertion to upper caudal-fin origin about 1/2 the length of interdorsal space . . . . . → ***36***

36a. Dermal denticles on sides with fairly thick cusps (Fig. 44) . . . . . ***Etmopterus princeps***

36b. Dermal denticles on sides with slender, bristle-like cusps (Fig. 45) . . . . . ***Etmopterus unicolor***
(occurrence in the area uncertain)

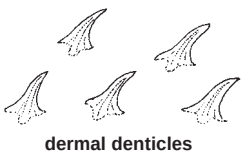
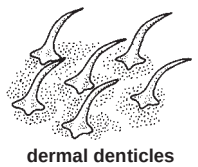




Fig. 44 ***Etmopterus princeps***



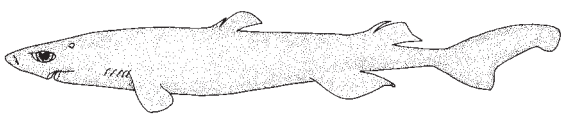


Fig. 45 ***Etmopterus unicolor***

List of species occurring in the area

The symbol ✦ is given when species accounts are included.

✦ *Centrophorus atromarginatus* Garman, 1906
✦ *Centrophorus granulosus* (Bloch and Schneider, 1801)
? *Centrophorus isodon* (Chu, Meng, and Liu, 1981)[1/]
? *Centrophorus lusitanicus* Bocage and Capello, 1864[2/]
✦ *Centrophorus moluccensis* Bleeker, 1860
✦ *Centrophorus niaukang* Teng, 1959
✦ *Centrophorus squamosus* (Bonnaterre, 1788)
Centrophorus sp. [New Caledonia][3/]

Centroscyllium cf. *kamoharai* Abe, 1966[4/]

Centroscymnus coelolepis Bocage and Capello, 1864

✦ *Cirrhigaleus barbifer* Tanaka, 1912

✦ *Dalatias licha* (Bonnaterre, 1788)

? *Deania calcea* (Lowe, 1839)
✦ *Deania profundorum* (Smith and Radcliffe, 1912)
✦ *Deania quadrispinosa* (McCulloch, 1915)

? *Etmopterus baxteri* Garrick, 1957[5/]
✦ *Etmopterus brachyurus* Smith and Radcliffe, 1912
? *Etmopterus decacuspidatus* Chan, 1966[6/]
? *Etmopterus granulosus* (Günther, 1880)[7/]
✦ *Etmopterus lucifer* Jordan and Snyder, 1902

1/ Described from Xisha (Paracel) Islands and off the Zujiang River mouth, Hong Kong, in the South China Sea just adjacent to the area; a similar species, possibly identical, occurs off the Maldive Islands, Sri Lanka, and the Philippines.
2/ Uncertain in the area but should be watched for. Often confused with *Centrophorus niaukang* and *C. granulosus*.
3/ This species could not be placed in the present key. Status uncertain. Described from the upper insular slopes of New Zealand somewhat south of the area.
4/ Recently collected in deep water (1 037 to 1 100 m) off Luzon, Philippines; close to this species but possibly distinct.
5/ This species has been synonymized with *Etmopterus granulosus*, but this is possibly incorrect.
6/ Known from the South China Sea just north of the area between the Viet Nam coast and Hainan Island, China.
7/ Presence in the western Pacific uncertain.

Etmopterus molleri Whitley, 1939
? *Etmopterus princeps* Collett, 1904[8/]
Etmopterus splendidus Yano, 1988
? *Etmopterus unicolor* (Engelhardt, 1912)[9/]
? *Etmopterus* sp. C [Last and Stevens, 1994]
Etmopterus sp. D [Last and Stevens, 1994]
Etmopterus sp. F [Last and Stevens, 1994]

Euprotomicrus bispinatus (Quoy and Gaimard, 1824)

Isistius brasiliensis (Quoy and Gaimard, 1824)

Scymnodon squamulosus (Günther, 1877)[10/]

? *Somniosus pacificus* Bigelow and Schroeder, 1944[11/]

Squaliolus aliae Teng, 1959
Squaliolus laticaudus Smith and Radcliffe, 1912

Squalus japonicus Ishikawa, 1908
Squalus megalops (Macleay, 1881)
Squalus melanurus Fourmanoir and Rivaton, 1979
Squalus mitsukurii Jordan and Snyder, 1903
Squalus rancureli Fourmanoir and Rivanton, 1979
Squalus sp. A [Last and Stevens, 1994]
Squalus sp. B [Last and Stevens, 1994]
Squalus sp. F [Last and Stevens, 1994]

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Last P.R. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

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8/ This species was nominally recorded from New Caledonia, but its status there needs clarification. Other large species of lanternsharks, including *Etmopterus baxteri* and *E. unicolor* may be involved instead.

9/ Described from Japan; a large lanternshark from the south coast of Australia termed *Etmopterus* sp. B by Last and Stevens (1994) and presently known to extend to just south of the area may be synonymous with *E. unicolor*.

10/ Placed in a separate genus, *Zameus*, by some authors.

11/ Some records in the South Pacific (Tasmania, off New Zealand and somewhat south of the area, and possibly Macquarie Island). Assignment of large southern hemisphere *Somniosus* to the North Pacific *S. pacificus* is tentative.

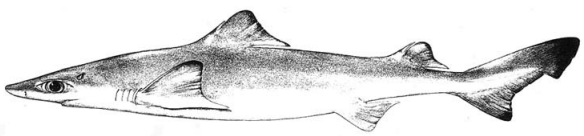
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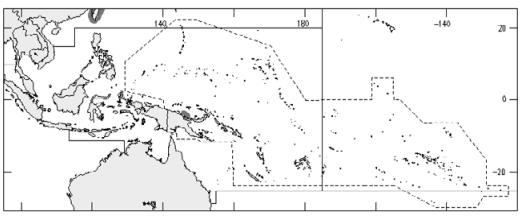
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Centrophorus atromarginatus Garman, 1913

En - Blackfin gulper shark.

Maximum total length at least 87 cm. A little-known deep-water dogfish, often confused with *Centrophorus granulosus*, from the upper continental slopes from 183 to at least 450 m. Probably taken in bottom trawls. Described from Japan (Suruga Gulf); also known from Taiwan Province of China, northern Papua New Guinea, and the Gulf of Aden.

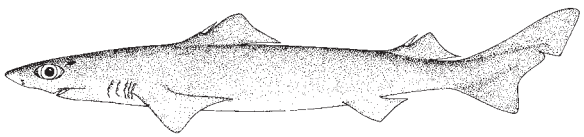


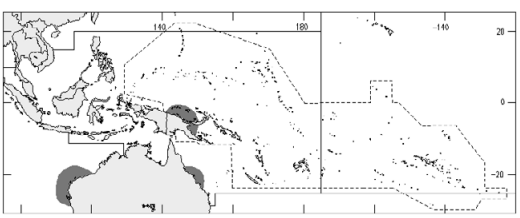


Centrophorus granulosus (Bloch and Schneider, 1801)

En - Gulper shark; **Fr** - Squale-chagrin commun; **Sp** - Quelvacho.

Maximum total length at least 96 cm. On the outer continental shelves and slopes near the bottom in depths from 100 to 1 200 m. Feeds mainly on bony fishes. Mode of utilization and fishing gear uncertain. Western North Atlantic (Gulf of Mexico), eastern Atlantic from France to South Africa, the Mediterranean Sea, western Indian Ocean (South Africa, Mozambique, and Aldabra Islands) and the western Pacific from Japan, Papua New Guinea, and tropical Australia.

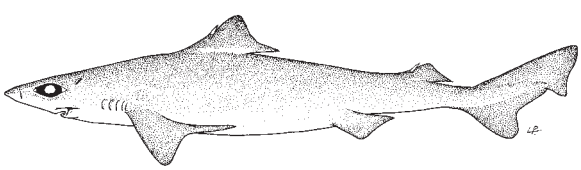


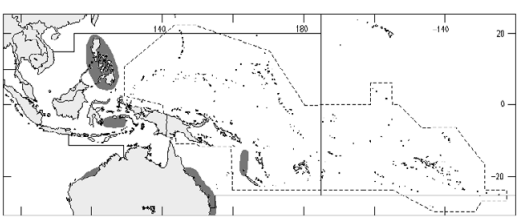


Centrophorus moluccensis Bleeker, 1860

En - Smallfin gulper shark; **Fr** - Squale-chagrin cagaou; **Sp** - Quelvacho de aleta corta.

Maximum total length about 1 m. On the outer continental shelves and upper slopes at depths from 130 to 820 m. Bottom-dwelling; feeds primarily on bony fishes, as well as other dogfish sharks, cephalopods, and shrimps. Probably taken in bottom trawls; utilized at least for fishmeal. Western Indian Ocean from South Africa to Mozambique, India, and western Pacific from Japan to Indonesia (Amboina), the Philippines, New Caledonia, and Australia.

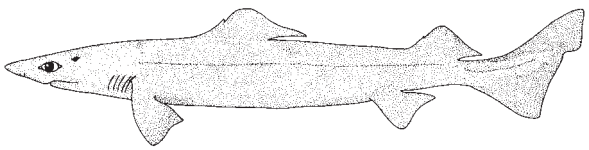


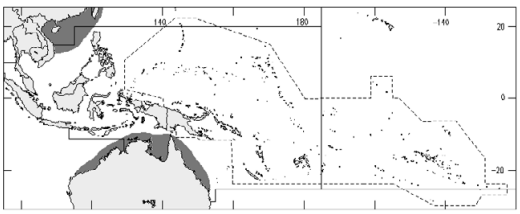


Centrophorus niaukang Teng, 1959

En - Taiwan gulper shark; **Fr** - Squale-chagrin quelvacho; **Sp** - Quelvacho chino.

Maximum total length at least 1.6 m, probably the largest gulper shark. On the outer continental shelves and upper slopes at depths from 250 to 720 m and probably deeper. Bottom-dwelling; little known. Taken in bottom trawls and on deep-set longlines; utilized for fishmeal and for human consumption. North Atlantic, southwestern Indian Ocean from South Africa and Mozambique, possibly the Maldives, and western Pacific from Japan, South China Sea in the northwestern part of the area, and probably Australia. Often confused with *Centrophorus granulosus* and *C. lusitanicus*.

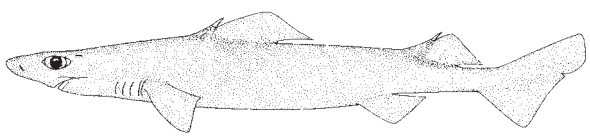


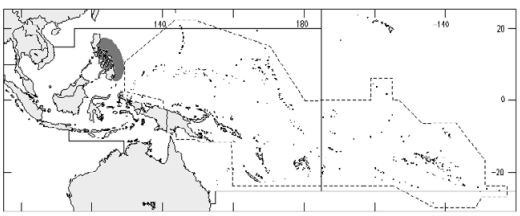


Centrophorus squamosus (Bonnaterre, 1788)

En - Leafscale gulper shark; **Fr** - Squale-chagrin de l'Atlantique; **Sp** - Quelvacho negro.

Maximum total length about 1.6 m. On the continental slopes at depths from 230 to 2 400 m near the bottom, also pelagically in the upper 1 250 m of water 4 000 m deep. Caught with bottom trawls, line gear, and fixed bottom nets; dried and salted for human consumption, also used for fishmeal. Eastern Atlantic from Iceland to South Africa, western Indian Ocean (South Africa, Aldabra Islands) and western Pacific from Japan, the Philippines, New Zealand, and southeastern Australia.

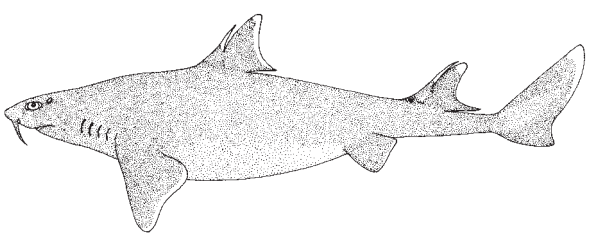


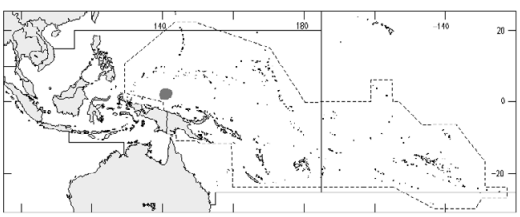


Cirrhigaleus barbifer Tanaka, 1912

En - Mandarin dogfish; **Fr** - Squale moustache; **Sp** - Tollo mandarín.

Maximum total length about 1.26 m. On or near the bottom of the uppermost continental and insular slopes, and probably the outer continental-insular shelves at depths of 146 to 640 m. Probably feeds mostly on bottom fishes and some invertebrates. High in squalene oil, but at present not utilized commercially. Western Pacific from Japan, Torres Island, New Zealand, and Australia (New South Wales).

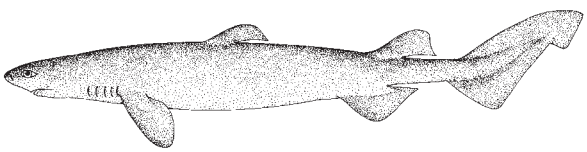


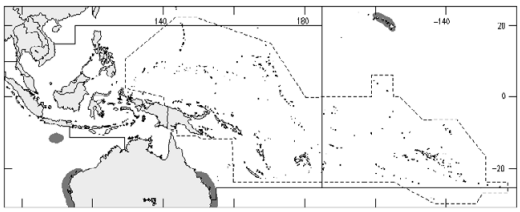


Dalatias licha (Bonnaterre, 1788)

En - Kitefin shark; **Fr** - Squale liche; **Sp** - Carocho.

Maximum total length least 1.6 m. Occurs on the bottom and in the midwater of the outer continental and insular shelves from depths of 40 to 1 800 m. Feeds on bony fish, as well as sharks, skates, cephalopods, and crustaceans. Caught for its squalene-rich liver, leather and meat, also for fishmeal. Western Atlantic (Georges Bank and Gulf of Mexico), eastern Atlantic from Scotland to Cameroon, the Mediterranean, western Indian Ocean (southern Africa), and western and Central Pacific from Japan, Australia, New Zealand, and Hawaii.



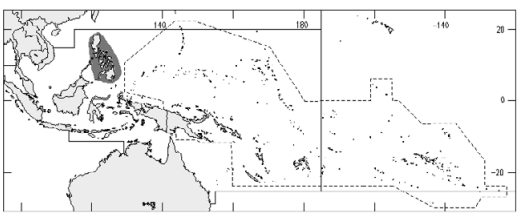


Deania profundorum (Smith and Radcliffe, 1912)

En - Arrowhead dogfish; **Fr** - Squale-savate lutin; **Sp** - Tollo flecha.

Maximum total length about 76 cm. On the upper continental and insular slopes, found on or near the bottom at depths from 280 to 1 790 m. Feeds on small bony fishes, including lanternfish, squid, and crustaceans. Interest to fisheries unknown. Western North Atlantic (North Carolina), eastern Atlantic from West Sahara to Namibia, western Indian Ocean from South Africa and the western Pacific (Philippines).

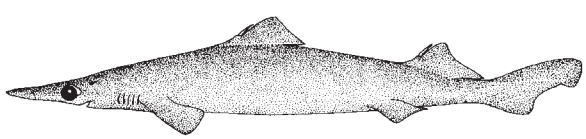


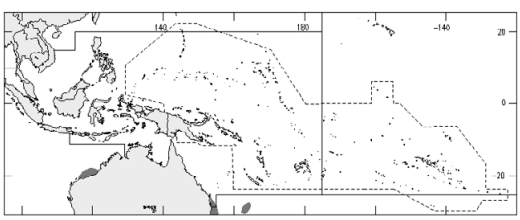


Deania quadrispinosa (McCulloch, 1915)

En - Longsnout dogfish; **Fr** - Squale-savate à long nez; **Sp** - Tollo trompalarga.

Maximum total length about 1.15 m. On the outer continental shelves and upper slopes at depths of 150 to 820 m, mostly below 400 m. Feeds on small bony fishes. Taken in bottom trawls, but with minor importance to fisheries. Southern Africa from Namibia to Mozambique, western Pacific off western and southern Australia, and New Zealand.

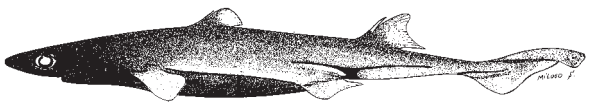




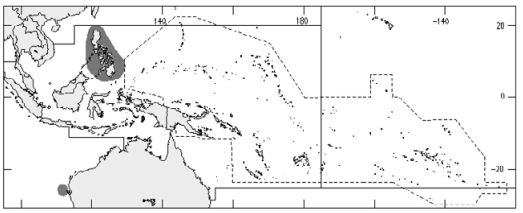
Etmopterus brachyurus Smith and Radcliffe, 1912

En - Shorttail lanternshark; **Fr** - Sagre porte-feu à queue courte; **Sp** - Tollo lucero mocho.

Maximum total length about 50 cm. Occurs on or near the bottom at depths of 400 to 610 m. Without interest to fisheries at present. Japan, the Philippines, and probably elsewhere in the western Pacific. Records from southern Africa possibly based on other species. Often confused with *Etmopterus molleri* and *E. lucifer*.



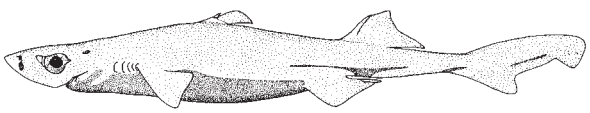
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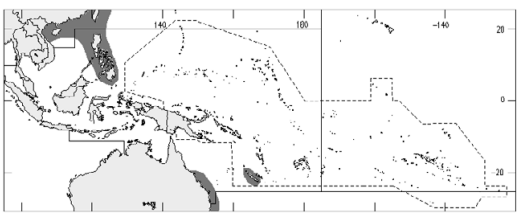


Etmopterus lucifer Jordan and Snyder, 1902

En - Blackbelly lanternshark; **Fr** - Sagre lucifer; **Sp** - Tollo lucero diablo.

Maximum total length about 47 cm. On the outer continental and insular shelves and upper slopes on or near the bottom, at depths of 183 to 1 000 m. Feeds mostly on squids and small bony fishes, including lanternfish, and also shrimps. Interest to fisheries unknown at present. South Atlantic from Uruguay, Argentina, and possibly Namibia, also southern Africa and the western Pacific from Japan, New Caledonia, southern Australia, and New Zealand. Some records probably based on *Etmopterus molleri* and *E. brachyurus*.





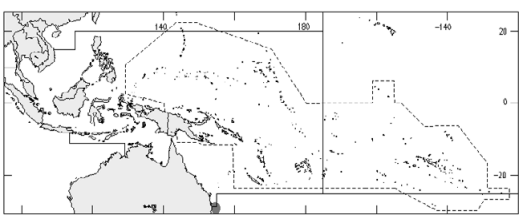
Etmopterus molleri Whitley, 1939

En - Slendertail lanternshark.

Maximum total length about 46 cm. Probably demersal on the upper continental slope in depths of about 250 to 480 m. Only recently recognized as distinct from *Etmopterus lucifer*. Biology and distribution poorly known. Without interest to fisheries. Known from Japan, eastern Australia, and New Zealand.



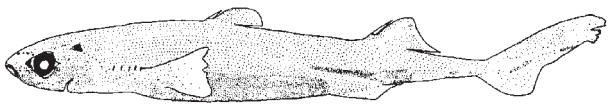
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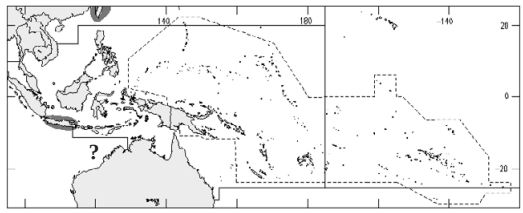


Etmopterus splendidus Yano, 1988

En - Splendid lanternshark.

Maximum total length about 30 cm. Probably demersal on the outer continental shelves and upper slopes at depths of 120 to 210 m. Biology little known, feeds on squid. Known from Japan, Taiwan Province of China, Java, and possibly northwestern Australia if *Etmopterus* sp. C [Last and Stevens, 1994] is identical to it.

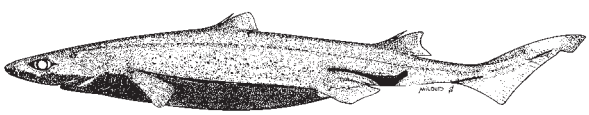




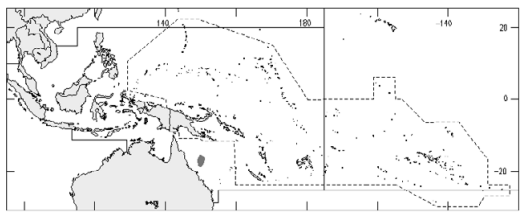
***Etmopterus* sp. D** [Last and Stevens, 1994]

En - Pink lanternshark.

Maximum total length at least 41 cm. Occurs near the bottom on the upper continental slope in depths of 800 to 880 m. Biology and distribution almost unknown. Without interest to fisheries at present. So far recorded only from off Cairns, northern Queensland.



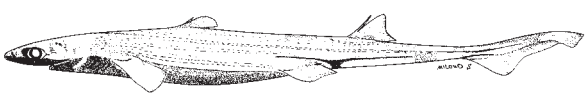
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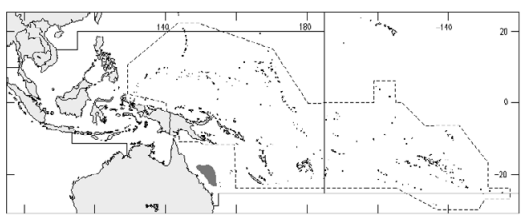
***Etmopterus* sp. F** [Last and Stevens, 1994]

En - Lined lanternshark.

Maximum total length at least 45 cm. On or near the bottom of the upper continental slope at depths of 590 to 700 m. Its biology is poorly known. The few known specimens were collected off northern Queensland between Cairns and Rockhampton. Interest to fisheries unknown.



(after Last and Stevens, 1994)

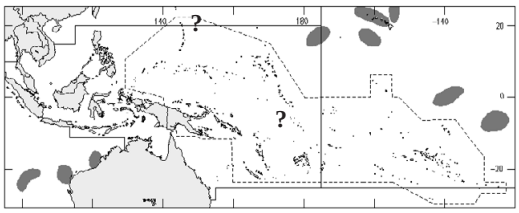


Euprotomicrus bispinatus (Quoy and Gaimard, 1824)

En - Pygmy shark; **Fr** - Squale pygmée; **Sp** - Tollo pigmeo.

Maximum total length about 27 cm. Occurs at or near the surface at night and apparently descends to below 400 m (possibly as deep as 1 800 m) during the day. Feeds on squid, bony fishes, and crustaceans. Without interest to fisheries. Oceanic and circumglobal in the tropical and temperate oceans.



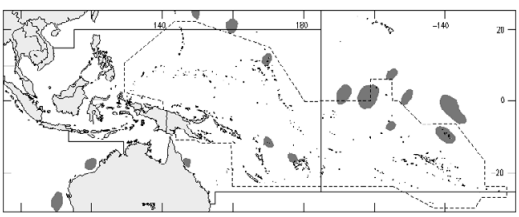


Isistius brasiliensis (Quoy and Gaimard, 1824)

En - Cookiecutter shark; **Fr** - Squalelet féroce; **Sp** - Tollo cigarro.

Maximum total length about 50 cm. Makes diurnal vertical migrations probably from below 1 000 m in the day to or near the surface at night. Feeds on free-living deep-water prey, but is also a facultative ectoparasite on larger marine organisms. Minor importance to fisheries in the area. Widespread oceanic in temperate and tropical oceans.



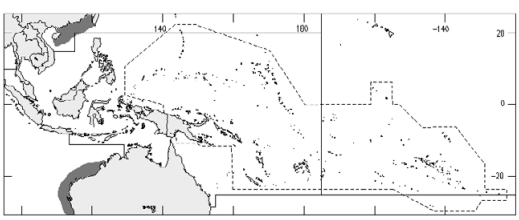


Scymnodon squamulosus (Günther, 1877)

En - Velvet dogfish; **Fr** - Squale-grogneur velouté; **Sp** - Bruja terciopelo.

Maximum total length at least 84 cm. Demersal or pelagic near continental slopes and seamounts in depths of 550 to 2 000 m. Without interest to fisheries. Western Atlantic (Gulf of Mexico, Surinam, Brazil), eastern Atlantic from Iceland to Senegal, southern Africa and the western Pacific from Japan, South China Sea, Australia, and New Zealand.



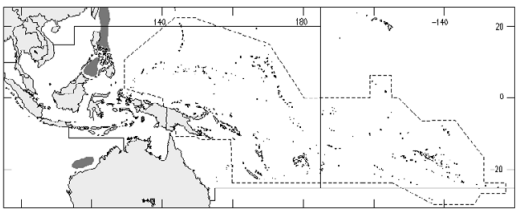


Squaliolus aliae Teng, 1959

En - Smalleye pigmy shark.

Maximum total length about 22 cm. Together with the following species possibly the smallest living shark. Epipelagic or mesopelagic near continental and island land masses; makes diurnal migrations probably from within 200 m of the surface at night down to about 2 000 m during the day. Feeds on cephalopods and small bony fish. Without interest to fisheries. Western Pacific from Japan to Australia.



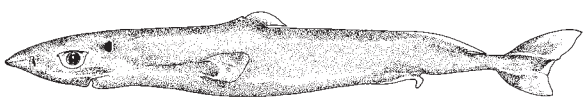


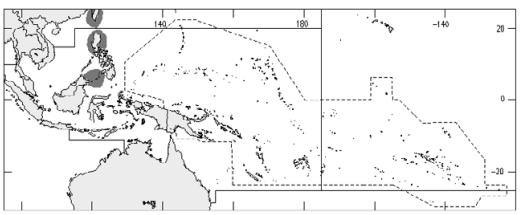
(after Last and Stevens, 1994)

Squaliolus laticaudus Smith and Radcliffe, 1912

En - Spined pygmy shark; **Fr** - Squale nain; **Sp** - Tollo pigmeo espinudo.

Maximum total length about 25 cm. Epipelagic near continental and island land masses, usually over the slopes at depths of 200 to 500 m. Feeds on deep-water squid and bony fish. Without interest to fisheries. Oceanic and nearly circumtropical.

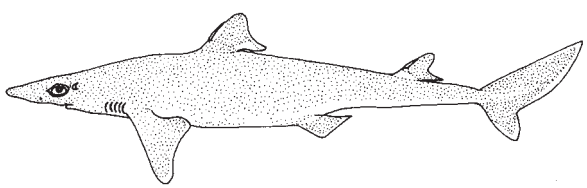


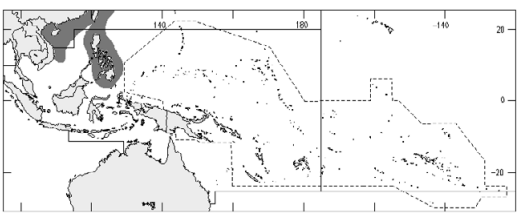


Squalus japonicus Ishikawa, 1908

En - Japanese spurdog; **Fr** - Aiguillat togari; **Sp** - Galludo japones.

Maximum total length about 91 cm. On the outer continental and insular shelves and uppermost slopes at depths of 150 to 300 m, presumably on or near bottom. Interest to fisheries unknown. Southeastern Japan to the East China Sea, including Korea and the Philippines.

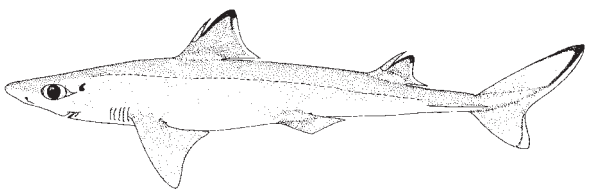


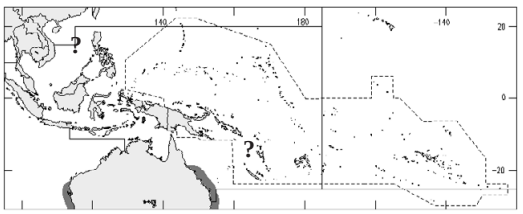


Squalus megalops (Macleay, 1881)

En - Shortnose spurdog; **Fr** - Aiquillat nez court; **Sp** - Galludo ñato.

Maximum total length about 71 cm. On the outer continental shelves and slopes on or near the bottom at depths of 50 to 730 m. Schooling; feeds on bony fish, also on cephalopods, crustaceans and other elasmobranchs. Taken in bottom trawls, and by hook-and-line (sports catches); consumed fresh, dried salted, or smoked. Eastern Atlantic from Guinea to South Africa, in the Pacific from South Africa to Mozambique, from Japan to (possibly) Viet Nam and off Australia, and possibly New Caledonia and Vanuatu. Possibly a species complex. Western North Pacific representatives often recognized as *Squalus brevirostris*.

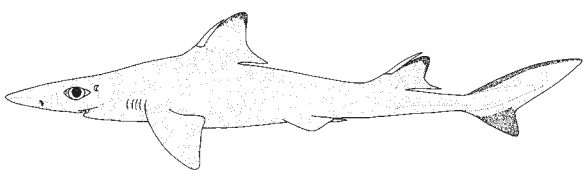


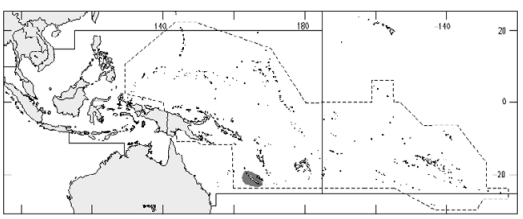


Squalus melanurus Fourmanoir and Rivaton, 1979

En - Blacktailed spurdog; **Fr** - Aiguillat à queue noire; **Sp** - Galludo cola negra.

Maximum total length 75 cm (adult females). Occurs on the insular slopes of New Caledonia, at depths of 320 to 340 m. Feeds on lanternfishes, boarfishes, barracudinas, and flatheads. Without interest to fisheries at present. Known only from New Caledonia, from the Ad and Bulari passes.

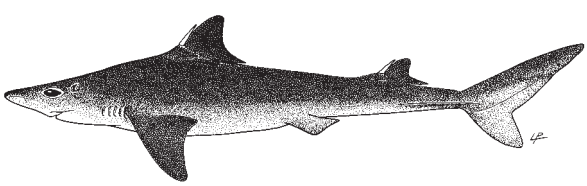


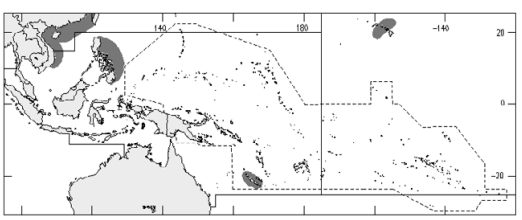


Squalus mitsukurii Jordan and Snyder, 1903

En - Shortspine spurdog; **Fr** - Aiguillat épinette; **Sp** - Galludo espinilla.

Maximum total length about 1.1 m; commonly to about 76 cm. On the continental and insular slopes and shelves and upper slopes at depths from 50 to 740 m. Feeds on bony fishes, cephalopods, and crustaceans. Caught in bottom trawls, but without importance to fisheries in the area. Considered to be widely distributed in temperate and subtropical parts of most oceans but possibly consisting of a species complex.

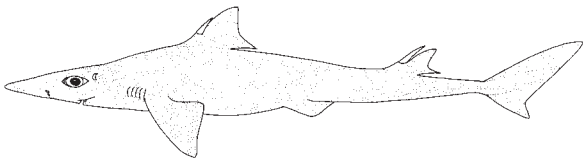


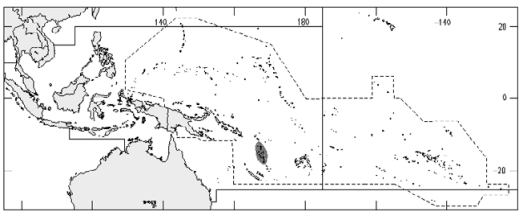


Squalus rancureli Fourmanoir and Rivanton, 1979

En - Cyrano spurdog; **Fr** - Aiguillat cyrano; **Sp** - Galludo cirann.

Maximum total length at least 77 cm. Occurs on the insular slopes of Vanuatu, at depths of 320 and 400 m. Without interest to fisheries at present. Known only from the vicinity of Vate, Vanuatu.

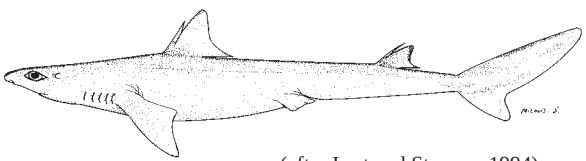




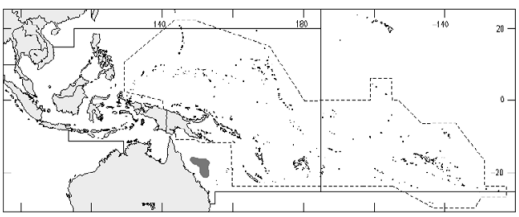
***Squalus* sp. A** [Last and Stevens, 1994]

En - Bartail spurdog.

Maximum total length at least 62 cm. Known only from a few specimens collected off Queensland between Cairns and Rockhampton in 220 to 450 m. Interest to fisheries unknown.



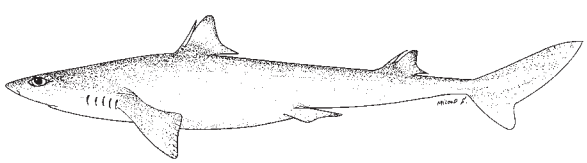
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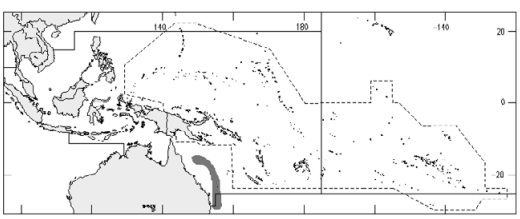


***Squalus* sp. B** [Last and Stevens, 1994]

En - Eastern highfin spurdog.

Maximum total length at least 65 cm. On the upper continental slopes in depths to 240 to 450 cm. Biology almost entirely unknown. Interest to fisheries unknown. Eastern Australia from the Queensland Plateau to Byron Bay. A similar and probably identical spurdog occurs off northern Papua New Guinea.

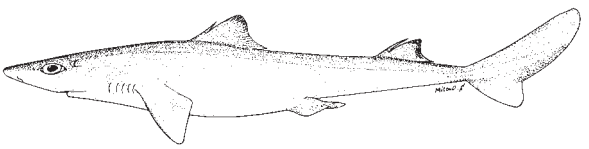


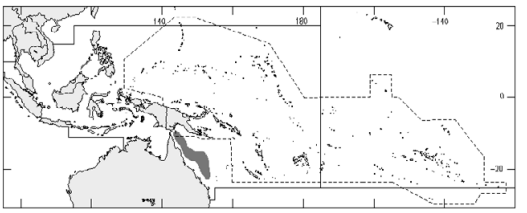


***Squalus* sp. F** [Last and Stevens, 1994]

En - Eastern longnose spurdog.

Maximum total length about 64 cm. On the continental slope off Queensland between Cape York and Rockhampton in depths from 220 to 500 m. A similar small, long-nosed spurdog occurs off north and eastern Luzon, Philippines, from coastal waters less than a depth of 40 m to 385 m. Interest to fisheries limited. The Philippines spurdog is fished locally.





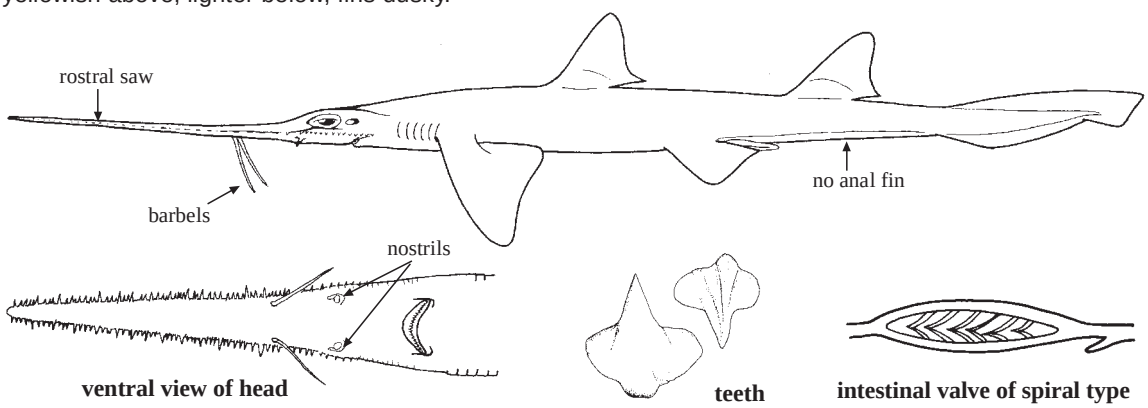
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PRISTIOPHORIDAE

Saw sharks

by L.J.V. Compagno

Diagnostic characters: Small sharks with cylindrical to somewhat depressed bodies, without lateral ridges but **tail with long lateral folds reaching caudal fin**; precaudal tail about as long as trunk. Head not expanded laterally, considerably depressed; 5 or 6 small gill slits present, all in front of pectoral-fin origins, their upper ends not expanded onto upper surface of head; no gill sieves or complex rakers on internal gill slits; **spiracles present and very large, behind eyes**; nostrils without barbels, nasoral grooves or circumnarial grooves, far anterior to mouth; eyes dorsal on head, without nictitating eyelids; **snout extremely long, depressed and blade-like, with lateral teeth and unique rostral barbels** in front of nostrils; **mouth small, short, transversely arched, and well behind eyes;** labial furrows very short, confined to mouth corners; teeth small, not blade-like, with a single low cusp, similar in upper and lower jaws and weakly differentiated along the jaws. **Two dorsal fins, without spines,** the first dorsal fin moderately large, high and angular, much shorter than caudal fin, and with its base nearly equidistant between pectoral- and pelvic-fin bases; second dorsal fin about as large as first; **anal fin absent**; caudal fin strongly asymmetrical, much less than 1/2 of total length, without a rippled or undulated dorsal margin but with a strong subterminal notch; lower lobe not present or very short; vertebral axis of caudal fin slightly raised above body axis. Caudal peduncle depressed, without precaudal pits but with low lateral folds continuing from precaudal tail. Intestinal valve of spiral type. **Colour:** uniform or mottled grey, brown or yellowish above, lighter below, fins dusky.

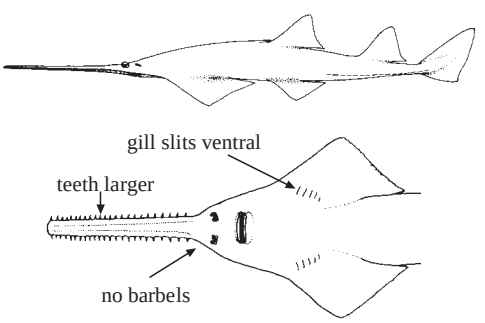


Habitat, biology, and fisheries: These are moderately abundant, primarily deep-water sharks, found on the outer continental shelves and upper slopes down to 915 m, sometimes inshore in shallow water. All species are ovoviviparous. They probably use their rostral saws to injure and kill small fishes and crustaceans, much as do the batoid sawfishes (Pristidae). They have a disjunct distribution at present from the western Pacific, western Indian Ocean, and western North Atlantic, but were formerly almost worldwide. Saw sharks are taken in bottom trawls, and are used fresh for human consumption, but are only of minor importance to fisheries in the area. Considerable fisheries exist in southern Australia, but also in the western North Pacific. Harmless sharks, not exceeding 1.4 m total length.

Similar families occurring in the area

No other sharks have a rostral saw with barbels.

Sawfishes (Pristidae, a family of batoid fishes) are (or formerly were) common in the area and also have a rostral saw, but differ from the sawsharks in having the pectoral fins expanded anteriorly over the gill openings and fused to the sides of the head, so that the head and pectoral fins form a distinct pectoral disc with the gill openings ventral (as in other batoids); additionally, the trunk is shorter and more depressed, the first dorsal fin is partially or entirely above the pelvic-fin bases, the rostral saw has relatively few, uniformly large, continuously growing teeth (small, varying in size along the rostrum, and not growing, but periodically replaced in Pristiophoridae) and no barbels. Furthermore, the species of sawfishes are much larger, reaching 6 m or more.



Pristidae (sawfishes)

Key to the species of Pristiophoridae occurring in thea area

1a. Barbels closer to rostral tip than mouth or approximately equidistant, prebarbel snout 45 to 51% of preoral snout; spiracles moderately large, width less than 0.5 of eye diameter; distance from nostrils to mouth more than 1.3 times internarial space; colour uniform pale yellowish brown above; maximum total length 80 cm, males mature at 62 cm (Australia) . . . . . ***Pristiophorus* sp. B**

1b. Barbels slightly closer to mouth than rostral tip, prebarbel snout 51 to 55% of preoral snout. Spiracles large, width almost 0.75 of eye diameter; distance from nostrils to mouth about 1.1 to 1.2 times internarial space; colour uniform dark brown above; maximum total length at least 73 cm (females) (Philippines) . . . . . ***Pristiophorus* sp.**

List of species occurring in the area

The symbol is given when species accounts are included.

Pristiophorus sp. B [Last and Stevens, 1994] (Australia)
Pristiophorus sp. (Philippines)

References

Compagno, L.J.V. 1984. FAO species catalogue. Vol.4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish. Synop.*, (125)Vol.4,Pt.1:150 p.

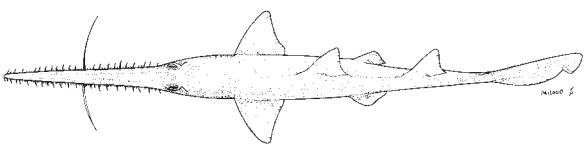
Last, P. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

Springer, S. and H.R. Bullis, Jr. 1960. A new species of sawsharks, *Pristiophorus schroederi*, from the Bahamas. *Bull. Mar. Sci. Gulf Caribb.*, 10(2):241-254.

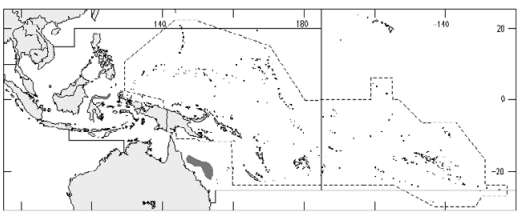
***Pristiophorus* sp. B** [Last and Stevens, 1994]

En - Tropical sawshark.

Maximum total length at least 84 cm. So far only known from the continental slope off tropical northeastern Australia between Rockhampton and Cairns in depths of 300 to 400 m. Interest to fisheries unknown.



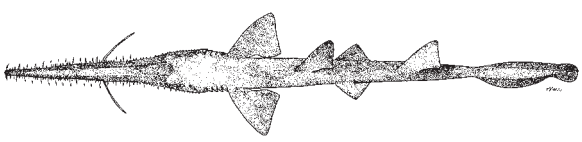
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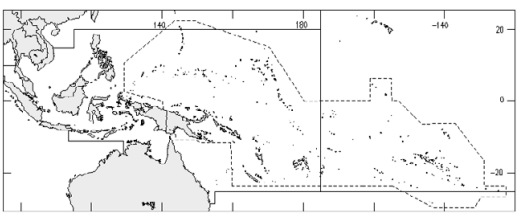


***Pristiophorus* sp.**

En - Philippine sawshark.

Maximum total length at least 73 cm. A little-known deep-water sawshark, so far only known from the upper continental slope off southern Luzon (Balayan Bay, Ragay Gulf) and between Negros and Siquijor in the Philippines at depths of 229 to 593 m. Interest to fisheries unknown. Previously confused with *Pristiophorus cirratus* and *P. japonicus*, which apparently do not occur in the area.



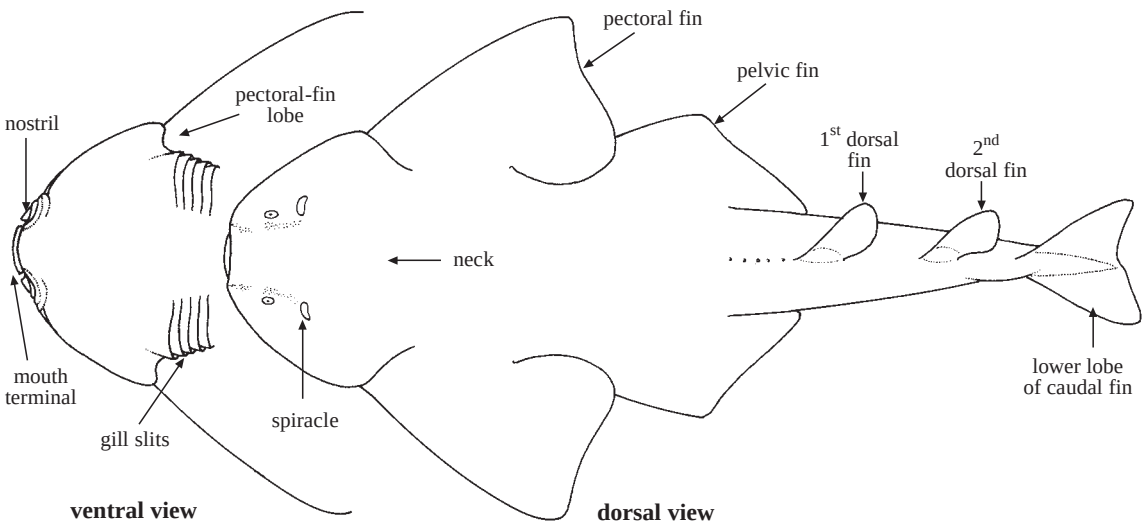


SQUATINIDAE

Angelsharks, sand devils

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Moderately large, **flattened, ray-like sharks.** Head transversely oval or round, **with a distinct neck at the pectoral-fin bases;** 5 pairs of moderately long gill slits situated ventrolaterally and not visible dorsally; no gill rakers; nostrils at tip of snout, with anterior flaps shaped as elaborate barbels; eyes on dorsal surface of head, without nictitating eyelids; **mouth terminal**, short and angular, extending under front of eyes when jaws are not protruded; teeth small, similar in both jaws, with a single, strong, needle-sharp cusp and no cusplets. **Two equally small, spineless dorsal fins located far rearward on tail,** the first originating behind the pelvic-fin bases; **pectoral fins greatly enlarged, with a broad triangular lobe extending forward from their bases on either side of gill slits** (but not fused to sides of head as in rays); pelvic fins enlarged and wing-like; **anal fin absent**; caudal fin very short, nearly symmetrical but not lunate, **its lower lobe slightly longer than the upper**. Caudal peduncle moderately depressed, with a short, low, longitudinal keel on each side, but without precaudal pits. Intestine with an auger- or corkscrew-like spiral valve. **Colour:** grey or brownish above, white below, with irregular darker markings or light ocelli.

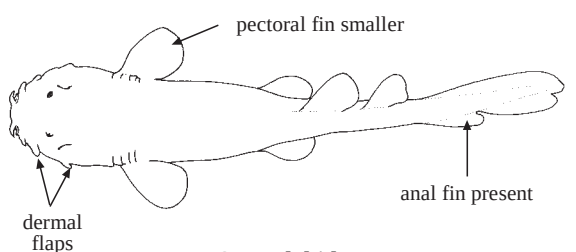


Habitat, biology, and fisheries: Angelsharks are widely distributed and often abundant in cool temperate to tropical seas, ranging in depth from shallow inshore waters down to the upper continental slope. They are bottom-dwelling sharks, often burying themselves in sand or mud, and feed on small fishes and bottom invertebrates. Ordinarily harmless, but aggressive when provoked and capable of causing serious cuts with their small but needle-sharp teeth and strong jaws. Angelsharks are commonly caught in trawls but their use varies from region to region; some are utilized for food and fishmeal; their skin makes good leather and shagreen for sanding wood.

Similar families occurring in the area

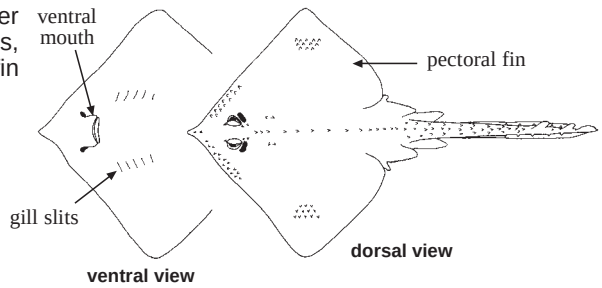
Orectolobidae: also with considerably depressed bodies, but pectoral fins much smaller and anal fin present.

The combination of characters in boldface readily distinguishes the angelsharks from all other shark families in the area.



Orectolobidae

Rays (Batoidea): pectoral fins fused to head over ventral gill slits, no neck at pectoral-fin bases, usually a ventral mouth, and lower lobe of caudal fin (when present) much shorter than the upper.



Batoidea

Key to the species of Squatinidae occurring in the area

1a. Anterior nasal barbels simple, with narrow spatulate tip . . . . . ***Squatina japonica***

1b. Anterior nasal barbels strongly fringed (Fig. 1) . . . . . → ***2***

2a. Interorbital space flat or convex, orbital thorns absent (Fig. 1a); numerous dark spots on lower lobe of caudal fin . . . . . ***Squatina australis***

2b. Interorbital space concave, orbital thorns usually present (Fig. 1b) more pale spots than dark spots on lower lobe of caudal fin . . . . . ***Squatina* sp. A**

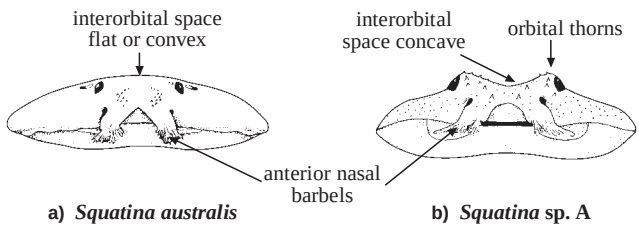


Fig. 1 frontal view of head

(after Last and Stevens, 1994)

List of species occurring in the area

The symbol is given when species accounts are included.

Squatina australis Regan, 1906
Squatina japonica Bleeker, 1858
Squatina sp. A [Last and Stevens, 1994]

References

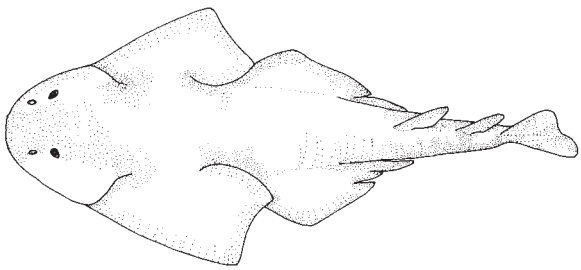
Compagno, L.J.V. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish. Synop.*, (125)Vol.4,Pt.1:249 p.

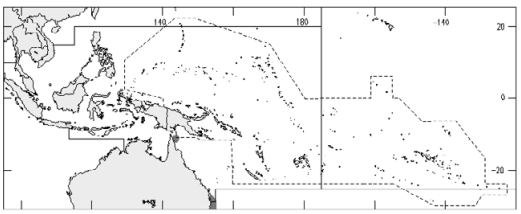
Last, P. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

Squatina australis Regan, 1906

En - Australian angelshark; **Fr** - Ange de mer australien; **Sp** - Angelote australiano.

Maximum total length about 1.52 m. A common but little-known angelshark of the continental shelf and uppermost slope, on or near bottom from close inshore to a depth of 130 m. Taken by bottom trawlers in Australia for human consumption. Southern Australia from Rottnest Island (western Australia) to New South Wales, including Tasmania.

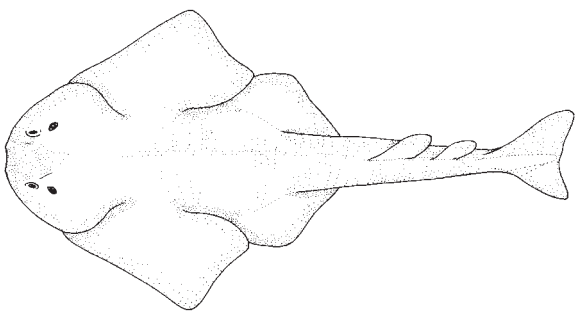


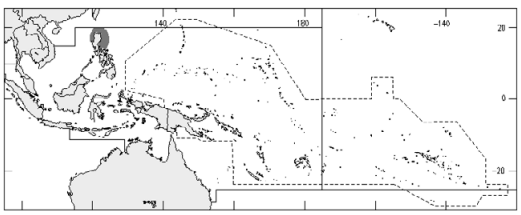


Squatina japonica Bleeker, 1858

En - Japanese angelshark; **Fr** - Ange de mer Kasuzame; **Sp** - Angelote japones.

Maximum total length about 2 m. A little known angelshark, found on or near the bottom mainly of temperate western North Pacific waters. Used for human consumption, but importance to fisheries in the area uncertain. Known from Japan, the Yellow Sea, Korea, northern China, and the Philippines.



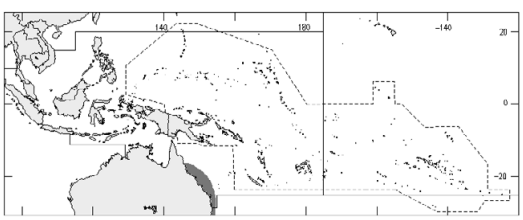


***Squatina* sp. A** [Last and Stevens, 1994]

En - Eastern angelshark.

Maximum total length at least 63 cm. On the outer continental shelf and upper slope off eastern Australia between Cairns (Queensland) and Lakes Entrance (Victoria) in depths of 130 to 315 m. Utilized for human consumption, but at present of minor importance to fisheries.





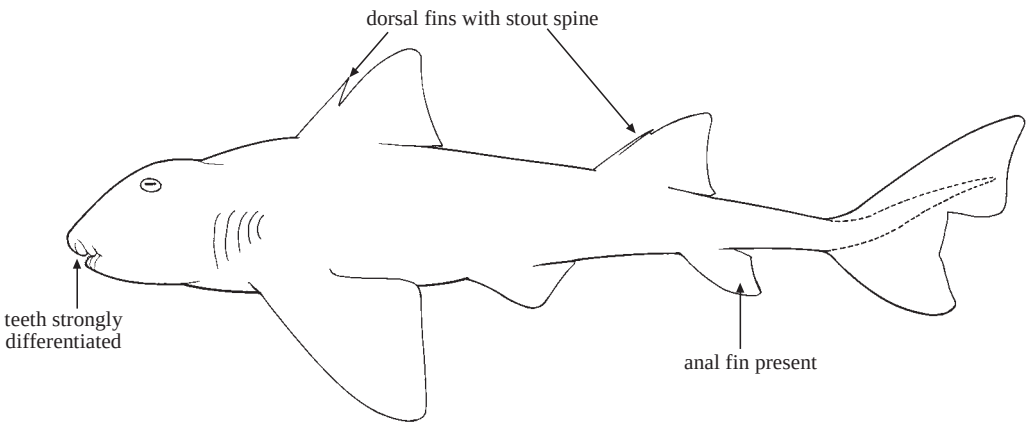
(after Last and Stevens, 1994)

HETERODONTIDAE

Bullhead sharks, horn sharks

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Small to medium-sized sharks, **with cylindrical or slightly compressed bodies**. Head conical and slightly elevated; 5 pairs of gill slits present on sides of head, the last 3 above the pectoral-fin bases; spiracles present and small, behind and below eyes; nostrils without barbels but with strong circumnarial grooves and with prominent nasoral grooves connecting nostrils to mouth; anterior nasal flaps elongated posteriorly and reaching mouth; **eyes on dorsolateral surface of head, without nictitating lower eyelids; snout very short and bluntly rounded**; mouth moderate, arched and short, well in front of eyes; labial furrows very large, present on both jaws; **teeth strongly differentiated along jaws, with anterior teeth small and cuspidate and posteriors enlarged, cuspidate and molariform**; no small intermediate teeth or a gap between anterior and lateroposterior teeth in upper jaw. **Two dorsal fins, each with a stout fin spine**, the first with its origin over the pectoral-fin bases or inner margins; pectoral fins moderately large, not ray-like and without triangular anterior lobes; pelvic fins moderately large, with vent continuous with their inner margins; **anal fin present**; caudal fin with a moderately long dorsal lobe and moderately long ventral lobe, the latter shorter than the dorsal lobe. Vertebral axis raised into caudal-fin lobe; intestinal valve of spiral type. **Colour:** brownish to greyish, with colour patterns of dark bars, stripes, or saddles in species of the area.



Habitat, biology, and fisheries: These are common, sluggish, warm-temperate and tropical bottom sharks of the continental and insular shelves and uppermost slopes of the western and eastern Pacific and western Indian Ocean. They are apparently night-active sharks and occur on or near the bottom from the intertidal to 275 m depth, but mostly in shallower water than 100 m. All species are oviparous. Bullhead sharks primarily feed on benthic invertebrates. They are of minimal interest to fisheries, being caught as a bycatch of bottom trawl and line fisheries and utilized for human consumption and for fishmeal. They are commonly caught by divers and in sport fisheries. These sharks can snap when provoked and occasionally pursue and bite their tormentors.

Similar families occurring in the area

None. No other living sharks combine fin spines in the dorsal fins with the presence of an anal fin. The tooth morphology of bullhead sharks is unique among sharks of the area.

Key to the species of Heterodontidae occurring in the area

1a. Supraorbital ridges very high, abruptly ending behind eyes (Fig. 1); body with broad blackish bands or saddle-markings . . . . . ***Heterodontus galeatus***

1b. Supraorbital ridges relatively low, not abruptly ending behind eyes; body with narrow bands or stripes . . . . . → ***2***

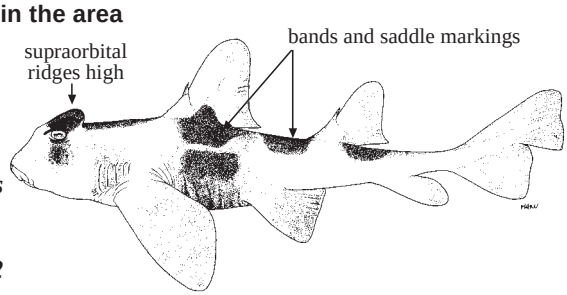


Fig. 1 ***Heterodontus galeatus***

2a. Colour pattern with narrow, discrete brown or black vertical bands on a pale background (Fig. 2) . . . . . ***Heterodontus zebra***

2b. Colour pattern with a set of harness-like narrow dark stripes on the back (Fig. 3) . . . . . ***Heterodontus portusjacksoni***

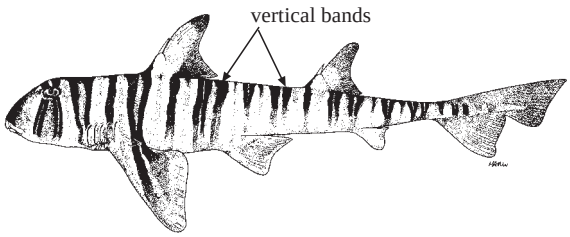


Fig. 2 ***Heterodontus zebra***

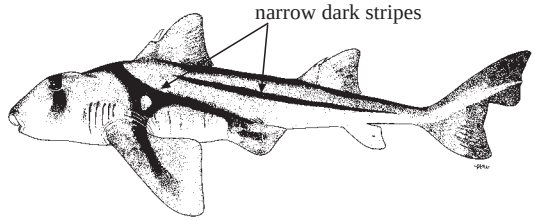


Fig. 3 ***Heterodontus portusjacksoni***

List of species occurring in the area

The symbol is are given when species accounts are included.

- *Heterodontus galeatus* (Günther, 1870)
- *Heterodontus portusjacksoni* (Meyer, 1793)
- *Heterodontus zebra* (Gray, 1831)

References

Compagno, L.J.V. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish. Synop.*, (125)Vol.4.Pt.1:249 p.

Last, P. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

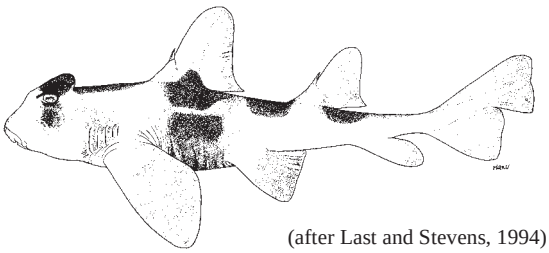
Regan, C.T. 1908. A synopsis of the sharks of the family Cestraciontidae. *Ann. Mag. Nat. Hist. (Ser.8)*, 1(69):493-497.

Taylor, L.R., Jr. 1972. *A revision of the shark family Heterodontidae (Heterodontiformes, Selachii)*. University of California, San Diego, Ph.D. Thesis, 176 p. Available from University Microfilms International, Ann Arbor, Michigan.

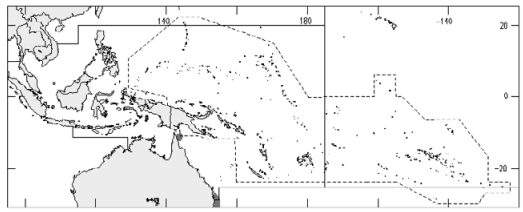
Heterodontus galeatus (Günther, 1870)

En - Crested bullhead shark; **Fr** - Requin dormeur à crête; **Sp** - Dormilón carenado.

Maximum total length about 1.3 m. A moderately common benthic and epibenthic shark of the continental shelves from close inshore to a depth of about 90 m. Feeds primarily on sea urchins (echinoids), but also on crustaceans, molluscs, and small fishes. Of minor interest to fisheries. Western South Pacific of Australia from southern Queensland to New South Wales.



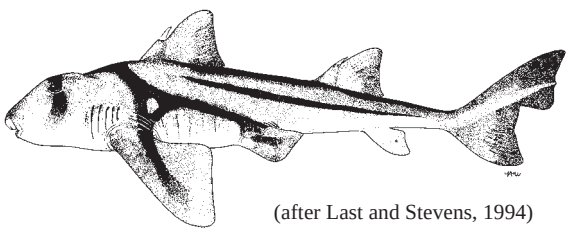
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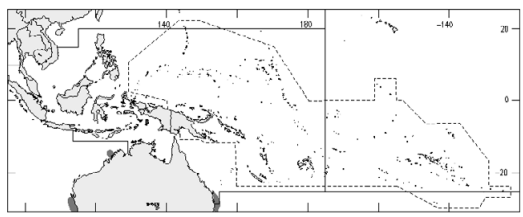
Heterodontus portusjacksoni (Meyer, 1793)

En - Port Jackson shark; **Fr** - Requin dormeur taureau; **Sp** - Dormilón toro.

Maximum total length about 1.65 m. A common shark of the continental shelves from close inshore to depths of at least 275 m. Feeds on benthic invertebrates, primarily echinoderms. Taken by bottom trawls, shrimp nets, beach seines, bottom longlines, and by rod and reel, but probably little utilized. Southern Australia from the Houtman Abrolhos (western Australia) to New South Wales, including Tasmania; a single record from New Zealand.



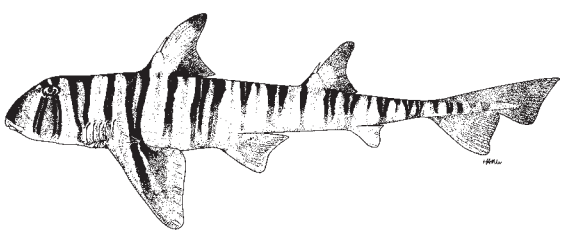
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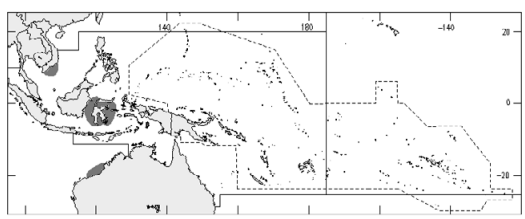
Heterodontus zebra (Gray, 1831)

En - Zebra bullhead shark; **Fr** - Requin dormeur zèbre; **Sp** - Dormilón acebrado.

Maximum total length about 1.22 m. A common but little-known bottom shark of the continental and insular shelves in depths down to at least 50 m. Probably feeds on bottom invertebrates. Of minor interest to fisheries. Distributed from Japan, Korea, China, and Viet Nam to Indonesia; also known from northern Australia.



(after Last and Stevens, 1994)

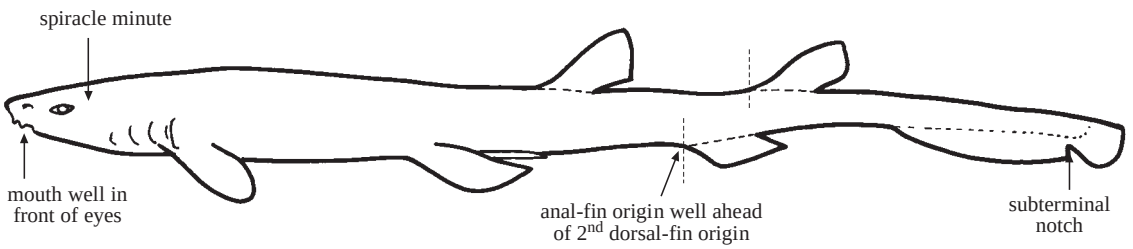


PARASCYLLIIDAE

Collared carpetsharks

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Small sharks with cylindrical or slightly depressed bodies, without ridges on sides. Head narrow and slightly flattened, without lateral flaps of skin; gill slits small, fifth overlapping fourth; internal gill slits without filter screens; **spiracles minute**, much smaller than eyes and not below them; **nostrils with short, pointed barbels and distinct circumnarial folds and grooves** around outer edges of incurrent apertures; eyes dorsolaterally on head, with subocular pockets; snout broadly rounded to slightly pointed**; mouth small, entirely in front of eyes,** and arched, without a symphyseal groove on chin; teeth not strongly differentiated in jaws, with a medial cusp, lateral cusplets and relatively strong labial root lobes; tooth rows 27 to 54/25 to 49. Dorsal fins equal sized, **first dorsal fin with origin and insertion well behind the pelvic-fin bases**; pectoral fins small, broad, and rounded, as large as pelvic fins or slightly larger; pelvic fins about as large as dorsal fins but slightly greater than anal fin; anal fin somewhat smaller than second dorsal fin, **with its origin well ahead of second dorsal-fin origin**; **anal fin with broad base and angular apex, separated by a space greater than its base length from lower caudal-fin origin**; caudal fin with its upper lobe not elevated above the body axis, less than a quarter as long as the entire shark, with a strong terminal lobe and subterminal notch but no ventral lobe. Caudal peduncle without lateral keels or precaudal pits. Supraorbital crests absent from cranium. Intestinal valve of spiral type. **Colour:** pattern of dark and light spots and saddle markings, in some species also a dark collar around gills.

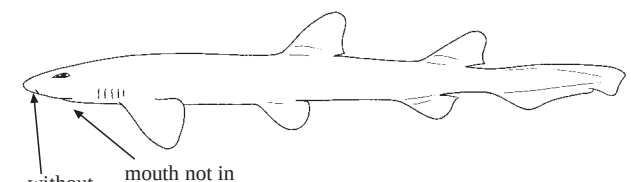


Habitat, biology, and fisheries: These are rare to common, harmless bottom sharks of often deepish temperate and tropical, continental waters of the western Pacific, occurring from close inshore down to at least 183 m offshore. They are found on muddy, sandy, or rocky bottom, and apparently can change colour somewhat to match the bottom type. All species are small, less than a metre long when mature. At least some of the species are ovoviviparous. They feed probably on small fish, crustaceans, and other bottom invertebrates. Several species are taken in bottom trawls, but utilization is probably minimal.

Similar families occurring in the area

Scyliorhinidae: mouth not entirely in front of eyes; no circumnarial folds and grooves around the nostrils.

Their mouth and nostril structures, 2 spineless dorsal fins and an anal fin, anal-fin origin well ahead of second dorsal-fin origin, and minute spiracles distinguish the Parascylliidae from all other sharks.

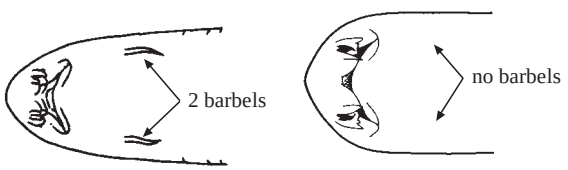


Scyliorhinidae

Key to the species of Parascylliidae occurring in the area

1a. A pair of barbels on throat (Fig. 1a); gill region without collar marking . . . . ***Cirrhoscyllium expolitum***

1b. No barbels on throat (Fig. 1b); gill region with a prominent dark brownish collar . . . . . ***Parascyllium collare***



a) ***Cirrhoscyllium expolitum*** b) ***Parascyllium collare***

Fig. 1 ventral view of head

List of species occurring in the area

The symbol is given when species accounts are included.

Cirrhoscyllium expolitum Smith and Radcliffe, 1913

Parascyllium collare Ramsay and Ogilby, 1888

References

Compagno, L.J.V. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish. Synop.*, (125)Vol.4.Pt.1:249 p.

Goto, T. and K. Nakaya. 1996. Revision of the genus *Cirrhoscyllium*, with the designation of a neotype for *C. japonicum* (Elasmobranchii, Parascylliidae). *Ichthyol. Res.*, 43(3):199-209.

Last, P. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

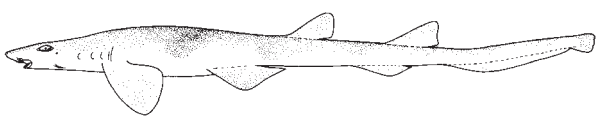
Ogilby, J.D. and A.R. McCulloch. 1908. A revision of the Australian Orectolobidae. *J. Proc. R. Soc. N.S.W.*, 42:264-299.

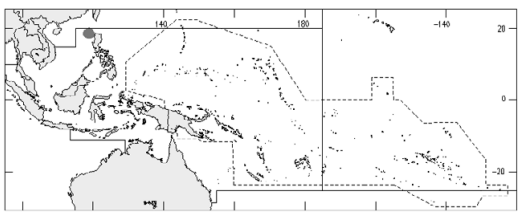
Regan, C.T. 1908. A revision of the sharks of the family Orectolobidae. *Proc. Zool. Soc. Lond.*, 1908:347-364.

Cirrhoscyllium expolitum Smith and Radcliffe, 1913

En - Barbelthroat carpetshark; **Fr** - Requin carpette à moustache; **Sp** - Alfombrera barbuda.

Maximum total length at least 33.5 cm. A little-known tropical shark of the continental shelf, offshore on or near the bottom at a depth of 180 m. Probably oviparous, but eggs are not known; food habits unknown. Interest to fisheries unknown. In the China Sea between Luzon, Philippines, and China.

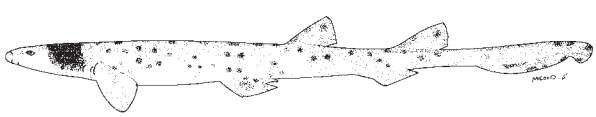




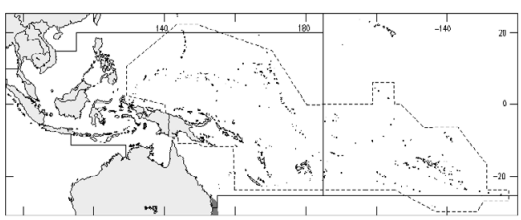
Parascyllium collare Ramsay and Ogilby, 1888

En - Collared carpetshark; **Fr** - Requin carpette à collarette; **Sp** - Alfombrera collareja.

Maximum total length about 86 cm. A common but little-known temperate-water shark of the continental shelf, on or near rock reefs and on firm bottom at depths from 20 to 160 m. Oviparous. Probably of minor interest to fisheries, although commonly taken by bottom trawlers and sometimes with line gear. Western South Australia from Victoria to southern Queensland.



(after Last and Stevens, 1994)

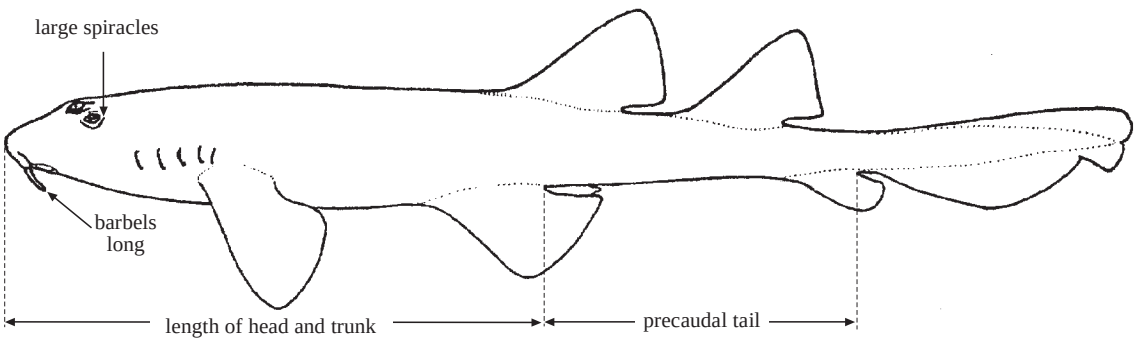


BRACHAELURIDAE

Blind sharks

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Small sharks. Trunk cylindrical or moderately depressed**, precaudal tail shorter than head and trunk**, **lateral ridges on sides of trunk and tail absent**. Head broad and somewhat flattened, without lateral flaps of skin; gill slits small, fifth close to fourth but not overlapping it; internal gill slits without filter screens; **spiracles very large**, subequal or larger than eyes and somewhat below them; **nostrils with long, pointed barbels** and distinct circumnarial folds and grooves around outer edges of incurrent apertures; eyes dorsolaterally situated on head, with subocular pockets; snout broadly rounded**; mouth small, subterminal on head, and nearly transverse, with a symphyseal groove on chin**; teeth not strongly differentiated in jaws, with a medial cusp, lateral cusplets and weak labial root lobes; tooth rows 32/21. Dorsal fins equal sized, **first dorsal fin with origin over the pelvic-fin bases** and insertion well behind the pelvic fin rear tips; pectoral fins moderate sized, broad and rounded, as large as pelvic fins or slightly larger, with fin radials not expanded into fin web; pelvic fins about as large as dorsal fins but slightly greater than anal fin; anal fin as large as or somewhat smaller than second dorsal fin**, with its origin about opposite midbase of second dorsal fin or its insertion**; anal fin with broad base and angular apex, separated by a space or narrow notch much less than base length from lower caudal-fin origin; caudal fin with its upper lobe at a low angle above the body axis, less than 1/3 as long as the entire shark, with a strong terminal lobe and subterminal notch but no ventral lobe. Caudal peduncle without lateral keels or precaudal pits. Supraorbital crests present on cranium, not laterally expanded. Valvular intestine of spiral-ring type. **Colour:** colour pattern of dark saddles and light spots present, or colour plain.



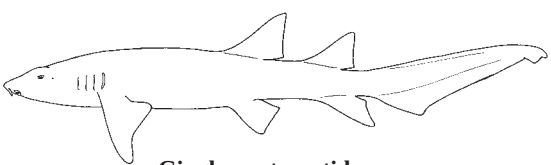
Habitat, biology, and fisheries: Blind sharks are common, harmless, inshore bottom sharks confined to temperate and tropical continental waters of Australia, in depths from the intertidal down to 110 m. They occur on rocky reefs or on coral close inshore, sometimes in water just sufficient to cover them. They are known to feed on small fishes, crustaceans, cuttlefish, and sea anemones. They are captured in bottom trawls but are not generally utilized; *Brachaelurus* is captured by sports fishermen.

Remark: The name “blind shark” stems not from lack of vision but because these sharks close their eyelids when removed from the water.

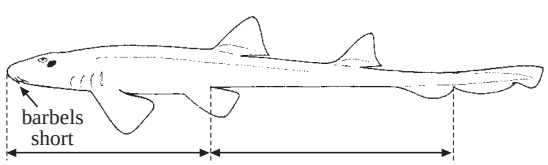
Similar families occurring in the area

Ginglymostomatidae: spiracles smaller than eyes, nostrils without circumnarial grooves, no symphyseal groove on chin, fins angular, second dorsal fin smaller than first.

Hemiscylliidae: nasal barbels shorter; no symphyseal groove on chin; precaudal tail greatly elongated, somewhat longer than head and trunk.



Ginglymostomatidae



Hemiscylliidae

Key to the species of Brachaeluridae occurring in the area

1a. Nostrils inferior on snout, nasal barbel bifurcated (Fig. 1); anal-fin origin below or in front of the second dorsal-fin origin; no white spots on body . . . . . ***Heteroscyllium colcloughi***

1b. Nostrils nearly terminal on snout, nasal barbel single lobed (Fig. 2); anal-fin origin just behind second dorsal-fin origin; mostly with white spots on body . . . . . ***Brachaelurus waddi***

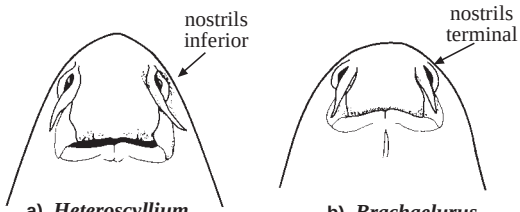


Fig. 1 underside of head
(after Last and Stevens, 1994)

List of species occurring in the area

The symbol is given when species accounts are included.

Brachaelurus waddi (Bloch and Schneider, 1801)

Heteroscyllium colcloughi (Ogilby, 1908)

References

Ogilby, J.D. and A.R. McCulloch. 1908. A revision of the Australian Orectolobidae. *J. Proc. R. Soc. N.S.W.,* 42:264-299.

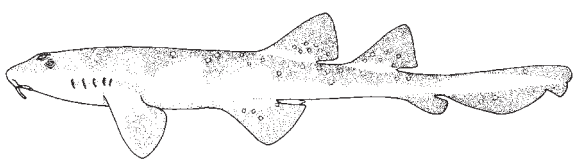
Last, P. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

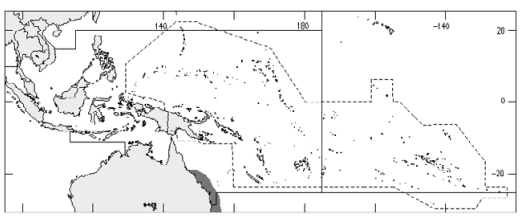
Regan, C.T. 1908. A revision of the sharks of the family Orectolobidae. *Proc. Zool. Soc. Lond.*, 1908:347-364.

Brachaelurus waddi (Bloch and Schneider, 1801)

En - Blind shark; **Fr** - Requin aveugle des roches; **Sp** - Tiburón ciego de roca.

Maximum total length to about 1 m; commonly to 60 cm. A common bottom shark of the continental shelf from the intertidal zone to about 140 m depth; favours rocky shoreline areas and coral reefs. Feeds on small reef invertebrates and small fish. Taken in bottom trawls but not used commercially. Western South Australia from southern Queensland to New South Wales.

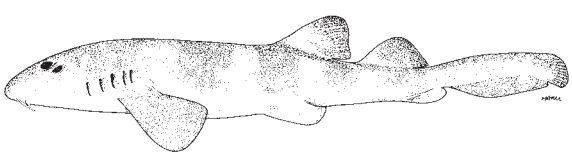


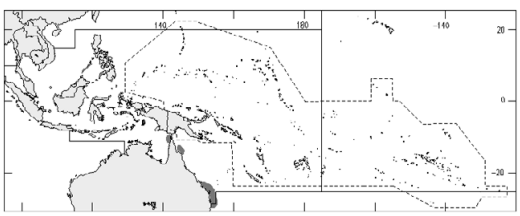


Heteroscyllium colcloughi (Ogilby, 1908)

En - Bluegray carpetshark; **Fr** - Requin aveugle gris-bleu; **Sp** - Tiburón ciego gris.

Maximum total length to about 76 cm. A little-known tropical or subtropical inshore bottom shark of the Queensland continental shelf, and off York Peninsula and the Great Barrier Reef. Of minor interest to fisheries.



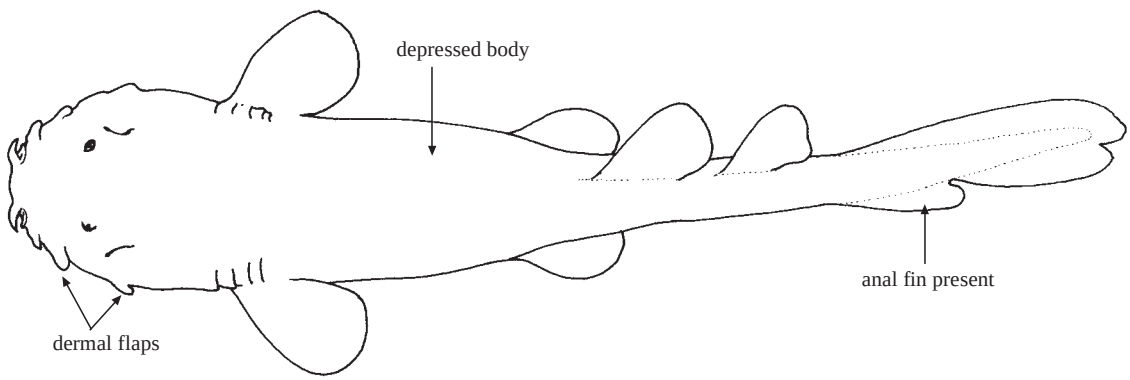


ORECTOLOBIDAE

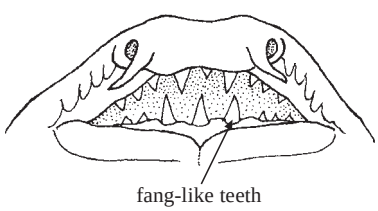
Wobbegongs

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Small to large sharks with **considerably depressed bodies**, without ridges on sides. **Head very broad and flattened, with unique lateral flaps of skin**; gill slits small, fifth well separated from fourth or close to it but not overlapping; internal gill slits without filter screens; **spiracles very large**, larger than eyes and somewhat below and lateral to them; **nostrils with long, pointed or branched barbels and distinct circumnarial folds and grooves** around outer edges of incurrent apertures; snout truncated; eyes dorsolaterally situated on head, with subocular pockets; **mouth fairly large, nearly terminal on head**, and nearly transverse, **with a symphyseal groove on chin**; teeth strongly differentiated in jaws, with **3 rows of fang-like teeth at the upper symphysis and 2 rows at the lower**; teeth with a median cusp, lateral cusplets variably present or absent, and weak labial root lobes; tooth rows 23 to 26/19. Dorsal fins equal sized, first dorsal fin with origin over or slightly behind the pelvic-fin insertions and insertion far behind rear tips of pelvic fins; **pectoral fins moderate sized or large,** broad and rounded, slightly larger than pelvic fins, with fin radials not expanded into fin web; pelvic fins larger than dorsal and anal fins; anal fin somewhat smaller than second dorsal fin, **with its origin about opposite rear 1/3 of second dorsal-fin base or insertion; anal fin with broad base and subrectangular apex, separated by a narrow notch much less than base length from lower caudal-fin origin**; caudal fin with its upper lobe hardly elevated above the body axis, less than 1/4 as long as the entire shark, **with a strong terminal lobe and subterminal notch** but without a ventral lobe. Caudal peduncle without lateral keels or precaudal pits. Supraorbital crests present on cranium, not laterally expanded. Intestine valve of ring type. **Colour:** colour pattern highly developed, including dark and light spots, dark saddles, rings, and reticulations on back.



Habitat, biology, and fisheries: These are common bottom sharks of warm-temperate to tropical continental waters of the western Pacific, occurring from the intertidal down to at least 110 m. They are often found on rocky and coral reefs or on sandy bottom, where they lurk and are concealed in part by their cryptic coloration and dermal lobes on their heads. All species are ovoviviparous, with large litters of 20 or more young. They are sluggish sharks and known to feed on bottom fishes and invertebrates. They are utilized for food and for their colourful skins which are sometimes used for leather. Wobbegongs of all sizes, but especially the larger individuals, should be regarded as potentially dangerous and should be treated with due respect.

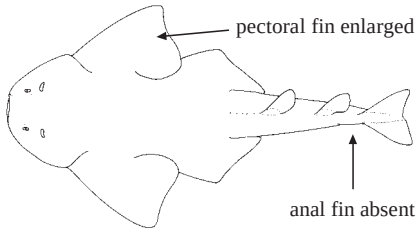


anteriormost part of head (ventral view)

Similar families occurring in the area

Squatinidae: also with considerably depressed bodies, but pectoral fins much larger and anal fin absent.

The distinctive flattened body and the narrow dermal flaps of skin around mouth and head distinguish the wobbegongs from other shark families in the area.



Squatinidae

Key to the species of Orectolobidae occurring in the area

1a. Dermal lobes highly branched, present on sides of head and on chin (Fig. 1a); body with a reticular pattern of narrow dark lines . . . . . ***Eucrossorhinus dasypogon***

1b. Dermal lobes weakly branched, present on sides of head but absent from chin (Fig. 1b); colour pattern variable, but without a reticular pattern of narrow dark lines . . . . . → ***2***

2a. Nasal barbels not branched (Fig. 2a); dermal lobes of head very broad-based, only 2 or 3 in front of eyes; colour pattern simple, dark rounded saddles with light outlining widely spaced by dusky areas and with a few dark spots; saddles on head and trunk forming conspicuous eyespots . . . . . ***Orectolobus wardi***

2b. Nasal barbels branched (Fig. 2b); dermal flaps narrow-based and more numerous, 5 or more in front of eyes; colour pattern with elaborate variegated spots and saddles . . . . . → ***2***

3a. Back dark, with light O-shaped markings obscuring darker saddles; about 6 to 10 dermal flaps below and in front of eyes (Fig. 2b) . . . . . ***Orectolobus maculatus***

3b. Back with dark colour variegated with light blotches and prominent saddle markings; about 5 or 6 dermal flaps below and in front of eyes . . . . . → ***3***

4a. Back with light areas between dark saddles marked with broad reticulated dark lines . . . . . ***Orectolobus japonicus***

4b. Back with light areas between dark saddles marked with dark, light-centred blotches and spots, not reticulated lines . . . . . ***Orectolobus ornatus***

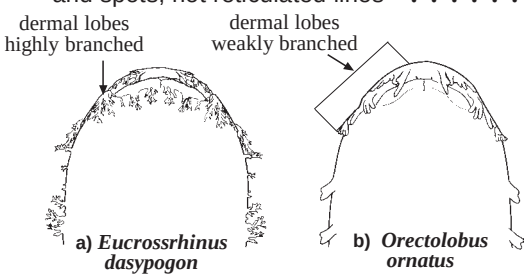


Fig. 1 head (ventral view)

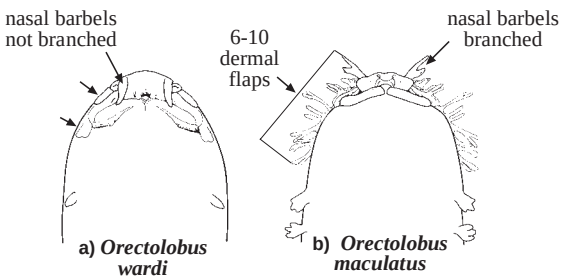


Fig. 2 head (ventral view)

(after Last and Stevens, 1994)

List of species occurring in the area

The symbol is given when species accounts are included.

- *Eucrossorhinus dasypogon* (Bleeker, 1867)
- *Orectolobus japonicus* Regan, 1906
- *Orectolobus maculatus* (Bonnaterre, 1788)
- *Orectolobus ornatus* (de Vis, 1883)
- *Orectolobus wardi* Whitley, 1939

References

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Last, P. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

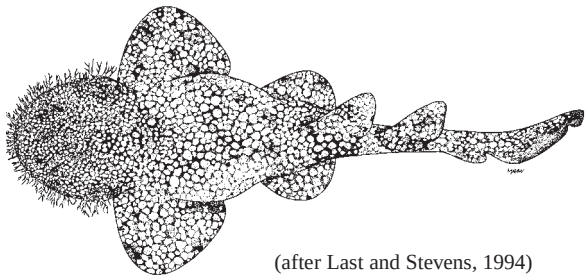
Ogilby, J.D. and A.R. McCulloch. 1908. A revision of the Australian Orectolobidae. *J. Proc. R. Soc. N.S.W.*, 42:264-299.

Regan, C.T. 1908. A revision of the sharks of the family Orectolobidae. *Proc. Zool. Soc. Lond.*, (1908):347-364.

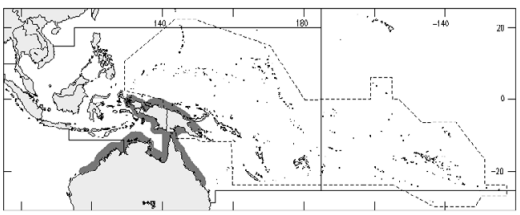
Eucrossorhinus dasypogon (Bleeker, 1867)

En - Tasselled wobbegong; **Fr** - Requin-tapis barbu; **Sp** - Tapicero barbudo.

Maximum total length about 1.25 m. A little-known inshore bottom shark, present on coral reefs. Probably feeds on bottom invertebrates and fishes. Of minor importance to fisheries; the tough skin is sometimes used for leather. Known from Indonesia, Papua New Guinea, and northern Australia.



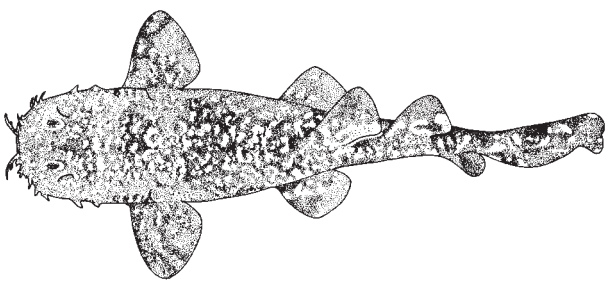
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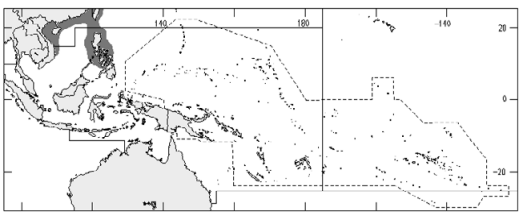


Orectolobus japonicus Regan, 1906

En - Japanese wobbegong; **Fr** - Requin-tapis moustache; **Sp** - Tapicero japonés.

Maximum total length at least 1 m. A little-known inshore bottom shark, nocturnal in habits. Feeds on fish, and presumably on bottom invertebrates. Interest to fisheries probably limited; caught in set nets in Japan and used for human consumption; also taken in China, Korea, and Viet Nam. Distributed from Japan and Korea southward to Viet Nam and the Philippines.

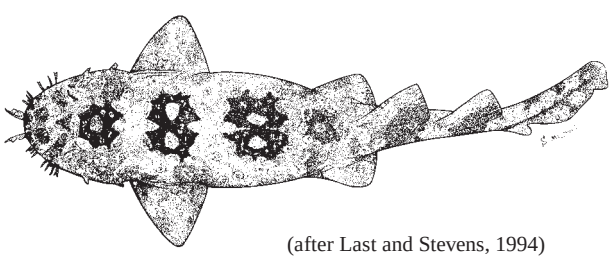




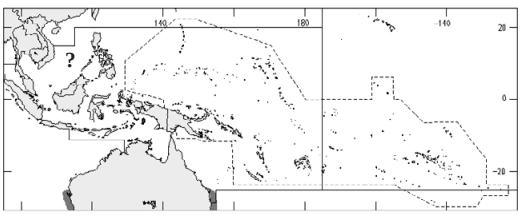
Orectolobus maculatus (Bonnaterre, 1788)

En - Spotted wobbegong; **Fr** - Requin-tapis tacheté; **Sp** - Tapicero manchado.

Maximum total length about 3.2 m; commonly between 1.5 and 1.8 m. An abundant, mostly inshore bottom shark but taken in depths to at least 110 m. Nocturnal, feeds on bottom invertebrates and fishes. Interest to fisheries limited, sometimes utilized for its meat and leather; commonly caught in trawls, beach seines, trammel nets, in lobster pots and traps, and with line gear. Western Australia to southern Queensland; possibly Japan and South China Sea.



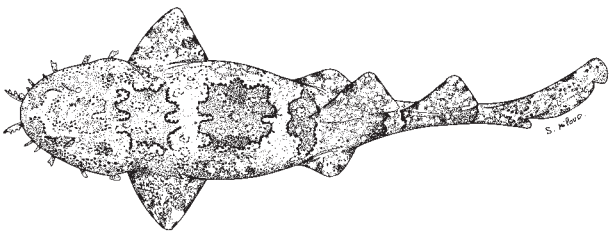
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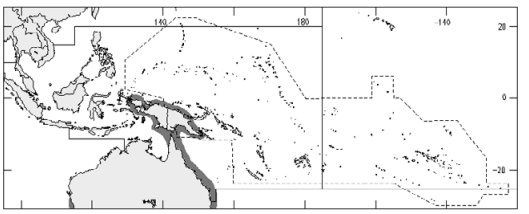


Orectolobus ornatus (de Vis, 1883)

En - Ornate wobbegong; **Fr** - Requin-tapis paste; **Sp** - Tapicero ornamentado.

Maximum total length to about 2.9 m. A common bottom-shark of continental waters, found on algal-covered rocky areas and coral reefs to depths of at least 100 m. Nocturnal, probably feeds on bottom invertebrates and fishes. Interest to fisheries limited; skin very tough and attractively patterned, and making a good leather. Western Pacific from Indonesia, Papua New Guinea and Australia (Queensland, New South Wales, Victoria, South Australia).



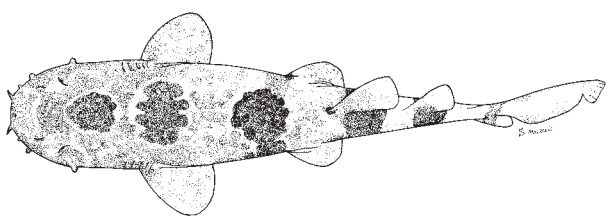


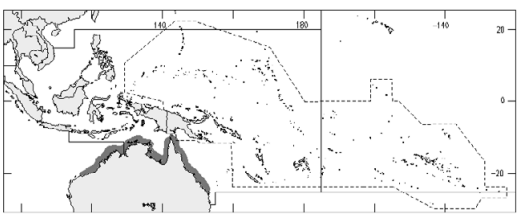
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Orectolobus wardi Whitley, 1939

En - Northern wobbegong; **Fr** - Requin-tapis savetier; **Sp** - Tapicero zapatilla.

Maximum total length at least 63 cm. A little-known, but possibly common tropical inshore bottom shark of the continental shelf. Presumably feeds on bottom invertebrates and fishes, but diet unrecorded. Of minor interest to fisheries at present. Northern Australia from Queensland to Onslow (western Australia).





(after Last and Stevens, 1994)

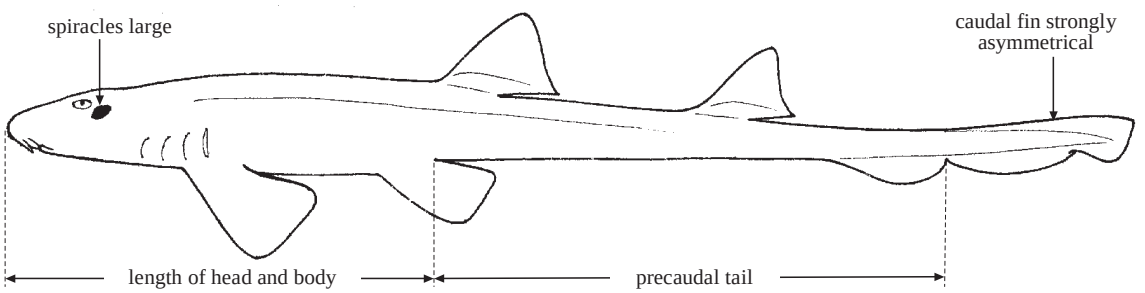
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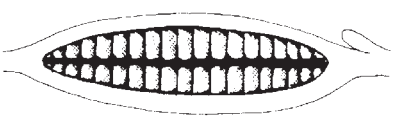
HEMISCYLLIIDAE

Longtail carpetsharks

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Small sharks. Trunk cylindrical or moderately depressed, **precaudal tail** cylindrical and **somewhat longer than head and trunk,** lateral ridges on sides of trunk and tail present or absent. Head not expanded laterally, cylindrical or moderately depressed; 5 small gill slits present, the last 3 over the pectoral-fin base, their upper ends not expanded onto upper surface of head; no gill sieves or rakers on internal gill slits; **spiracles very large and located behind and below eyes; nostrils with barbels, nasoral grooves, and circumnarial grooves**, close in front of mouth; eyes above and medial to sides of head, without nictitating eyelids; snout short to moderately long, slightly depressed, parabolic to broadly rounded, not greatly flattened and blade-like and without lateral teeth or barbels; **mouth small, nearly transverse, and well in front of eyes, without a symphyseal groove on chin**; labial furrows present on both jaws and relatively large, with upper furrows extending in front of mouth; teeth small, not blade-like, with a single cusp on upper and lower teeth and with cusplets small or absent; teeth similar in both jaws, not differentiated into medials, anteriors, intermediates, laterals, or posteriors. Two dorsal fins without spines, the first moderate sized, subangular, much shorter than the caudal fin, and with its origin over or behind the pelvic-fin bases; **second dorsal fin about as large as the first and of similar shape; anal fin moderately large, very low, broad and rounded, with its origin well behind the second dorsal-fin base and its base separated by a notch from the caudal fin;** caudal fin strongly asymmetrical, much less than 1/2 of total length, without a rippled dorsal margin or lower lobe but with a strong subterminal notch; vertebral axis of caudal fin hardly raised above body axis. Caudal peduncle cylindrical, without precaudal pits or keels. Intestinal valve of ring type. **Colour:** back yellowish, brownish or grey-brown, lighter below, with dark or light spots or dark saddles, sometimes absent in adults.



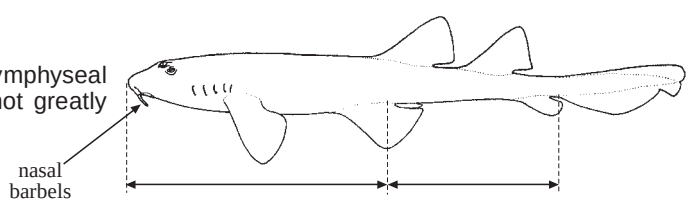


intestinal valve of ring type

Habitat, biology, and fisheries: Longtail carpetsharks are a small group of inshore tropical sharks of the Indian Ocean and western Pacific, being confined to continental waters and continental islands. They are slow-swimming bottom-dwellers, often clambering with their muscular paired fins on coral and rocky reefs. At least some of the species are oviparous. They feed on invertebrates and small fishes and are harmless to people. *Hemiscyllium* species are little utilized for fisheries, but *Chiloscyllium* species are commonly caught in small-scale artisanal fisheries and by bottom trawlers in the western and eastern Pacific and eastern central Indian Ocean.

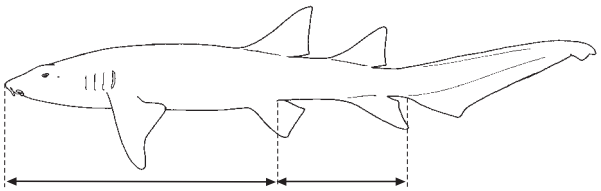
Similar families occurring in the area

Brachaeluridae: nasal barbels longer; symphyseal groove present on chin; precaudal tail not greatly elongated, shorter than head and trunk.



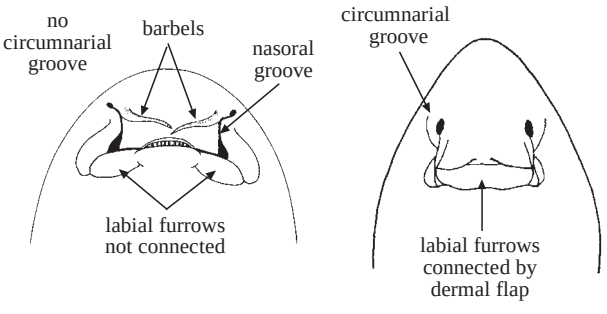
Brachaeluridae

Ginglymostomatidae: precaudal tail not greatly elongated, shorter than head and trunk; no circumnarial grooves around nostrils; head more depressed and flattened; spiracles minute; labial furrows not connected across chin by a dermal flap (present in Hemiscylliidae); anal fin higher, more angular, and separated from the lower caudal-fin origin by a space; origin of anal fin under second dorsal-fin base.



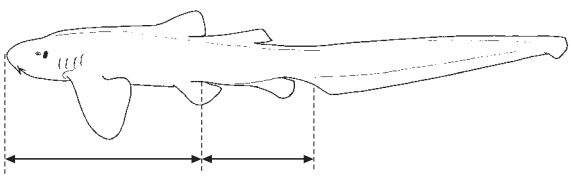
Ginglymostomatidae

Stegostomatidae: precaudal tail not greatly elongated, shorter than head and trunk; no circumnarial grooves around nostrils, labial furrows not connected across chin by a dermal flap; first dorsal-fin origin far anterior to pelvic-fin bases, its insertion over or slightly anterior to pelvic-fin insertions (far posterior to pelvic-fin insertions in Hemiscylliidae), second dorsal fin much smaller than first dorsal fin; pelvic fins much smaller than pectoral fins; anal-fin origin under second dorsal-fin base; caudal fin about as long as rest of shark.



Ginglymostomatidae **Hemiscylliidae**

(ventral view of head)



Stegostomatidae

Key to the species of Hemiscylliidae occurring in the area

1a. Nostrils subterminal on snout (Fig. 1a); eyes and supraorbital ridges hardly elevated; preoral snout long, mouth closer to eyes than snout tip; no black hood on head or large dark spot or spots on sides of body above pectoral fins (Fig. 1b) . . . . . **(*Chiloscyllium*)** → ***2***

1b. Nostrils terminal on snout (Fig. 2a); eyes and supraorbital ridges prominently elevated; preoral snout short, mouth closer to snout tip than eyes; a large spot or spots on sides of body above pectoral fins, or a black hood on head (Fig. 2b) . . . . . **(*Hemiscyllium*)** → ***6***

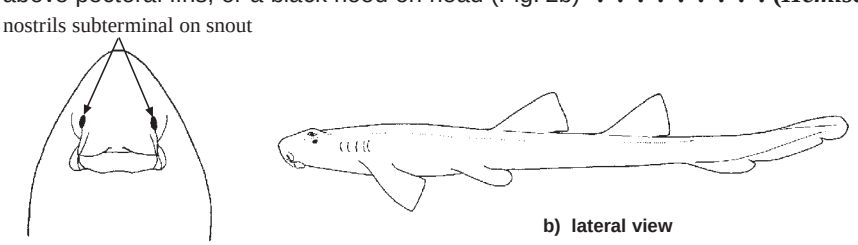


Fig. 1 ***Chiloscyllium***

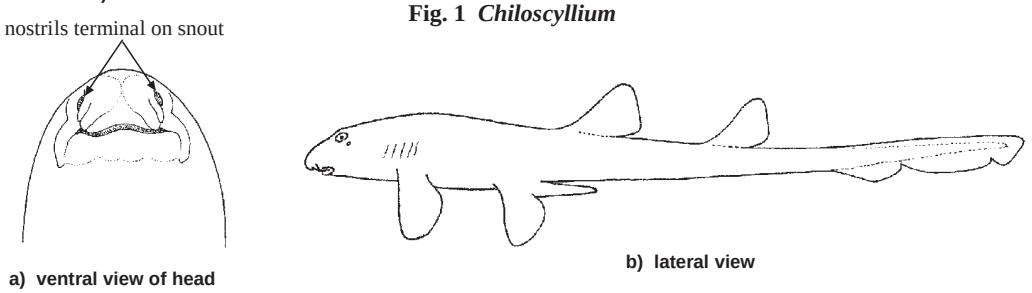


Fig. 2 ***Hemiscyllium***

2a. Body and tail very slender; length of anal fin from origin to free tip subequal to length of hypural caudal-fin lobe from lower caudal-fin origin to subterminal notch (Fig. 3) . . . . . ***Chiloscyllium indicum***

2b. Body and tail moderately slender to relatively stout; length of anal fin considerably shorter than hypural caudal-fin lobe (Figs 4 and 5) . . . . . → ***3***

3a. Body with lateral dermal ridges; young and adults with transverse dark bands and numerous white spots (Fig. 4) . . . . . ***.Chiloscyllium plagiosum***

3b. Body without lateral dermal ridges; adults usually without colour pattern, dark transverse bands in young only . . . . . → ***4***

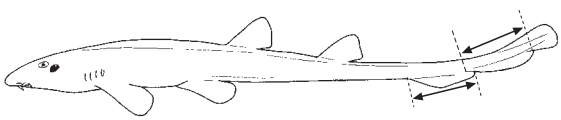


Fig. 3 ***Chiloscyllium indicum***

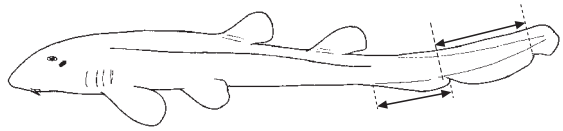


Fig. 4 ***Chiloscyllium plagiosum***

4a. Dorsal fins larger than pelvic fins, with projecting free rear tips (Fig. 5) . . . . . ***Chiloscyllium punctatum***

4b. Dorsal fins smaller than pelvic fins, without projecting free rear tips . . . . . → ***5***

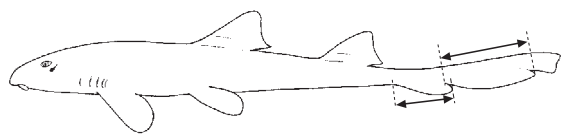


Fig. 5 ***Chiloscyllium punctatum***

5a. First to second dorsal-fin distance usually more than 9.3% of total length; first dorsal-fin height more than 6.6% of total length; second dorsal-fin height usually more than 5.8% of total length; dark bands of juveniles not outlined in black (Fig. 6) . . . . . ***Chiloscyllium griseum***

5b. First to second dorsal-fin distance less than 9.3% of total length; first dorsal-fin height less than 6.6% of total length; second dorsal-fin height usually less than 5.8% of total length; dark bands of juveniles outlined in black (Fig. 7) . . . . . ***Chiloscyllium hasselti***

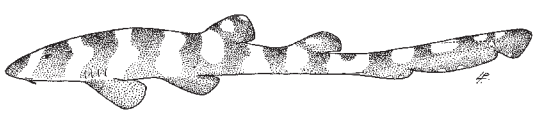


Fig. 6 ***Chiloscyllium griseum***



Fig. 7 ***Chiloscyllium hasselti***

6a. Head and snout with an abrupt black hood; body with conspicuous large white spots (Fig. 8) . . . . . ***Hemiscyllium strahani***

6b. Head and snout light, without a black hood but with conspicuous black spots above pectoral fins; body with light spots inconspicuous or absent . . . . . → ***7***

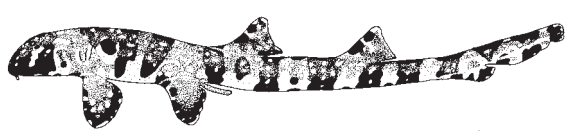


Fig. 8 ***Hemiscyllium strahani***

7a. Black spot behind gills small, not in the form of a conspicuous ocellus (Fig. 9) . . . . . ***Hemiscyllium freycineti***

7b. Black spot behind gills large, in the form of a conspicuous ocellus, ringed with white (Figs 10 to 12) . . . . . → ***8***

8a. Body covered with numerous, densely clustered dark small and large spots that form a reticular network of light ground colour between them; dark crossbands strong on ventral surface of tail (Fig. 10) . . . . . ***Hemiscyllium trispeculare***

8b. Body with sparse, large spots that do not form a reticular network of light ground colour between them; dark crossbands not reaching ventral surface of tail . . . . . → ***9***

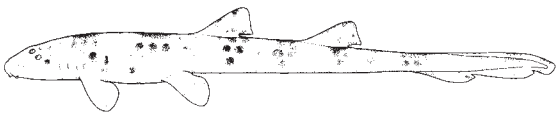


Fig. 9 ***Hemiscyllium freycineti***

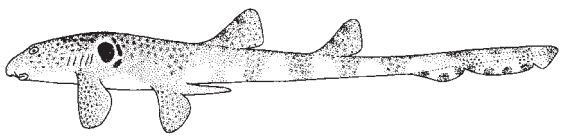


Fig. 10 ***Hemiscyllium trispeculare***

9a. Lateral ocellus not surrounded by large spots; spots present on head in front and below eyes (Fig. 11) . . . . . ***Hemiscyllium ocellatum***

9b. Lateral ocellus surrounded by large black spots; spots absent from head in front and below eyes (Fig. 12) . . . . . ***Hemiscyllium hallstromi***

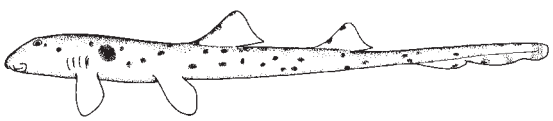


Fig. 11 ***Hemiscyllium ocellatum***

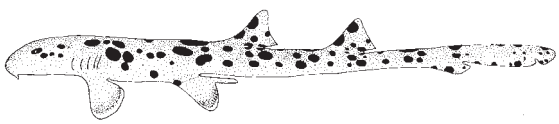


Fig. 12 ***Hemiscyllium hallstromi***

List of species occurring in the area

The symbol is given when species accounts are included.

Chiloscyllium griseum Müller and Henle, 1839
Chiloscyllium hasselti Bleeker, 1852
Chiloscyllium indicum (Gmelin, 1789)
Chiloscyllium plagiosum (Bennett, 1830)
Chiloscyllium punctatum Müller and Henle, 1838

Hemiscyllium freycineti (Quoy and Gaimard, 1824)
Hemiscyllium hallstromi Whitley, 1967
Hemiscyllium ocellatum (Bonnaterre, 1788)
Hemiscyllium strahani Whitley, 1967
Hemiscyllium trispeculare Richardson, 1845

Reference

Compagno, L.J.V. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish. Synop.*, (125)Vol.4.Pt.1:249 p.

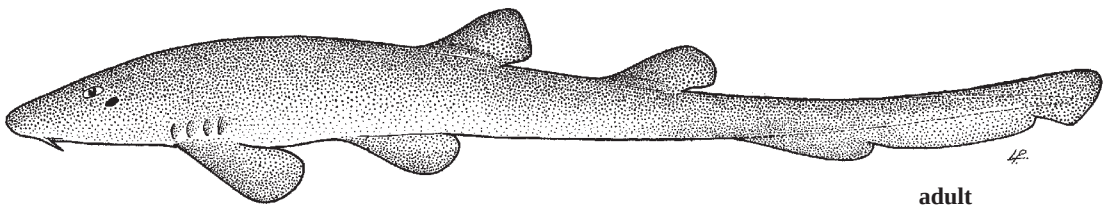
Dingerkus, G. and T.C. DeFino. 1983. A revision of the orectolobiform shark family Hemiscylliidae (Chondrichthyes, Selachii). *Bull. Am. Mus. Nat. Hist.*, 176(1):1-93.

Regan, C.T. 1908. A revision of the sharks of the family Orectolobidae. *Proc. Zool. Soc. Lond.*, (1908):347-364.

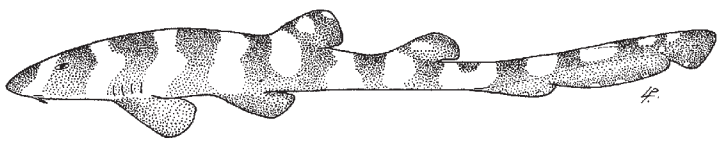
Chiloscyllium griseum Müller and Henle, 1839

Frequent synonyms / misidentifications: None / *Chiloscyllium hasselti* Bleeker, 1852; *C. plagiosum* (Bennett, 1830); *C. punctatum* Müller and Henle, 1838.

FAO names: En - Grey bambooshark; **Fr** - Requin-chabot gris; **Sp** - Bamboa gris.



adult



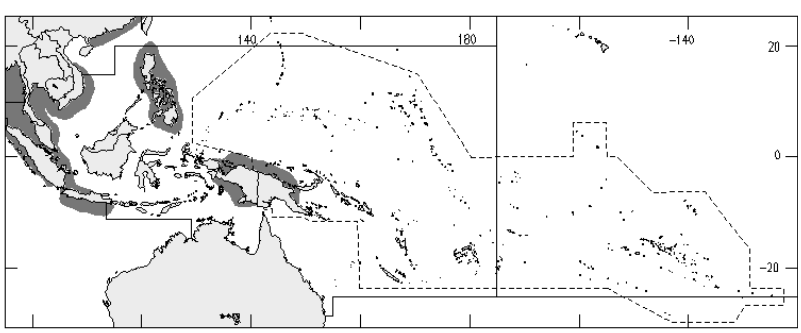
juvenile

Diagnostic characters: A small shark; **body moderately stout, without lateral ridges**; precaudal tail moderately stout, longer than head and trunk. Snout broadly rounded; 5 small gill slits; spiracles large and below eyes; eyes hardly elevated, with a low supraorbital ridge above them, without nictitating eyelids; nostrils subterminal**,** with short barbels, nasoral grooves, and circumnarial grooves; mouth small, transverse, and well in front of eyes; teeth small, similar in both jaws, with a single small cusp. **Two dorsal fins, slightly smaller than pelvic fins and without attenuated, projecting free rear tips; origin of first dorsal fin varying from over last 1/3 of pelvic-fin bases to over pelvic-fin insertions**, second dorsal fin almost as large as first; **anal fin** long, low and broadly rounded**, with its origin behind free rear tip of second dorsal fin** and with its insertion at lower caudal-fin origin; caudal fin strongly asymmetrical, with a pronounced caudal subterminal notch but without a ventral lobe, its length less than 1/3 the length of rest of shark. Caudal peduncle cylindrical, without keels or precaudal pits. Intestinal valve of ring type. **Colour: light brown, yellow-brown or grey-brown above**, cream below, **with 12 or 13 prominent saddle marks in young**, fading out with growth and absent in adults.

Size: Maximum total length at least 74 cm.

Habitat, biology, and fisheries: A common, sluggish inshore bottom dweller. Oviparous, deposits eggs in small, oval egg cases on the bottom. Probably feeds mainly on invertebrates. Caught in bottom trawls and in fixed bottom gill nets, drifting bottom gill nets, and occasionally pelagic gill nets; in the area regularly taken in inshore fisheries off Thailand, and utilized for human consumption.

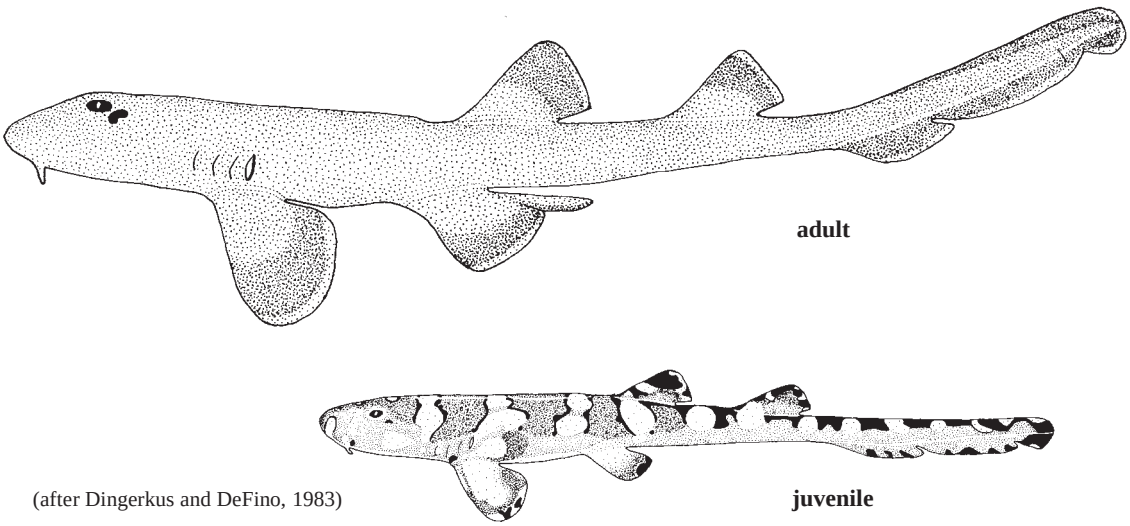
Distribution: Western Indian Ocean from the Arabian Sea eastward to Pakistan, India, and probably Sri Lanka; in the eastern Indian Ocean and western Central Pacific extending eastward to Malaysia, Thailand, Indonesia, Viet Nam, South China, Japan, Philippines, and New Guinea, but many records need confirmation.



Chiloscyllium hasselti Bleeker, 1852

Frequent synonyms / misidentifications: None / *Chiloscyllium griseum* Müller and Henle, 1839; *C. plagiosum* (Bennett, 1830); *C. punctatum* Müller and Henle, 1838.

FAO names: En - Hasselt's bambooshark.



adult

juvenile

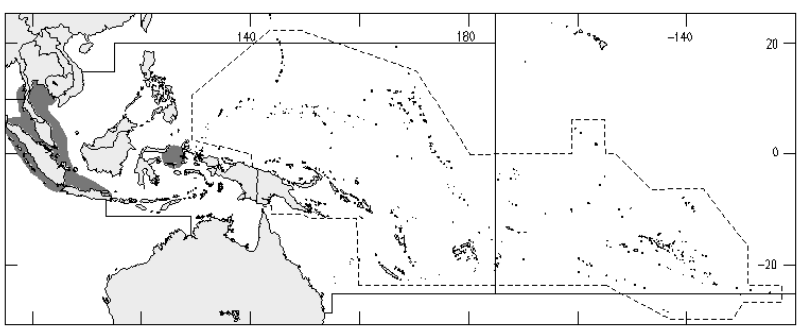
(after Dingerkus and DeFino, 1983)

Diagnostic characters: A small shark, **body moderately slender, without lateral ridges**, precaudal tail moderately slender, longer than head and trunk. Snout broadly rounded; 5 small gill slits; spiracles large and below eyes; eyes hardly elevated, with a low supraorbital ridge above them, without nictitating eyelids; nostrils subterminal, with short barbels, nasoral grooves and circumnarial grooves; mouth small, transverse, and well in front of eyes; teeth small, similar in both jaws, with a single small cusp. **Two dorsal fins, smaller than pelvic fins and without attenuated, projecting free rear tips; first dorsal-fin origin over pelvic-fin bases**; second dorsal fin almost as large as first; **anal fin** long, low, and broadly rounded, **with its origin behind free rear tip of second dorsal fin** and with its insertion at lower caudal-fin origin; caudal fin strongly asymmetrical with a pronounced subterminal notch but without a ventral lobe; caudal fin less than 1/3 the length of rest of shark. Caudal peduncle cylindrical, without keels or precaudal pits. Intestinal valve of ring type. **Colour: juveniles with dark grey-brown bands outlined in black, adult specimens with uniform medium- to dark-brown colour**, the black edgings being the last parts of the colour pattern to disappear.

Size: Maximum total length about 60 cm.

Habitat, biology, and fisheries: A common inshore bottom-dweller. Biology little known. Presumably oviparous and primarily an invertebrate-feeder as with other *Chiloscyllium* species. Caught in bottom trawls and in fixed bottom gill nets, possibly traps and with line gear. Utilized for human consumption in the area.

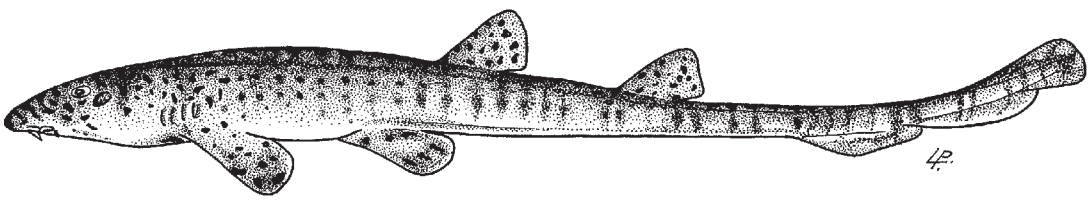
Distribution: Western Pacific from Thailand, Malaysia, and Indonesia (Sumatra, Java, and Moluccas).

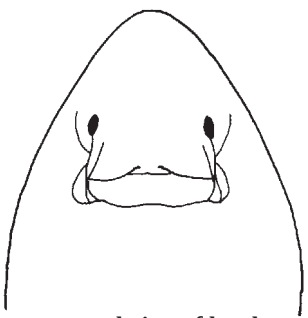


Chiloscyllium indicum (Gmelin, 1789)

Frequent synonyms / misidentifications: *Chiloscyllium colax* (Meuschen, 1781) / *Chiloscyllium plagiosum* (Bennett, 1980).

FAO names: En - Slender bambooshark; **Fr** - Requin-chabot élégant; **Sp** - Bamboa elegante.





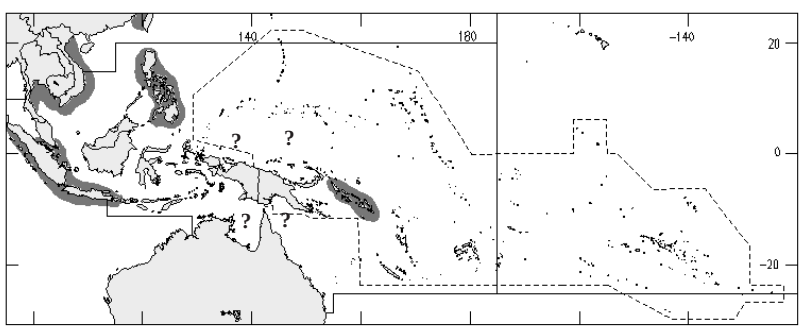
ventral view of head

Diagnostic characters: Small sharks, **body slender, with low lateral ridges**, precaudal tail slender, longer than head and trunk. Snout narrowly rounded or almost pointed; 5 small gill slits; spiracles large and below eyes; eyes hardly elevated, nostrils subterminal**,** with short barbels, nasoral grooves and circumnarial grooves; mouth small, transverse, and well in front of eyes, teeth small, similar in both jaws, with a single small cusp. **Two dorsal fins, about as large as pelvic fins and without attenuated, projecting free rear tips; first dorsal-fin origin over inner margins of pelvic tins and behind pelvic-fin insertions**; second dorsal fin almost as large as first; **anal fin** long, low, and broadly rounded, **with its origin far behind free rear tip of second dorsal fin** and with its insertion at lower caudal-fin origin, caudal fin strongly asymmetrical with a pronounced subterminal notch but without a ventral lobe; caudal fin less than 1/3 the length of rest of shark. Caudal peduncle cylindrical, without keels or precaudal pits. Intestinal valve of ring type. **Colour: light brown above,** cream below, **with numerous dark spots on body, tail, and fins, these often forming** indistinct vertical bars and saddles.

Size: Maximum total length about 65 cm.

Habitat, biology, and fisheries: A common, but little-known inshore sluggish bottom dweller. Oviparous, deposits eggs in small, oval egg cases on bottom. Probably feeds mainly on invertebrates. Caught in bottom trawls and in fixed bottom gill nets, drifting bottom gill nets, and occasionally pelagic gill nets; utilized fresh for human consumption, but relatively unimportant to fisheries in the area.

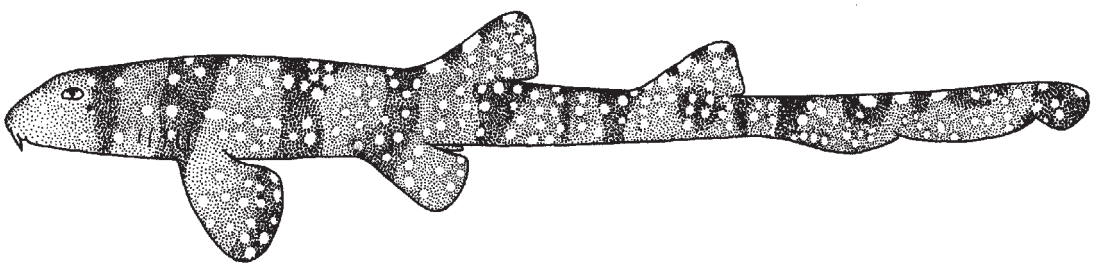
Distribution: Indo-West Pacific from the Arabian Sea eastward to India, Sri Lanka, Singapore, Thailand, Indonesia, Viet Nam, Taiwan Province of China, the Philippines, Solomon Islands, and possibly Korea and Japan.



Chiloscyllium plagiosum (Bennett, 1830) |

Frequent synonyms / misidentifications: *Scyllium ornatum* Gray, 1832 / *Chiloscyllium griseum* Müller and Henle, 1839; *C. hasselti* Bleeker, 1852; *C. indicum* (Gmelin, 1789); *C. punctatum* Müller and Henle, 1839.

FAO names: **En** - Whitespotted bambooshark; **Fr** - Requin-chabot à taches blanches; **Sp** - Bamboa punteada.

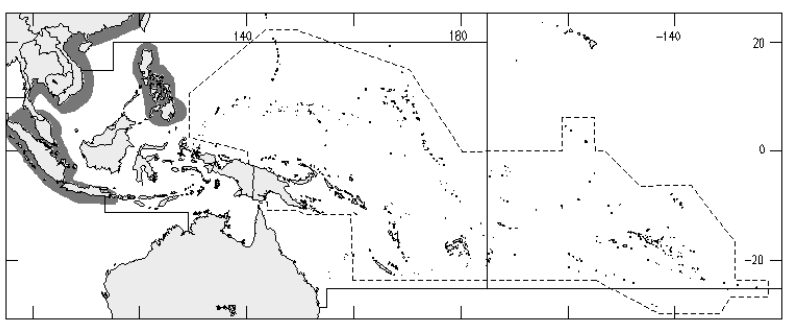


Diagnostic characters: A small shark, **body fairly stout, with lateral ridges**, precaudal tail stout, longer than head and trunk. Snout rounded anteriorly; 5 small gill slits; spiracles large and below eyes; eyes hardly elevated, with a low supraorbital ridge above them, without nictitating eyelids; nostrils subterminal**,** with short barbels, nasoral grooves and circumnarial grooves; mouth small, transverse, and well in front of eyes; teeth small, similar in both jaws, with a single small cusp. **Two dorsal fins, about equal in size to pelvic fins and without attenuated, projecting free rear tips; first dorsal-fin origin over or behind pelvic-fin bases**; second dorsal fin almost as large as first; **anal fin** long, low and broadly rounded, **with its origin somewhat behind free rear tip of second dorsal fin** and with its insertion at lower caudal-fin origin; caudal fin strongly asymmetrical with a pronounced subterminal notch but without a ventral lobe; caudal fin less than 1/3 the length of rest of shark. Caudal peduncle cylindrical, without keels or precaudal pits. Intestinal valve of ring type. **Colour:** a prominent colour pattern of **numerous white spots on a dark brown background, with darker brown or blackish transverse bands**.

Size: Maximum total length about 95 cm; adult males 67 to 69 cm, an adult female 95 cm.

Habitat, biology, and fisheries: A common but little-known inshore bottom shark. Oviparous. Regularly taken in inshore fisheries in India, Thailand, China, and probably elsewhere where it occurs, and utilized for human consumption.

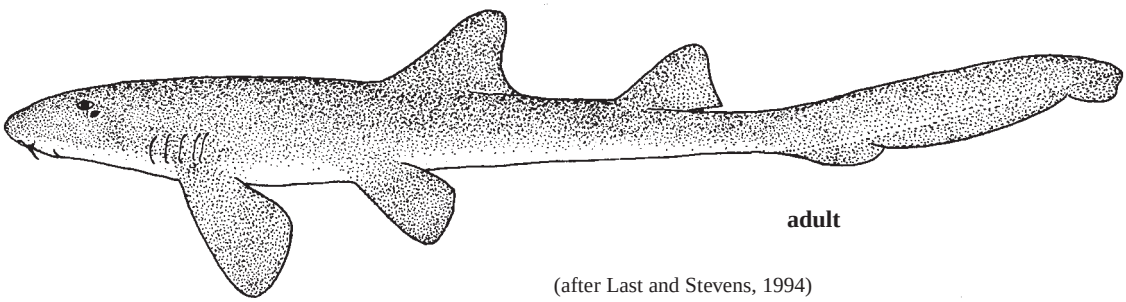
Distribution: Indo-West Pacific: India, Sri Lanka, Singapore, possibly Malaysia, Thailand, Indonesia, Viet Nam, China (including Taiwan Province), Japan, and the Philippines.



Chiloscyllium punctatum Müller and Henle, 1838

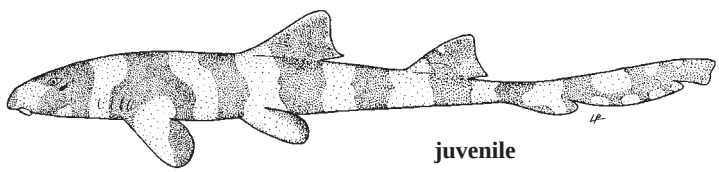
Frequent synonyms / misidentifications: *Chiloscyllium margaritiferum* Bleeker, 1964 / *Chiloscyllium griseum* Müller and Henle, 1839; *C. hasselti* Bleeker, 1852; *C. plagiosum* (Bennett, 1830).

FAO names: **En** - Brownbanded bambooshark; **Fr** - Requin-chabot bambou; **Sp** - Bamboa estriada.



adult

(after Last and Stevens, 1994)



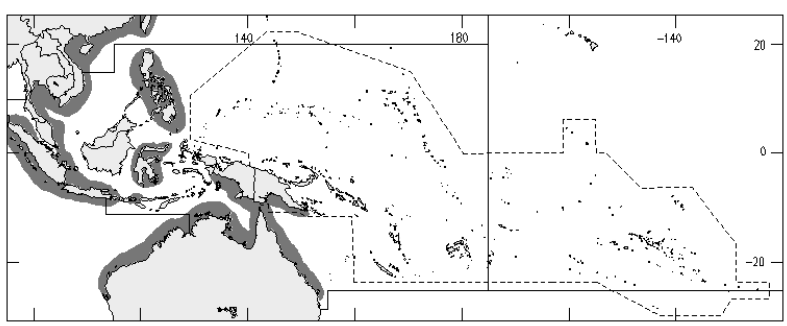
juvenile

Diagnostic characters: A small shark, **body moderately slender, without lateral ridges**, precaudal tail moderately slender, longer than head and trunk. Snout rounded anteriorly; 5 small gill slits; spiracles large and below eyes; eyes hardly elevated, with a low supraorbital ridge above them, without nictitating eyelids; nostrils subterminal, with short barbels, nasoral grooves and circumnarial grooves; mouth small, transverse, and well in front of eyes; teeth small, similar in both jaws, with a single small cusp**. Two dorsal fins, somewhat larger than pelvic fins and with attenuated, projecting free rear tips; first dorsal-fin origin over anterior halves of pelvic-fin bases**; second dorsal fin almost as large as first; **anal fin** long, low, and broadly rounded, **with its origin somewhat behind free rear tip of second dorsal fin** and with its insertion at lower caudal-fin origin; caudal fin strongly asymmetrical with a pronounced subterminal notch but without a ventral lobe; caudal fin less than 1/3 the length of rest of shark. Caudal peduncle cylindrical, without keels or precaudal pits. Intestinal valve of ring type. **Colour: young with dark transverse bands** and usually a scattering of a few dark spots; **adults light-brown**, usually without a colour pattern.

Size: Maximum total length about 1.04 m.

Habitat, biology, and fisheries: A common inshore bottom shark found on coral reefs, often in tidepools. Very tenacious of life, can survive out of water for a long period (half a day). Oviparous, deposited in rounded egg cases. Gills sometimes infested by larval isopods (Praniza-larva of the isopod *Gnathia*). Regularly taken in inshore fisheries in India and Thailand, and utilized for human food. In Australia it is taken in beach seines and on hook-and-line and is said to prefer squid bait; it is little utilized by Australians but regarded as good eating.

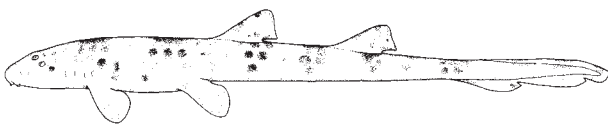
Distribution: Indo-West Pacific: India, Thailand, Malaysia, Singapore, Indonesia (Java, Sumatra, Komodo, Sulawesi), Philippines, New Guinea, and northern Australia (Northern Territory, western Australia, Queensland); also Viet Nam, China (including Taiwan Province), and Japan.

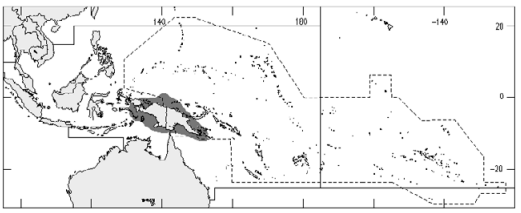


Hemiscyllium freycineti (Quoy and Gaimard, 1824)

En - Indonesian speckled carpetshark; **Fr** - Requin-chabot grivelé; **Sp** - Bamboa jaspeada.

Maximum total length at least 46 cm. A little-known bottom shark, probably common on coral reefs. Of minor interest to fisheries at present. Western South Pacific from Indonesia (Irian Jaya, Waigeo) and Papua New Guinea.

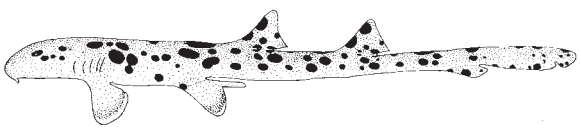




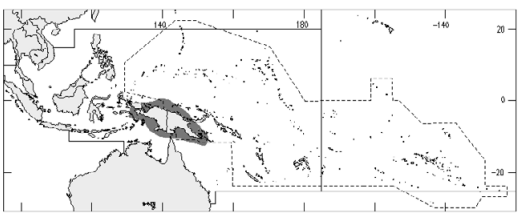
Hemiscyllium hallstromi Whitley, 1967

En - Papuan epaulette shark; **Fr** - Requin-chabot épaulette; **Sp** - Bamboa hombrera.

Maximum total length at least 75 cm. A little-known inshore bottom shark, probably on coral reefs. Of minor interest to fisheries at present. Western South Pacific from Papua New Guinea and Indonesia (Irian Jaya).



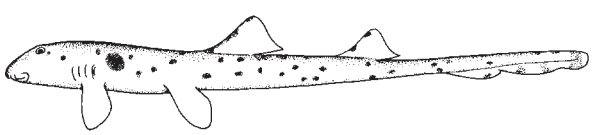
(after Dingerkus and DeFino, 1983)

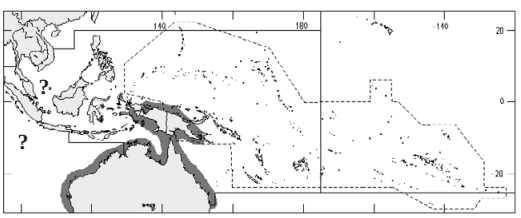


Hemiscyllium ocellatum (Bonnaterre, 1788)

En - Epaulette shark; **Fr** - Requin-chabot ocellé; **Sp** - Bamboa ocelada.

Maximum total length about 1 m. An abundant, small, harmless tropical shark found on coral reefs in shallow water, often in tidepools. Oviparous, feeding on benthic invertebrates. Survives well in aquaria, but otherwise not used commercially. Known from New Guinea and Australia (Northern Territory, western Australia, Queensland, and New South Wales); possibly also Malaysia, Indonesia (Sumatra), and Solomon Islands.

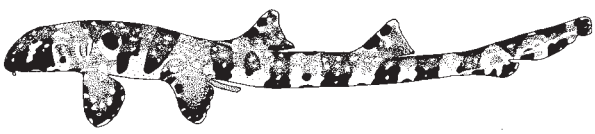




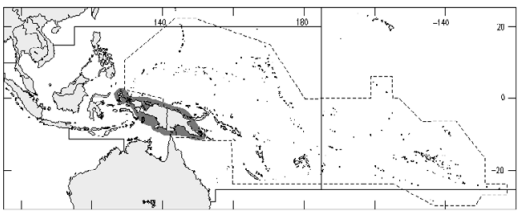
Hemiscyllium strahani Whitley, 1967

En - Hooded carpetshark; **Fr** - Requin-chabot moine; **Sp** - Bamboa capuchona.

Maximum total length about 75 cm. A little-known inshore bottom shark of singular and unique appearance, probably on coral reefs. Of minor importance to fisheries at present. Western South Pacific from Papua New Guinea and Indonesia (Irian Jaya).



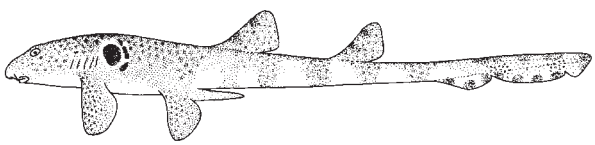
(after Dingerkus and DeFino, 1983)



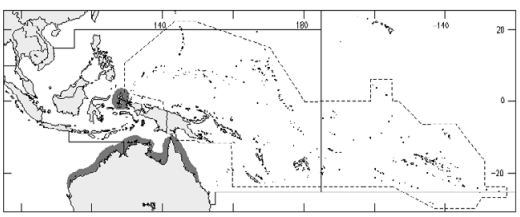
Hemiscyllium trispeculare Richardson, 1845

En - Speckled carpetshark; **Fr** - Requin-chabot marqueterie; **Sp** - Bamboa moteada.

Maximum total length about 64 cm. A common, small, harmless tropical continental shelf shark that is found on coral reefs in shallow water. Oviparous, probably mainly feeding on benthic invertebrates. Of minor interest to fisheries. Australia (Northern Territory, Western Australia, and Queensland) and possibly Indonesia (Moluccas).



(after Dingerkus and DeFino, 1983)



GINGLYMOSTOMATIDAE

Nurse sharks

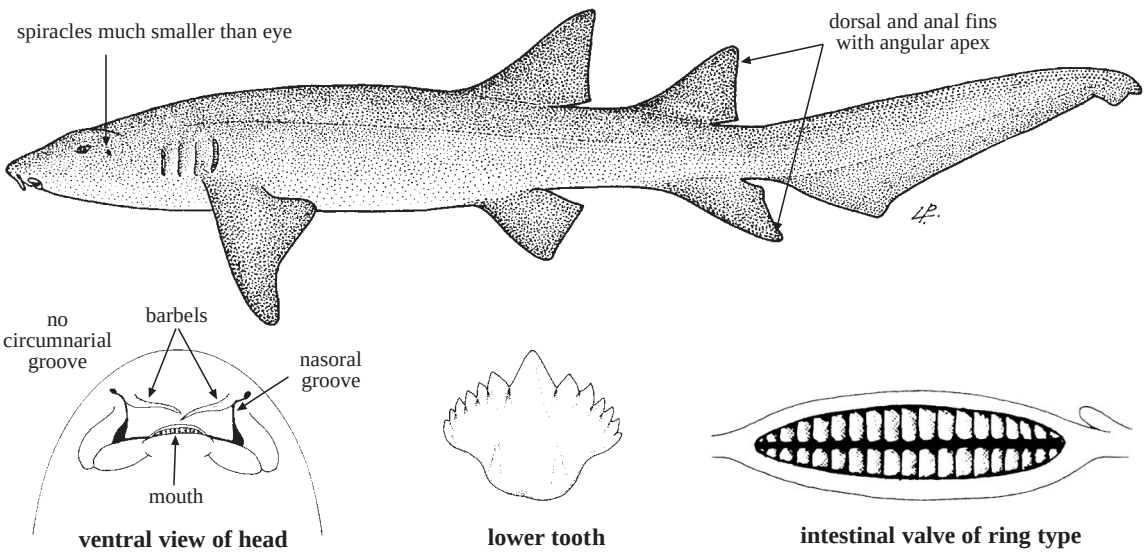
by L.J.V. Compagno

A single species of interest to fisheries occurring in the area.

Nebrius ferrugineus (Lesson, 1830)

Frequent synonyms / misidentifications: *Ginglymostoma ferrugineum* (Lesson, 1830); *Nebrius concolor* Rüppell, 1837; *N. doldi* Smith, 1953 / None.

FAO names: En - Tawny nurse shark; **Fr** - Requin-nourrice fauve; **Sp** - Gata nodriza atezada.

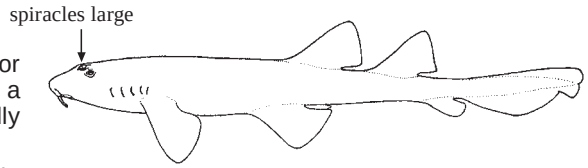


Diagnostic characters: A large, relatively stout-bodied shark, without lateral ridges; **precaudal tail shorter than trunk**. Head with 5 moderate gill slits, the last 2 behind pectoral-fin origin and very close to each other, no gill rakers; **spiracles much smaller than eyes**; nostrils close to front of snout, **with short barbels and nasoral grooves connecting them with the mouth but without circumnarial grooves and folds**; no nictitating lower eyelids; snout very short, broad, and very broadly rounded or truncated; mouth moderately large, nearly transverse and far forward on head, well in front of eyes; teeth small, weakly differentiated in different regions of the mouth, somewhat compressed, with short medial cusps and short cusplets on sides; tooth rows 24 to 38/22 to 32. **Two dorsal fins, both with angular apices, the origin of the first about over the pelvic-fin origins and its insertion slightly behind the pelvic-fin insertions; second dorsal fin slightly smaller than first**; anal fin present, high and with an angular apex, and with its origin about under the midbase of the second dorsal fin; **caudal fin about 1/3 of total length, strongly asymmetrical**, with a strong subterminal notch but with ventral lobe weak to short. Caudal peduncle not strongly depressed, without lateral keels or precaudal pits. Supraorbital crests present on cranium, these laterally expanded. Valvular intestine of ring type. **Colour:** no colour pattern, tan above, lighter below, fins slightly dusky.

Similar families occurring in the area

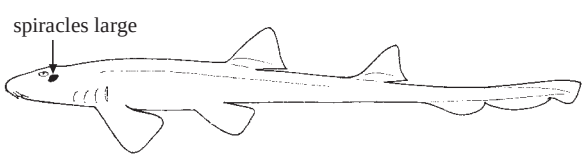
Brachaeluridae: spiracles very large, subequal or larger than eyes, nostrils with circumnarial grooves, a symphyseal groove present on chin, fins broadly rounded, dorsal fins equal sized.

Hemiscylliidae: precaudal tail longer than trunk; spiracles large, nearly or quite eye length; nostrils with circumnarial grooves; anal fin very low and arcuate.

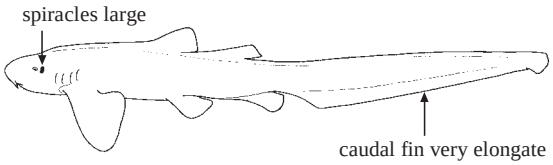


Brachaeluridae

Stegostomatidae: body with lateral ridges; spiracles as large as eyes; first dorsal fin with origin far anterior to pelvic-fin origins; caudal fin about 1/2 of total length.



Hemiscyllidae

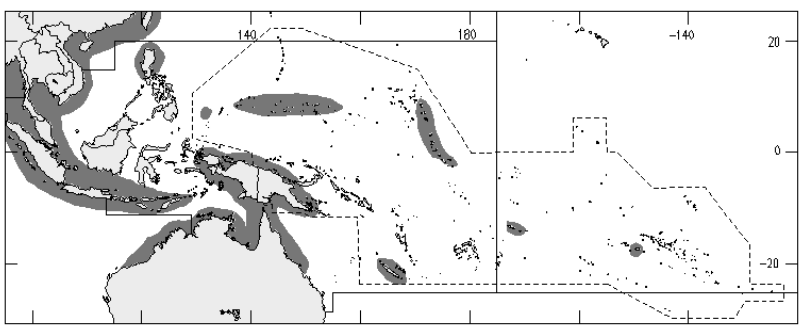


Stegostomatidae

The combination of characters such as the nasoral grooves, the presence of barbels, the anterior mouth, the posterior position of the first dorsal fin, the absence of nictitating lower eyelids, the absence of body ridges, caudal keels and precaudal pits, and the asymmetrical caudal fin with ventral lobe weak or absent readily distinguishes this family from all others in the area.

Size: Maximum total length about 3.2 m; commonly to 2.5 m.

Habitat, biology, and fisheries: A sluggish, nocturnal and sometimes diurnal shallow-water bottom shark common on coral and rocky reefs, in lagoons and on sand flats, at depths from the intertidal zone to at least 70 m. Ovoviviparous, size at birth about 60 cm. Feeds on a wide variety of bottom invertebrates and small fishes; capable of capturing small reef fishes with its powerful suction feeding mechanism. Caught inshore in Pakistan, India, Thailand, Philippines, and probably elsewhere where it occurs; taken in bottom trawls, in floating and fixed bottom gill nets, and with longlines; utilized fresh and dried-salted for human food; livers are processed for vitamins; fins dried for the oriental sharkfin trade; also processed for fishmeal.



Distribution: In the Indian Ocean and western Pacific from southeastern Africa and the Red Sea eastward to Japan, Australia, and Tahiti.

References

Compagno, L.J.V. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish. Synop.*, (125)Vol.4.Pt.1:249 p.

Dingerkus, G. 1986. Interrelationships of orectolobiform sharks (Chondrichthyes: Selachii). *Proc. 2nd Int. Conf. Indo-Pacific Fish.*, 1986:227-245.

Regan, C.T. 1908. A revision of the sharks of the family Orectolobidae. *Proc. Zool. Soc. Lond.*, (1908):347-364.

STEGOSTOMATIDAE

Zebra sharks

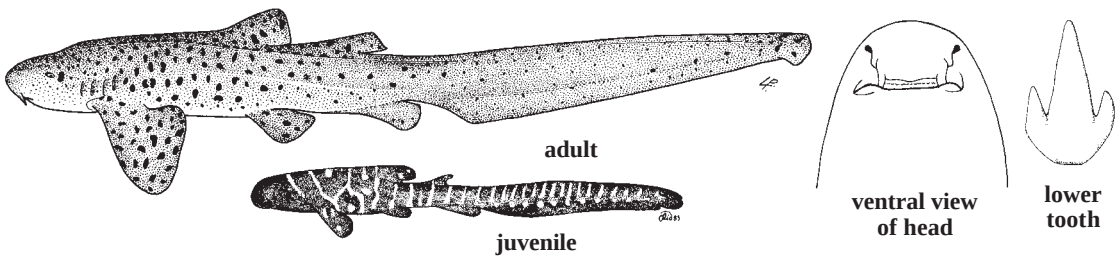
by L.J.V. Compagno

A single species in this family.

Stegostoma fasciatum (Hermann, 1783)

Frequent synonyms / misidentifications: *Stegostoma varium* (Seba, 1758); *S. tygrinus* (Bonnaterre, 1788) / None.

FAO names: **En** - Zebra shark; **Fr** - Requin zèbre; **Sp** - Tiburón acebrado.



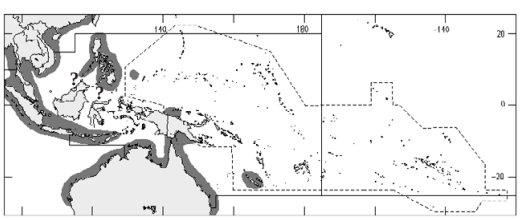
Diagnostic characters: A large, moderately stout-bodied shark with prominent ridges on side. Head with 5 small gill slits, the last 3 behind pectoral-fin origin and the last 2 very close to each other; no gill rakers; **spiracles subequal in size to eyes; nostrils close to front of snout**, **with short barbels and nasoral grooves connecting them with the mouth but without circumnarial grooves and folds;** no nictitating lower eyelids; snout very short, broad and bluntly rounded; **mouth short**, nearly transverse, and far forward on head, **well in front of eyes; teeth small**, poorly differentiated in different regions of the mouth, **with moderately long medial cusps and short cusplets on sides**; tooth rows 28 to 33/22 to 32. **Two dorsal fins, the base of the first extending forward of pelvic-fin origins as a low keel that reaches level of pectoral-fin bases** but with insertion posterior to pelvic-fin origins; **second dorsal fin 1/2 the size of first or less;** anal fin present, rounded but not keel-shaped with its origin under rear 1/3 of second dorsal-fin base; **caudal fin nearly or quite 1/2 of total length,** strongly asymmetrical, with a deep subterminal notch but **with the lower lobe hardly developed.** Caudal peduncle not strongly depressed, without lateral keels or precaudal pits, **but with dermal ridges extending forward onto sides**. Supraorbital crests present on cranium, these laterally expanded. Intestinal valve of ring type. **Colour: young below 60 cm with the back dark brown or blackish, with vertical yellow bars, spots and reticulations**, and the underside of the head, abdomen and tail whitish; in subadults and adults the dark areas break up into scattered dark spots on a yellowish background, shading into the whitish ventral surface.

Similar families occurring in the area

None. The barbels, nasoral grooves, anterior mouth, teeth, anteriorly elongated dorsal fin, lateral ridges on the sides, greatly elongated caudal fin about 1/2 the total length, and distinctive colour patterns of young and adults separate this shark from all others in the area.

Size: Maximum total length at least 2.35 m; possibly to 3.54 m.

Habitat, biology, and fisheries: Common in inshore waters of the continental and insular shelves, often found on coral reefs, on or near the bottom. Oviparous, depositing eggs in rounded oblong egg cases 10 to 17 cm long; size at birth between 20 and 36 cm. Probably nocturnal, feeds primarily on molluscs but also takes small fishes. Caught in bottom trawls, in floating and fixed bottom gill nets, and with longlines; utilized fresh and dried-salted for human consumption; livers are processed for vitamins; fins dried for the oriental sharkfin trade; also processed for fishmeal.



Distribution: In the Indian Ocean and western Pacific from South Africa and the Red Sea eastward to Japan, Palau, western and northern Australia, and New Caledonia.

References

Compagno, L.J.V. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish. Synop.*, (125)Vol.4.Pt.1:249 p.

Dingerkus, G. 1986. Interrelationships of orectolobiform sharks (Chondrichthyes: Selachii). *Proc. 2nd Int. Conf. Indo-Pacific Fish.*, 1986:227-245.

Regan, C.T. 1908. A revision of the sharks of the family Orectolobidae. *Proc. Zool. Soc. Lond.*, (1908):347-364.

RHINCODONTIDAE

Whale sharks

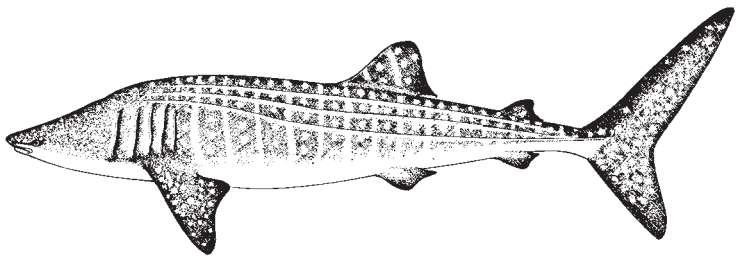
by L.J.V. Compagno

A single species in this family.

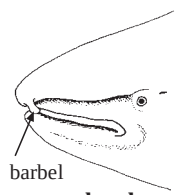
Rhincodon typus Smith, 1828

Frequent synonyms / misidentifications: *Rhiniodon typus* Smith, 1828 / None.

FAO names: En - Whale shark; **Fr** - Requin baleine; **Sp** - Tiburón ballena.



Diagnostic characters: A very large shark with cylindrical or moderately depressed body**. Head very broad and flattened**, with 5 large gill slits, the posterior 3 over the pectoral-fin bases; no gill rakers but filter grids of transverse bars and lobes across the internal gill slits; spiracles much smaller than eyes; nostrils with short, quadrate anterior nasal flaps, minute barbels, and shallow nasoral grooves; no nictitating eyelids; **snout extremely short, truncated** ; mouth nearly subterminal, very wide, **transverse** and short, not reaching backward to eyes**; teeth very small and extremely numerous**, similar in both jaws, not bladelike and **with hooked cusps**. Two dorsal fins, the first with rear 1/3 of base over pelvic-fin bases, the second less than half the size of first; anal fin present; **caudal fin asymmetrical, crescentic, with a strong lower lobe but no subterminal notch. Caudal peduncle depressed, with a strong keel on each side continuing forward onto the back and over the gill slits as a small ridge and flanked by 2 additional ridges above**; upper precaudal pit present. Supraorbital crests present on cranium, these laterally expanded. Valvular intestine of ring type. **Colour:** dark grey, reddish, or greenish grey above, **with white or yellow spots and transverse stripes**; white or yellowish below.



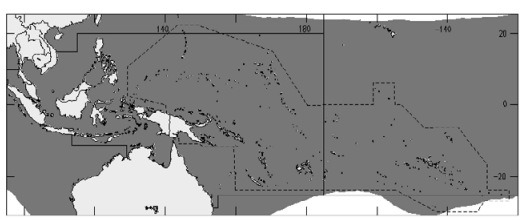
head

Similar families occurring in the area

None. The combination of characters such as the truncated snout, the transverse mouth in front of eyes, the numerous small teeth, the lateral ridges, the precaudal keels and the colour pattern distinguishes the whale shark from all other sharks in the area.

Size: Maximum total length at least 12 m; possibly to 21.4 m.

Habitat, biology, and fisheries: This huge pelagic filter feeder occurs singly or in schools, often at or near the surface, near shore or on the open sea. Ovoviviparous, can have as many as 300 fetuses. Feeds on small pelagic crustaceans, schooling fishes including anchovies, sardines, and even albacores, and squids. Often seen in a vertical position with head at or near the surface when feeding. Usually harmless, and permitting close approach by divers; rarely ramming small boats, possibly when excited by fish hooked from the boats, but more often struck by ships while basking at the surface. The whale shark was formerly of limited interest to fisheries worldwide, but recently became the subject of a high value fishery off Taiwan Province of China and the Pilippines for fins, flesh, and other products. Captured in gill nets and sometimes in trawls, and often harpooned. Utilized fresh and dried-salted for human consumption, liver processed for oil, fins used for soup base, and offal probably used for fishmeal. These sharks are increasingly popular as the subject of ecotouristic dive tours, as they migrate seasonally along coasts and concentrate in inshore tropical areas during part of the year. This shark is listed on the IUCN Red List of Threatened Animals (data deficient).



Distribution: Circumglobal in the tropical and warm temperate Pacific and Atlantic Oceans, oceanic and coastal.

References

Compagno, L.J.V. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish. Synop.*, (125)Vol.4.Pt.1:249 p.

Wolfson, F.H. 1986. Occurrences of the whale shark, *Rhincodon typus* Smith. *Proc. 2nd Int. conf. Indo-Pacific Fish.*, 1986:208-226.

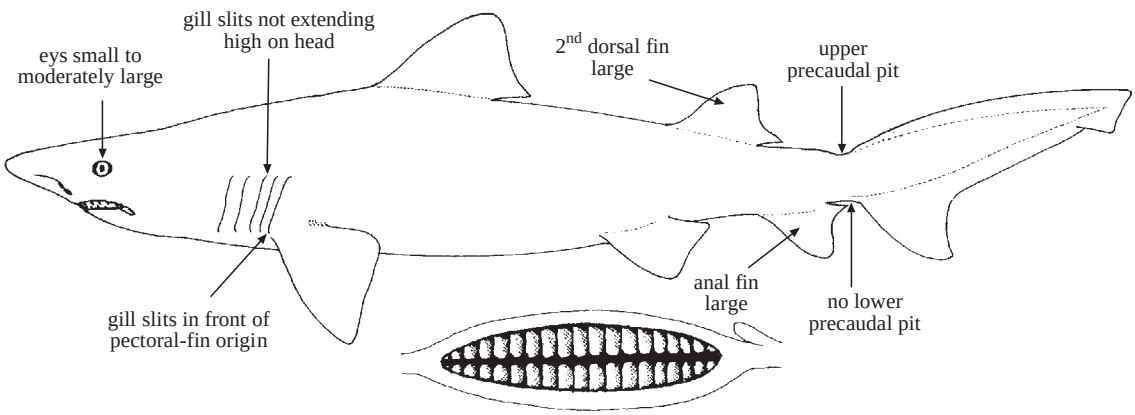
Wolfson, F.H. and G. Notarabartolo di Sciara. 1981. The whale shark, *Rhiniodon typus* Smith, 1828; an annotated bibliography (Selachii Rhiniodontidae). *Atti Soc. Ital. Sci. Nat. Mus. Civ. Stor. Nat. Milano*, 122(3-4):171-203.

ODONTASPIDIDAE

Sand tiger sharks

by L.J.V. Compagno and V.H Niem

Diagnostic characters: Large sharks. Head with 5 medium-sized gill slits, all in front of pectoral-fin bases, **their upper ends not extending onto dorsal surface of head**; gill arches without rakers; spiracles present but very small; no nasal barbels or nasoral grooves; eyes small or moderately large, without nictitating eyelids; snout conical or moderately depressed, not blade-like; mouth very long and angular, extending well behind eyes when jaws are not protruded; **lower labial furrows usually present at mouth corners**; anterior teeth enlarged, with long, narrow, sharp-edged but unserrated cusps and small basal cusplets (absent in young of at least 1 species), the upper anteriors separated from the laterals by a gap and tiny intermediate teeth. Two moderately large, **high dorsal fins, the first originating well in advance of the pelvic fins,** the second as large as or somewhat smaller than the first; anal fin as large as second dorsal fin or slightly smaller; caudal fin short, asymmetrical, with a strong subterminal notch and a short but well-marked ventral lobe. Caudal peduncle not depressed, **without keels; a deep upper precaudal pit present but no lower pit**. Intestinal valve of ring type, with turns closely packed like a stack of washers. **Colour:** grey or grey-brown above, white or lighter below, with round or oval spots on at least 1 species.



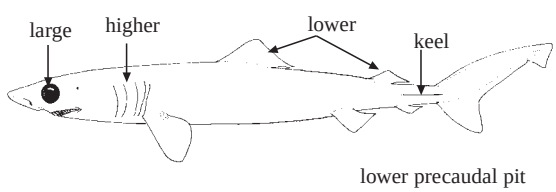
intestinal valve of ring type

Habitat, biology and fisheries: These are wide-ranging, tropical to cool-temperate sharks, found inshore and down to moderate depths on the edge of the continental shelves and around some oceanic islands, but not oceanic. Development is ovoviviparous. They feed on small bony fishes other sharks, squids, and occasionally bottom crustaceans. Normally inoffensive, but potentially dangerous if provoked. In the area, at least 1 species is regularly caught for food, liver oil, and processed for fishmeal.

Similar families occurring in the area

Pseudocarchariidae: body slimmer, gill slits higher and reaching onto dorsal sides of head, eyes larger, no true labial furrows, dorsal and anal fins lower, a weak lateral keel on caudal peduncle and both upper and lower precaudal pits present.

Proscylliidae, Triakidae, Hemigaleidae, and Carcharhinidae: nictitating eyelids present, anterior teeth not greatly enlarged, no intermediate teeth between anteriors and laterals, intestinal valve of spiral or scroll type.

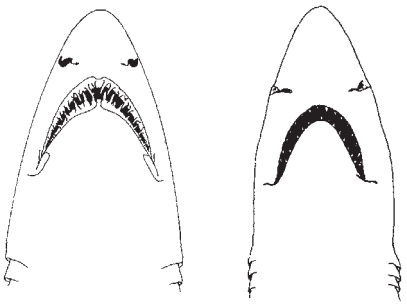


Pseudocarchariidae

Key to the species of Odontaspididae occurring in the area

1a. Snout short and somewhat flattened (Fig. 1a); eyes very small; 3 rows of anterior teeth on either side of upper symphysis (Fig. 2b); dorsal and anal fins about equal in size, first dorsal fin closer to pelvic fin than to pectoral-fin bases (Fig. 3) . . . . . ***Carcharias taurus***

1b. Snout longer, bulbous and conical (Fig. 1b); eyes relatively large; 2 rows of large anterior teeth on either side of upper symphysis (Fig. 2b); first dorsal fin markedly larger than the second, closer to pectoral than to pelvic-fin bases; second dorsal fin considerably larger than anal fin (Fig. 4) . . . . . ***Odontaspis ferox***



a) ***Carcharias taurus*** **b)** ***Odontaspis feros***

Fig. 1 ventral view of head

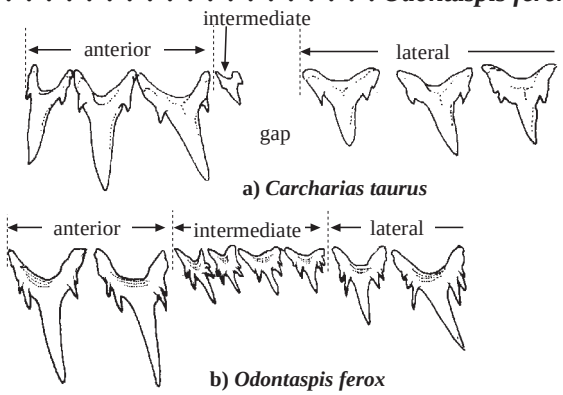


Fig. 2 upper teeth of left side

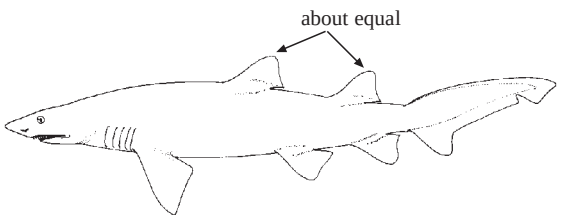


Fig. 3 ***Carcharius taurus***

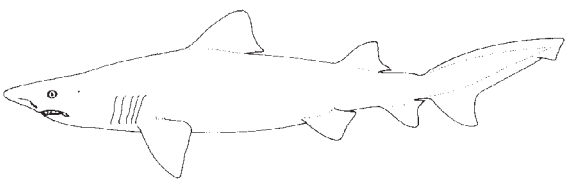


Fig. 4 ***Odontaspis ferox***

List of species occurring in the area

The symbol is given when species accounts are included.

Carcharias taurus Rafinesque, 1810

? *Odontaspis ferox* (Risso, 1810)

References

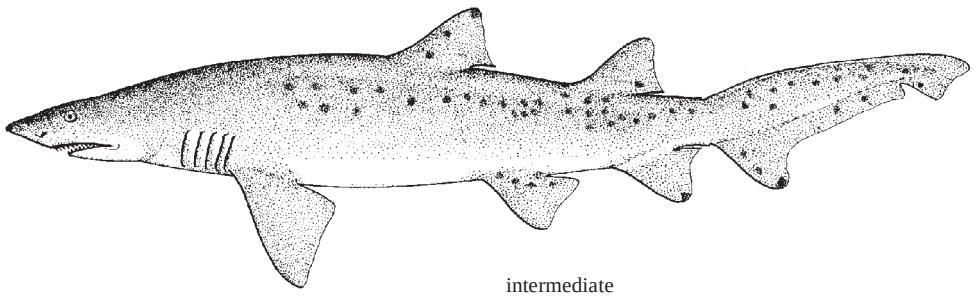
Compagno. L.J.V. 1984. FAO Species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish Synop.*, (125)Vol.4, Pt.1:249 p.

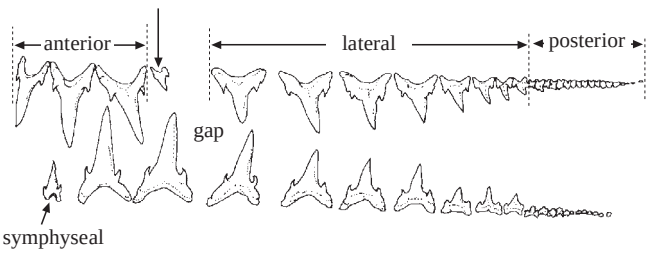
Last, P.R. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

Carcharias taurus Rafinesque, 1810

Frequent synonyms / misidentifications: *Odontaspis taurus* (Rafinesque, 1810); *Eugomphodus taurus* (Rafinesque, 1810) / *Odontaspix ferox* (Risso, 1810).

FAO names: **En** - Sandtiger shark; **Fr** - Requin taureau (= Requin sable tacheté, Fishing Area 31); **Sp** - Toro bacota (= Pez toro).



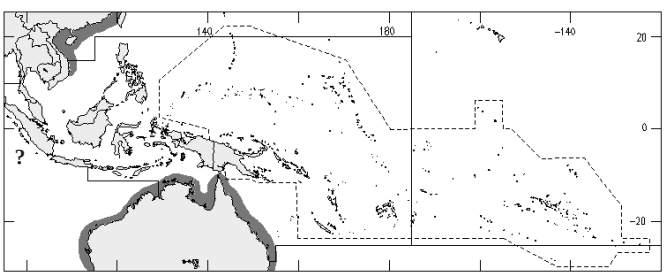


upper and lower teeth of left side

Diagnostic characters: A large shark. Head with 5 medium to large gill slits, all in front of pectoral-fin bases, no gill rakers; **snout very short, moderately flattened;** no nasal barbels or nasoral grooves; **eyes small, without nictitating eyelids;** mouth very long and angular, extending well behind eyes; anterior teeth in **3 rows on either side of symphysis,** large, with long, narrow, hooked, sharp-edged but non-serrated cusps and usually 1 short cusplet on each side; upper anteriors separated from the smaller laterals by a single row of tiny intermediate teeth (lacking in lower jaw); lower anteriors separated at front by 2 rows of small symphyseal teeth (**generally** lacking in upper jaw). Two dorsal fins, the base of first just in front of pelvic-fin bases and well posterior to **pectoral fins; second dorsal fin about as large as first dorsal and anal fins;** caudal fin short, strongly asymmetrical, with a pronounced subterminal notch and a short ventral lobe. No keels on caudal peduncle, but with a strong upper precaudal pit. Intestinal valve of ring type. **Colour:** light grey-brown above, white below, often with round or oval, yellow, or yellow-brown spots.

Size: Maximum total length about 3.18 m; adults between 2.2 to 3 m.

Habitat, biology, and fisheries: A common littoral shark found inshore from the surf zone and in shallow bays to at least 191 m on the outer continental shelves in tropical and (mostly) temperate waters. It commonly lives near or on the bottom but occurs at midwater and at the surface. It is a slow but strong swimmer that can readily halt and hover motionless in midwater, and is the only known shark to gulp and store air in its stomach to maintain neutral buoyancy while swimming. Ovoviviparous, with litters of 2 young recorded. Feeds on a wide variety of bony fishes, small sharks, rays, squids, crabs, and lobsters. This species previously had a bad reputation as a "maneater" in Australian waters ("gray nurse shark"), probably in large part by confusion with certain requiem sharks (Carcharhinidae) and with the white shark. It is apparently mostly inoffensive, but occasionally can become aggressive and nips divers without attempting to feed. It is caught by a large variety of fishing gear including line gear, bottom gill nets, and in pelagic and bottom trawls and is utilized for its flesh, liver oil, fins, and hides for leather. It is now protected in Australian waters after suffering local declines due to divers killing this easily-approached shark for "sport" with powerheads. This shark is listed on the IUCN Red List of Threatened Animals (vulnerable).

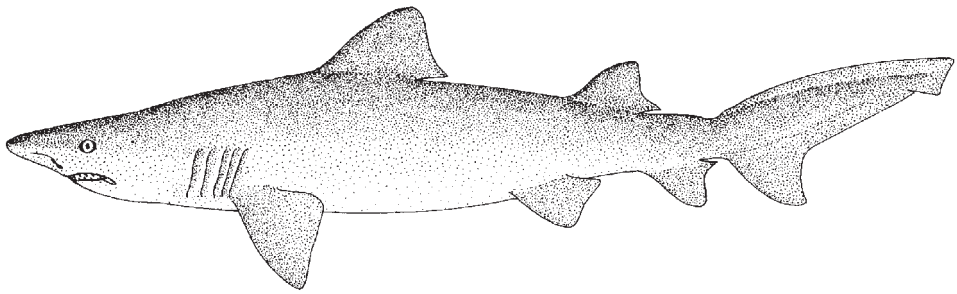


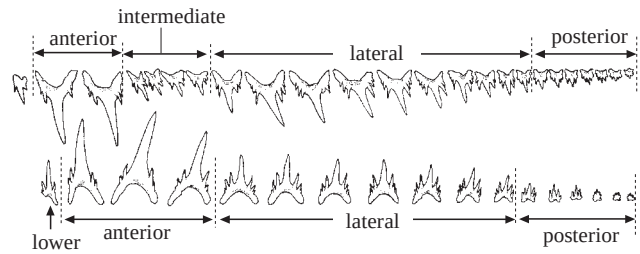
Distribution: Found in all warm seas except perhaps the eastern Pacific. In the Indo-West Pacific, off South Africa and in the Red Sea westwards to Japan, Korea, and Australia. In the area, along the entire northern coast of Australia, off the south coast of Viet Nam, and Indonesia (Aru and Obi Islands, possibly more widespread). Nominally recorded as *Carcharias tricuspidatus* from the Philippines.

Odontaspis ferox (Risso, 1810)

Frequent synonyms / misidentifications: *Odontaspis herbsti* Whitley, 1950 / *Carcharias taurus* Rafinesque, 1810.

FAO names: En - Smalltooth sand tiger; **Fr** - Requin féroce; **Sp** - Solrayo.





upper and lower teeth of left side

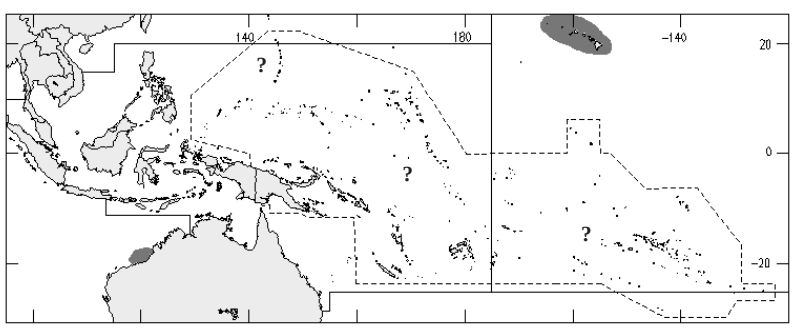
Diagnostic characters: A large shark. Head with 5 medium to large gill slits, all in front of pectoral-fin bases; no gill rakers; **snout moderately elongated, bulbously conical;** no nasal barbels or nasoral grooves **eyes moderately large, without nictitatinq eyelids**; mouth very long and angular, extending well behind eyes; anterior teeth moderately large. with long, narrow, hooked, sharp-edged but non-serrated cusps and **2 or 3 moderately long cusplets on each side,** separated in front by **2 rows of small symphyseal teeth in both jaws; upper anteriors set in 2 rows** on either side of symphysis **and separated from the smaller laterals by 3 or 4 rows of tiny intermediate teeth;** lower anteriors set in 3 rows on either side of symphysis and not followed by small intermediate teeth. Two dorsal fins, the **first large and situated closer to the pectoral fins than to the pelvic fins, its free rear tip well ahead of pelvic-fin origins**, the second dorsal fin smaller than the first and usually slightly larger than anal fin; caudal fin short, strongly asymmetrical, with a pronounced subterminal notch and a short ventral lobe. No keels on caudal peduncle, but a strong upper precaudal pit. Intestinal valve of ring type. **Colour:** grey above, paler below, tips of dorsal, anal, pectoral, and pelvic fins may be dark-tipped in young; dark spots present on sides in some individuals.

Size: Maximum total length about 3.6 m.

Habitat, biology, and fisheries: An uncommon, little-known, primarily deep-water species found at depths between 15 and 420 m from inshore waters to the upper continental and insular slopes. Probably ovoviviparous. Bottom-dwelling, feeds on small bony fishes, squids, and crustaceans. The large oily liver presumably has a hydrostatic function. This species is not implicated in attacks on people. Taken with bottom gill nets, line gear and bottom trawls, primarily in the Mediterranean Sea and off Japan; used for its meat and for its squalene-rich liver.

Distribution: Known from the Mediterranean Sea and eastern Atlantic; Indo-West Pacific off South Africa and Maldives, Madagascar, southern Japan, Australia (New South Wales and northwestern Australia just adjacent to the area), and New Zealand; Central Pacific off Hawaii; and eastern Pacific off southern California and Baja California. Probably has a wider range than is known and is to be expected inside the area.

Remarks: Unspotted individuals have been distinguished as *Odontaspis herbsti*, but apparently presence of spots is a matter of individual variation in 1 species. *Carcharias taurus* is also variable in having or lacking spots. A somewhat similar deepwater and possibly oceanic species, *Odontaspis noronhai*, has been recorded off Hawaii in deep water and may eventually be recorded for the area.



PSEUDOCARCHARIIDAE

Crocodile sharks

by L.J.V. Compagno

A single species in this family.

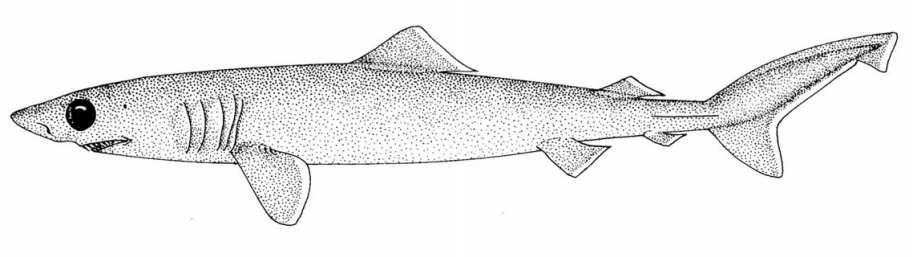
Pseudocarcharias kamoharai (Matsubara, 1936)

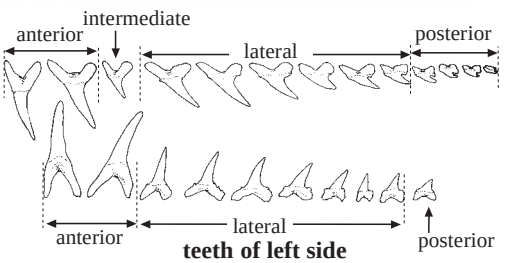
Frequent synonyms / misidentifications: *Odontaspis kamoharai* (Matsubara, 1936) / None.

FAO names: En - Crocodile shark; **Fr** - Requin crocodile; **Sp** - Tiburón cocodrilo.



ventral view of head





teeth of left side

Diagnostic characters: A small relatively slender shark. Head with 5 large gill slits, all in front of pectoral-fin bases, their upper ends extending onto dorsal surface of head; no gill rakers; spiracles usually present but very small; no nasal barbels or nasoral grooves; **eyes very large, without nictitating eyelids**; snout conical (not greatly elongated or flattened and blade-like); **mouth very long and angular, extending well behind eyes**; no true labial furrows; anterior teeth very large, with long, narrow, hooked, sharp-edged but unserrated cusps and no cusplets, set in 2 rows on either side of symphysis in both jaws, and not separated in front by small symphyseal teeth; upper anteriors separated from the smaller laterals by a gap and tiny intermediate teeth. Two low dorsal fins, the first about midway between the pectoral and pelvic fins, and well in front of pelvic fin bases, the second somewhat smaller than the first, but larger than anal fin; caudal fin short, strongly asymmetrical, with a pronounced subterminal notch and a short ventral lobe. Caudal peduncle slightly depressed, with a low keel on each side and upper as well as lower precaudal pits. Intestinal valve of ring type, with close-set turns resembling a stack of washers. **Colour:** light or dark grey above, lighter below, fins white-edged, sometimes small white spots on body and a white blotch between the mouth and gill slits.

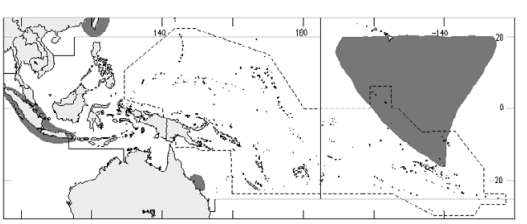
Similar families occurring in the area

None. The combination of the characters described above separates this species from all other sharks.

Size: Maximum total length to about 1.1 m; commonly between 75 cm and 1 m.

Habitat, biology, and fisheries: A rare to locally abundant oceanic and possibly mesopelagic shark, usually found offshore from the surface to at least 300 m. Its habits are little known. Ovoviviparous. Feeds on oceanic fishes, cephalopods, and crustaceans. Most frequently caught by pelagic longline fisheries, but usually discarded due to its small size; utilized for its large, squalene-rich liver.

Distribution: Possibly circumtropical; known from the eastern and southwestern Atlantic, southwestern and perhaps northeastern Indian Ocean, northwestern, central and eastern Pacific. In the Indo-West Pacific, off South Africa and the Mozambique Channel near Madagascar, possibly the Bay of Bengal, New Zealand, Indonesia (Java, Sumatra), Taiwan Province of China, Korea, Japan, Australia (Queensland), and Coral Sea.



References

Compagno. L.J.V. 1984. FAO Species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish Synop.*, (125)Vol.4, Pt.1:249 p.

Last, P.R. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

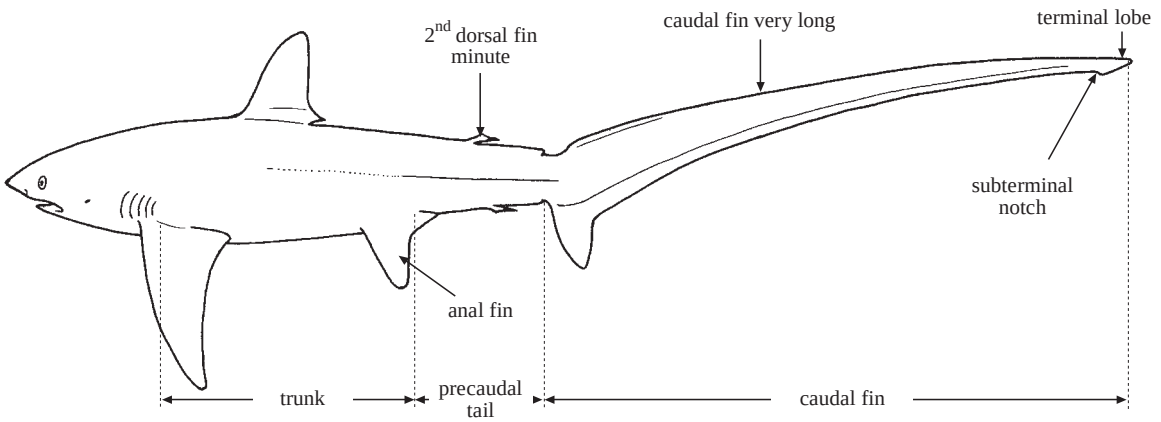
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ALOPIIDAE

Thresher sharks

by L.J.V. Compagno

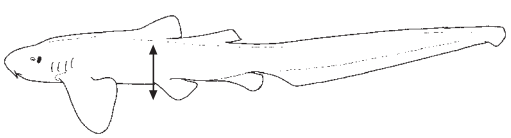
Diagnostic characters: Large sharks. Trunk and precaudal tail cylindrical, not depressed and without lateral ridges; **precaudal tail much shorter than trunk.** Head not expanded laterally, not depressed; 5 small to medium-sized gill slits present, the last 2 behind pectoral-fin origins, their upper ends not expanded onto upper surface of head; no gill rakers or sieves on internal gill slits; spiracles present and minute; nostrils without barbels, nasoral grooves, or circumnarial grooves, well separated from mouth; eyes on sides of head, without nictitating lower eyelids; snout moderately long, bluntly conical, not flattened and without lateral teeth or barbels; mouth small but arched and elongate, extending well behind eyes; labial furrows present on lower jaw only or absent, when present not reaching front of mouth; teeth small, blade-like and compressed, with erect to oblique cusps and cusplets very small or absent; anterior teeth in upper jaw slightly larger than lateral teeth and sometimes separated from them by a row of smaller intermediate teeth on each side. Two dorsal fins, without spines, the first moderately large, high and angular, much shorter than the caudal fin, and with its base located over the interspace between pelvic and pectoral-fin bases; second dorsal fin low, minute, and less than 1/10 the size of the first dorsal fin; anal fin present, very small, with its origin under or behind the second dorsal-fin insertion; caudal fin strongly asymmetrical, **the upper lobe enormously enlarged, about 1/2 the total length and with a subterminal notch,** and an undulated or rippled dorsal margin, the lower lobe short but strong; vertebral axis of caudal fin raised above body axis. Caudal peduncle not depressed, without keels; precaudal pits present. Intestinal valve of ring type. **Colour:** bluish, blackish, grey, or brown above, shading to white or grey below.



Habitat, biology, and fisheries: These are active, strong-swimming, pelagic, coastal and deep-water sharks, with the young of 1 species occurring close inshore and inside bays. They feed mainly on small to moderately large schooling fishes and squid, which may be herded and stunned by the long, strap-like tail. Threshers are circumtemperate and tropical in all warm oceans. This monogeneric family comprises only 3 or 4 species worldwide, 3 of which occur in the area. Thresher sharks form an important component of the oceanic shark fishery, particularly because of their high-quality meat which is utilized fresh, frozen, smoked, and dried-salted. Their fins are used for shark-fin soup, livers for vitamin extraction, and hides for leather. Thresher sharks are primarily captured by offshore longline fisheries but also offshore and near shore with line gear (including rod and reel) and fixed bottom gill nets.

Similar families occurring in the area

Stegostomatidae: this is the only other family of sharks with the caudal fin about as long as the body; it differs from Alopiidae in numerous characters, including its striped or barred colour pattern, nasal barbels, transverse mouth in front of eyes, small tricuspid teeth, broad rounded pectoral fins, first dorsal fin over pelvic-fin bases, larger second dorsal and anal fins, broad upper lobe on caudal fin, no ventral caudal-fin lobe, and axis of caudal fin not raised.



Stegostomatidae

No other sharks in the area have the caudal fin about 1/2 the total length.

Key to the species of Alopiidae occurring in the area

1a. Head nearly flat between eyes; a deep horizontal groove on nape of each side above gills; eyes very large, with orbits expanded onto dorsal surface of head; teeth larger, less than 25 rows in each jaw; first dorsal-fin base closer to pelvic-fin bases than pectoral-fin bases (Fig. 1) . . . . . ***Alopias superciliosus***

1b. Head strongly arched between eyes; no horizontal groove or an inconspicuous one on nape of each side; eyes smaller, with orbits not expanded onto dorsal surface of head; teeth smaller, 29 or (usually) more rows in each jaw; first dorsal-fin base about equidistant between pectoral and pelvic-fin bases or closer to pectoral-fin bases (Figs 2 and 3) . . . . . → ***2***

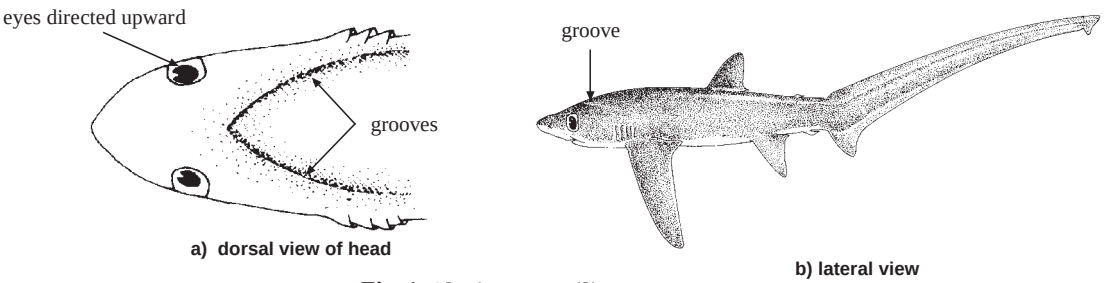


Fig. 1 ***Alopias superciliosus***

2a. Sides above pectoral-fin bases dark, without an extension of the white abdominal area; head narrow, snout more elongated, forehead nearly straight; labial furrows absent; pectoral fins nearly straight and broad-tipped; distance between pelvic and caudal-fin bases shorter than prebranchial length; terminal lobe of caudal fin shorter, its length from subterminal notch to caudal tip about equal to second dorsal-fin base (Fig. 2) . . . . . ***Alopias pelagicus***

2b. Sides above pectoral-fin bases marked with a white patch extending forward from the abdominal area; head broad, snout shorter, forehead strongly arched; labial furrows present; pectoral fins falcate and narrow-tipped; distance between pelvic and caudal-fin bases greater than prebranchial length; terminal lobe of caudal fin longer, its length from subterminal notch to caudal tip over twice second dorsal-fin base (Fig. 3) . . . . . ***Alopias vulpinus***

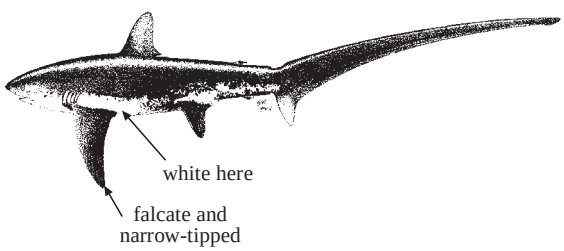


Fig. 2 ***Alopias vulpinus***

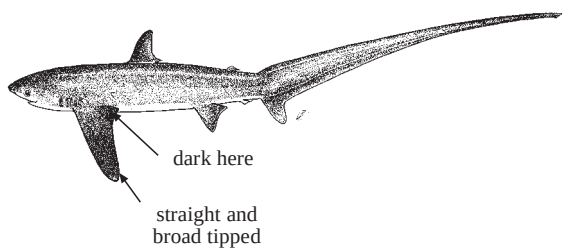


Fig. 3 ***Alopias pelagicus***

List of species occurring in the area

The symbol is given when species accounts are included.

- *Alopias pelagicus* Nakamura, 1935
- *Alopias superciliosus* (Lowe, 1839)
- *Alopias vulpinus* (Bonnaterre, 1788)

References

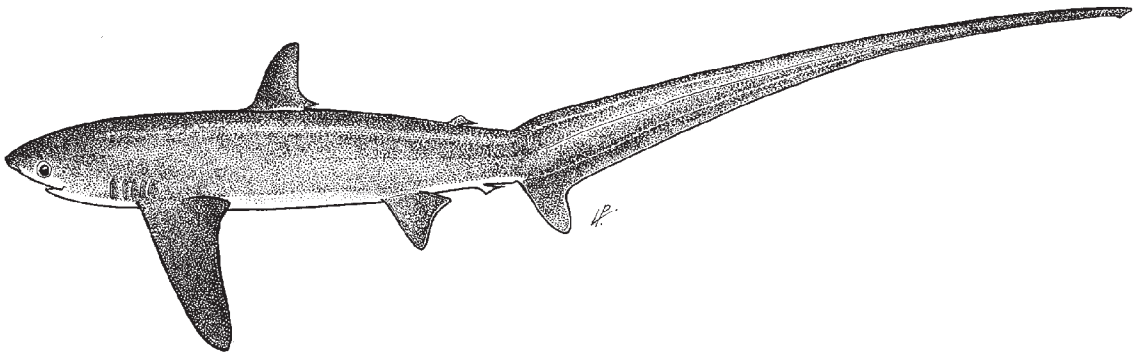
Compagno, L.J.V. 1984. FAO Species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish Synop.*, (125)Vol.4, Pt.1:249 p.

Last, P.R. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

Alopias pelagicus Nakamura, 1935

Frequent synonyms / misidentifications: None / *Alopias superciliosus* (Lowe, 1839); *A. vulpinus* (Bonnaterre, 1788).

FAO names: En - Pelagic thresher; **Fr** - Renard pélagique; **Sp** - Zorro pelágico.

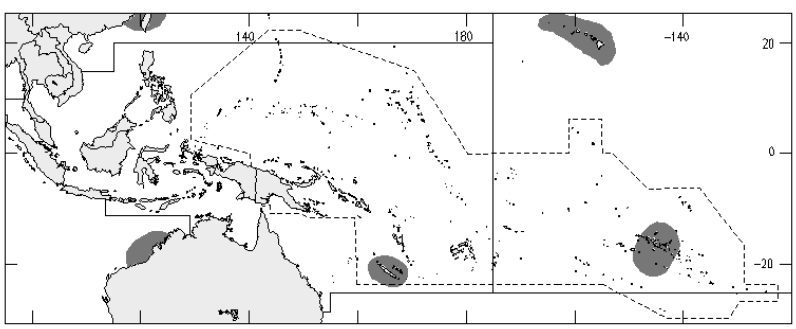


Diagnostic characters: A large shark. Head with 5 medium-sized gill slits, the last 2 above pectoral-fin bases; a weak horizontal groove on nape on each side from level of mouth to pectoral fins; no nasal barbels or nasoral grooves on nostrils; snout moderately long and conical; **forehead nearly straight in lateral view, broadly arched between eyes**; head narrow; no nictitating eyelids; eyes moderately enlarged in adults and subadults, but greatly enlarged in young, **not expanded onto dorsal furface of head**; mouth moderately long and semicircular, placed below eyes, with labial furrows rudimentary or absent; teeth small, **more than 29 rows in each jaw,** sharp-edged, with a single, narrow, nearly erect or distally oblique cusp and often a distal cusplet; anterior teeth not greatly enlarged, uppers separated from the large laterals by smaller intermediate teeth. Two dorsal fins, the first moderately large and **located about equidistant between the pectoral and pelvic-fin bases or slightly closer to the pectoral-fin bases**; second dorsal fin minute and positioned well ahead of the small anal fin; **pectoral fins narrow, long and nearly straight, broad-tipped, and not falcate**; upper lobe of caudal fin very long and strap-like, about as long as the rest of the shark; lower lobe short but strong; terminal lobe very small. Upper precaudal pit present but caudal keels absent. Intestinal valve of ring type. **Colour:** bluish or grey above, white below, with a silvery sheen in gill region; **white colour from belly not expanded over pectoral-fin bases.**

Size: Maximum total length at least 3.3 m (adult females).

Habitat, biology, and fisheries: A little-known species, primarily oceanic and epipelagic, but sometimes caught near-shore, ranging from the surface to a depth of at least 150 m. An active, strong-swimming species. Ovoviviparous, with at least 2 young; apparently a uterine cannibal like other species of *Alopias*. Presumably feeds on small fishes and squid, but no details are known. Harmless to people. Formerly exploited by the longline fishery in the northwestern Indian Ocean (primarily by Russia), but is also fished in the Central and eastern Pacific. Utilized for its meat (for human consumption), liver oil for vitamin extraction, hides for leather, and fins for shark-fin soup.

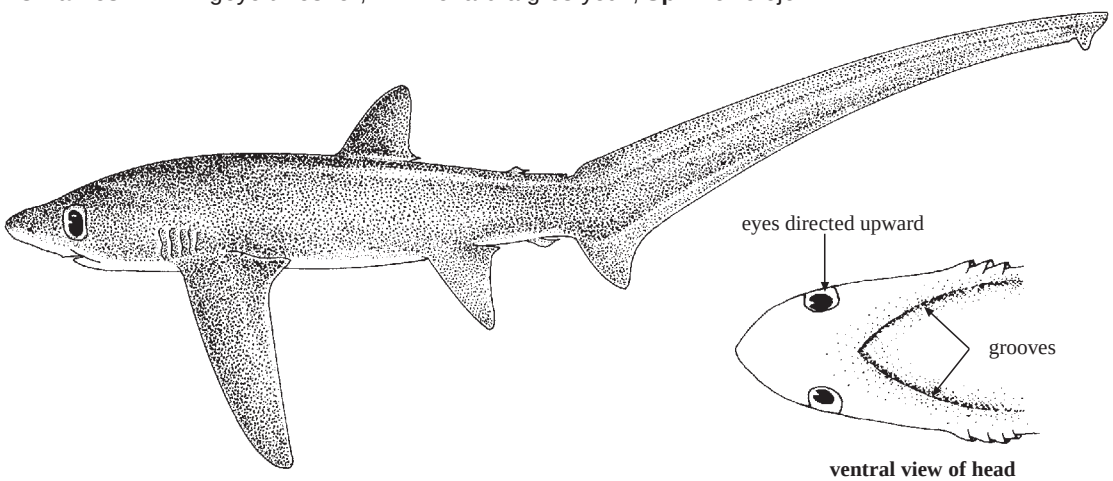
Distribution: Wide-ranging in the tropical and subtropical Indo-Pacific.



Alopias superciliosus (Lowe, 1839)

Frequent synonyms / misidentifications: *Alopias profundus* Nakamura, 1935 / *Alopias pelagicus* Nakamura, 1935; *A. vulpinus* (Bonnaterre, 1788).

FAO names: En - Bigeye thresher; **Fr** - Renard à gros yeux; **Sp** - Zorro ojón.

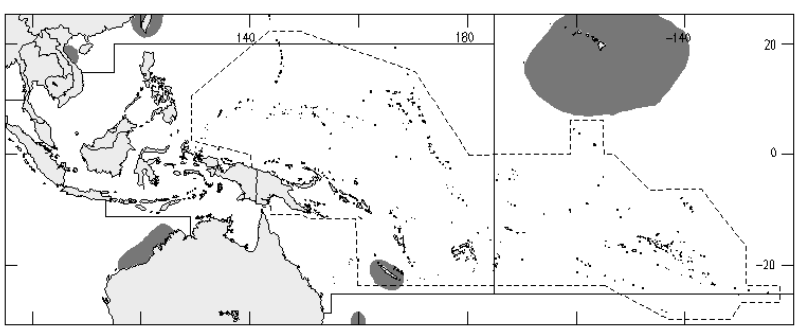


ventral view of head

Diagnostic characters: A large shark. Head with 5 medium-sized gill slits, the last 2 above pectoral-fin bases; **a deep horizontal groove on nape on each side** from the level of mouth to pectoral fins; no nasal barbels or nasoral grooves on nostrils; **snout moderately long and conical; profile of forehead distinctly indented over eyes; interorbital space nearly flat;** no nictitating eyelids; **eyes very large, expanding onto dorsal surface of head**, permitting upward vision; mouth moderately long and semicircular, placed below the eyes, with rudimentary labial furrows; teeth moderately large, **less than 25 rows in upper or lower jaws**, sharp-edged, with a single, broad, straight or posteriorly curved cusp and no cusplets; anterior teeth not greatly enlarged, uppers not separated from the large laterals by smaller intermediate teeth. Two dorsal fins, the first moderately large and **located just in front of the pelvic-fin origins**, closer to the pelvic fins than to the pectoral fins; second dorsal fin minute and positioned well ahead of the small anal fin; pectoral fins very narrow, long and falcate, broad-tipped; upper lobe of caudal fin very long and strap-like, almost or quite equal to the length of rest of shark; lower lobe short but well developed. Upper precaudal pit present but caudal keels absent. Intestinal valve of ring type. **Colour:** purplish grey above, cream below, posterior edges of pectoral and pelvic fins and sometimes first dorsal fin dusky; **light colour of abdomen not expanded over pectoral-fin bases.**

Size: Maximum total length about 4.6 m; commonly between 3 and 4 m.

Habitat, biology, and fisheries: Found in coastal waters over the continental shelves, sometimes close inshore in shallow waters, and on the high seas far from land, in deep water down to at least 500 m. Apparently strong-swimming. Ovoviviparous, with uterine cannibalism, number of young usually 2 per litter, but sometimes up to 4. Feeds on pelagic fishes (lancetfishes, clupeoids, scombroids, and small billfishes) and bottom fishes (hakes); also squids. Apparently stuns its prey with its long caudal fin, as individuals are often tail-hooked on longlines. Apparently harmless to people. Caught in oceanic longline fisheries; especially important areas for these fisheries are the North Atlantic, northwestern Indian Ocean, and the Central and eastern Pacific. The species is also taken in fixed bottom and pelagic gill nets, in trawls, and with sportsfishing gear (rod and reel). Its meat is utilized fresh, smoked, and dried-salted for human consumption, its liver oil is processed for vitamins, its skin for leather, and fins for shark-fin soup.

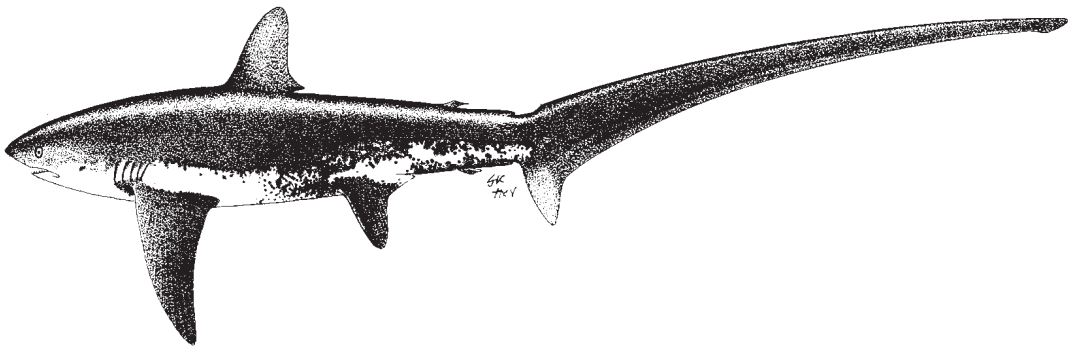


Distribution: Virtually circumglobal in tropical and warm temperate seas.

Alopias vulpinus (Bonnaterre, 1788)

Frequent synonyms / misidentifications: None / *Alopias pelagicus* Nakamura, 1935; *A. superciliosus* (Lowe, 1839).

FAO names: En - Thresher shark; **Fr** - Renard; **Sp** - Zorro.

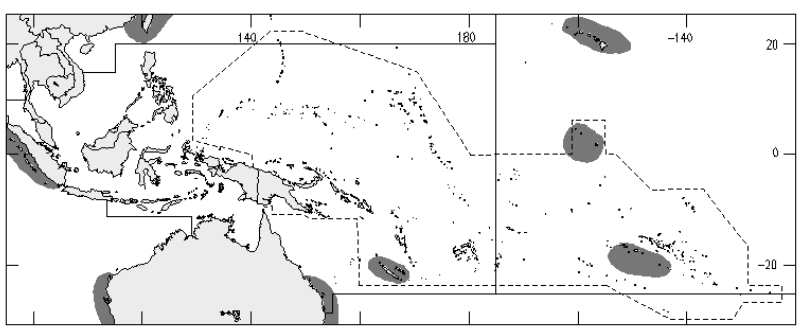


Diagnostic characters: A large shark. Head with 5 medium-sized gill slits, the last 2 above pectoral-fin bases; **no grooves on nape;** no gill rakers; no nasal barbels or nasoral grooves on nostrils; **snout short and conical;** forehead broadly convex in lateral view, not indented at nape; no nictitating eyelids; **eyes moderately large, not expanded onto dorsal surface of head;** mouth short and semicircular, below eyes, with short lower labial furrows; teeth small, **usually over 29 rows in upper and lower jaws,** sharp-edged, with a single, broad, straight or posteriorly curved cusp and usually no cusplets; anterior teeth not greatly enlarged, **uppers usually separated from the laterals by a small intermediate tooth.** Two dorsal fins, the first moderately large, **with its base well ahead of the pelvic-fin bases and farther from them than from the pectoral-fin bases;** second dorsal fin minute and positioned just in front of the small anal fin; **pectoral fins very long and falcate, with narrowly rounded (small juveniles) to acutely pointed, narrow tips;** upper lobe of caudal fin very long and strap-like, about as long as, or longer than, rest of shark; lower lobe short but well-developed. Upper precaudal pit present but caudal keels absent. Intestinal valve of ring type. **Colour:** brown, grey, blue-grey, or blackish on back and underside of snout, lighter on sides, and abruptly white below; **a white area extends from the abdomen over the pectoral-fin bases;** pectoral-, pelvic-, and dorsal fins blackish, white dots sometimes present on pectoral-, pelvic-, and caudal-fin tips.

Size: Maximum total length about 5.5 m; commonly between 4.3 and 4.9 m; apparently larger than *Alopias superciliosus* and *A. pelagicus*.

Habitat, biology, and fisheries: Coastal over the continental and insular shelves and epipelagic far from land in temperate to tropical waters; young often close inshore and in shallow bays, from the surface down to 370 m. An active, strong-swimming shark, sometimes leaping out of the water. Ovoviviparous and apparently a uterine cannibal, number of young 2 to 4 per litter (usually 2). Feeds mostly on small schooling fishes, including mackerels, bluefishes, clupeids, needlefishes, lancetfishes, and lanternfishes; also squids, octopuses and pelagic crustaceans, and rarely seabirds. Herds and stuns its prey with its long, whip-like caudal fin, and is often caught on longlines by being tail-hooked. Apparently harmless to people, though the size of adults of this species should invite respect. Caught in oceanic longline fisheries; especially important areas for these fisheries are or were the northwestern Indian Ocean and the Central Pacific. Also fished with anchored bottom and surface gill nets, floating gill nets and sportfishing gear (rod and reel). The meat is highly prized fresh for human consumption but is also eaten smoked and dried-salted; the fins are valuable for shark-fin soup; the hide is usable for leather and the liver oil can be processed for vitamins.

Distribution: Virtually circumglobal in temperate to tropical waters.

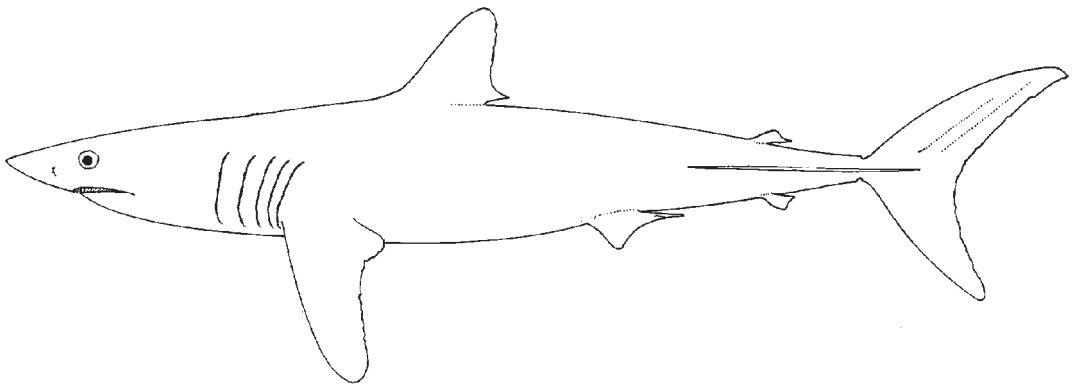


LAMNIDAE

Mackerel sharks, makos, white sharks, porbeagles

by L.J.V. Compagno

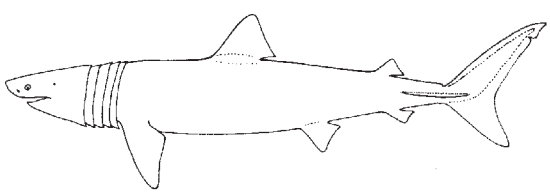
Diagnostic characters: Large-sized sharks with a fusiform body. Head with 5 gill slits, **all in front of pectoral-fin origins;** gill arches without rakers; no nictitating eyelids; **teeth long and few in number,** awl-or blade-like, with a single cusp. **Two dorsal fins, the first** much shorter at base than caudal fin and **far in advance of pelvic fins; second dorsal fin and anal fin much smaller than first dorsal fin; caudal fin lunate,** less than 1/3 of total length. **Caudal peduncle strongly depressed dorsoventrally** and expanded laterally, **with a prominent keel on each side, extending well out on caudal fin.** Intestinal valve of ring type. **Colour:** back greyish blue to black, or brownish; belly white.



Habitat, biology, and fisheries: Mackerel sharks inhabit temperate and tropical waters (oceanic as well as coastal) throughout the world. They are very fast swimmers and voracious predators, feeding mainly on fish and squid, but also other sharks, batoids, marine mammals, sea birds, and carrion; some species are dangerous to man. Mackerel sharks are often used for food or for production of liver oil, fishmeal and other shark products.

Similar families occurring in the area

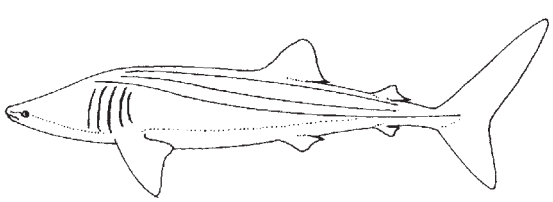
Cetorhinidae: the basking shark, *Cetorhinus maximus* (Gunnerus, 1765) is known to occur close to the area (western North Pacific southwards to Taiwan Province of China as well as southwestern Australia) and may eventually be found in the area. It can be distinguished from members of Lamnidae by having much longer gill openings, extending from upper surface of head to throat; gill rakers well developed on internal gill openings; teeth minute and hooked, not blade-like; anal fin and second dorsal fin larger; and size of adults larger (9 m or more).



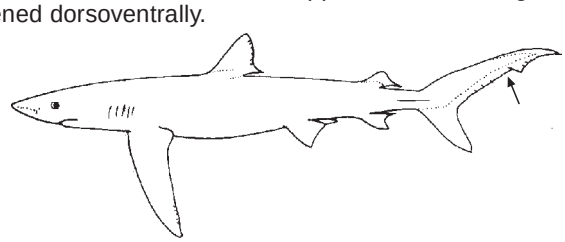
Cetorhinidae

Rhincodontidae: body with several prominent dermal ridges on either side; last gill slit well behind pectoral-fin origin; snout squared off anteriorly; mouth nearly terminal; at least half of first dorsal-fin base posterior to pelvic-fin origins; gill arches connected by masses of spongy tissue; and a spotted and striped colour pattern.

All other shark families: caudal fin strongly asymmetrical and not lunate, the upper lobe extending far beyond lower lobe; caudal peduncle not greatly flattened dorsoventrally.



Rhincodontidae



other shark families (e.g. Carcharhinidae)

Key to the species of Lamnidae occurring in the area

1a. Upper teeth triangular with serrate edges (Fig. 1a); origin of first dorsal fin opposite or slightly anterior to inner corners of pectoral fins when the latter are laid back; anal-fin origin posterior to second dorsal-fin base (Fig. 2) . . . . . ***Carcharodon carcharias***

1b. Upper teeth with smooth-edged cusps (Fig. 1b, c); origin of first dorsal fin posterior to inner corners of pectoral fins when the latter are laid back; anal-fin origin below midbase or insertion of second dorsal-fin base (Figs 3 and 4) . . . . . → ***3***

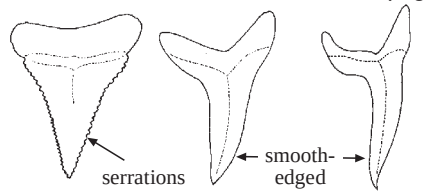


Fig. 1 upper tooth

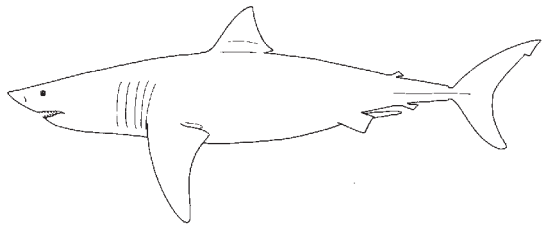


Fig. 2 ***Carcharodon carcharias***

2a. Snout usually acutely pointed (Fig. 5a); cusps of upper and lower anterior teeth recurved at bases but with tips reversed and curving outward; pectoral fins considerably shorter than head, relatively narrow-tipped in young, acutely pointed in adults; origin of anal fin about under midbase of second dorsal fin (Fig. 3); underside of snout and mouth white . . . . . ***Isurus oxyrinchus***

2b. Snout narrowly to bluntly (usually not acutely) pointed (Fig. 5b); cusps of upper and lower anterior teeth straighter, with tips not reversed; pectoral fins about as long as head, relatively broad-tipped in young and adults; origin of anal fin about under insertion of second dorsal fin (Fig. 4); underside of snout and mouth dusky . . . . . ***Isurus paucus***

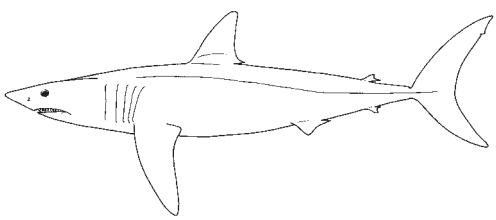


Fig. 3 ***Isurus oxyrinchus***

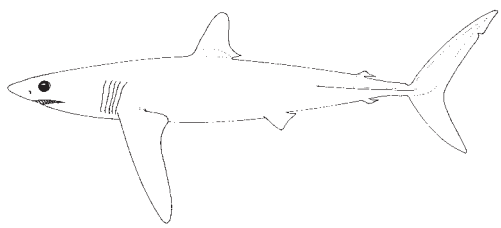


Fig. 4 ***Isurus paucus***

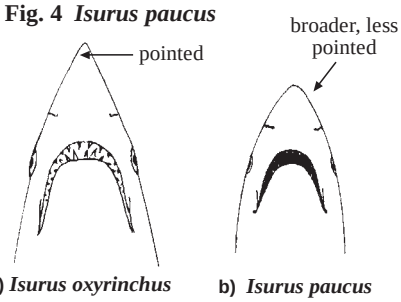


Fig. 5 ventral view of head

List of species occurring in the area

The symbol ⊣ is given when species accounts are included.

⊣ *Carcharodon carcharias* (Linnaeus, 1758)

⊣ *Isurus oxyrinchus* Rafinesque, 1810

⊣ *Isurus paucus* Guitart Manday, 1966

References

Bigelow, H.B. and W.C. Schroeder. 1948. Sharks. *Mem. Sears Found. Mar. Res.*, (1):56-576

Compagno. L.J.V. 1984. FAO Species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish Synop.*, (125)Vol.4, Pt.1:249 p.

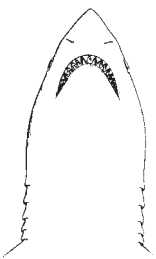
Garrick J.A.F. 1967. Revision of sharks of genus *Isurus* with description of a new species (Galeoidea, Lamnidae). *Proc. U.S. Natl. Mus.*, 118(3537):663-690.

Last, P.R. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

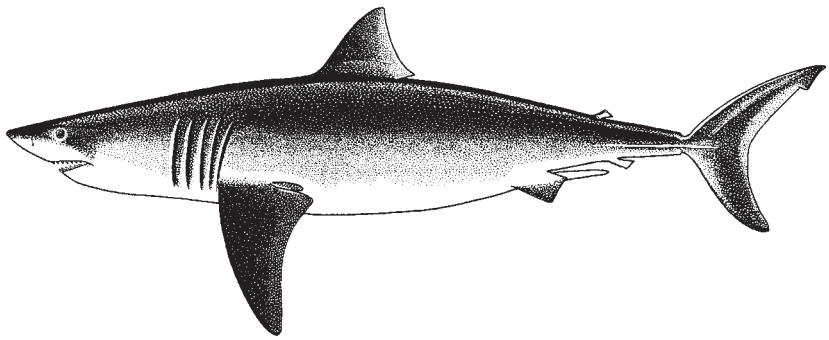
Carcharodon carcharias (Linnaeus, 1758)

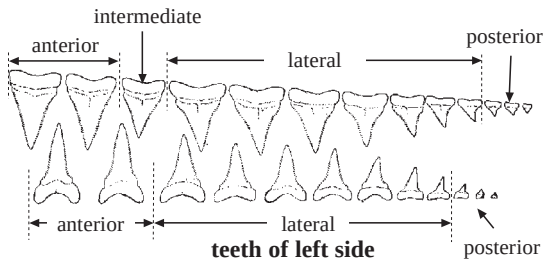
Frequent synonyms / misidentifications: None / None.

FAO names: En - Great white shark; **Fr** - Grand requin blanc; **Sp** - Jaquentón blanco (= Jaquetón).



ventral view of head



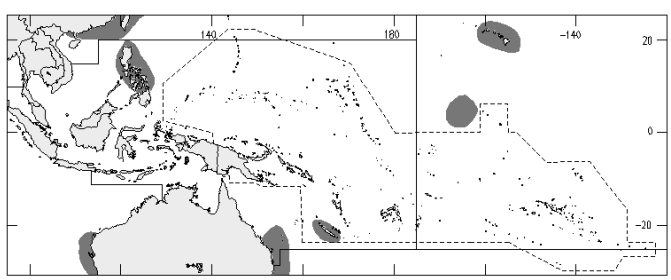


teeth of left side

Diagnostic characters: A very large shark with a fusiform, usually heavy body and a moderately long, **bluntly pointed snout.** Head with 5 long gill slits, all in front of pectoral-fin origins; gill arches without rakers; spiracles very small; mouth long and broadly rounded; **teeth very large** and relatively few, narrower in the lower than in the upper jaw, pointed backwards, with **a single broad cusp and strong serrations** at most sizes (irregular in individuals below 1.5 m length, and with cusplets present up to about 2 m length, but lost in larger individuals); anterior teeth greatly enlarged in both jaws, in 2 rows on either side of symphysis, broadly triangular and compressed, not recurved; intermediate and first few lateral teeth a little smaller, the intermediate ones less differentiated from the anterior and lateral teeth than in other members of the family. Two dorsal fins, the first large, originating over inner margins of pectoral fins, the second very small; pectoral fins shorter than head and falcate; **anal-fin origin posterior to rear end of second dorsal-fin base;** caudal fin lunate, **its lower lobe strongly developed.** Caudal peduncle very much flattened dorsoventrally, expanded laterally, **with a prominent keel on either side extending well out on caudal fin** but with no secondary keel on the fin. **Colour:** grey-brown, dark grey, blue-grey, blackish, light grey or grey-white above, white below, fins with dusky margins below, black tips on underside of pectoral fins, a black spot present or lacking on pectoral-fin axils.

Size: Maximum total length possibly 6.4 to 7.2 m or more (a record of 10.98 m later proved incorrect); commonly between 5 and 6 m.

Habitat, biology, and fisheries: An inshore, offshore, and oceanic species, often occurring on the continental shelves off island and reefs, in enclosed shallow bays and off beaches; recorded from the surface and the intertidal down to 1 280 m. A powerful, strong swimmer. Ovoviviparous, possibly up to 10 fetuses in a litter. A powerful, highly opportunistic apical predator, feeding on a wide variety of marine animals, including other sharks, rays, chimaeras, bony fishes, seals, sea lions, dolphins, porpoises, sea birds, squid, crustaceans, and carrion. One of the most dangerous sharks, responsible for a number of unprovoked attacks on swimmers, divers, surfers, and boats. Of limited interest to fisheries, mostly taken as a bycatch with longlines, hook-and-line, fixed bottom gill nets, fish traps, herring weirs, and trammel nets, harpoons, and even bottom and pelagic trawls, as well as purse seines. Utilized fresh, dried-salted, and smoked for human consumption; the liver oil is extracted for vitamins; the carcass used for fishmeal; the skin for leather; the fins for shark-fin soup; and the teeth and jaws for decorations, with properly prepared large jaws bringing a high price. Protected in South Africa, Namibia, Israel, the USA, and Australia, threatened by targeted and bycatch fisheries. This shark is listed on the IUCN Red List of Threatened Animals (vulnerable).

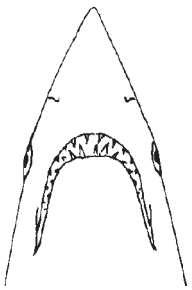


Distribution: Cosmopolitan in boreal to tropical seas, but apparently more abundant in cool to warm-temperate waters.

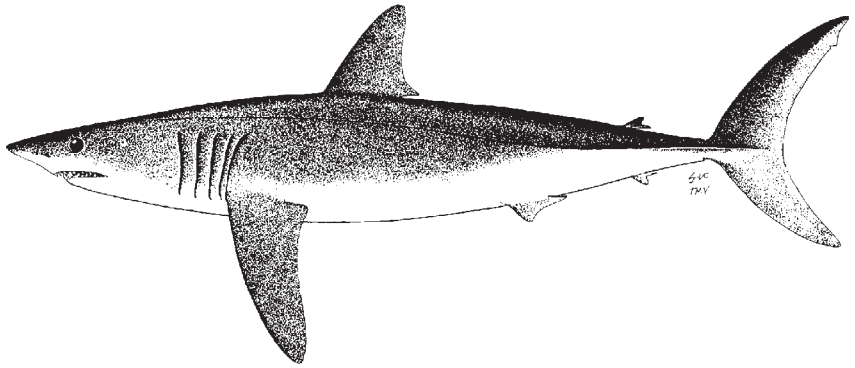
Isurus oxyrinchus Rafinesque, 1810

Frequent synonyms / misidentifications: *Isurus glaucus* (Müller and Henle, 1839) / *Isurus paucus* Guitart Manday, 1966.

FAO names: En - Shortfin mako; **Fr** - Taupe bleu; **Sp** - Marrajo dientuso (= Marrajo).

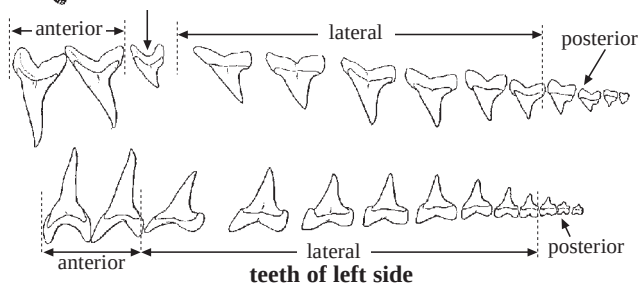


ventral view of head





upper and lower teeth in natural position at tip of mouth (lateral view)

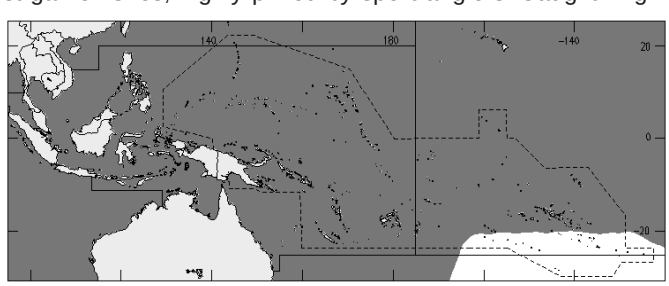


teeth of left side

Diagnostic characters: A large shark with a fusiform and moderately slender body and a long and **acutely pointed snout.** Head with 5 long gill slits, all in front of pectoral-fin origins; gill arches without rakers; spiracles very small; mouth broadly rounded and notably long; **teeth strong and relatively few,** alike in both jaws, backward-pointing, somewhat flexuous in outline, **smooth-edged, with a single cusp;** the first 2 in each jaw much the largest, recurved at base but curve-reversed at tips. Two very unequal dorsal fins, **the first comparatively large, its origin posterior to inner corners of pectoral fins when latter are laid back,** its apex bluntly rounded (young) to acutely pointed (adults); **pectoral fins moderately long (shorter than head)** and falcate; **anal-fin origin below about middle of second dorsal-fin base;** caudal fin lunate, its lower lobe strongly developed. **Caudal peduncle very much flattened dorsoventrally, but expanded laterally, with a prominent keel on each side extending well out on caudal fin. Colour:** back grey-blue, occasionally deep blue; belly white.

Size: Maximum total length to about 4 m; commonly to 2.7 m.

Habitat, biology, and fisheries: An oceanic and coastal species, usually in surface waters, approaching close inshore, but also in deeper water to at least 150 m. Perhaps the most active and strong-swimming of sharks, renowned for leaping out of the water, especially when hooked. Ovoviviparous, number of young in a litter 1 to 6, rarely 10. Feeds heavily on schooling fishes (mackerels, jacks, herrings, etc.), also small sharks and attacks larger species such as tunas and swordfishes. An aggressive, dangerous shark, responsible for unprovoked attacks on swimmers and boats; hooked individuals fight very hard and may leap into the boats of anglers. An important species for longline fisheries, because of its high-quality meat, and also it is also famed as one of the finest game fishes, highly prized by sport anglers. Caught in gill nets, and on pelagic longlines, and hook-and-line. The meat is utilized fresh, frozen, smoked, and dried-salted for human consumption; the oil is extracted for vitamins; the fins used for shark-fin soup; the hides processed into leather and the jaws and teeth used for ornaments.

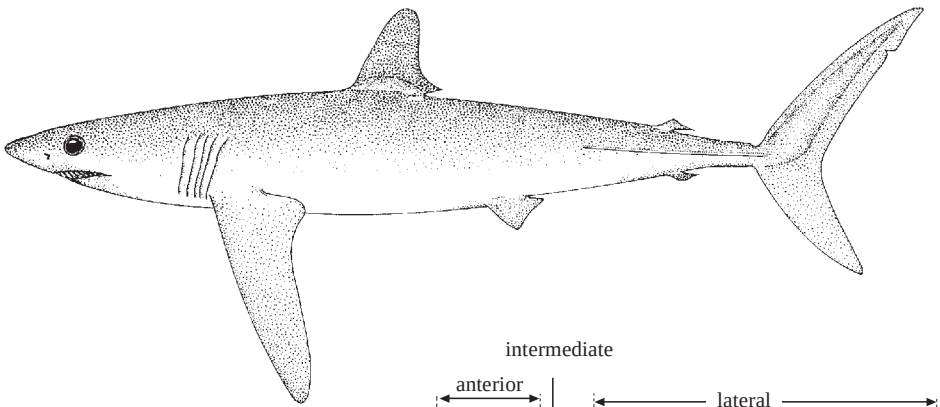


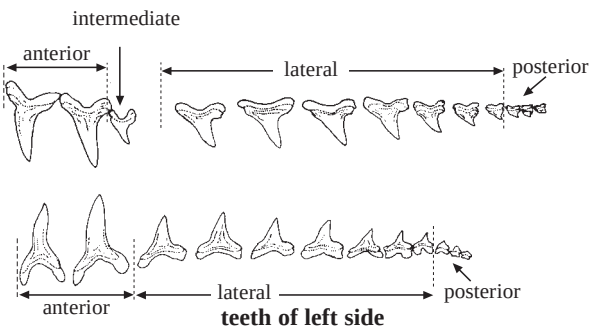
Distribution: Cosmopolitan in warm-temperate and tropical seas.

Isurus paucus Guitart Manday, 1966

Frequent synonyms / misidentifications: *Isurus alatus* Garrick, 1966 / *Isurus oxyrinchus* Rafinesque, 1810.

FAO names: En - Longfin mako; **Fr** - Petit taupe; **Sp** - Marrajo carite.





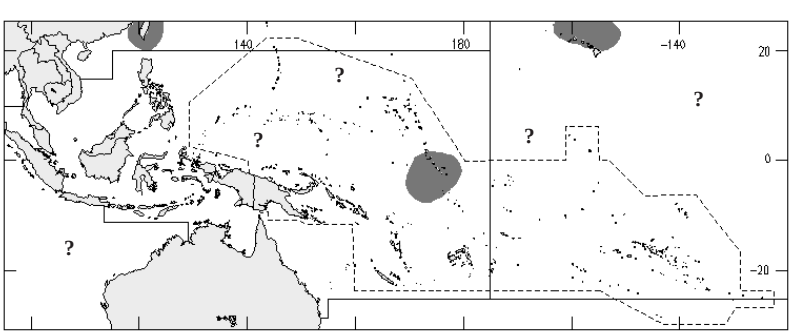
teeth of left side

Diagnostic characters: A large shark **with a fusiform and moderately slender body and a long, pointed snout.** Head with 5 long gill slits, all in front of pectoral-fin origins; gill arches without rakers; spiracles very small; mouth long and broadly rounded; teeth large and relatively few, alike in both jaws, pointed backward, with a single cusp, but **without cusplets or serrations; anterior teeth greatly enlarged in both jaws,** in 2 rows on each side, **cusps recurved at bases but not reversed at tips.** Two dorsal fins, the first large, originating posterior to free rear tips of pectoral fins, **with a bluntly rounded apex,** the second very small; anal fin very small, **originating about under rear end of second dorsal-fin base; pectoral fins about as long as head, straight to falcate, and broad-tipped;** caudal fin lunate, **with a very long lower lobe. Caudal peduncle strongly flattened dorsoventrally and expanded laterally, with a prominent keel on each side** extending well onto caudal fin. **Colour:** back and sides intense blue in life, fading to blackish after death, abdomen white; **underside of snout and mouth partly to entirely dusky**; undersides of pectoral fins with dark blotches in larger individuals, pelvic fins dark with white posterior ends above, white- or dark-blotched below; anal fin with dark blotches or white with an anterior dark blotch.

Size: Maximum total length at least 4.17 m.

Habitat, biology, and fisheries: A little-known oceanic shark, possibly approaching land to give birth. Ovoviviparous, number of young 2. Probably feeds on oceanic schooling fishes as does *Isurus oxyrinchus*, but its large broad fins and slender body suggest that it is a slower, less active shark than that species. Not known to have attacked people or boats, but potentially dangerous because of its size and large teeth. Taken with longlines, hook-and-line, and anchored gill nets. It is utilized fresh, frozen, and dried-salted for human consumption.

Distribution: Western North Atlantic from eastern USA to Cuba and southern Brazil, eastern Atlantic from Guinea, Ghana, and possibly the Cape Verde Islands, western Indian Ocean from Madagascar, western Pacific off Taiwan Province of China and Central Pacific near Phoenix Island and north of Hawaii.



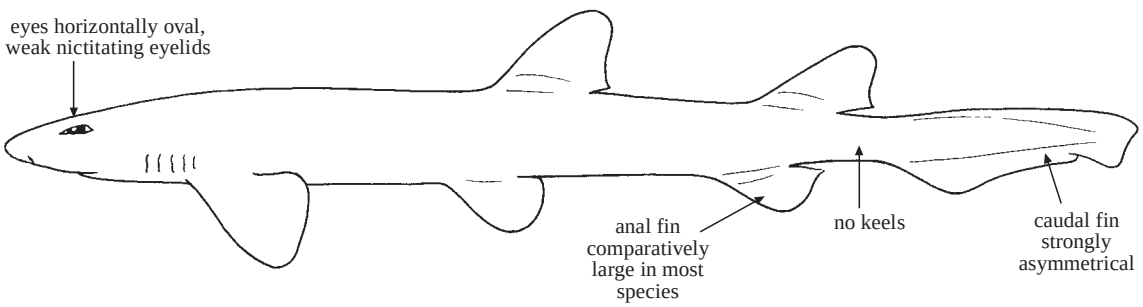
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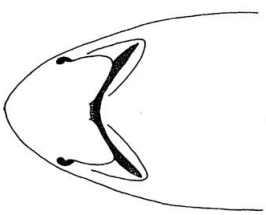
SCYLIORHINIDAE

Catsharks

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: small sharks with slender and elongate to moderately stout bodies. Head with 5 gill slits, **the last 2 posterior to pectoral-fin origins;** gill arches with or without small papillose rakers; nostrils with or without barbels and lacking deep nasoral or circumnarial grooves; eyes horizontally oval, elongate, **with weakly differentiated nictitating lower eyelids** delimited below by a variably developed subocular pouch; mouth moderately large, with rear corners behind front margins of eyes; **labial furrows present or absent** (in species from the area); **teeth very small, numerous, with a single medial cusp and usually 1 or more cusplets on each side near the centre of mouth**, the rear teeth often comb-like. Two dorsal fins (only 1 dorsal fin in *Pentanchus*), **the first originating over or posterior to pelvic-fin bases,** the second dorsal fin smaller, as large, or larger than the first dorsal fin, but never greatly reduced; anal fin usually considerably longer than, and originating in advance of, second dorsal fin; caudal fin strongly asymmetrical, with a subterminal notch, **its lower lobe absent or only weakly indicated, its upper edge unrippled or with a denticulated crest**. Caudal peduncle not flattened dorsoventrally, **without lateral keels or precaudal pits.** Intestine with a corkscrew or auger-like spiral valve, with 5 to 22 turns. **Colour:** grey, brown, yellowish, or black, often with light or dark spots and dark blotches, bars, and saddles.

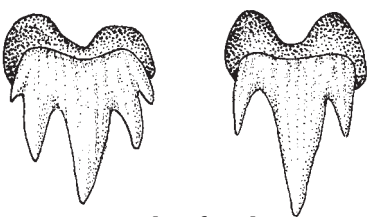




ventral view of head



intestinal valve of spiral type



examples of teeth (with a central cusp and 1 or more pairs of lateral cusplets)

Habitat, biology, and fisheries: This is by far the largest family of sharks, with small to moderate-sized species (rarely reaching to 1 m total length) from tropical and temperate latitudes, ranging from shallow coastal waters to depths greater than 2 000 m. They are generally poor swimmers and do not migrate over great distances. Most species live on or near the bottom, feeding chiefly on invertebrates and small fishes. Some species are rather common and regularly taken as bycatch in trawl fisheries, and are used for fishmeal, oil, and lobster bait. Many are deep-water sharks, and are not known to be utilized to a great extent, although they may be a minor component of the catch of large, deep-fishing offshore trawlers.

Similar families occurring in the area

None. The catsharks are easily distinguished from superficially similar families by the combination of characters such as their small size, the location of the last 2 gill slits behind the pectoral-fin origins, the posterior position of the first dorsal fin, the comparatively large anal fin, the strongly asymmetrical caudal fin, the absence of keels or precaudal pits on the caudal peduncle and the presence of a spiral intestinal valve.

Key to the species of Scyliorhinidae occurring in the area

Note: this key does not include various undescribed species of the large and problematical genus *Apristurus* that occur in the area but which need further study to determine their validity and the means of separating them from described species. There are also several *Apristurus* species recently described from the South China Sea that may occur in the area but were not published with precise localities given and which are omitted from the key. There is an undescribed species of *Parmaturus* from Indonesia that could not be placed in the key.

1a. Supraorbital crests present on cranium, above eyes (Fig. 1a) . . . . . → ***2***

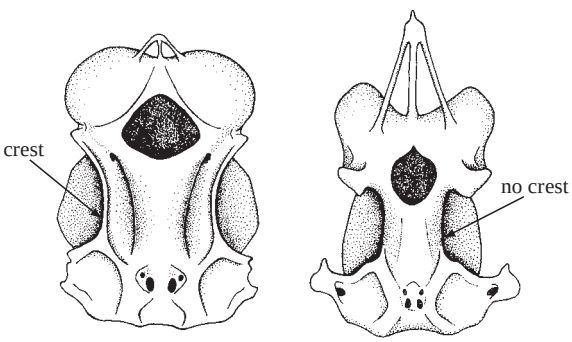
1b. Supraorbital crests absent from cranium (Fig. 1b) . . . . . → ***14***

2a. Second dorsal fin about as large as first . . . . . → ***3***

2b. Second dorsal fin considerably smaller than first . . . . . → ***6***

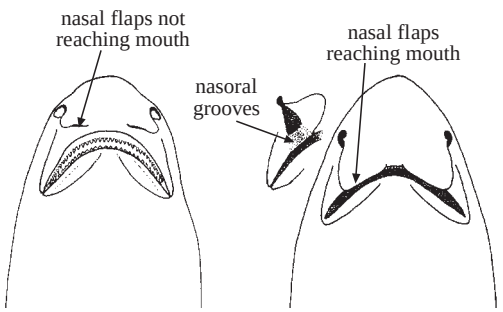
3a. Anterior nasal flaps not expanded and not reaching mouth; nasoral grooves absent (Figs 2a and 3) . . . . . ***Aulohalaelurus kanakorum***

3b. Anterior nasal flaps greatly expanded, reaching mouth; nasoral grooves present (Fig. 2b) . . . . . ***(Atelomycterus)*** → ***4***



a) ***Cephaloscyllium*** b) ***Galeus***

Fig. 1 cranium (dorsal view)



a) ***Aulohalaelurus kanakorum*** b) ***Atelomycterus***

Fig. 2 ventral view of head

4a. Dorsal fins not angled rearwards, posterior margins sloping posteroventrally from fin apices; black spots and markings relatively few, small, and scattered, colour pattern dominated by greyish saddles and bands on light background (Fig. 4) . . . ***Atelomycterus fasciatus***

4b. Dorsal fins angled rearwards, posterior margins sloping anteroventrally from fin apices; black spots and markings numerous and dominating colour pattern . . . . . → ***5***

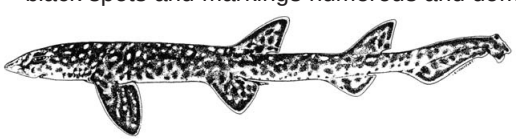


Fig. 3 ***Aulohalaelurus kanakorum***

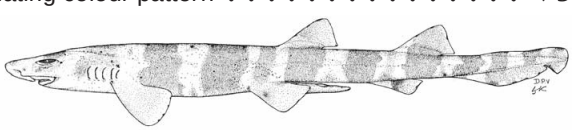


Fig. 4 ***Atelomycterus fasciatus***

5a. Colour pattern of grey saddles separated by light areas and outlined by numerous small black spots (hatchlings have a simpler pattern of dusky saddles, remarkably similar to the coolie loach, *Acanthophthalmus semicinctus*) (Fig. 5) . . . . . ***Atelomycterus macleayi***

5b. Saddle markings obsolete, light grey and white spots outlined by large black spots, bars and lines (Fig. 6) . . . . . ***Atelomycterus marmoratus***

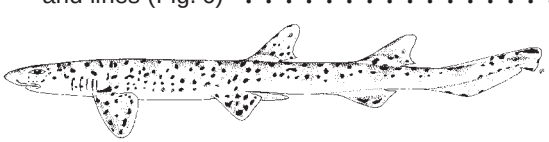


Fig. 5 ***Atelomycterus macleayi***

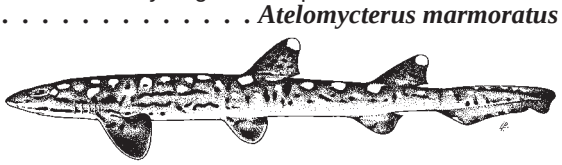


Fig. 6 ***Atelomycterus marmoratus***

6a. Labial furrows present on 1 or both jaws (Fig. 7a) . . . . . ***(Scyliorhinus)*** → ***7***

6b. Labial furrows absent or rudimentary (Fig. 7b) . . . . . ***(Cephaloscyllium)*** → ***8***

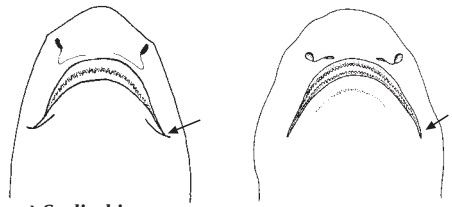


Fig. 7 ventral view of head

7a. Colour pattern of dark spots on fins and body, with 7 dusky saddle marks, interspersed with dark and light spots (Fig. 8) . . . . . ***Scyliorhinus garmani***

7b. Colour pattern of 6 to 9 distinct dusky saddle marks, interspersed with dark and light spots; fins plain (Fig. 9) . . . . . ***Scyliorhinus torazame***



Fig. 8 ***Scyliorhinus garmani***

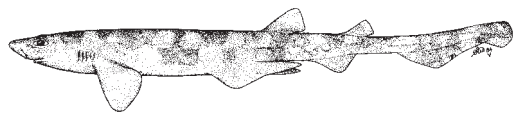


Fig. 9 ***Scyliorhinus torazame***

8a. Colour pale with darker pattern of narrow lines . . . . . → ***9***

8b. Body coloration not as above . . . . . → ***10***

9a. Colour pattern of very narrow lines forming open-centred saddles, blotches and reticulations on back and sides (Fig. 10) . . . . . ***Cephaloscyllium fasciatum***

9b. Colour pattern of narrow, transverse bars on back and sides, not connected to form open-centred saddles, blotches and reticulations (northeastern Australia) (Fig. 11) . . . . . ***Cephaloscyllium* sp. D**



Fig. 10 ***Cephaloscyllium fasciatum***

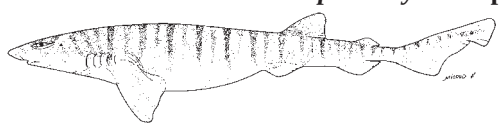


Fig. 11 ***Cephaloscyllium* sp. D**
(after Last and Stevens, 1994)

10a. A simple colour pattern, consisting of only a few broad dark saddles on back and sides, and without white spots . . . . . → ***11***

10b. A strong colour pattern, mostly with scattered blotches and dark and white spots on body . . . . . → ***12***

11a. First dorsal-fin origin about opposite pelvic-fin insertions; pectoral fin wide, posterior margin greater than mouth width; pelvic-anal space greater than anal-fin length in adults; a moderate-sized species, to at least 70 cm total length, males maturing at about 55 cm (northeastern Australia) (Fig. 12) . . . . . ***Cephaloscyllium* sp. B**

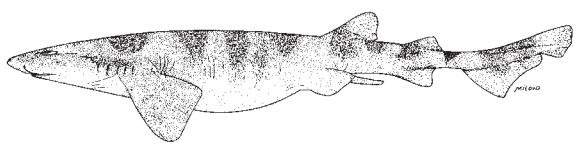


Fig. 12 ***Cephaloscyllium* sp. B**
(after Last and Stevens, 1994)

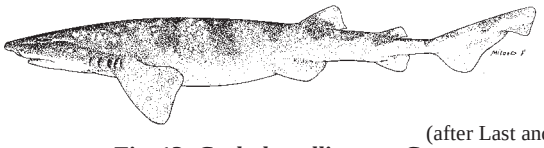
11b. First dorsal-fin origin just behind pelvic-fin origins; pectoral fin narrow, posterior margin less than mouth width; pelvic-anal space less than anal-fin length in adults; a dwarf species, to 44 cm total length, males mature at 39 cm, females maturing at 36 cm (South China Sea to Viet Nam) . . . . . ***Cephaloscyllium* sp.**

12a. Ventral surface (including pectoral fins) prominently spotted with darker and light spots on grey background; dark blotches and saddles on tail and caudal fin outlined and dotted with large bright white spots; anal fin with prominent dark blotch (northeastern Papua New Guinea) . . . . . ***Cephaloscyllium sp.***

12b. Ventral surface plain grey or white; posterior dark blotches and saddles on tail and caudal fin with scattered outlined and dotted with bright white spots; anal fin plain . . . . . → ***13***

13a. Pectoral fin broader than mouth width; upper surface of body with dark saddles, interspersed with light blotches and flecks that extend onto the fins (temperate eastern Australia) (Fig. 13) . . . . . ***Cephaloscyllium* sp. C**

13b. Pectoral-fin width about equal to mouth width; upper surface of body heavily mottled, with saddles (tropical Australia) (Fig. 14) . . . . . ***Cephaloscyllium* sp. E**



(after Last and Stevens, 1994)

Fig. 13 ***Cephaloscyllium* sp. C**

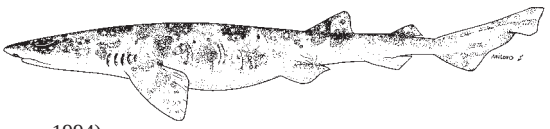


Fig. 14 ***Cephaloscyllium* sp. E**

14a. Head broadly flattened and spatulate, snout elongated and usually longer than mouth width; labial furrows very long, uppers reaching upper symphysis (Fig. 15a) . . . . . → ***15***

14b. Head moderately or little-flattened, not spatulate, snout equal or usually shorter than mouth width; labial furrows shorter or absent, when present not reaching upper symphysis (Fig. 15b) . . . . . → ***20***

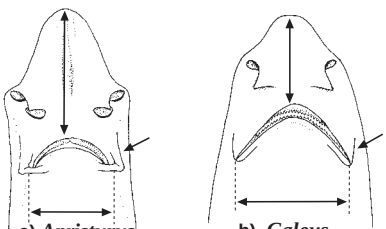


Fig. 15 ventral view of head

15a. One dorsal fin (Fig. 16) . . . . . ***Pentanchus profundicolus***

15b. Two dorsal fins . . . . . **(*Apristurus*)** →***16***

16a. First dorsal fin much smaller than second, about 1/2 its area or less, with its origin usually behind pelvic-fin insertions but over last 1/4 of pelvic-fin bases in some species . . . . . → ***17***

16b. First dorsal fin nearly or quite as large as second, 2/3 to equal its area, with its origin about opposite pelvic-fin midbases or more posterior and about opposite last 1/3 of pelvic-fin bases . . . . . → ***19***

17a. Origin of first dorsal fin somewhat in front of pelvic-fin insertions; distance between pectoral-and pelvic-fin bases extremely short, less than preoral snout, rear tips of pectoral fins about opposite or just in front of pelvic-fin origins (Fig. 17) . . . . ***Apristurus herklotsi***

17b. Origin of first dorsal fin near or behind pelvic-fin insertions; distance between pectoral- and pelvic-fin bases long, at least length of preoral snout, rear tips of pectoral fins far in front of pelvic-fin origins . . . . . → ***18***



Fig. 16 ***Pentanchus profundicolus***

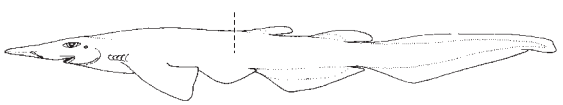


Fig. 17 ***Apristurus herklotsi***

18a. Colour white or reddish white; snout relatively narrow and pointed; mouth extending well in front of eyes; eyes very small, about equal to longest gill slit (Fig. 18) . . . . . ***Apristurus sibogae***

18b. Colour black, brown, or grey; snout broad and rounded; mouth below eyes; eyes larger, their length much greater than widest gill slit (Fig. 19) . . . . . ***Apristurus verweyi***

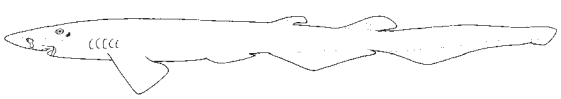


Fig. 18 ***Apristurus sibogae***



Fig. 19 ***Apristurus verweyi***

19a. Gill slits covered with grooves and pleats that extend to the epibranchial area and to the entire throat region behind the jaws; snout shorter, preoral length about 9% of total length (Fig. 20) . . . . . ***Apristurus spongiceps***

19b. Gill slits not covered with grooves and pleats; snout extremely long, preoral length about 12% of total length (Fig. 21) . . . . . ***Apristurus longicephalus***

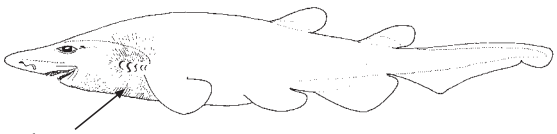


Fig. 20 ***Apristurus spongiceps***



Fig. 21 ***Apristurus longicephalus***

20a. Dorsal caudal-fin margin, and sometimes preventral margin, with a crest of enlarged denticles (Fig. 22a) . . . . . → ***21***

20b. No caudal-fin crests of denticles (Fig. 22b) . . . . . → ***28***

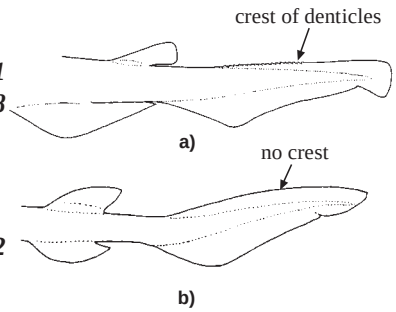


Fig. 22 caudal fin

21a. Pectoral fins relatively small, width of their posterior margins usually smaller than mouth width; subocular ridges well-developed, eyes dorsolateral; body soft; colour plain, no pattern (Figs 23 and 24) . . . **(*Parmaturus)*** → ***22***

21b. Pectoral fins relatively large, width of their posterior margins usually larger than mouth width; subocular ridges obsolete or nearly so, eye lateral; body firm; colour pattern of blotches and spots often present (Figs 26 to 31) . . . . . **(*Galeus)*** → ***23***

22a. Colour light brown with distal parts and anterior margins of fins, snout, nostrils, and gills blackish brown in young, possibly uniform blackish brown in adults; second dorsal fin about as large as anal fin (South China Sea, just adjacent to the area) (Fig. 23) . . . . . ***Parmaturus melanobranchius***

22b. Colour uniform pale yellowish brown; second dorsal fin noticably smaller than anal fin (Australia) (Fig. 24) . . . . . ***Parmaturus* sp. A**



Fig. 23 ***Parmaturus melanobranchius***



Fig. 24 ***Parmaturus* sp. A**
(after Last and Stevens, 1994)

23a. A crest of denticles present on the preventral caudal-fin margin (Fig. 25) . . . . . → ***24***

23b. No crest of denticles on the preventral caudal-fin margin . . . . . → ***25***

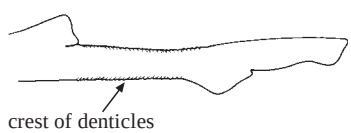


Fig. 25 caudal peduncle

24a. Three broad dark saddles in front of first dorsal fin, about as wide as eye diameter or wider (northeastern Australia) (Fig. 26) . . . . . ***Galeus boardmani***

24b. Ten to 16 narrow dark bands and saddles in front of first dorsal fin, about as wide as eye diameter (Fig. 27) . . . . . ***Galeus* sp. B**

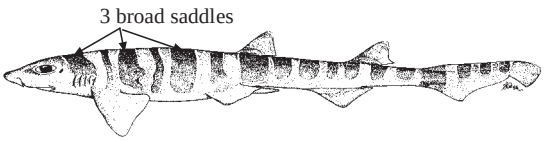


Fig. 26 ***Galeus boardmani***

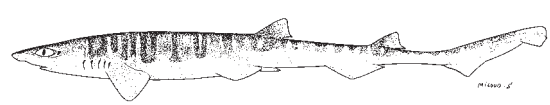


Fig. 27 ***Galeus* sp. B**
(after Last and Stevens, 1994)

25a. Labial furrows very short, confined to mouth corners; snout broadly rounded, usually considerably less than mouth width (Fig. 28) . . . . . ***Galeus schultzi***

25b. Labial furrows more elongated, extending well beyond mouth corners; snout more angular and pointed, usually nearly equal to, or about equal to mouth width (Fig. 29) . . . . . → ***26***

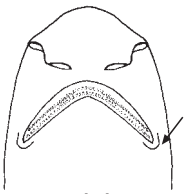


Fig. 28 *Galeus schultzi*

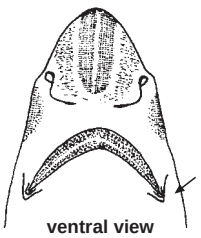


Fig. 29 *Galeus sauteri*

26a. Dorsal fins and sometimes upper and lower caudal-fin lobes with prominent black tips . . . . . ***Galeus sauteri***

26b. Dorsal and caudal fins without black tips, usually edged with white (Figs 30 and 31) . . . . . → ***27***

27a. Eyes smaller and dorsolateral on head, length 3.2 to 3.3% total length; colour pattern of bold saddle markings on body and precaudal tail, but without dark markings on the terminal and hypural caudal-fin lobes (Fig. 30) . . . . . ***Galeus gracilis***

27b. Eyes larger and lateral on head, length 3.5 to 4.2% total length; colour pattern of obscure saddle markings on body and precaudal tail, and with dark markings on the terminal and hypural caudal-fin lobes (Fig. 31) . . . . . ***Galeus eastmani***

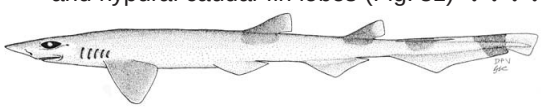


Fig. 30 *Galeus gracilis*

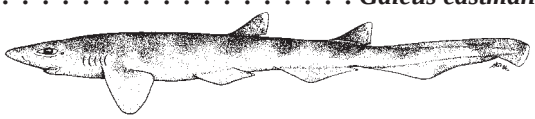


Fig. 31 *Galeus eastmani*

28a. Adult males with inner margins of pelvic fins fused over claspers, forming an "apron"; a colour pattern of spots present, but gill slits not elevated and snout rounded (Fig. 32) . . . . . **(*Asymbolus*)** → ***31***

28b. Adult males without inner margins of pelvic fins fused over claspers; either no colour pattern or, if pattern of dark spots is present, gill slits elevated above level of mouth and snout pointed (Figs 33 to 35) . . . . . **(*Halaelurus*)** → ***29***

29a. Snout bluntly rounded; gill slits not elevated above mouth level, lateral in position; body soft, skin thin with erect denticles that gives it a velvety texture; no colour pattern (Fig. 33) . . . . . ***Halaelurus immaculatus***
(occurrence in the area uncertain)

29b. Snout more or less pointed and wedge-shaped; gill slits elevated above level of mouth and dorsolateral in position; body firm, skin thick with low, flat, smooth denticles; colour pattern of dark spots, with saddles or vertical bars indistinct or absent (Figs 34 and 35) . . . . → ***30***

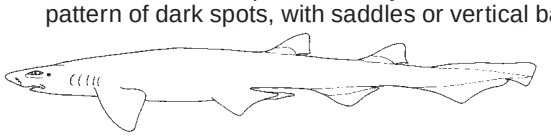


Fig. 32 *Asymbolus*

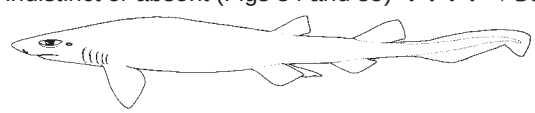


Fig. 33 *Halaelurus immaculatus*

30a. Dark spots few and mostly much larger than spiracles, sometimes in clusters around vague saddle blotches; labial furrows reduced or absent, lower furrows 2 mm long or less (Fig. 34) . . . . . ***Halaelurus buergeri***
(occurrence in the area uncertain)

30b. Dark spots small and very numerous, usually not much larger than spiracles, over or between weak saddles or bars; labial furrows moderately strong, lower furrows 5 mm long or more (Fig. 35) . . . . . ***Halaelurus boesemani***

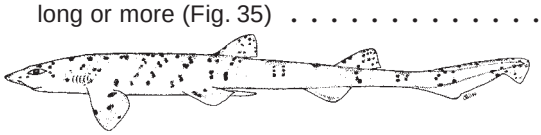


Fig. 34 *Halaelurus buergeri*

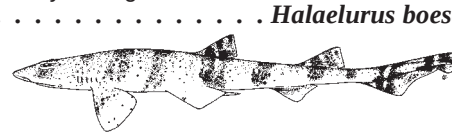


Fig. 35 *Halaelurus boesemani*

31a. Colour pattern of scattered dark brown spots on pale yellow-brown background (north-eastern Australia) . . . . . ***Asymbolus* sp. E**

31b. Colour pattern of numerous small light spots and scattered small and large dark spots and blotches on a dark background (New Caledonia) . . . . . ***Asymbolus* sp.**

List of species occurring in the area

The symbol ✓ is given when species accounts are included.

? *Apristurus acanutus* Chu, Meng, and Li, In Meng, Chu, and Li, 1985
? *Apristurus gibbosus* Meng, Chu, and Li, 1985
✓ *Apristurus herklotsi* (Fowler, 1934)
✓ *Apristurus longicephalus* Nakaya, 1975
? *Apristurus macrostomus* Meng, Chu, and Li, 1985
? *Apristurus micropterygeus* Meng, Chu, and Li, In Chu, Meng, and Li, 1986
✓ *Apristurus sibogae* (Weber, 1913)
? *Apristurus sinensis* Chu and Hu, In Chu, Meng, Hu, and Li, 1981
✓ *Apristurus spongiceps* (Gilbert, 1895)
✓ *Apristurus verweyi* (Fowler, 1934)
Apristurus sp. A. [Last and Stevens, 1994]
Apristurus sp. B. [Last and Stevens, 1994]
Apristurus sp. G. [Last and Stevens, 1994]
Apristurus sp. [Seret] (New Caledonia)
Apristurus sp. [Seret] (Philippines)
Apristurus sp. [Seret] (Indonesia)

Asymbolus sp. E. [Last and Stevens, 1994]
Asymbolus sp. [Seret] (New Caledonia)

✓ *Atelomycterus fasciatus* Compagno and Stevens, 1993
✓ *Atelomycterus macleayi* Whitley, 1939
✓ *Atelomycterus marmoratus* (Bennett, 1830)

✓ *Aulohalaelurus kanakorum* Seret, 1990

✓ *Cephaloscyllium fasciatum* Chan, 1966
Cephaloscyllium sp. [Compagno, 1984, 1988]
Cephaloscyllium sp. [J.Randall, pers. comm. 1994] (Papua New Guinea)
Cephaloscyllium sp. [Seret] (New Caledonia)
Cephaloscyllium sp. B. [Last and Stevens, 1994]
Cephaloscyllium sp. C. [Last and Stevens, 1994]
Cephaloscyllium sp. D. [Last and Stevens, 1994]
Cephaloscyllium sp. E. [Last and Stevens, 1994]

✓ *Galeus boardmani* (Whitley, 1928)
✓ *Galeus eastmani* (Jordan and Snyder, 1904)
✓ *Galeus gracilis* Compagno and Stevens, 1993
✓ *Galeus sauteri* (Jordan and Richardson, 1909)
✓ *Galeus schultzi* Springer, 1979
Galeus sp. B. [Last and Stevens, 1994]

? *Halaelurus immaculatus* Chu and Meng, 1982[1/]
✓ *Halaelurus boesemani* Springer and D'Aubrey, 1972
? *Halaelurus buergeri* (Mueller and Henle, 1838)[2/]

✓ *Parmaturus melanobranchius* (Chan, 1966)[3/]
Parmaturus sp. A [Last and Stevens, 1994]
? *Parmaturus* sp. [Seret] (Indonesia)

✓ *Pentanchus profundicolus* Smith and Radcliffe, 1912

✓ *Scyliorhinus garmani* (Fowler, 1934)
✓ *Scyliorhinus torazame* (Tanaka, 1908)

References

Compagno, L.J.V. 1988. *Sharks of the order Carcharhiniformes*. Princeton, New Jersey, Princeton University Press, 572 p.

Last, P.R. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

Regan, C.T. 1908. A synopsis of the sharks of the family Scyliorhinidae. *Ann. Mag. Nat. Hist. (Ser.8)*, 1(6):453-65.

Springer, S. 1979. A revision of the catsharks, family Scyliorhinidae. *NOAA Tech. Rep., NMFS Circ.*, (422):152 p.

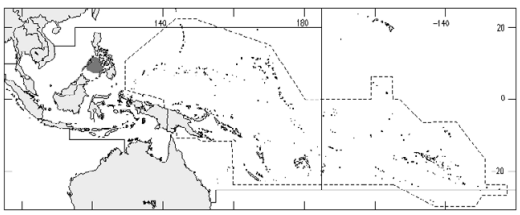
1/ Occurrence in the area uncertain, marginal in the South China Sea.
2/ This species was collected less than a degree west of the northwestern boundary of the area.
3/ This species was collected less than a degree north of the northwestern boundary of the area.

Apristurus herklotsi (Fowler, 1934)

En - Longfin catshark; **Fr** - Holbiche à longues nageoires; **Sp** - Pejegato aletón.

Maximum total length at least 48.5 cm. A poorly known deep-water bottom shark. Of minor interest to fisheries. Known from Japan, the East China Sea, and the Philippines.

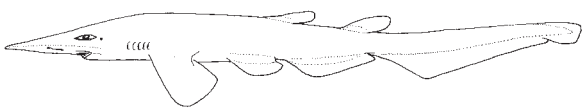


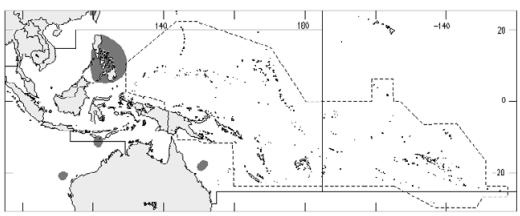


Apristurus longicephalus Nakaya, 1975

En - Longhead catshark; **Fr** - Holbiche à grande tête; **Sp** - Pejegato cabezón.

Maximum total length at least 50 cm. Inhabits deep water, probably near the bottom at depths to 900 m. Biology poorly known. Of minor interest to fisheries. Known from Japan, the East China Sea, Seychelles, the Philippines, and northern Australia.

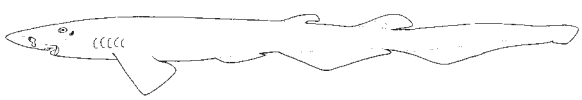


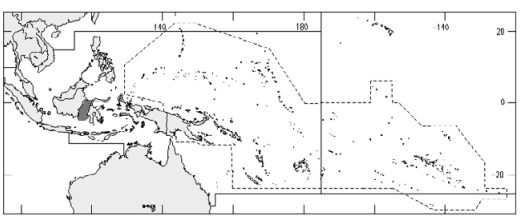


Apristurus sibogae (Weber, 1913)

En - Pale catshark; **Fr** - Holbiche pâle; **Sp** - Pejegato paliducho.

Maximum total length over 21 cm (juvenile). A rare catshark. Known only from the holotype taken at the Makassar Straits slope (between Borneo and Sulawesi) at a depth of 655 m. Without interest to fisheries.

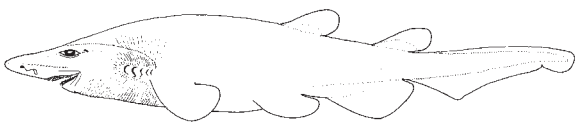


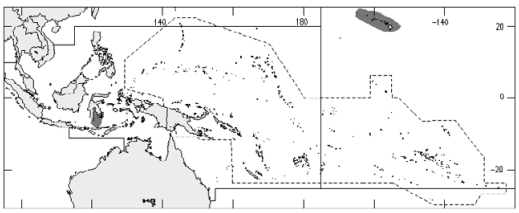


Apristurus spongiceps (Gilbert, 1895)

En - Spongehead catshark; **Fr** - Holbiche tête molle; **Sp** - Pejegato esponjoso.

Maximum size at least 50 cm. A rare shark known from 2 specimens taken on the insular slopes, on or near the bottom at depths of 572 to 1482 m. Probably oviparous; the holotype is a gravid female. Without interest to fisheries. Central Pacific off Hawaii and western South Pacific in the Banda Sea off southern Sulawesi.



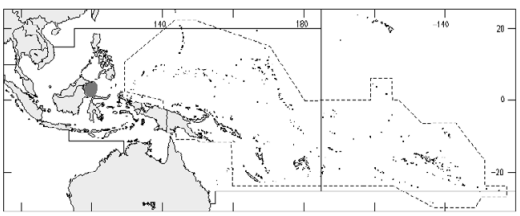


Apristurus verweyi (Fowler, 1934)

En - Borneo catshark; **Fr** - Holbiche malaise; **Sp** - Pejegato de Borneo.

Maximum total length at least 30 cm. A rare deep-water catshark, known only from the holotype. Without interest to fisheries. Known only from the type locality (southeastern Sabah, Borneo, Malaysia).

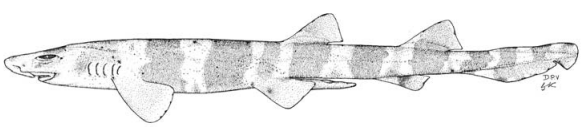


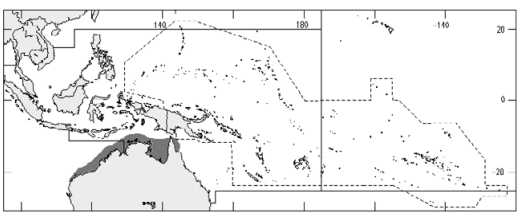


Atelomycterus fasciatus Compagno and Stevens, 1993

En - Banded sand catshark.

Maximum total length about 45 cm, with size at maturity between 30 to 39 cm. A common offshore catshark off northern Australia, on mud, sand, or shelly-sand bottom at depths of 27 to 122 m with most records shallower than 60 m. Oviparous. Confined to the northwestern shelf of Western Australia, and the Northern Territory and northern Queensland in the area. Western Australian specimens lack the white spots and are lighter coloured.

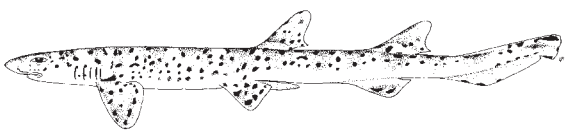


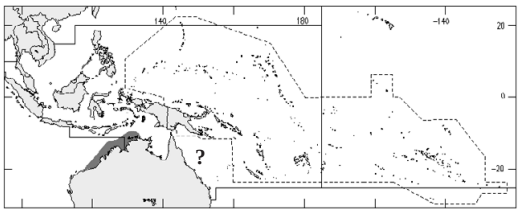


Atelomycterus macleayi Whitley, 1939

En - Australian marbled catshark; **Fr** - Chien marbré; **Sp** - Pejegato jaspeado.

Maximum total length about 60 cm. A little-known inshore, shallow-water catshark, found on sandy and rocky bottom at depths of 0.5 to 3.5 m and presumably deeper. Oviparous. Of minor interest to fisheries at present. In the western South Pacific off northwestern Australia, and possibly Queensland.

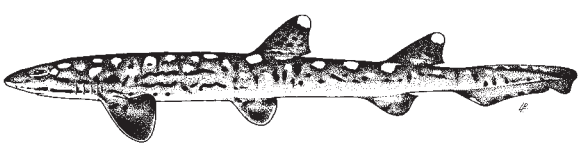


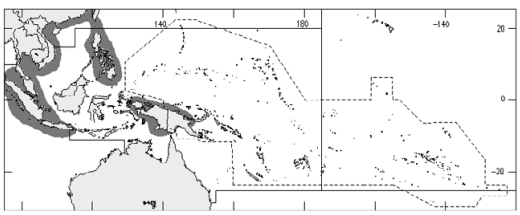


Atelomycterus marmoratus (Bennett, 1830)

En - Coral catshark; **Fr** - Chien corail; **Sp** - Pintarroja coral.

Maximum total length about 70 cm. A common but little-known, harmless inshore species, found on coral reefs, and thought to inhabit crevices and holes on reefs, Oviparous. Relatively unimportant for fisheries, forming a minor catch of inshore artisanal fisheries. From Pakistan and India eastward to Malaysia, Singapore, Indonesia, New Guinea, Thailand, Viet Nam, Philippines, South China, and Taiwan Province of China.

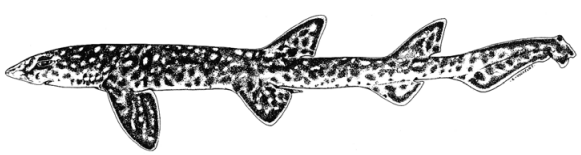


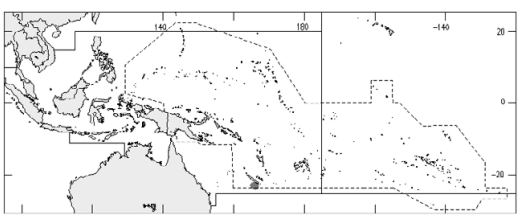


Aulohalaelurus kanakorum Seret, 1990

En - New Caledonia catshark.

Maximum total length about 79 cm. A rare inshore catshark, found on coral reefs at a depth of 49 m. Mode of reproduction unknown. Known only from a single specimen, collected off southwestern New Caledonia.

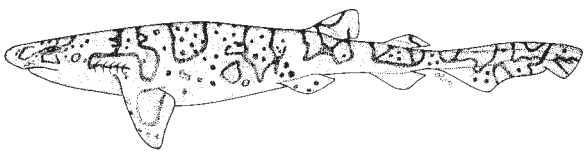


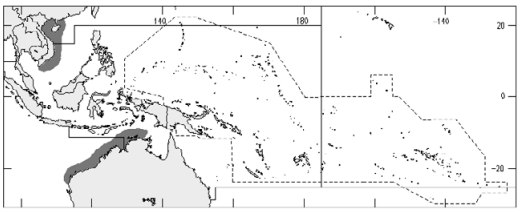


Cephaloscyllium fasciatum Chan, 1966

En - Reticulated swellshark; **Fr** - Holbiche bouffie; **Sp** - Pejegato mallero.

Maximum total length at least 42 cm. A tropical swellshark found in fairly deep water on or near the bottom on the outer continental shelf and uppermost slope, at depths of 220 to 450 m. Can expand itself with air or water. Oviparous. Of minor interest to fisheries at present, caught by commercial bottom trawlers. In the western Pacific off Viet Nam, China (Hainan Island), and northwestern Australia.

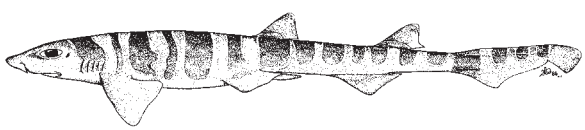


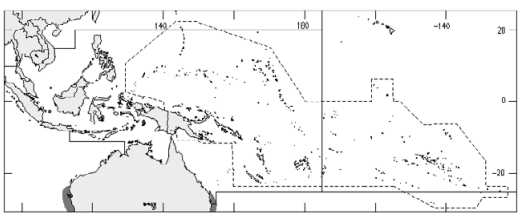


Galeus boardmani (Whitley, 1928)

En - Australian sawtail catshark; **Fr** - Chien égoïne; **Sp** - Pintarroja australiana.

Maximum total length about 61 cm, males mature at 54 cm. A little-known but common Australian catshark of temperate and subtropical waters, from the outer continental shelf and upper slope, presumably on or near bottom at depths from 128 to 823 m. Frequently found in the demersal trawl bycatch, but of minor interest to fisheries at present. Southern coasts of Australia off western Australia (including Tasmania) to southern Queensland.

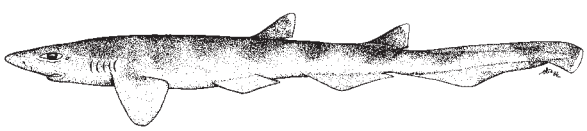


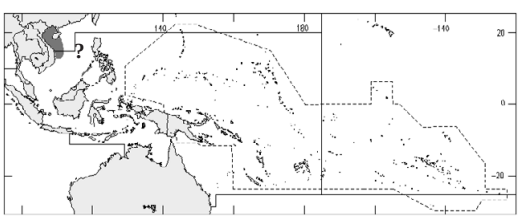


Galeus eastmani (Jordan and Snyder, 1904)

En - Gecko catshark; **Fr** - Chien gecko; **Sp** - Pintarroja salamanquesa.

Maximum total length at least 40 cm; possibly to 50 cm. A little-known, but very common shark, found in deep water near the bottom. Oviparous. In Japanese waters, this species shows sexual segregation, with reported schools of mostly females. Of minor interest to fisheries at present. Western North Pacific off Japan, the East China Sea, and possibly Viet Nam.

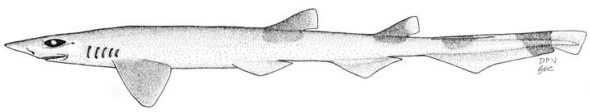


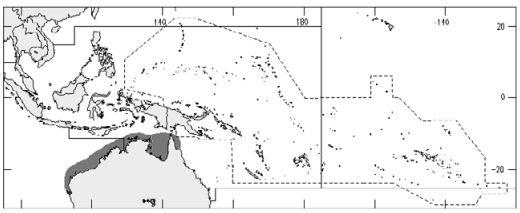


Galeus gracilis Compagno and Stevens, 1993

En - Slender sawtail catshark.

Maximum total length about 34 cm. A little-known bottom-dwelling catshark of the uppermost continental slopes at depths of 290 to 470 m. Mode of reproduction unknown. Rare and of no commercial interest at present. Confined to the tropics of Australia, from Western Australia to northern Queensland.

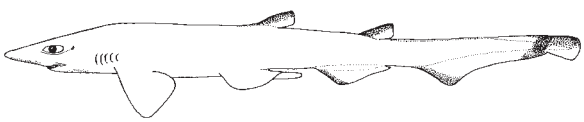


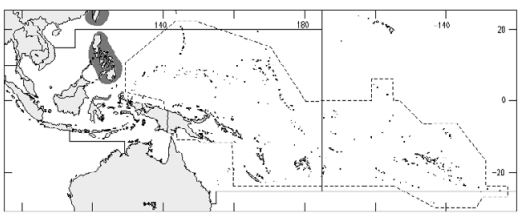


Galeus sauteri (Jordan and Richardson, 1909)

En - Blacktip sawtail catshark; **Fr** - Chien lime; **Sp** - Pintarroja rabonegro.

Maximum total length 45 cm. A little-known bottom-dwelling catshark of the continental shelves, offshore at depths of 60 to 90 m in the Taiwan Straits, but possibly deeper elsewhere. Apparently oviparous. Taken by bottom trawls in Taiwan Straits, but of limited interest to fisheries. Western North Pacific off Taiwan Province of China, the Philippines, and Japan.

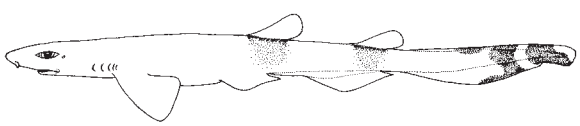


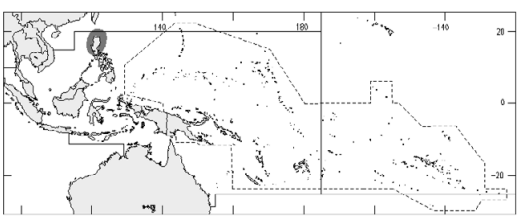


Galeus schultzi Springer, 1979

En - Dwarf sawtail catshark; **Fr** - Chien nain; **Sp** - Pintarroja enana.

Maximum total length about 27 cm; one of the smallest sharks. A little-known bottom-dwelling shark of the continental slopes at depths of 329 to 431 m. Of minor interest to fisheries. Known from Luzon (Philippines).

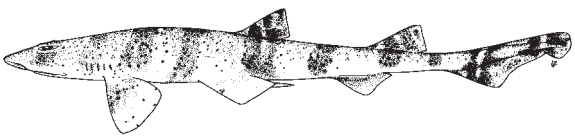


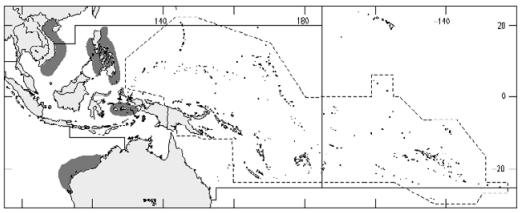


Halaelurus boesemani Springer and D'Aubrey, 1972

En - Speckled catshark; **Fr** - Holbiche mouchetée; **Sp** - Pejegato pintado.

Maximum total length about 48 cm. A little-known but wide-ranging bottom-dwelling shark of the continental and insular shelves, at depths of 37 to 91 m. Of minor interest to fisheries at present. In the Indo-West Pacific off Somalia, the Gulf of Aden, Western Australia, Indonesia, the Philippines, and Viet Nam.



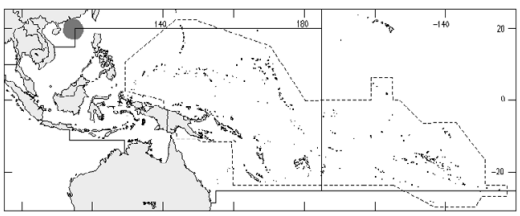


Parmaturus melanobranchius (Chan, 1966)

En - Blackgill catshark; **Fr** - Holbiche à joues noires; **Sp** - Pejegato de agallas negras.

Maximum total length about 85 cm. A poorly known deep-water bottom-dwelling shark from the upper continental slopes off China, on mud bottom at depths of 549 to 810 m. Without interest to fisheries. Known only from 3 specimens taken in the South China Sea.



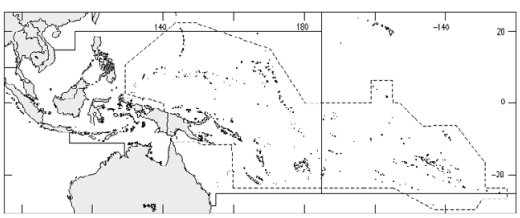


Pentanchus profundicolus Smith and Radcliffe, 1912

En - Onefin catshark; **Fr** - Holbiche voile; **Sp** - Pejegato velero.

Maximum total length at least 50 cm. A poorly known deep-water bottom-dwelling shark inhabiting the insular slopes. Without interest to fisheries. The holotype and only known specimen was taken in the Mindanao Sea (Philippines).

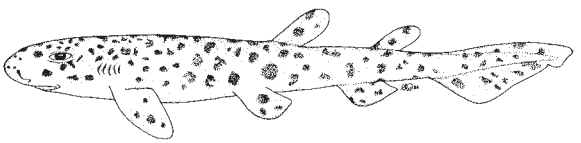


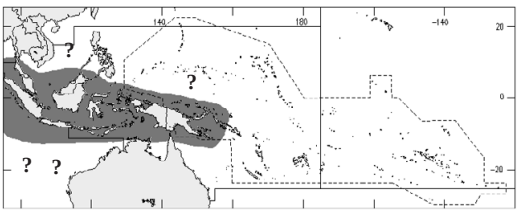


Scyliorhinus garmani (Fowler, 1934)

En - Brownspotted catshark; **Fr** - Roussette à taches brunes; **Sp** - Alitán manchado.

Maximum total length possibly 38 cm; adult size unknown. Without interest to fisheries. Recorded from the indefinite type locality (”East Indies” = Indonesia) and from the Philippines (Dumaguete, Negros).

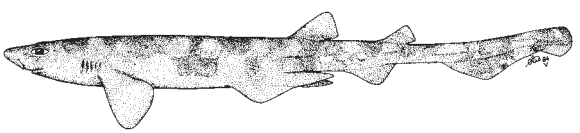


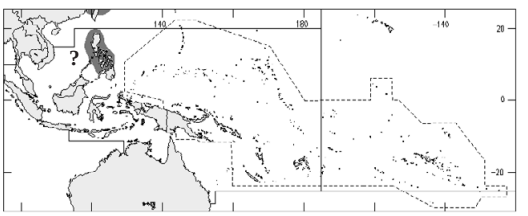


Scyliorhinus torazame (Tanaka, 1908)

En - Cloudy catshark; **Fr** - Roussette nuageuse; **Sp** - Alitán nubarrado.

Maximum total length to about 48 cm. A common catshark of the western Pacific continental shelf, from close inshore down to a depth of at least 100 m. Oviparous. Interest to fisheries unknown. Western North Pacific from Japan, Korea to Taiwan Province of China and the Philippines (the Philippine record needs confirmation).





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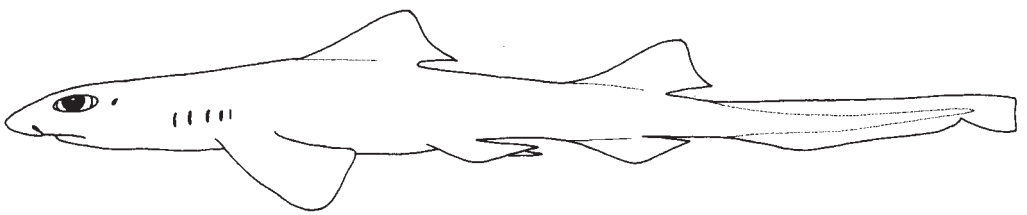
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PROSCYLLIIDAE

Finback catsharks

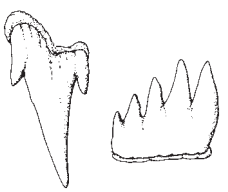
by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Small sharks. Trunk and precaudal tail cylindrical or somewhat compressed, not depressed and without lateral ridges; precaudal tail much shorter than head and trunk. Head not expanded laterally, moderately depressed; 5 small gill slits present, the last 2 or 3 over the pectoral fin bases, their upper ends not expanded onto upper surface of head; **small gill raker papillae on internal gill slits** (except in genus *Gollum*); **spiracles moderately large and behind eyes**; **nostrils without barbels, nasoral grooves, or circumnarial grooves, well separated from mouth;** eyes dorsolateral on head, with weakly differentiated nictitating lower eyelids; snout short to moderately long, depressed and parabolic or narrowly rounded, not greatly flattened and blade-like and without lateral teeth and barbels; mouth moderately large, arched and elongated, and extending behind front margins of eyes; very short labial furrows present on both jaws or absent; teeth similar in upper and lower jaws, not enlarged toward front of mouth, small, with a sharp primary cusp and 1 or more cusplets on either side of it, **posterior teeth comb-shaped.** Two dorsal fins, without spines, small, moderately high and angular or subangular, much shorter than caudal fin; first dorsal-fin base located over the interspace between pectoral- and pelvic-fin bases, but closer to pelvic fins than to pectoral fins; **second dorsal fin about at large as first dorsal fin;** anal fin moderately large, with its origin slightly in front or slightly behind second dorsal-fin origin but well in front of midpoint of second dorsal-fin base; **caudal fin asymmetrical, much less than 1/2 of total length, without a rippled dorsal margin and without ventral lobe** but with a strong subterminal notch; vertebral axis of caudal fin little raised above body axis. **Caudal peduncle cylindrical or compressed, without keels or precaudal pits**. Intestinal valve of spiral type. **Colour:** grey or brown above, white or lighter below, either plain, with dark stripes on the caudal fin, or with a spotted or blotched colour pattern.

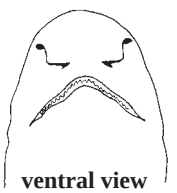




intestinal valve of spiral type



upper and lower tooth



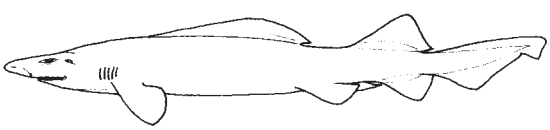
ventral view of head

Habitat, biology, and fisheries: This is a small family of poorly known, deep-water sharks with a disjunct distribution in tropical to warm temperate waters of the western North Atlantic and Indo-West Pacific. Finback catsharks live on the outer continental and insular shelves and upper slopes, on or near the bottom, at depths of 50 to 713 m. Most of the species are ovoviviparous, except for the oviparous *Proscyllium habereri*. Food of these harmless sharks consists of small fishes and invertebrates. Their interest to fisheries is minimal, a few species are taken by commercial bottom trawlers and longliners, but their small size makes them unsuitable for fisheries utilization other than for fishmeal.

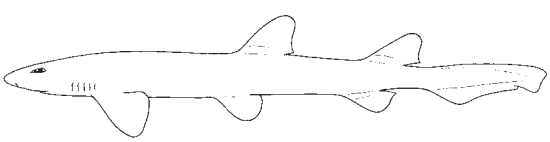
Similar families occurring in the area

Pseudotriakidae: first dorsal fin long, low, and keel-shaped, as long as caudal fin; spiracles about as large as eyes.

Scyliorhinidae: first dorsal fin over or behind pelvic-fin bases.



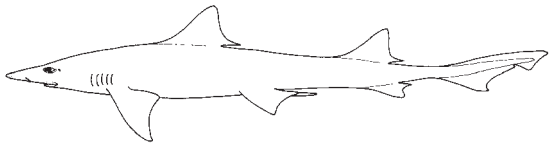
Pseudotriakidae



Scyliorhinidae (*Atelomycterus*)

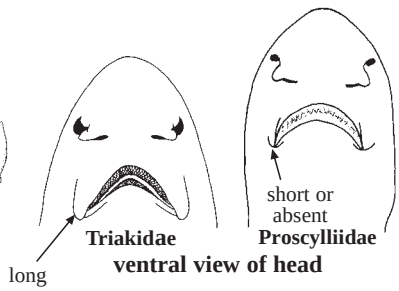
Triakidae: no gill raker papillae on internal gill openings; nictitating lower eyelids better differentiated, with a deeper subocular pocket and a well-developed secondary lower eyelid edge; labial furrows long; teeth stouter, with heavier cusps or no cusps, posterior teeth not comb-like; first dorsal-fin base in species from the area more anterior, closer to the pectoral-fin bases than to the pelvic fins or about equidistant between the 2.

No other sharks in the area combine the following characteristics: nictitating lower eyelids, small, cuspidate teeth in both jaws, mouth located under eyes, intestinal valve of spiral type, no precaudal pits, and no rippled dorsal caudal-fin margin.



Triakidae (*Mustelus*)





Key to the species of Proscylliidae occurring in the area

1a. Head and snout bell-shaped in dorsoventral view (Fig. 1a); no oral papillae or gill rakers in mouth (Fig. 2) . . . . . ***Gollum attenuatus***

1b. Head and snout narrowly rounded in dorsoventral view (Fig. 1b, c); oral papillae and gill rakers present in mouth . . . . . → **2**

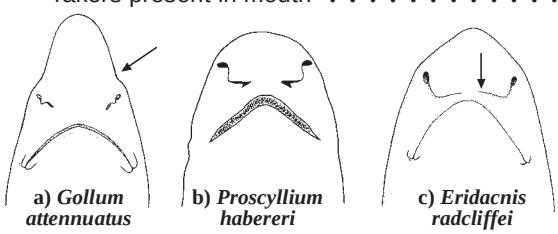


Fig. 1 ventral view of head

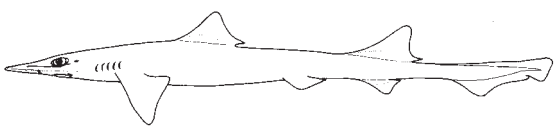


Fig. 2 *Gollum attenuatus*

2a. Caudal fin narrow and ribbon-like; colour dark brown with blackish markings on dorsal fins (Fig. 3) . . . . . ***Eridacnis radcliffei***

2b. Caudal fin broad and not ribbon-like; colour pattern of round dark brown spots and indistinct saddles (Fig. 4) . . . . . ***Proscyllium habereri***

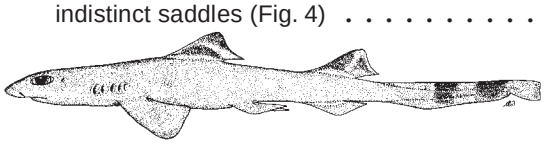


Fig. 3 *Eridacnis radcliffei*

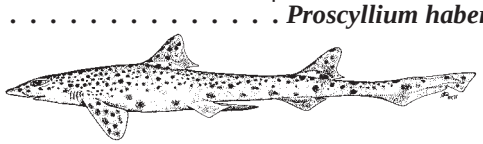


Fig. 4 *Proscyllium haberi*

List of species occurring in the area

The symbol is given when species accounts are included.

Eridacnis radcliffei Smith, 1913

Gollum attenuatus (Garrick, 1954)

Proscyllium habereri Hilgendorf, 1904

References

Compagno. L.J.V. 1970. Systematics of the genus *Hemitriakis* (Selachii: Carcharhinidae), and related genera. *Proc. Calif. Acad. Sci.*, (38)4:63-98.

Compagno. L.J.V. 1973. *Ctenacis* and *Hemitriakis*, two genera of sharks (Selachii: Carcharhinidae). *Proc. Calif. Acad. Sci.*, (39)4:257-272.

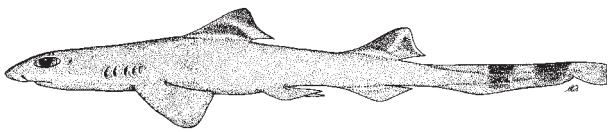
Compagno. L.J.V. 1973. *Gogolia filewoodi*, a new genus and species of shark from New Guinea (Carchariniformes: Triakidae), with a redefinition of the family Triakidae and a key to the genera. *Proc. Calif. Acad. Sci.*, (39)4:383-410.

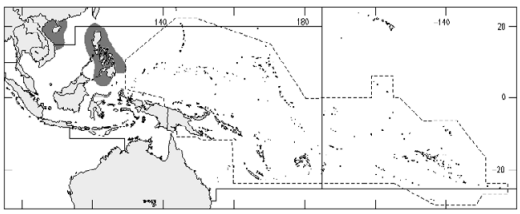
Compagno. L.J.V. 1988. *Sharks of the order Carcharhiniformes*. Princeton, New Jersey, Princeton University Press, 572 p.

Eridacnis radcliffei Smith, 1913

En - Pygmy ribbontail catshark; **Fr** - Requin chat pygmé; **Sp** - Tollo coludo pigmeo.

Maximum total length about 24 cm. One of the smallest living sharks. Often occurs on mud bottoms, on the upper continental and insular slopes and the outer shelves at depths from 71 to 766 m. Feeds primarily on small bony fishes and crustaceans. Taken in bottom trawls in the Philippines, but utilization not known. Wide-ranging in the Indo-West Pacific, but with only spotty records from Tanzania, the Gulf of Aden, India, the Andaman Islands, Viet Nam, and the Philippines.

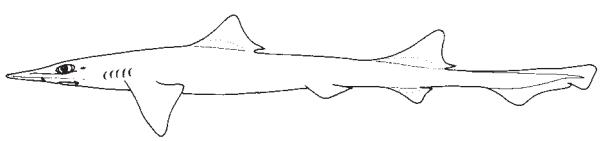


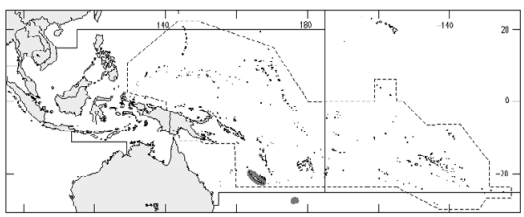


Gollum attenuatus (Garrick, 1954)

En - Slender smooth-hound; **Fr** - Requin chat golloum; **Sp** - Tollo coludo elegante.

Maximum total length about 1.1 m, maturing at about 70 cm, with females growing slightly larger than males. An uncommon to common deep-water bottom-dwelling shark of the outermost continental shelf and upper slope of New Zealand and on adjacent seamounts and submarine banks, found at depths of 220 to 660 m, but most commonly between 400 and 600 m. Probably occurs in schools. Feeds on a wide variety of mostly small pelagic and benthic bony fishes, deep-water sharks, cephalopods (including pelagic squid and octopuses), sea snails, isopods, crabs and shrimps, and brittle stars. Ovoviviparous, with usually 2 young per litter, fetuses eat unfertilized eggs (uterine cannibalism) and store consumed yolk in their yolk sacs. Without interest to fisheries at present, although taken in small numbers by bottom trawlers off New Zealand and collected in moderate numbers by experimental longliners fishing in deep water on seamounts and banks. Occurs in the western South Pacific, off New Zealand and on rises between New Zealand and the east coast of Australia, New Caledonia, and Fiji just south of the area. Placement in Proscylliidae provisional, probably will be relocated in Pseudotriakidae.

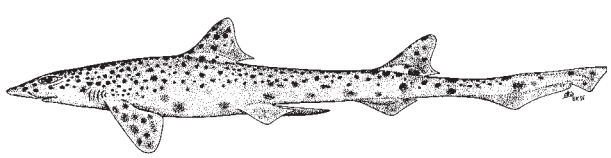


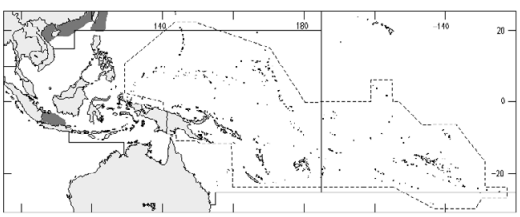


Proscyllium habereri Hilgendorf, 1904

En - Graceful catshark; **Fr** - Requin chat gracile; **Sp** - Tollo coludo grácil.

Maximum total length about 65 cm. A little-known, uncommon bottom-dwelling shark of tropical and warm-temperate continental and insular waters, found on the shelves at depths from 50 to 100 m. Food habits little-known. Taken by bottom trawlers in the Taiwan Straits and elsewhere in its range, utilisation unknown. In the western Pacific from southeastern Japan southwards to Viet Nam, also known from northwestern Java.





PSEUDOTRIAKIDAE

False catsharks

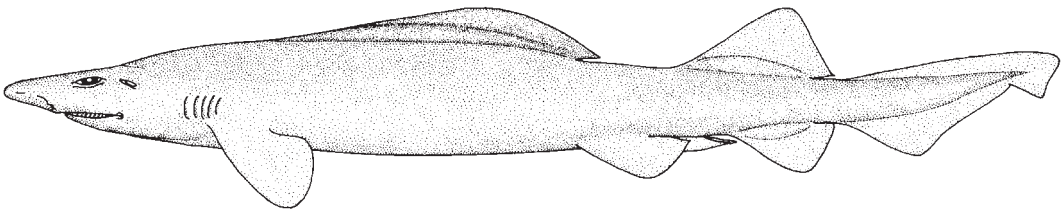
by L.J.V. Compagno

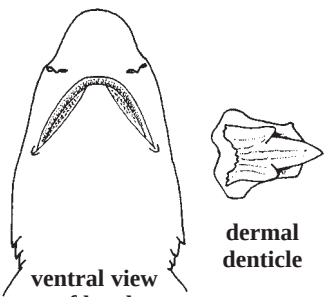
A single species in this family.

Pseudotriakis microdon Capello, 1868

Frequent synonyms / misidentifications: None / None.

FAO names: En - False catshark; **Fr** - Requin à longue dorsale; **Sp** - Musolón aleta larga.





Diagnostic characters: A large, soft-bodied shark. Head with 5 small gill slits, the last 2 over the pectoral-fin bases; no dermal gill rakers; **spiracles very large, about as long as eyes;** nostrils without barbels or nasoral grooves; eyes above sides of head, horizontally elongated, with weakly differentiated nictitating lower eyelids that are delimited below the eyes by shallow pouches; snout moderately long, narrowly rounded; mouth very wide and long, extending behind front of eyes, angular in shape; labial furrows present but short, not extending forward to front of mouth; **teeth extremely small and numerous,** similar in both jaws and not bladelike, with a small primary cusp and 1 or more cusplets, becoming comblike in the rear of mouth; upper anterior teeth small and grading into the laterals, not separated from these by small intermediate teeth. **Two dorsal fins, the first greatly elongated, low, keel-like, and broadly rounded above,** its base just ahead of pelvic-fin origins and **as long as caudal fin**; second dorsal fin short but higher than the first and larger than the anal fin; anal-fin base under second dorsal-fin base; caudal fin greatly asymmetrical, its lower lobe hardly developed, its upper edge not rippled and a subterminal notch present. Caudal peduncle not depressed, without lateral keels or precaudal pits. Intestinal valve of spiral type. **Colour:** dark brownish grey above and below, darker on posterior edges of pelvic, dorsal, anal and caudal fins.

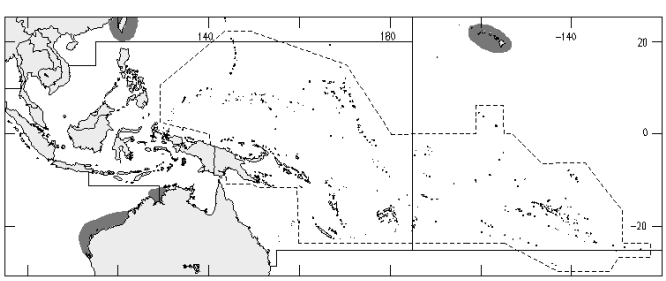
Similar families occurring in the area

None. No other sharks in the area combine the presence of a low, keel-like first dorsal fin equal in length to the caudal fin, no anal-fin and no dorsal-fin spines.

Size: Maximum total length about 2.95 m; females mature at about 2.1 m.

Habitat, biology, and fisheries: A deep-water bottom-dwelling shark, normally occurring on the upper continental and insular slopes at depths between 200 and 1500 m; occasionally wandering onto continental shelves, even in shallow water. Ovoviviparous; practices uterine cannibalism, with fetuses eating unfertilized eggs; 2 young per litter. Apparently somewhat inactive and sluggish. Feeding habits little known, once photographed in deep water eating a bony fish; probably feeds on a variety of deep-water bony fishes, elasmobranchs, and invertebrates. Taken incidentally offshore on deep-set longlines and less commonly on bottom trawls. Utilization not recorded.

Distribution: Western North Atlantic from New York and New Jersey, eastern North Atlantic from Iceland to Senegal, western Indian Ocean from the Aldabra Islands group and western Pacific from Japan, Taiwan Province of China, New Zealand, Western Australia, and Hawaii.



Reference

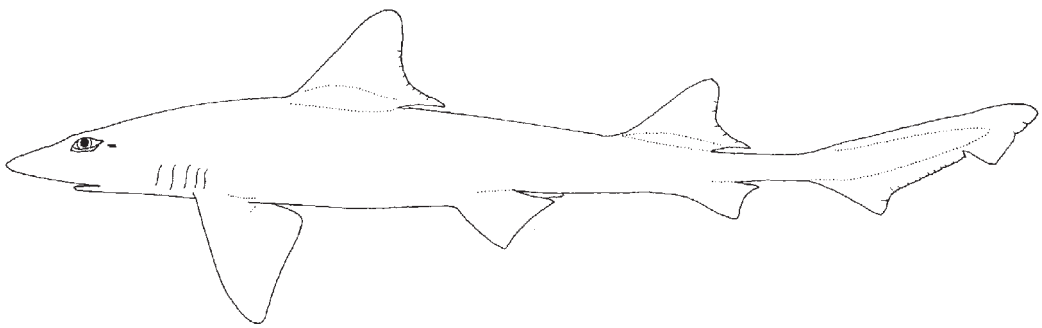
Compagno. L.J.V. 1988. *Sharks of the order Carcharhiniformes*. Princeton, New Jersey, Princeton University Press, 572 p.

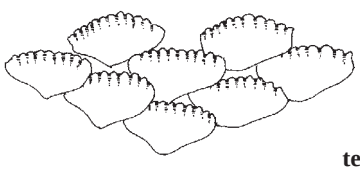
TRIAKIDAE

Houndsharks, smoothhounds, topes

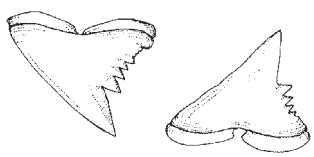
by L.J.V Compagno and V.H. Niem

Diagnostic characters: Body elongate and slender to moderately stout. Head with 5 gill slits, **the last pair posterior to pectoral-fin origins;** small spiracles present; gill arches without rakers; eyes horizontally oval, situated on or above sides of head, with a nictitating eyelid partly or entirely within the eye opening; anterior nasal flaps of nostrils either broadly to narrowly expanded or greatly reduced, **but not in the form of slender barbels;** mouth ending below or behind eyes; labial furrows moderately long; teeth usually similar in both jaws, but differentiated in a few species; in *Mustelus*, they are numerous, small, cuspless (or weak-cusped), and arranged in a pavement, in *Galeorhinus* they are larger, blade-like, with a strong cusp, and small cusplets but no serrations, and in *Triakis* they are of intermediate structure. Two dorsal fins, the first much shorter than caudal fin and with **its base entirely anterior to pelvic fins; second dorsal fin somewhat smaller than the first, originating ahead of anal fin**; **anal fin as large as or smaller than second dorsal fin;** caudal fin asymmetrical, its lower lobe varying from virtually absent to strong, **its upper edge not rippled.** Caudal peduncle not flattened dorsoventrally or expanded laterally, **without keels or precaudal pits. Intestine with a corkscrew or auger-like spiral valve,** with 6 to 10 turns. **Colour:** back usually greyish brown, belly white; some species are capable of undergoing slow colour changes.





Mustelus



teeth

Galeorhinus

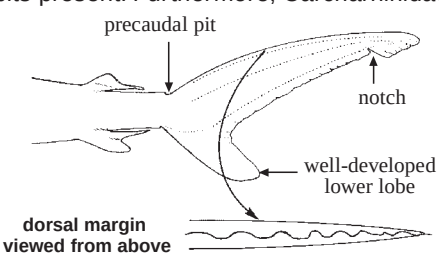


intestinal valve of spiral type

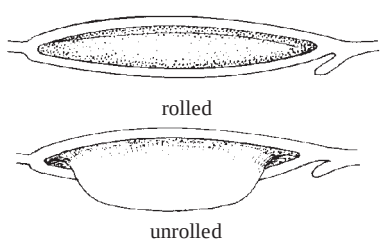
Habitat, biology, and fisheries: Houndsharks are widely distributed in tropical and warm temperate to cold seas, ranging from shallow to moderately deep water (300 m or more). The species are variably ovoviviparous or viviparous, and lack or have a yolk sac placenta. They feed on bottom-dwelling invertebrates (especially crustaceans, but also molluscs and worms), and on small bony fishes and fish eggs. None of the species are particulary dangerous to people. Smoothhounds (*Mustelus*) and topes or soupfin sharks (*Galeorhinus*) are important commercial species.

Similar families occurring in the area

Carcharhinidae and Hemigaleidae: upper edge of caudal fin with a rippled or undulating margin; precaudal pits present. Furthermore, Carcharhinidae have an intestinal valve of scroll type.

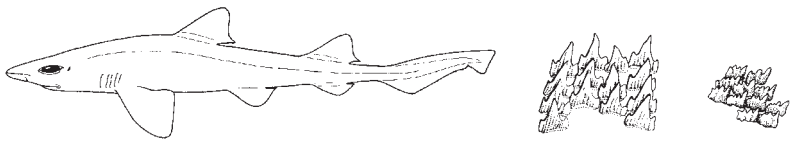


Carcharhinidae



Carcharhinidae
(intestinal valve of scroll type)

Proscylliidae: gill raker papillae present on internal gill openings (lacking in *Gollum*); nictitating lower eyelids not well developed, of rudimentary type, with a weaker subocular pocket and a poorly differentiated secondary lower eyelid edge; teeth with slender cusps, comb-like at ends of dental bands.



Proscylliidae

Other families: the combination of characters such as nictitating lower eyelids, small spiracles, mouth under or behind the eyes, well-developed labial furrows, 2 spineless dorsal fins with the first over the interspace between the pectoral and pelvic fins, absence of precaudal pits, and presence of an anal fin separates this family from all other sharks occurring in the area.

Key to the species of Triakidae occurring in the area

1a. First dorsal-fin base about as long as caudal fin and 2.3 to 3.2 times the first dorsal height; preoral length about 1.6 to 1.7 times mouth width (Fig. 1) . . . . ***Gogolia filewoodi***

1b. First dorsal-fin base 0.7 times or less in length of caudal fin and 2 times or less the first dorsal-fin height; preoral length 0.7 to 1.4 times mouth width . . . . . → ***2***

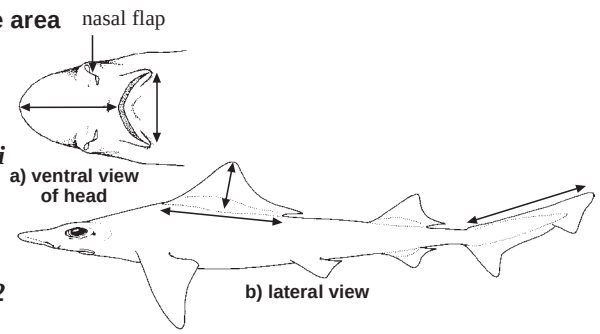


Fig. 1 ***Gogolia filewoodi***

2a. Ventral caudal-fin lobe very long at all stages; second dorsal fin markedly smaller than first, 1/2 its area or less (Figs 2 and 3) . . . . . → ***3***

2b. Ventral caudal-fin lobe absent to short in adults, weak or absent in young; second dorsal fin nearly or quite as large as first, 2/3 to about equal its area . . . . . → ***4***

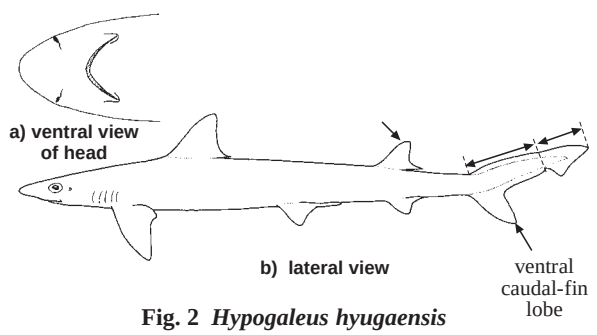


Fig. 2 ***Hypogaleus hyugaensis***

3a. Mouth angular; second dorsal fin considerably larger than anal fin; terminal lobe of caudal fin about 1/3 of total dorsal caudal-fin margin length (Fig. 2) . . . . . ***Hypogaleus hyugaensis***

3b. Mouth arcuate; second dorsal fin about as large as anal fin; terminal lobe of caudal fin about 1/2 of total dorsal caudal-fin margin length (Fig. 3) . . ***Galeorhinus galeus***

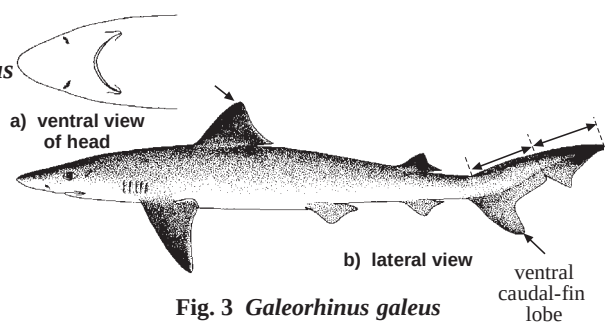


Fig. 3 ***Galeorhinus galeus***

4a. Eyes lateral, subocular ridges obsolete (Fig. 4a); origin of first dorsal fin far anterior, over pectoral-fin bases (Fig. 5) . . . . . ***Iago garricki***

4b. Eyes dorsolateral, subocular ridges strong (Fig. 4b); origin of first dorsal fin more posterior, over or behind inner margins of pectoral fins (Figs 6 to14) . . . . . → ***5***

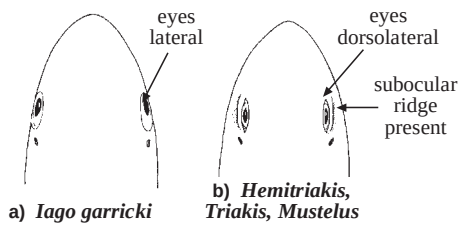


Fig. 4 dorsal view of head

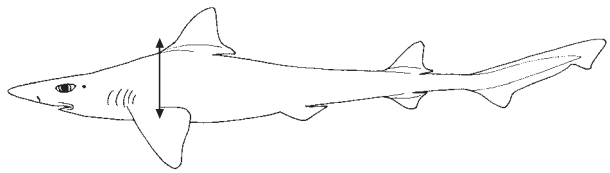


Fig. 5 ***Iago garricki***

5a. Internarial width about 2.5 times the nostril width (Figs 6 and 7); teeth strongly compressed and blade-like, differentiated into medials at symphyses of both jaws and antero-posteriors adjacent to them . . . . . **(*Hemitriakis*)** → ***6***

5b. Internarial width 1 to 2 times the nostril width (Figs 9,10 and12); teeth broad and blunt to semi-blade-like, not strongly compressed, not differentiated into medials and antero-posteriors . . . . . → ***9***

6a. Eyes relatively low and slit-like; first dorsal-fin origin over or behind pectoral fin free rear tips; fins not strongly falcate in adults (Fig. 6) . . ***Hemitriakis japanica***
(occurrence in the area uncertain)

6b. Eyes relatively high and horizontally oval; first dorsal-fin origin anterior to pectoral fin free rear tips; fins strongly falcate in adults . . . . . → ***7***

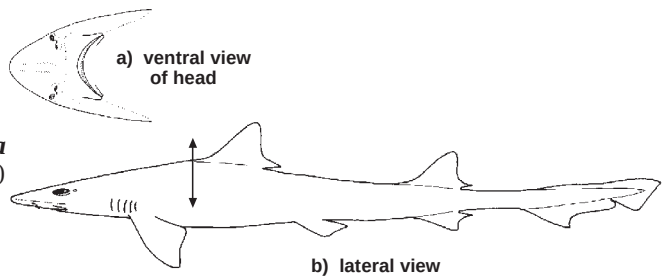


Fig. 6 ***Hemitriakis japanica***

7a. Precaudal vertebral counts 94 to 96, monospondylous precaudal vertebral counts 34 to 35; no dusky bar on underside of snout; young with dark bars on caudal fin but not elsewhere (Fig. 7) . . . . . ***Hemitriakis leucoperiptera***

7b. Precaudal vertebral counts 116 to 132, monospondylous precaudal counts 44 to 57; dusky bar present on underside of snout; young with prominent dark bars and spots on fins and body . . . . . → ***8***

8a. Young with light spots in centres of saddle markings, light tip on caudal fin; precaudal vertebral counts 116, monospondylous precaudal counts 44, diplospondylous precaudal counts 72 . . . . . ***Hemitriakis* sp.**

8b. Young with solid saddle markings, without light central spots, dark tip on caudal fin; precaudal vertebral counts 126 to 132, monospondylous precaudal counts 48 to 57, diplospondylous precaudal counts 75 to 78 (Fig. 8) . . . . . ***Hemitriakis abdita***

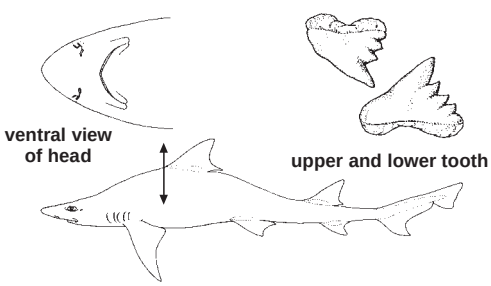


Fig. 7 ***Hemitriakis leucoperiptera***

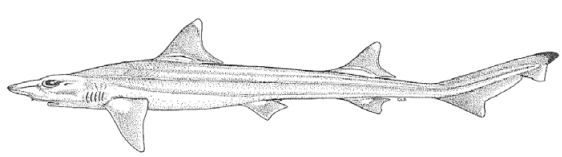


Fig. 8 ***Hemitriakis abdita***

9a. Snout bluntly rounded in dorsoventral view; mouth arcuate, lower jaw with convex edges (Fig. 9) . . . . . ***Triakis scyllium***
(occurrence in the area uncertain)

9b. Snout parabolic to subangular in dorsoventral view; mouth angular, lower jaw with straight or nearly straight edges (Figs 10 and 12) . . . . . **(*Mustelus*)** → ***10***

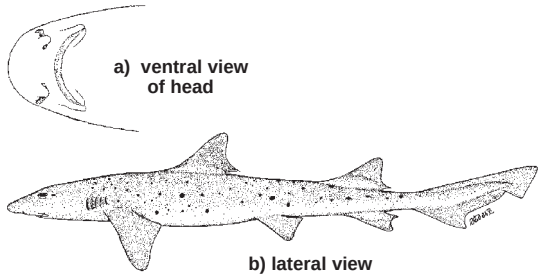


Fig. 9 ***Triakis scyllium***

10a. No white spots on body; upper labial furrows longer than lower furrows (Fig. 10) . . . . . → ***11***

10b. Numerous small white spots on dorsal surface of body; upper labial furrows subequal to or shorter than lower furrows (Fig. 12) . . . . . → ***12***

11a. Interorbital space 3.6 to 4.5% of total length; teeth in both jaws with low cusps; precaudal centra fewer, 73 to 80 (Fig. 10) . . . . . ***Mustelus griseus***

11b. Interorbital space 5.6 to 6.0% of total length; teeth in both jaws with high cusps; precaudal centra more numerous, 90 to 92 (Fig. 11) . . . . . ***Mustelus* sp. A**

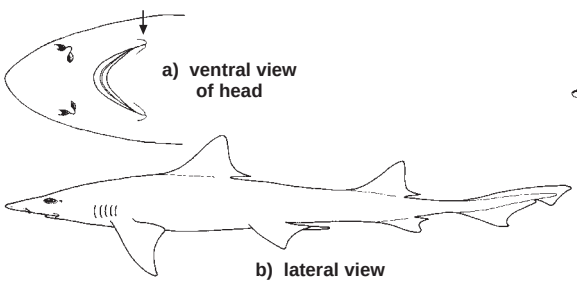


Fig. 10 ***Mustelus griseus***

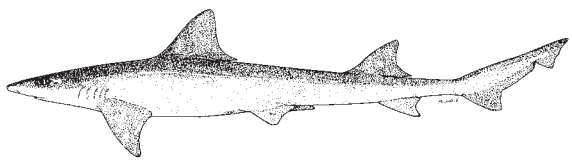


Fig. 11 ***Mustelus* sp. A**
(after Last and Stevens, 1994)

12a. Interorbital space relatively narrow, 3.7 to 4.5% of total length (Fig. 12) . . . . . ***Mustelus manazo***

12b. Interorbital space relatively broad, 6.1 to 7.1% of total length (*Mustelus antarcticus* species complex) . . . . . → ***13***

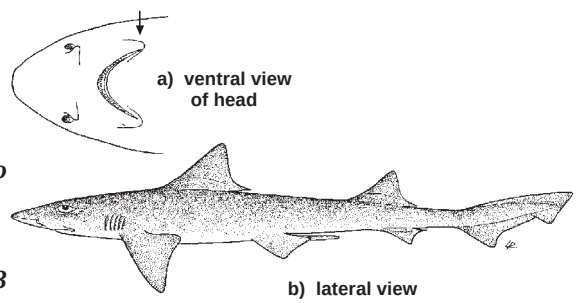


Fig. 12 ***Mustelus manazo***

13a. Total vertebrae 125 to 133; monospondylous precaudal centra 34 to 37; precaudal centra 79 to 86; size at maturity over 80 to 85 cm and reaching 1.75 m total length; temperate species occurring from inshore to 350 m (Fig. 13) . . . . . ***Mustelus antarcticus***

13b. Total vertebrae 135 to 143; monospondylous centra 37 to 39; precaudal centra 88 to 95; size at maturity over 70 cm and reaching 1.17 m total length; tropical species in deeper water, 120 to 400 m (Fig. 14) . . . . . ***Mustelus* sp. B** (eastern form)

13c. Total vertebrae 119 to 128, mostly less than 125; monospondylous centra 33 to 35; precaudal centra 76 to 80; size at maturity about 60 cm and reaching 1.03 m total length; tropical species in deeper water, 120 to 400 m (Fig. 14) . . . . . ***Mustelus* sp. B** (western form)

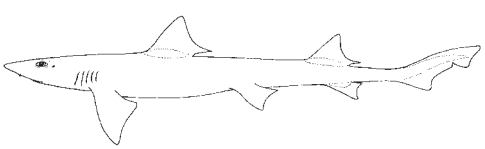


Fig. 13 ***Mustelus antarcticus***

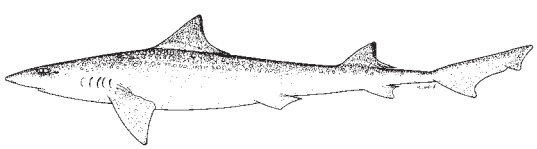


Fig. 14 ***Mustelus* sp. B**
(after Last and Stevens, 1994)

List of species occurring in the area

The symbol is given when species accounts are included.

Galeorhinus galeus (Linnaeus, 1758)

Gogolia filewoodi Compagno, 1973

Hemitriakis abdita Compagno and Stevens, 1993[1/]

? *Hemitriakis japanica* (Müller and Henle, 1839)[2/]

Hemitriakis leucoperiptera Herre, 1923

Hemitriakis sp. [Compagno, 1988][3/]

Hypogaleus hyugaensis (Miyosi, 1939)

Iago garricki Fourmanoir, 1979[4/]

Mustelus antarcticus Günther, 1870

Mustelus griseus Pitschmann, 1908[5/]

Mustelus manazo Bleeker, 1854

Mustelus cf. *manazo* [Seret, pers. comm. 1994]

Mustelus sp. A. [Last and Stevens, 1994][6/]

Mustelus sp. B. [Last and Stevens, 1994][7/]

? *Triakis scyllium* Müller and Henle, 1839[8/]

References

Compagno, L.J.V. 1970. Systematics of the genus *Hemitriakis* (Selachii: Carcharhinidae), and related genera. *Proc. Calif. Acad. Sci.*, 38(4):63-98.

Compagno, L.J.V. 1973. *Gogolia filewoodi*, a new genus and species of shark from New Guinea (Carcharhiniformes; Triakidae), with a redefinition of the family Triakidae and a key to the genera. *Proc. Calif. Acad. Sci.*, 39(4):383-410.

Compagno, L.J.V. 1988. *Sharks of the order Carcharhiniformes*. Princeton, New Jersey, Princeton University Press, 572 p.

Last, P.R. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

1/ Including specimens from the Coral Sea off Queensland, Australia, and a specimen from New Caledonia that agrees with the Coral Sea material in most particulars.

2/ Nominal from Amboina and New Caledonia; unconfirmed from the former locality, and based on a specimen close to if not identical to *Hemitriakis abdita* from New Caledonia.

3/ Based on 4 late fetuses from the Philippines in the Stanford University collections, originally misidentified as *Triakis scyllium*. Postnatal material has not been examined.

4/ A Philippines' *Iago* is similar to *I. garricki* but may be distinct.

5/ A Philippines' *Mustelus* is similar to *M. griseus* and *Mustelus* sp. A, particularly the former, but needs further investigation to determine its identity.

6/ An unspotted smoothhound known from isolated localities off northern Australia, but presumably more widely distributed.

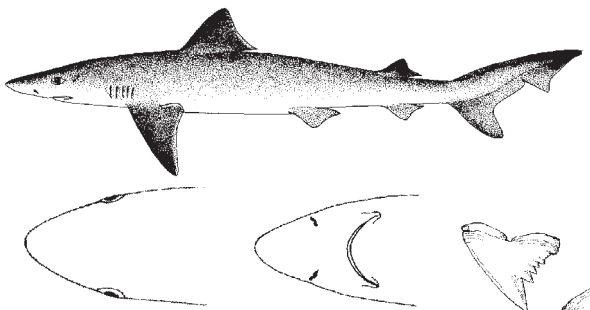
7/ Known from few isolated localities off northern Australia. It is not clear if the western and eastern Australian populations represent 1 or 2 species or are just variations or subspecies of *Mustelus antarcticus*.

8/ Nominal records from Philippines, apparently based in part on *Hemitriakis* sp. Otherwise a temperate coastal species occurring from China to Korea and Japan.

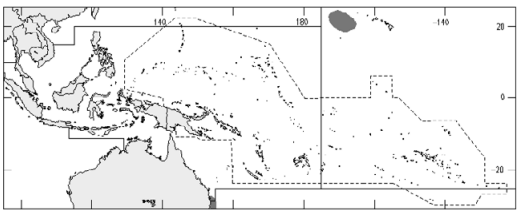
Galeorhinus galeus (Linnaeus, 1758)

En - Tope shark; **Fr** - Requin-hâ; **Sp** - Cazón.

Maximum total length about 1.95 m. An active, strong-swimming, abundant, coastal-pelagic species of temperate continental and insular waters, near or on the bottom, from inshore waters down to a depth of 300 m. Ovoviviparous, without a yolk-sac placenta. Feeds on small schooling fish, other bottom fishes, crustaceans, and echinoderms. Caught with bottom trawls, on longlines, and in pelagic trawls; utilized fresh, dried salted and processed for oil (Vitamin A) and fishmeal. In the western South Atlantic, eastern North and South Atlantic, also off southern Australia, New Zealand, the Laysan Islands, Hawaii, and the eastern North and South Pacific.



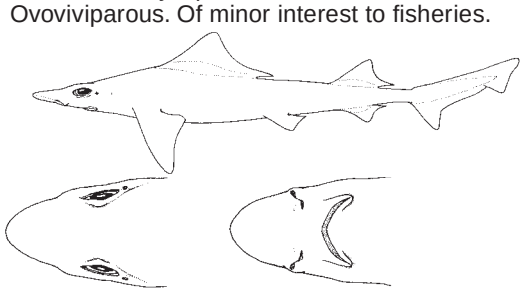
dorsal view of head **ventral view of head** **upper and lower tooth**



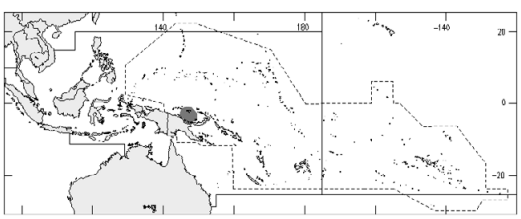
Gogolia filewoodi Compagno, 1973

En - Sailback houndshark; **En** - Requin-hâ voile; **Sp** - Cazón velero.

Maximum total length about 74 cm. A little-known shark of the northern New Guinea continental shelf, the only specimen of which was taken at a depth of 73 m, probably near the bottom. Ovoviviparous. Of minor interest to fisheries.



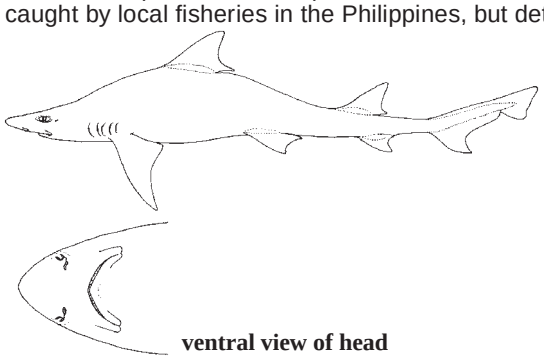
dorsal view of head **ventral view of head**



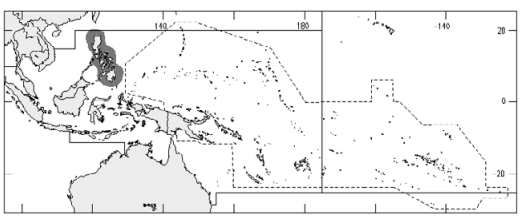
Hemitriakis leucoperiptera Herre, 1923

En - Whitefin topeshark; **Fr** - Requin-hâ aile blanche; **Sp** - Cazón de aleta blanca.

Maximum total length about 96 cm. A little-known inshore tropical shark, in Philippine coastal waters down to a depth of 48 m. Viviparous, but it is not known if a yolk-sac placenta is formed; presumably caught by local fisheries in the Philippines, but details are unknown.



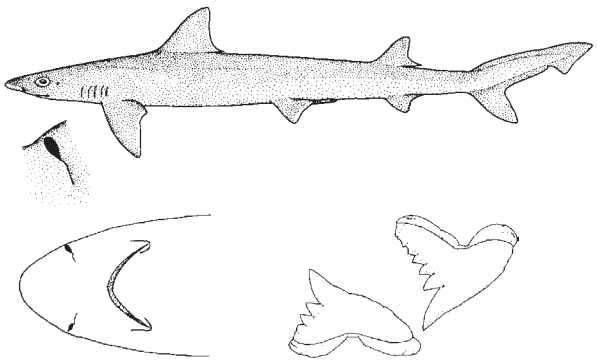
ventral view of head



Hypogaleus hyugaensis (Miyosi, 1939)

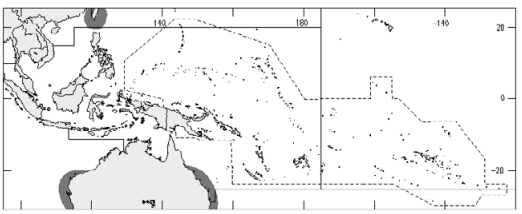
En - Blacktip tope; **Fr** - Requin-hâ elegant; **Sp** - Cazón elegant.

Maximum total length at least 1.3 m. A bottom-living shark of fairly deep continental waters, ranging in depths from 40 to 230 m. Viviparous, with a yolk-sac placenta. Feeds on bony fishes. Caught in bottom trawls and on hook-and-line; a minor fisheries catch off southern Australia and Japan, but uncommon and apparently little utilized elsewhere. Occurs off South Africa, Kenya, Zanzibar, the Persian Gulf, and in the western Pacific off southern Japan, Taiwan Province of China, and Australia.



ventral view of head

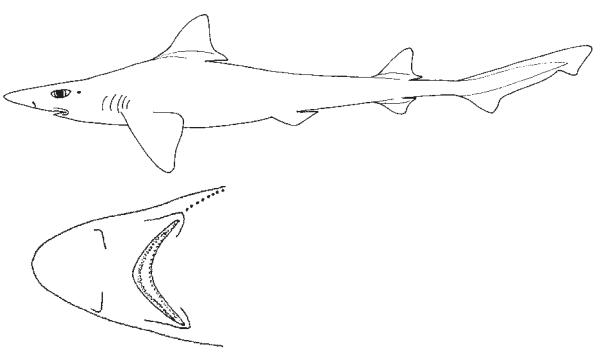
upper and lower tooth



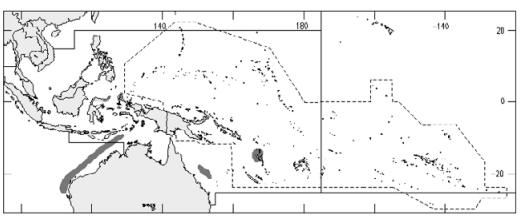
Iago garricki Fourmanoir and Rivaton, 1979

En - Longnose houndshark; **Fr** - Requin-hâ long nez; **Sp** - Cazón picudo.

Maximum total length about 75 cm. A little-known, deep-water tropical shark found at depths of 250 to 475 m. Viviparous, with a yolk-sac placenta. Feeds on cephalopods. Of minor interest to fisheries at present. Known from the Vanuatu and tropical Australia; also, a shark that is somewhat similar to this species, but may be distinct, occurs in the Philippines (Batangas, Luzon) in depths of 124 to 441 m.



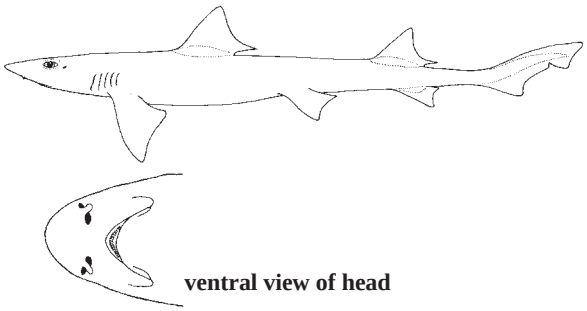
ventral view of head



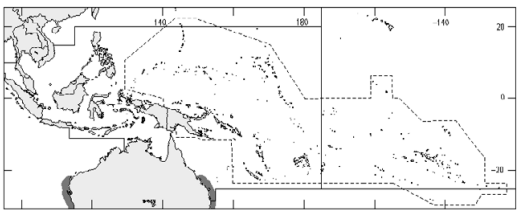
Mustelus antarcticus Günther, 1870

En - Gummy shark; **Fr** - Emissole gommée; **Sp** - Musola austral.

Maximum total length about 1.75 m. An abundant inshore and offshore shark of temperate waters, found on or near the bottom and from the intertidal to a depth of 183 m. Ovoviviparous, without a yolk-sac placenta. Feeds on crustaceans (including crabs), marine worms, and small fishes. This small shark is widely fished in Australia, and utilized fresh for human consumption. Western Australia to southern Queensland, also Tasmania.



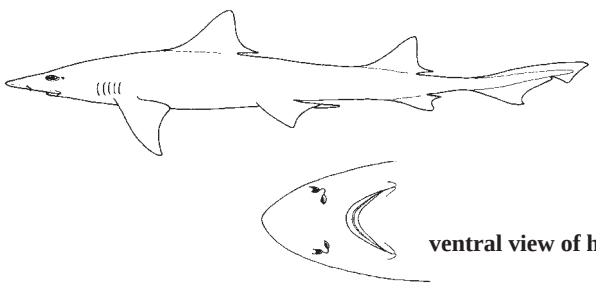
ventral view of head



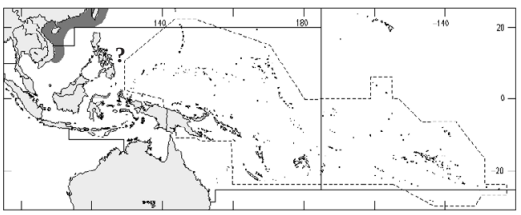
Mustelus griseus Pietschmann, 1908

En - Spotless smooth-hound; **Fr** - Emissole cotiere; **Sp** - Musola gris.

Maximum size at least 1 m. A common western Pacific temperate and tropical inshore bottom-dwelling shark, found down to a depth of at least 51 m. Viviparous, with a yolk-sac placenta. Probably feeds on bottom-dwelling invertebrates, especially crustaceans. Regularly fished off Japan, China and Taiwan Province of China, presumably also caught by local fisheries in the area, but details are unknown. In the western North Pacific off Japan, Korea, China, Taiwan Province of China, and Viet Nam, possibly also the Philippines.



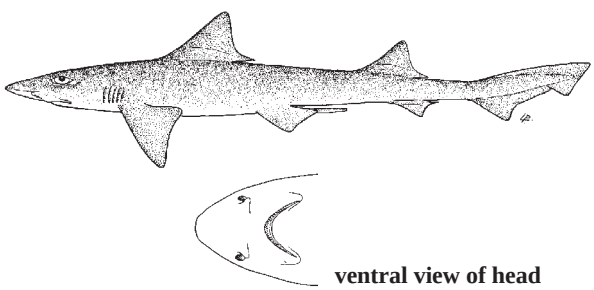
ventral view of head



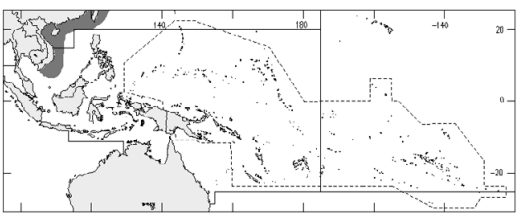
Mustelus manazo Bleeker, 1854

En - Starspotted smooth-hound; **Fr** - Emissole etoilée; **Sp** - Musola celestrial.

Maximum total length to about 1.17 m. An abundant, bottom-living shark found in continental waters, ranging from the intertidal zone to a depth of at least 360 m. Ovoviviparous, without a yolk-sac placenta. Feeds mostly on bottom invertebrates. Caught in bottom trawls and on hook-and-line (sports catches). In the western Pacific southwards to Viet Nam, also recorded from Kenya.



ventral view of head

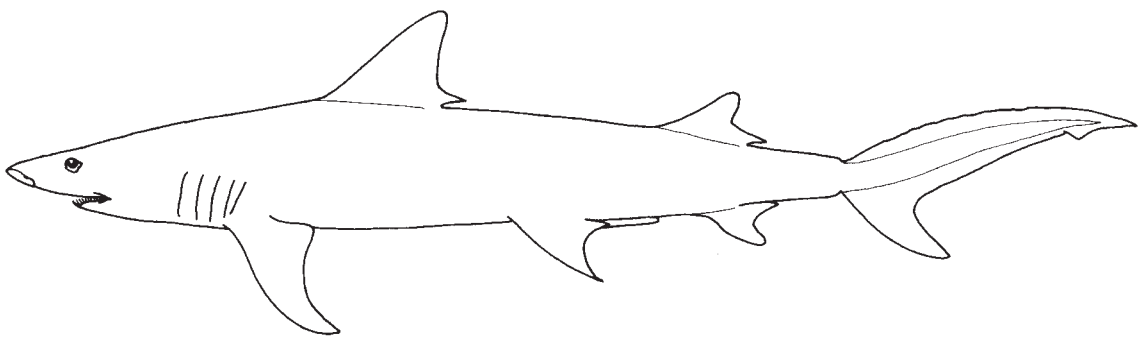


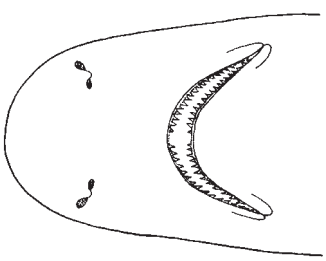
HEMIGALEIDAE

Weasel sharks

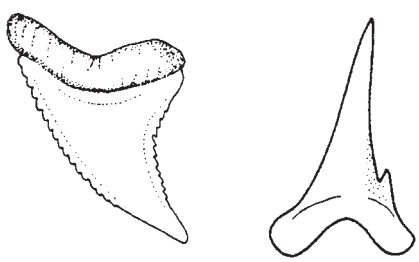
by L.J.V. Compagno

Diagnostic characters: Small to medium-sized sharks with cylindrical or slightly compressed bodies without lateral ridges; precaudal tail much shorter than trunk. Head not expanded laterally, moderately depressed; 5 small to medium-sized gill slits present, the last 2 or 3 over or behind pectoral-fin origins, their upper ends expanded partway onto upper surface of head in some species; **no gill sieves or gill rakers**; **spiracles minute, and behind but not below eyes**; nostrils without barbels, nasoral grooves, or circumnarial grooves, well-separated from mouth; eyes on sides of head, with a well-developed nictitating lower eyelid; snout moderately long, depressed, and parabolic to broadly rounded, not greatly flattened and blade-like and without lateral teeth and barbels; mouth moderately large, arched, and elongated, and extending well behind eyes; labial furrows present on both jaws and moderately large, reaching front of mouth or ending well behind it; **teeth small to large, blade-like**, and with a single cusp on teeth of both jaws, cusplets or strong serrations present on upper teeth, and cusplets variably present or absent on lower teeth; **anterior teeth in upper jaw smaller than lateral teeth and not separated from them by smaller intermediate teeth on each side**. Two dorsal fins without spines, the first dorsal fin moderately large, high and angular or subangular, much shorter than the caudal fin, with its base located over the interspace between, the pectoral- and pelvic-fin bases and entirely anterior to origins of pelvic fins; second dorsal fin moderately large, about 2/3 the size of first dorsal fin; anal fin moderately large, slightly smaller than second dorsal fin, with its origin slightly behind second dorsal-fin origin but in front of second dorsal-fin midbase; caudal fin strongly asymmetrical, much less than half of total length**, with a rippled or undulated dorsal margin**, a well-marked subterminal notch, and a short, but well-defined lower lobe; vertebral axis of caudal fin raised above body axis. Caudal peduncle cylindrical**, without keels but with well-developed precaudal pits**. **Intestinal valve of spiral type**. **Colour:** grey, grey-brown or dark grey above, white or cream below, fins sometimes with dusky tips or white posterior margins; sometimes a few white spots but no elaborate colour pattern.





ventral view of head

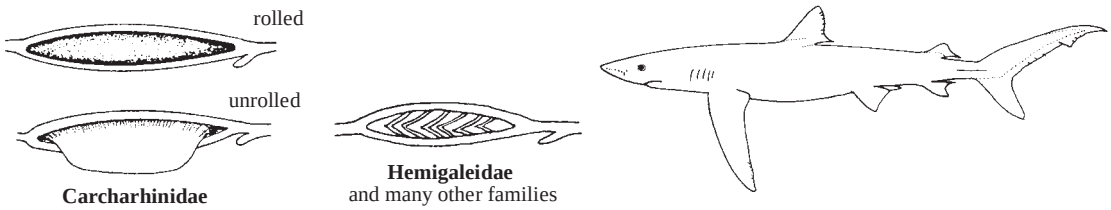


upper and lower teeth

Habitat, biology, and fisheries: The Hemigaleidae is a small family of small to medium-sized, coastal sharks with a primary diversity (about 7 to 9 species) in the continental and insular tropical waters of the Indo-West Pacific (but not extending into the Central Pacific); a single additional species occurs in the Atlantic. It is closely related to the large family Carcharhinidae. These sharks feed on small fishes, octopuses, and probably other invertebrates, and are not known to have attacked people. All species in the area are fished for human consumption, but due to their modest abundance they form only a small fraction of the shark catch in the area.

Similar families occurring in the area

Carcharhinidae: intestine with a scroll valve; also, no carcharhinids in the area show the character combination of a long snout, spiracles, upper teeth with cusplets, lower teeth well differentiated from uppers, long labial furrows, and second dorsal fin about 2/3 as large as first dorsal fin and with its origin anterior to that of the slightly smaller anal fin.

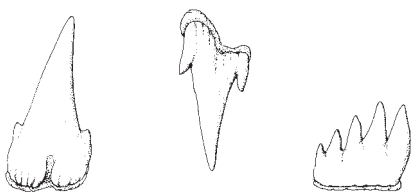


Carcharhinidae
scroll valves

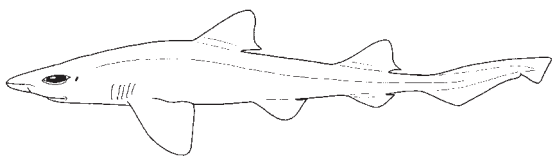
Hemigaleidae
and many other families
spiral valve

Carcharhinidae

Proscylliidae and Triakidae: no precaudal pits or undulated dorsal caudal-fin margin, teeth not strongly differentiated in upper and lower jaws, spiracles usually larger.



upper and lower teeth

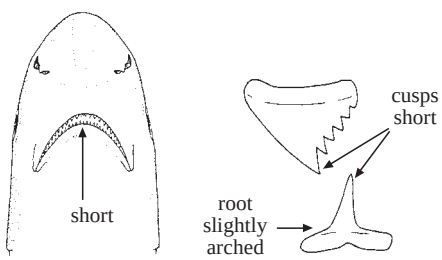


Proscylliidae

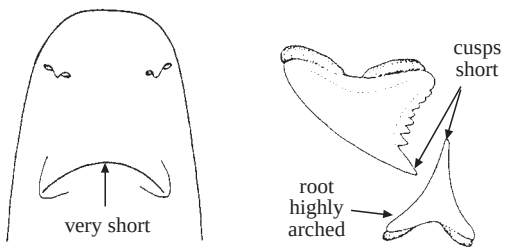
Key to the species of Hemigaleidae occurring in the area

1a. Lower teeth near symphysis with short, straight or weakly hooked cusps that are concealed or barely protrude when mouth is closed (Fig. 1a, b); gill slits small, less than twice the eye length . . . . . → ***2***

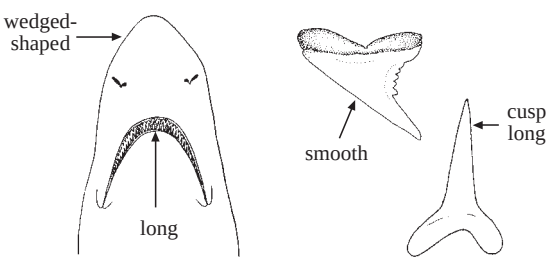
1b. Lower teeth near symphysis with long, strongly hooked cusps that prominently protrude from mouth when it is closed (Fig. 1c, d); gill slits large, over twice the eye length . . . . . → ***4***



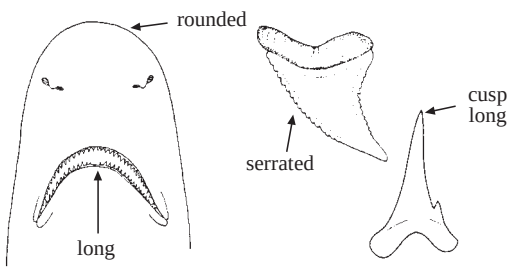
a) ***Paragaleus tengi***



b) ***Hemigaleus microstoma***



c) ***Chaenogaleus macrostoma***



d) ***Hemipristis elongatus***

Fig. 1 teeth and ventral view of head

2a. Lower teeth near symphysis with mostly erect cusps and slightly arched roots, giving them an inverted T-shape; cusplets present on lower teeth; mouth longer, narrowly arched (Fig. 1a); pelvic, dorsal and caudal fins not falcate (Fig. 2) . . . . . ***Paragaleus tengi***

2b. Lower teeth near symphysis with erect cusps and highly arched roots, giving them an inverted Y-shape; no cusplets on lower teeth; mouth very short, broadly arched (Fig. 1b); pelvic fins, both dorsal fins, and ventral caudal fin lobe strongly falcate (Fig. 3) . . . . . → ***3***

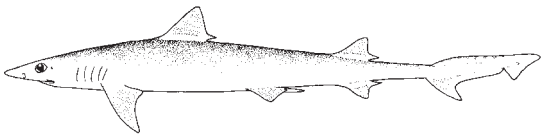


Fig. 2 ***Paragaleus tengi***

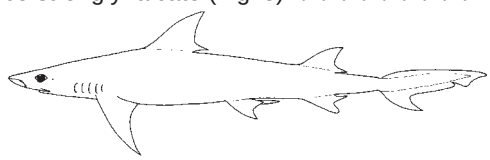


Fig. 3 ***Hemigaleus microstoma***

3a. Fins dark-tipped; tooth counts 28-34/43-54; total vertebral counts 111 to 118 (Australia) . . . . . ***Hemigaleus* sp. aff. *"microstoma"***

3b. Fins light-tipped; tooth counts 25-32/37-43; total vertebral counts 137 to 150 (Java, Singapore, and Thailand) . . . . . ***Hemigaleus microstoma***

4a. Snout obtusely wedge-shaped in dorsoventral view; teeth present at symphysis of lower jaw; mesial edges of upper teeth smooth at all sizes (Fig. 1c); fins not falcate, posterior margins of pelvic and pectoral fins straight or slightly concave (Fig. 4) . . . ***Chaenogaleus macrostoma***

4b. Snout bluntly rounded in dorsoventral view; teeth absent at symphysis of lower jaw, mesial edges of upper teeth serrated (but smooth in young below 60 cm) (Fig. 1d); fins strongly falcate, posterior margins of pelvic and pectoral fins deeply concave (Fig. 5) . . . . . ***Hemipristis elongatus***

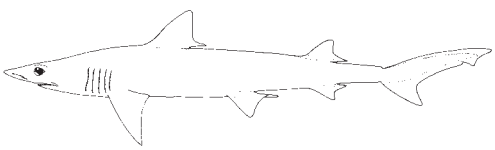


Fig. 4 ***Chaenogaleus macrostoma***

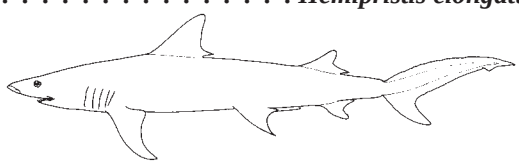


Fig. 5 ***Hemipristis elongatus***

List of species occurring in the area

The symbol ⊰ is given when species accounts are included.

⊰ *Chaenogaleus macrostoma* (Bleeker, 1852)

⊰ *Hemigaleus microstoma* Bleeker, 1852
Hemigaleus sp. aff. *"microstoma"*

⊰ *Hemipristis elongatus* (Klunzinger, 1871)

⊰ *Paragaleus tengi* (Chen, 1963)

References

Compagno, L.J.V. 1988. *Sharks of the order Carcharhiniformes*. Princeton, New Jersey, Princeton University Press, 572 p.

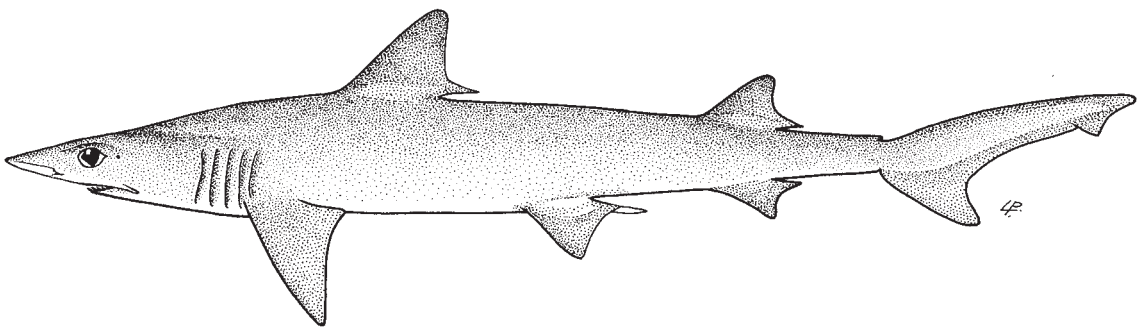
Compagno, L.J.V. and M.J. Smale. 1985. *Paragaleus leucolomatus*, a new shark fro South Africa, with notes on the systematics of hemigaleid sharks (Carcharhiniformes: Hemigaleidae). *Spec. Publ. J.L.B. Smith Inst. Ichthyol.*, (37):391-401.

Compagno, L.J.V., F. Krupp, and K.E. Carpenter. 1996. A new weasel shark of the genus *Paragaleus* from the northwestern Indian Ocean and the Arabian Gulf. *Fauna of Saudi Arabia*, 15:391-401.

Chaenogaleus macrostoma (Bleeker, 1852)

Frequent synonyms / misidentifications: *Hemigaleus macrostoma* Bleeker, 1852; *H. balfouri* Day, 1878 / *Hemigaleus microstoma* Bleeker, 1852; *Hemipristis elongatus* (Klunzinger, 1871).

FAO names: En - Hooktooth shark; **Fr** - Milandre harpon; **Sp** - Comadreja ganchuda.

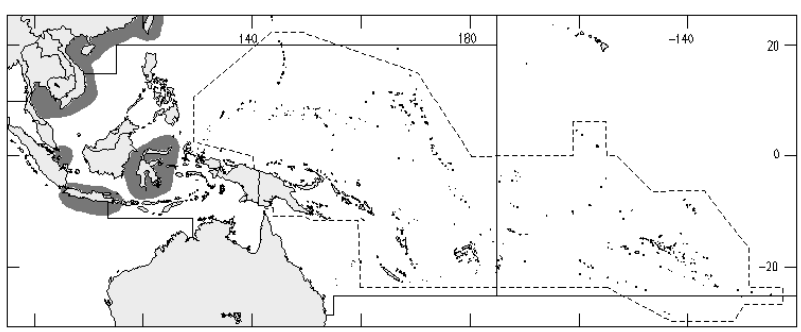


Diagnostic characters: A small shark. Body moderately slender. **Snout long,** its length slightly greater than mouth width, **obtusely wedge-shaped toward tip;** labial furrows moderately long and easily seen, the uppers ending well behind symphysis of lower jaw; anterior nasal flaps with a short, broad, triangular lobe; **mouth long and parabolic, its length over 2/3 of the width**; spiracles small; **gill slits very long, the longest over twice the eye length**; teeth in upper jaw with narrow, erect to oblique, high cusps and distal cusplets (except for those at symphysis), entirely smooth-edged; **teeth in lower jaw with arched roots and long, hooked, slender mostly erect cusps that prominently protrude when mouth is closed**, without cusplets or serrations. First dorsal fin moderately large, with a pointed or narrowly rounded apex and short inner margin, its origin slightly posterior to free rear tips of pectoral fins and the free rear tip anterior to pelvic-fin origins**; second dorsal fin high, about 2/3 of length of first**, with a short inner margin less than fin height, and its origin slightly anterior to anal-fin origin; **anal fin slightly smaller than second dorsal fin,** without long preanal ridges; upper precaudal pit transverse and crescentic, no keels on caudal peduncle; **pectoral and pelvic fins with straight or slightly concave inner margins.** Intestine with a spiral valve. **Colour:** bronzy-grey above, white below when fresh, fading to greyish or greyish brown in preservation, dorsal fins often with dusky or black tips.

Size: Maximum total length about 1 m.

Habitat, biology, and fisheries: A small, common, coastal, inshore and offshore shark of the continental and insular shelves, caught at depths down to 59 m. Viviparous, number of young 4; size at birth 20 cm. Probably feeds on small fishes and invertebrates; harmless to people. Commonly caught in inshore and offshore artisanal fisheries probably everywhere where it occurs. Caught in drifting and bottom gill nets and on longlines and other line gear. Utilized fresh for human consumption; offal processed into fishmeal.

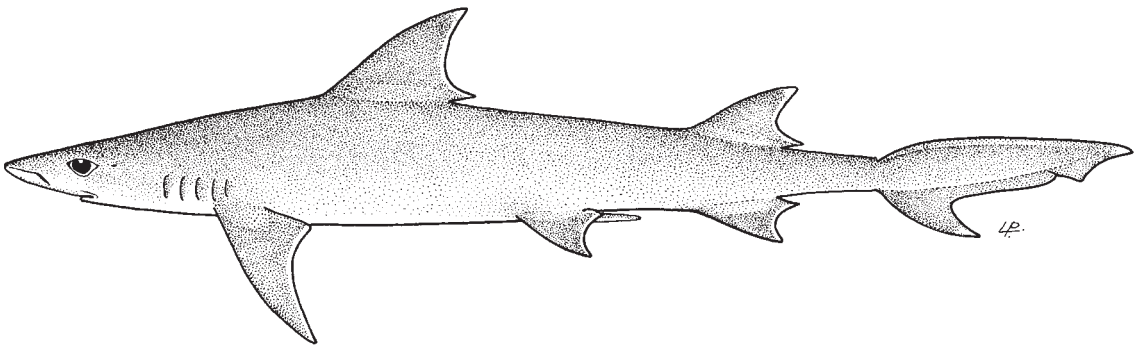
Distribution: Indo-Pacific from the Persian Gulf to India and Sri Lanka, and off Singapore, Thailand, Viet Nam, China (including Taiwan Province), Java, and Sulawesi.



Hemigaleus microstoma Bleeker, 1852

Frequent synonyms / misidentifications: *Negogaleus microstoma* (Bleeker, 1852) / *Chaenogaleus macrostoma* (Bleeker, 1852); *Hemipristis elongatus* (Klunzinger, 1871).

FAO names: En - Sicklefin weasel shark; **Fr** - Milandre faucille; **Sp** - Comadreja segadora.



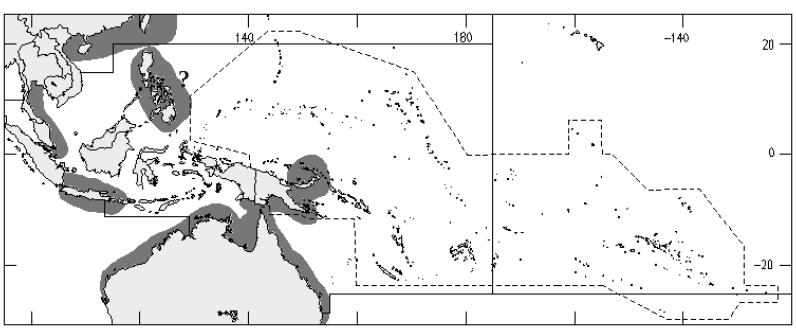
Diagnostic characters: A small shark. Body moderately slender. **Snout long,** its length somewhat greater than mouth width, **parabolic toward tip**; **labial furrows moderately long and easily seen,** the upper furrows nearly reaching symphysis of lower law, anterior nasal flaps with a short, broad, triangular lobe; **mouth very short and broadly arched, its length about 1/3 of the width**; spiracles small; gill openings short, the longest slightly longer than eye length in adults, slightly shorter in young; **teeth in upper jaw with very narrow, short, oblique cusps and prominent distal cusplets** (except for those at symphysis), entirely smooth-edged; **teeth in lower jaw very small, with arched roots and short, mostly erect, slender, straight cusps that do not protrude when mouth is closed**, and no cusplets or serrations. First dorsal fin moderately large, with a pointed apex and short inner margin, its origin slightly posterior to free rear tips of pectoral fins and the free rear tip anterior to pelvic-fin origins; **second dorsal fin high, about 2/3 of length of first dorsal fin,** with a short inner margin less than fin height, and its origin slightly anterior to anal-fin origin; anal fin slightly smaller than second dorsal fin, without long preanal ridges; upper precaudal pit transverse and crescentic, no keels on caudal peduncle; **pectoral and pelvic fins strongly falcate, with deeply concave posterior margins.** Intestine with a spiral valve. **Colour:** grey-brown above, lighter below, dorsal fins with white tips and posterior margins: sometimes white spots on sides of body.

Size: Maximum total length about 1.1 m.

Habitat, biology, and fisheries: A small coastal, inshore and offshore shark of continental tropical waters, at depths down to 170 m. Viviparous, 2 fetuses in a litter. Feeds mainly on cephalopods, particularly octopus. Harmless to humans. Taken regulary in inshore artisanal fisheries in the Indo-Pacific, but of no commercial importance locally. Caught with floating and bottom gill nets, longlines and hook-and-line. Utilized fresh for human consumption; offal used for fishmeal.

Distribution: Indo-West Pacific off southern India, Sri Lanka, Thailand, Singapore, Java, China, Taiwan Province of China, northern Viet Nam, the Philippines, New Guinea, and eastern, northern, and western Australia.

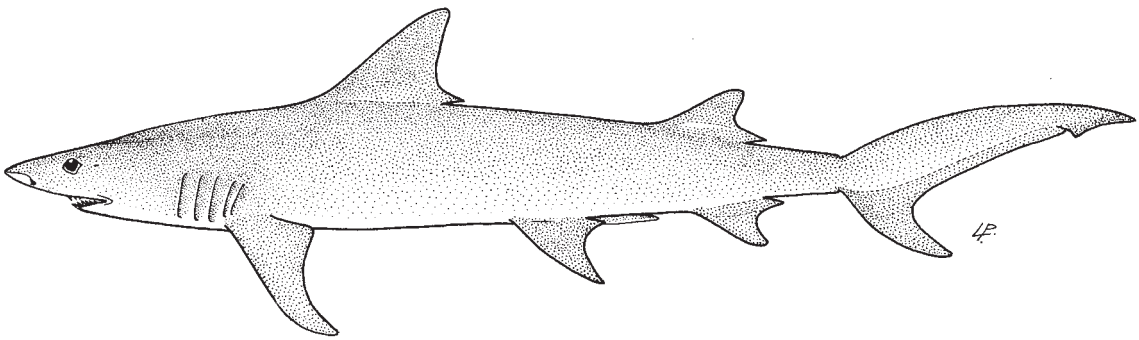
Remarks: Differences in coloration and meristics suggest that the Australian and possibly the northern Indian Ocean representatives of this species may be separated as species or subspecies, as indicated in the key.



Hemipristis elongatus (Klunzinger, 1871)

Frequent synonyms / misidentifications: *Carcharhinus ellioti* (Day, 1878) / *Chaenogaleus macrostoma* (Bleeker, 1852); *Hemigaleus microstoma* Bleeker, 1852.

FAO names: En - Snaggletooth shark; **Fr** - Milandre chicor; **Sp** - Comadreja sobrediente.

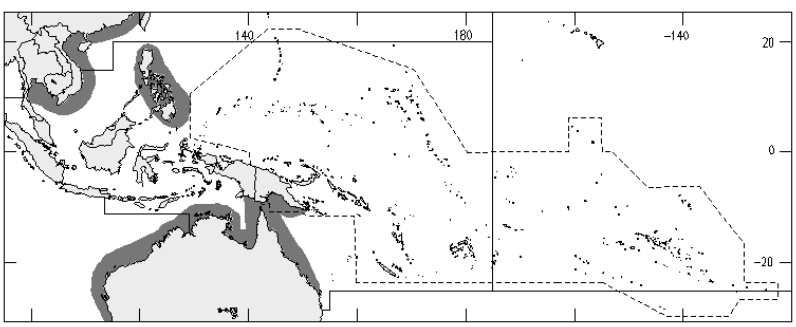


Diagnostic characters: A medium-sized shark. Body moderately slender. **Snout long**, its length slightly greater than mouth width, **bluntly rounded toward tip; labial furrows moderately long and easily seen,** the upper furrows falling well behind symphysis of lower jaw; anterior nasal flaps with a short triangular lobe; **mouth long and semiparabolic, with a truncated lower symphysis, its length about 2/3 of the width**; spiracles small; **gill openings long, the longest over twice the eye length**; **teeth in upper jaw with strong, distally curved, broad and oblique cusps (except for erect-cusped symphyseal teeth),** prominent distal cusplets and mesial serrations; **teeth in lower jaw** large but considerably narrower than uppers, with arched roots and **long, strong, hooked, erect to oblique cusps that prominently protrude when mouth is closed**, and basal serrations or small cusplets on more distal teeth. First dorsal fin moderately large, with a pointed apex and short inner margin, its origin slightly posterior to free rear tips of pectoral fins and the free rear tip anterior to pelvic-fin origins; **second dorsal fin high, about 2/3 of length of first**, with a short inner margin less than fin height and its origin somewhat anterior to anal-fin origin; anal fin slightly smaller than second dorsal fin, without long preanal ridges; upper precaudal pit transverse and crescentic; no keels on caudal peduncle; **pectoral and pelvic fins strongly falcate, with deeply concave posterior margins**. Intestine with a spiral valve. **Colour:** grey or grey-brown above, lighter below, no prominent markings.

Size: Maximum total length about 2.4 m; commonly to 2 m.

Habitat, biology, and fisheries: A rare to common tropical coastal shark, inshore and offshore at depths down to 130 m. Viviparous, number of young 6 to a per litter; size at birth about 45 cm. Feeds on a variety of fish species, also on cephalopods. Potentially dangerous because of its size and large teeth, but never recorded as attacking people. Regularly taken in artisanal fisheries, in the area especially off Thailand. Caught with bottom gill nets, floating longlines and probably on hook-and-line. Utilized fresh for human consumption; liver processed for vitamins; fins used in the oriental sharkfin trade, and offal for fishmeal.

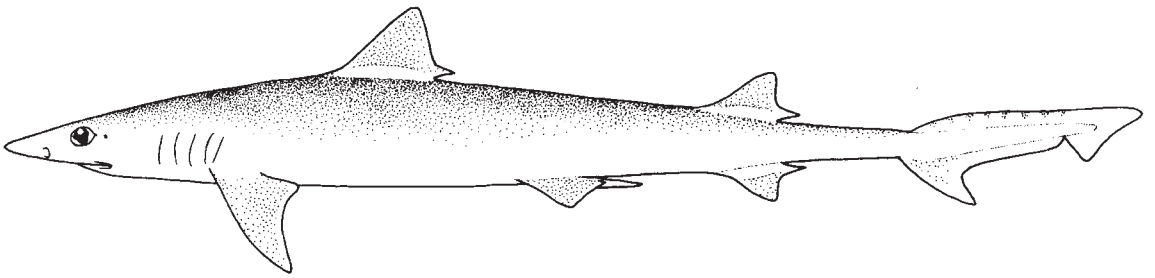
Distribution: Indo-West Pacific off South Africa, Madagascar, Mozambique, Tanzania, Aden, Red Sea, the Persian Gulf, Pakistan, India, Thailand, Viet Nam, China, the Philippines, and Australia (Queensland, and western Australia).

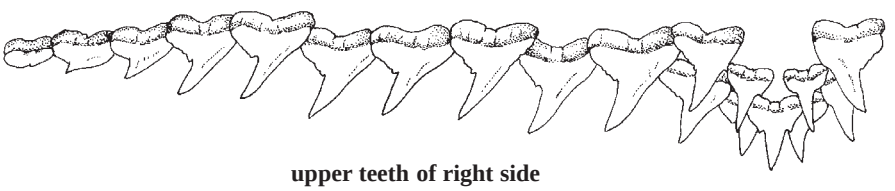


Paragaleus tengi (Chen, 1963)

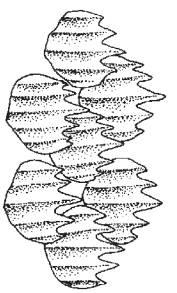
Frequent synonyms / misidentifications: *Negogaleus tengi* Chen, 1963; *N. longicaudatus* Bessednov, 1964 / None.

FAO names: En - Straight-tooth weasel shark; **Fr** - Milandre belette; **Sp** - Comadreja coluda.





upper teeth of right side



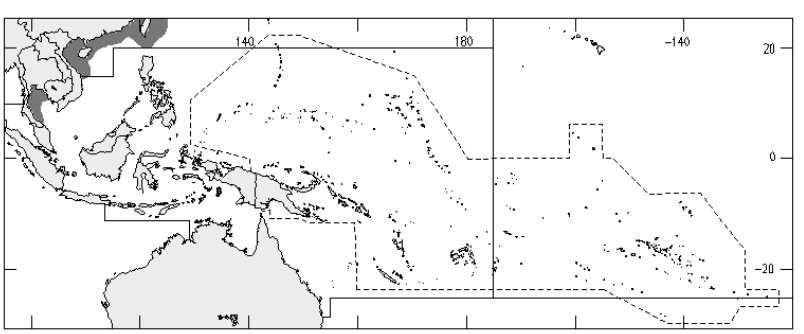
dermal denticles

Diagnostic characters: A small shark. Body slender. **Snout long**, its length slightly greater than mouth width, **rounded toward tip**; **labial furrows moderately long and easily seen,** the upper furrows falling well behind symphysis of lower jaw; anterior nasal flaps with a short triangular lobe; **mouth rather short and arched, its length about 2/3 of the width;** spiracles small; **gill openings moderate sized, the longest slightly longer than eye length in adults**, slightly shorter in young; **teeth in upper jaw with narrow, moderately long, semierect to oblique cusps and distal cusplets** (except for erect-cusped symphyseal teeth), entirely smooth-edged; **teeth in lower jaw with slightly arched roots and moderately long, mostly erect cusps that do not protrude when mouth is closed**, and with low cusplets but no serrations. First dorsal fin moderately large, with a narrowly rounded apex and short inner margin, its origin slightly posterior to free rear tips of pectoral fins and the free rear tip anterior to pelvic-fin origins, **second dorsal fin high, about 2/3 of length of first dorsal fin**, with a short inner margin less than fin height, and its origin slightly anterior to anal-fin origin; anal fin slightly smaller than second dorsal fin, without preanal ridges; upper precaudal pit transverse and crescentic, no keels on caudal peduncle; **pectoral fins weakly falcate and pelvic fins not falcate**. Intestine with a spiral valve. **Colour:** body grey or grey-brown above, light below, no prominent markings on body and fins.

Size: Maximum total length about 88 cm.

Habitat, biology, and fisheries: A little-known inshore shark, depth range not reported. Taken in fisheries in Thailand, and elsewhere where it occurs.

Distribution: Western Pacific from Japan, Taiwan Province of China, Viet Nam, southern China, and Thailand.



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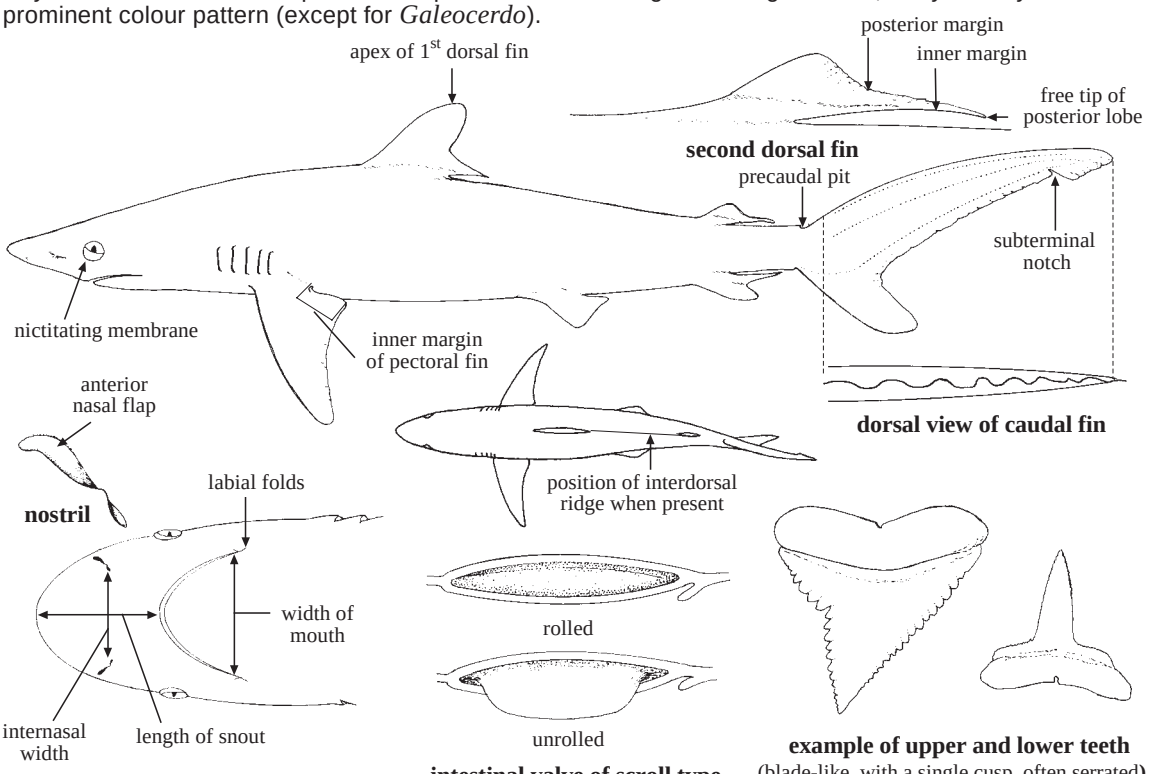
CARCHARHINIDAE

Requiem sharks

(also, ground sharks, blue sharks, sharpnose sharks)

by L.J.V. Compagno and V.H. Niem

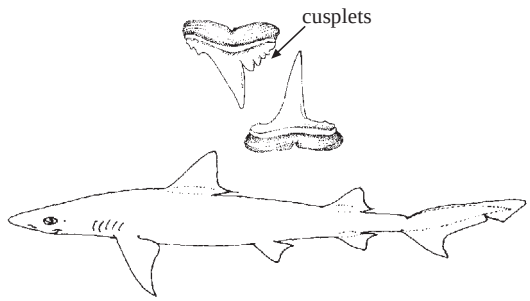
Diagnostic characters: Small to large sharks. Trunk and precaudal tail cylindrical, not depressed and without lateral ridges: precaudal tail much shorter than trunk. Head not expanded laterally, conical to moderately depressed; 5 small- to medium-sized gill slits present, the last 1 to 3 over or behind pectoral-fin origins, their upper ends not expanded onto dorsal surface of head; no gill sieves and usually no gill rakers on internal gill slits (short dermal gill rakers present in *Prionace*); spiracles usually absent (but always present in *Galeocerdo*); nostrils well separated from mouth, without barbels, nasoral grooves, or circumnarial grooves; **eyes on sides of head, with a well-developed nictitating lower eyelid;** snout short to moderately long, conical and slightly pointed to depressed and broadly rounded, never greatly flattened and blade-like and without lateral teeth and barbels; mouth usually large, arched and elongated, and extending well behind eyes; labial furrows usually present on both jaws but generally greatly reduced, confined to mouth corners, and barely visible when mouth is closed (but *Galeocerdo* and *Rhizoprionodon* species have well-developed labial furrows); upper labial furrows usually not reaching front of mouth (except in *Galeocerdo*); **teeth small to large, blade-like,** with a single cusp and cusplets variably developed; **anterior teeth in upper jaw smaller than lateral teeth and not separated from them by smaller intermediate teeth on each side.** Two dorsal fins, without spines, the first dorsal fin moderately large, high and angular or subangular, much shorter than the caudal fin, its base located over the interspace between pectoral and pelvic-fin bases and entirely anterior to origins of pelvic fins (free rear tip of dorsal fin may reach or extend posterior to pelvic-fin origins in *Scoliodon, Negaprion, Rhizoprionodon*, and *Triaenodon*); second dorsal fin varying from less than 1/5 the height of the first dorsal fin to about as high as the first (*Lamiopsis* and *Negaprion*); anal fin present, moderately large, with its origin varying from somewhat anterior to the second dorsal-fin origin to under the first half of second dorsal-fin base; **caudal fin strongly asymmetrical**, much less than 1/2 of total length, **with a rippled or undulated dorsal margin,** a well-marked subterminal notch, and **a short but well-defined lower lobe;** vertebral axis of caudal fin raised above body axis. Caudal peduncle not strongly depressed dorsoventrally or widely expanded laterally with weak **longitudinal keels** (*Prionace, Galeocerdo*) **or none; precaudal pits present and well developed. Intestinal valve of scroll type. Colour:** brown, grey, yellowish or bluish above, white to cream or yellowish below, some species with prominent dark or light markings on fins; body usually without a prominent colour pattern (except for *Galeocerdo*).



Habitat, biology, and fisheries: The Carcharhinidae are one of the largest families of sharks and are the dominant sharks in tropical waters, often both in variety and in abundance and biomass. Small to very large species often occur close inshore, but most large ones are more abundant well offshore, but still near or over the continental or insular shelves. A few species, including the blue, silky, and oceanic whitetip sharks, are truly oceanic. Requiem sharks are active, strong swimmers, occurring singly or in small to large schools. Some species are continually active, while others are capable of resting motionless for extended periods on the bottom. Many are more active at night or dawn and dusk than the daytime. Except for the ovoviviparous tiger shark (*Galeocerdo cuvier*), all species are viviparous, with a yolk sac placenta, and have litters of young from 1 or 2 to 135. All are voracious predators, feeding heavily on bony fishes, other sharks, rays, squid, octopuses, cuttlefishes, crabs, lobsters, and shrimp, but also sea birds, turtles, sea snakes, marine mammals, gastropods, bivalves, and carrion. The larger carcharhinids are dangerous to people, and they make up an important fraction of the shark species known to have attacked people. This is by far the most important shark family for fisheries in the tropics, and various species figure prominently in catches within the area. Most are utilized for human food, but also for the preparation of various subproducts, including oil and Vitamin A from the liver, fishmeal, and fins for the oriental soupfin markets.

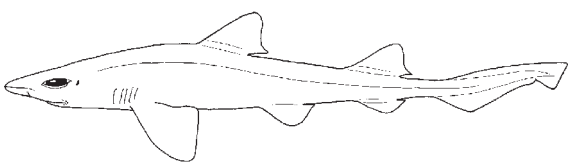
Similar families occurring in the area

Hemigaleidae: intestinal valve of spiral type; also, no carcharhinids in the area combine the characters of long snout, spiracles, upper teeth with strong distal cusplets, long labial furrows, and second dorsal fin large, about 2/3 as large as first dorsal fin, with a very short inner margin, and with its origin anterior to that of the slightly smaller anal fin.

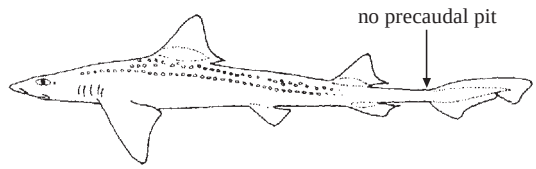


Hemigaleidae

Proscylliidae and Triakidae: no precaudal pits, dorsal margin not undulated, intestinal valve of spiral type, eyes usually dorsolateral on head (except for *Hypogaleus* and *Galeorhinus*).



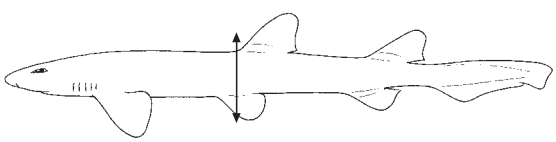
Proscylliidae



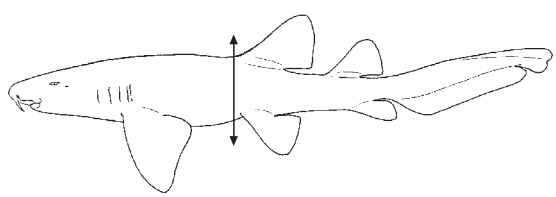
Triakidae

Scyliorhinidae: first dorsal-fin base over or posterior to pelvic-fin bases (anterior to pelvic-fin bases in Carcharhinidae).

Ginglymostomatidae: origin of first dorsal fin over, or only slightly anterior to pelvic-fin bases; nostrils connected with mouth by deep nasoral grooves, their anterior margins with a long, cylindrical barbel; eyes well behind mouth (over mouth in Carcharhinidae).



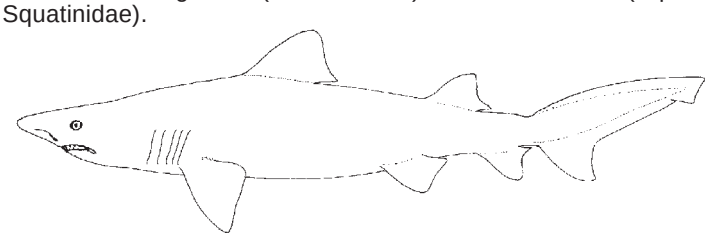
Scyliorhinidae



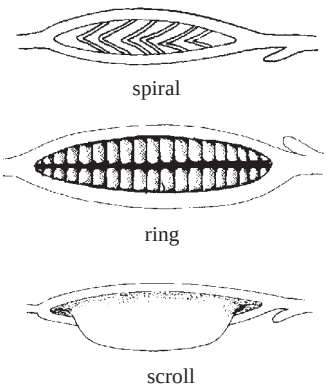
Ginglymostomatidae

Odontaspididae: fifth gill opening in front of pectoral-fin origin; eyes without nictitating folds; largest teeth in front part of jaws (on either side of symphysis), in upper jaw separated from large teeth at sides by a gap, usually with 1 or 2 rows of intermediate teeth (largest teeth as sides of jaws and no gap in teeth row of upper jaw in Carcharhinidae).

Other shark families: either caudal fin very long (Alopiidae), or head with "hammer-like" lateral projections (Sphyrnidae), or caudal fin lunate (Lamnidae), or size of adults much larger (Rhincodontidae), or a single dorsal fin and 6 or 7 gill slits (Hexanchidae), or anal fin absent (Squalidae and Squatinidae).



Odontaspididae



(only Carcharhinidae and Sphyrnidae)
types of intestinal valves

Key to the species of Carcharhinidae occurring in the area

1a. Upper labial furrows very long, extending to front of eyes; spiracles present and relatively large; prominent lateral keels on caudal peduncle (Fig. 1); vertical black or dusky bars on back, obscure or absent on adults . . . . . ***Galeocerdo cuvier***

1b. Upper labial furrows long to very short, not extending in front of eyes; spiracles usually absent; lateral keels usually absent (except for weak ones in *Prionace glauca*) (Fig. 2) . . . . . → ***2***

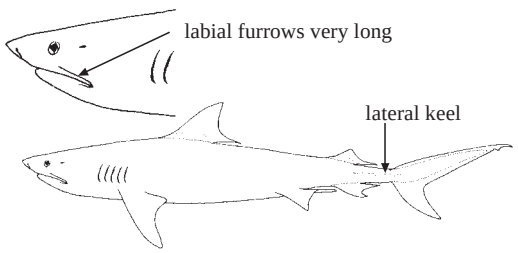


Fig. 1 ***Galeocerdo cuvier***

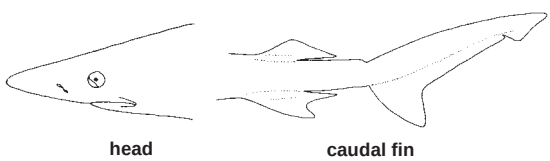


Fig. 2 other species

2a. High proximal and distal cusplets present on most teeth in both jaws; expanded anterior nasal and mesonarial flaps forming a tube for the excurrent aperture (Fig. 3) . . ***Triaenodon obesus***

2b. Cusplets usually absent on lower teeth, low or absent on uppers (Fig. 4); nasal flaps not forming a tube . . . . . → ***3***

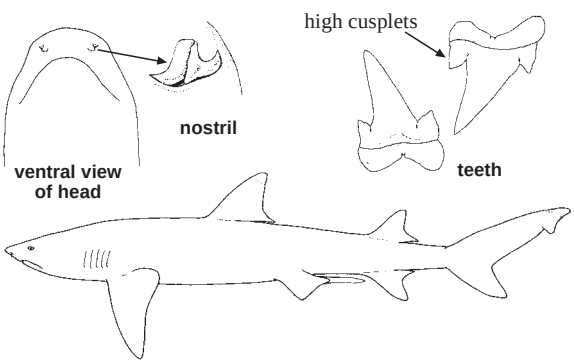


Fig. 3 ***Triaenodon obesus***

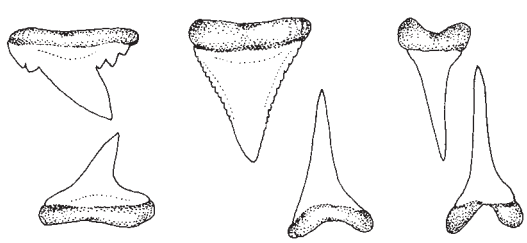


Fig. 4 teeth

3a. Second dorsal fin nearly or quite as large as first (Fig. 5). . . . . → ***4***

3b. Second dorsal fin considerably smaller than first (Fig. 6). . . . . → ***5***

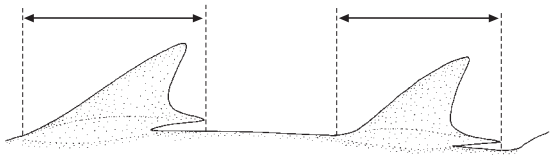


Fig. 5 dorsal fins



Fig. 6 dorsal fins

4a. Snout short, preoral length much less than mouth width; upper and lower teeth with narrow, unserrated cusps (Fig. 7) . . . . . ***Negaprion acutidens***

4b. Snout longer, preoral length about equal to mouth width; upper teeth with broad, triangular, serrated cusps, lowers with narrow, smooth cusps (Fig. 8). . . . . ***Lamiopsis temmincki***

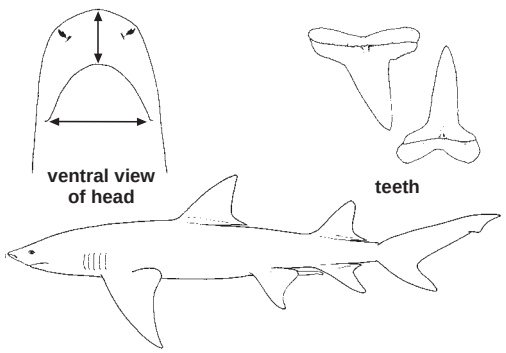


Fig. 7 ***Negaprion acutidens***

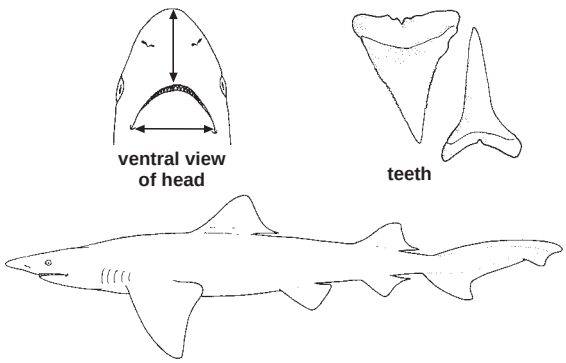


Fig. 8 ***Lamiopsis temmincki***

5a. Head greatly depressed and trowel-shaped; pectoral fins broadly triangular, their length from origins to free rear tips about equal to their anterior margins; free rear tip of first dorsal fin about over midbases of pelvic fins; postventral margin of caudal fin usually only shallowly concave (Fig. 9) . . . . . ***Scoliodon laticaudus***

5b. Head varying from conical to slightly depressed; pectoral fins narrower, length 4/5 or less of anterior margin (usually less); free rear tip of first dorsal fin over or (usually) anterior to pelvic-fin origins; postventral margin of caudal fin deeply incised (Fig. 10). . . . . → ***6***

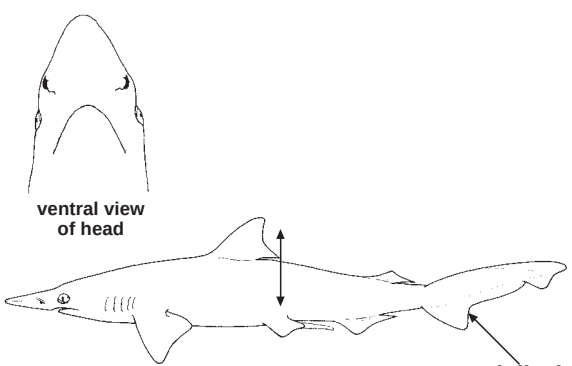


Fig. 9 ***Scoliodon laticaudus***

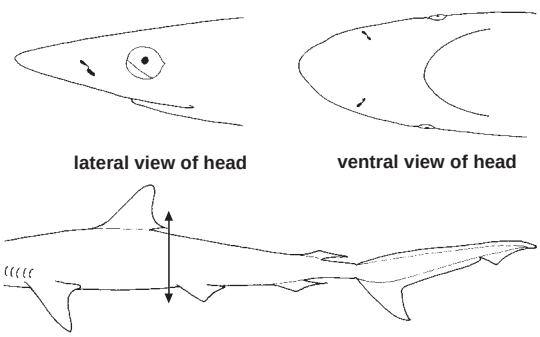
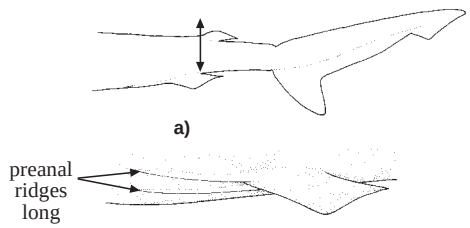


Fig. 10

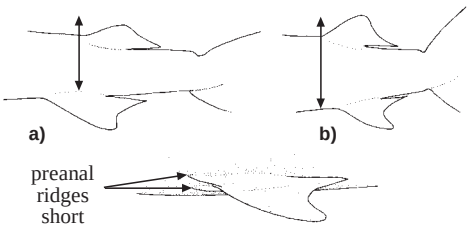
6a. Second dorsal-fin origin well behind anal-fin origin, usually over or slightly anterior to anal-fin insertion (Fig. 11a); preanal ridges very long and prominent, subequal to or greater in length than anal-fin base (Fig. 11b); posterior margin of anal fin straight or shallowly concave (Fig. 11b) . . . . . → ***7***

6b. Second dorsal-fin origin usually near anal-fin origin, in some species posterior to it (Fig. 12a); but usually well anterior to anal-fin insertion (Fig. 12b) and midbase of anal fin; preanal ridges variably developed, short, up to 1/2 the anal-fin base length or less (Fig. 12c); posterior margin of anal fin deeply concave or deeply notched (Fig. 12c) . . . . . → ***10***



b) ventrolateral view of anal fin

Fig. 11



c) ventrolateral view of anal fin

Fig. 12

7a. Posterior notches present on eyes; first dorsal-fin base 2 to 3 times in distance between pectoral and pelvic-fin bases (Fig. 13). . . . . ***Loxodon macrorhinus***

7b. No eye notches; first dorsal-fin base usually less than 2 times in distance between pectoral to pelvic-fin bases (up to 2 times in adult *R. acutus*) (Fig. 14). . . . **(*Rhizoprionodon*)** → ***8***

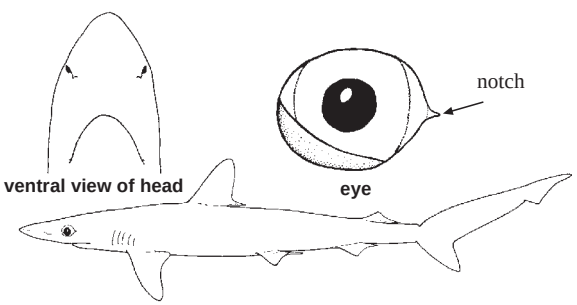


Fig. 13 ***Loxodon macrorhinus***

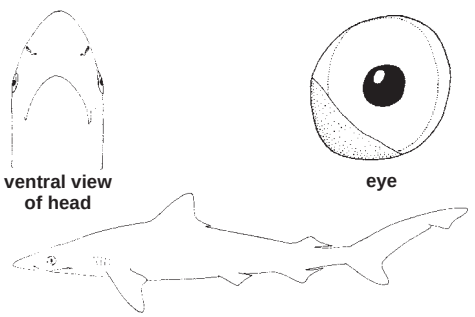
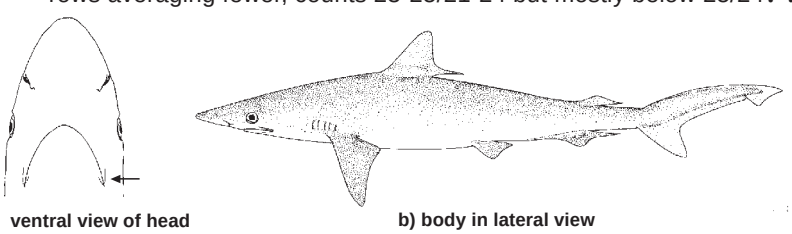


Fig. 14 ***Rhizoprionodon***

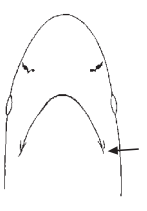
8a. Upper labial furrows long and rather prominent, 1.4 to 2% of total length; uppers usually longer than lower furrows (Fig. 15a); tooth rows more numerous in average, counts usually 25/24 (Fig. 15b) . . . . . ***Rhizoprionodon acutus***

8b. Upper labial furrows reduced and often inconspicuous, generally less than 1% of total length and rarely up to 1.3%; uppers usually shorter than lower furrows (Fig. 16); tooth rows averaging fewer, counts 23-25/21-24 but mostly below 25/24 . . . . . → ***9***



a) ventral view of head **b) body in lateral view**

Fig. 15 ***Rhizoprionodon acutus***



ventral view of head

Fig. 16

9a. Total number of enlarged hyomandibular lateral-line pores just behind mouth corners on both sides of head fewer, 7 to 16 and rarely above 14; precaudal vertebral centra 84 to 91 (Fig. 17) . . . . . ***Rhizoprionodon oligolinx***

9b. Total number of enlarged hyomandibular pores greater, 15 to 22; precaudal vertebral centra 73 to 80 (Fig. 18) . . . . . ***Rhizoprionodon taylori***

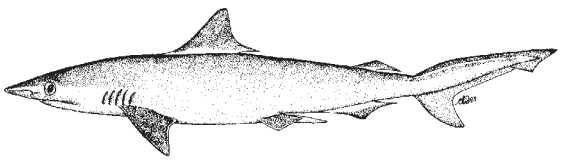


Fig. 17 ***Rhizoprionodon oligolinx***

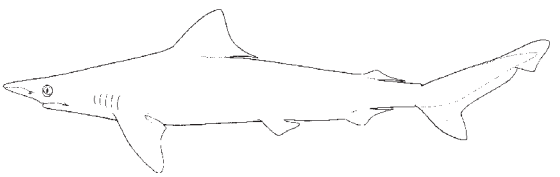


Fig. 18 ***Rhizoprionodon taylori***

10a. Papillose gill rakers present on gill arches (Fig. 19a); weak lateral keels present on caudal peduncle; first dorsal-fin base much closer to pelvic- than to pectoral-fin bases (Fig. 20); colour brilliant dark blue above in life . . . . . ***Prionace glauca***

10b. No papillose gill rakers on gill arches (Fig. 19b); no lateral keels on caudal peduncle; first dorsal-fin base equidistant between pectoral- and pelvic-fin bases or (usually) closer to pectoral fins (Figs 21 and 22); colour light to dark grey, grey-brown, brown, or grey-black above . . . . . → ***11***

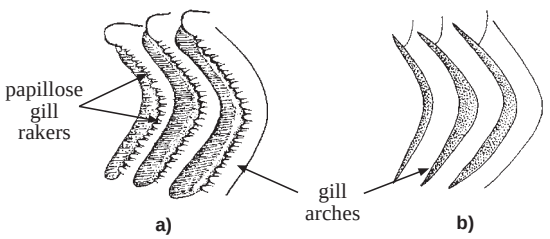


Fig. 19

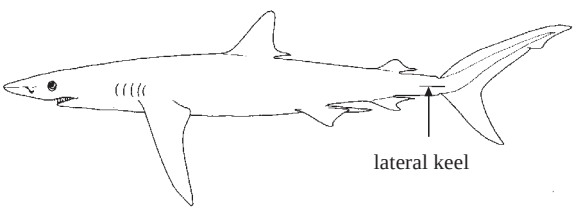


Fig. 20 ***Prionace glauca***

11a. Second dorsal fin 1/2/ to 3/5 height of first dorsal fin; precaudal pits longitudinal and not crescentic (Fig. 21) . . . . . **(*Glyphis*)** → ***12***

11b. Second dorsal fin 2/5 height of first dorsal fin or less; precaudal pits transverse and crescentic (Fig. 22) . . . . . **(*Carcharhinus*)** → ***14***

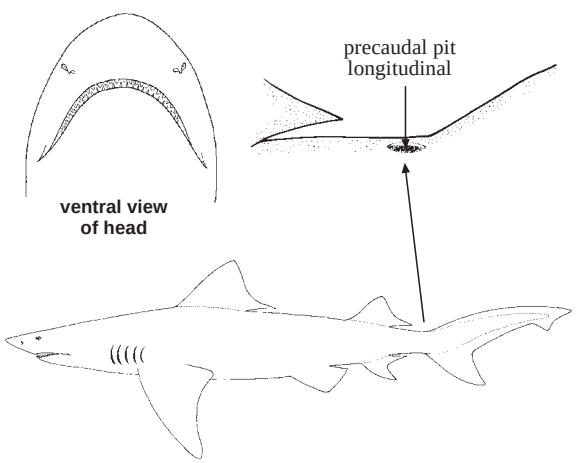


Fig. 21 ***Glyphis***

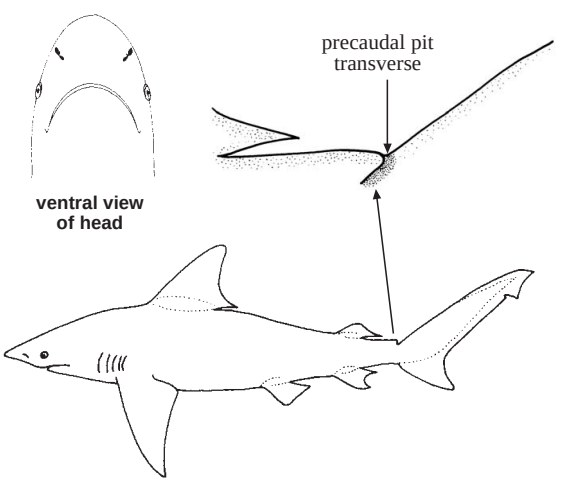


Fig. 22 ***Carcharhinus***

12a. Head very flat and narrowly wedge-shaped in lateral view; total vertebral counts 147 to 148, diplospondylous caudal centra 65 to 68 (New Guinea and northern Australia) (Fig. 23) . . ***Glyphis* sp. C**

12b. Head higher and broader in lateral view; total vertebral counts 196 to 217, diplospondylous caudal centra 85 to 93 . . . . . → ***13***

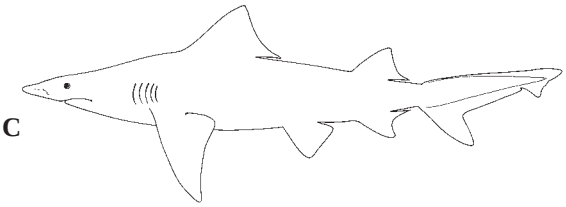


Fig. 23 ***Glyphis* sp. C**

13a. Lower anterior teeth enlarged, with cusps smooth basally but with a serrated, spear-like (hastate) expanded tip; total tooth row counts 55; free rear tip of first dorsal fin about opposite pelvic-fin origins; total vertebral counts 217, monospondylous precaudal count 70, diplospondylous precaudal count 54; all fins with black or dusky edges and dusky webs in young (Queensland, Australia) (Fig. 24) . . . . . ***Glyphis* sp. A**

13b. Lower anterior teeth with cusps entirely serrate and without a spear-like expanded tip; total tooth row counts 60 to 63; free rear tip of first dorsal fin somewhat anterior to pelvic-fin origins; total vertebral counts 196 to 205, monospondylous precaudal count 63 to 67, diplospondylous precaudal count 43 to 51; fins plain and light, except for dark patch on pectoral-fin bases and dusky tip on ventral caudal-fin lobe (Borneo) (Fig. 25) . . . . . ***Glyphis* sp. B**

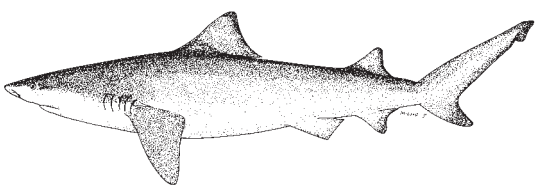


Fig. 24 ***Glyphis* sp. A**

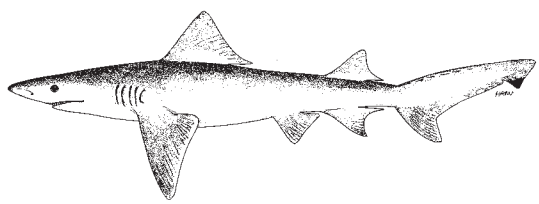


Fig. 25 ***Glyphis* sp. B**

14a. Pectoral and first dorsal fins very broad distally and broadly rounded apically, only slightly tapering toward their apices; most fin tips mottled white in adults, also black-tipped and with black dorsal saddle-marks on the caudal peduncle in juveniles (Fig. 26) . . . . . ***Carcharhinus longimanus***

14b. Pectoral and first dorsal fins tapering distally and usually pointed or narrowly rounded; fins not mottled white, often black tipped but without black saddles on the caudal peduncle . . . . . → ***15***

15a. First dorsal, pectoral, pelvic, and caudal fins with extremely conspicuous white tips and posterior edges (Fig. 27) . . . . . ***Carcharhinus albimarginatus***

15b. Fins not conspicuously tipped and edged with white . . . . . → ***16***

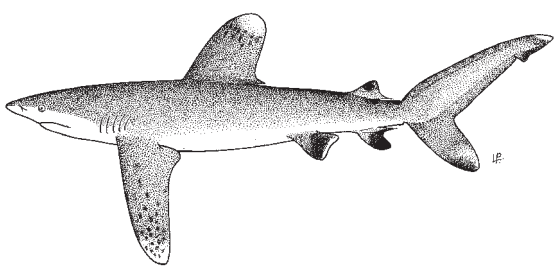


Fig. 26 ***Carcharhinus longimanus***

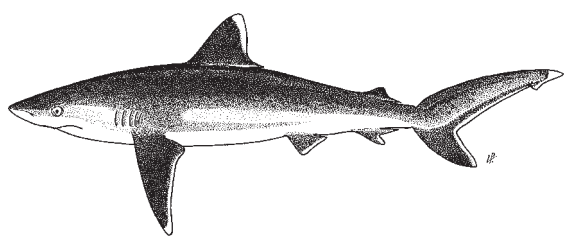


Fig. 27 ***Carcharhinus albimarginatus***

16a. Second dorsal fin with a conspicuous black tip but other fins plain (Figs 28 and 29) . . . . . → ***17***

16b. Second dorsal fin plain, white or black-tipped but never the only fin with markings . . . . . → ***18***

17a. First dorsal fin triangular, erect, and with a posteroventrally sloping posterior margin; usually 13/13-14 rows of anteroposterior teeth, and 28/27 to 29 total rows of teeth; distal cusplets serrated on upper anterolateral teeth; pectoral-fin length 1.4 to 1.8 in anterior margin length; mouth width 6.4 to 8.3% of total length; precaudal centra 54 to 74 (Fig. 28) . . . . . ***Carcharhinus dussumieri***

17b. First dorsal fin falcate, with almost vertical posterior margin (apart from free rear tip); usually 12/12 rows of anteroposterior teeth, and 26/25 total rows of teeth; distal cusplets smooth on upper anterolateral teeth; pectoral length 1.7 to 2 in anterior margin length; mouth width 4.2 to 6.6% of total length; precaudal centra 74 to 85 (Fig. 29) . . . ***Carcharhinus sealei***

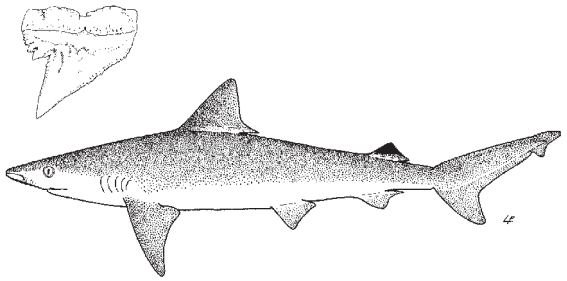


Fig. 28 ***Carcharhinus dussumieri***

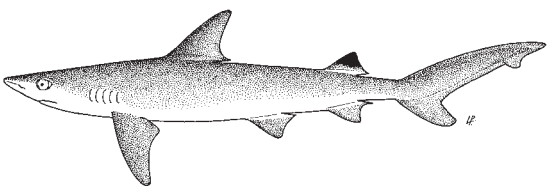


Fig. 29 ***Carcharhinus sealei***

18a. Caudal fin prominently edged with black along entire posterior edge; first dorsal fin plain or white-tipped, never black-tipped (Fig. 30) . . . . . ***Carcharhinus amblyrhynchos***

18b. Caudal fin either plain or prominently edged with black, but if black, first dorsal fin also prominently black-tipped . . . . . → ***19***

19a. Upper anterolateral teeth with bent, hooked, narrow cusps (Fig. 31) . . . ***Carcharhinus brachyurus***

19b. Upper anterolateral teeth variably shaped, and broad or narrow, but with cusps nearly straight . . . . . → ***20***

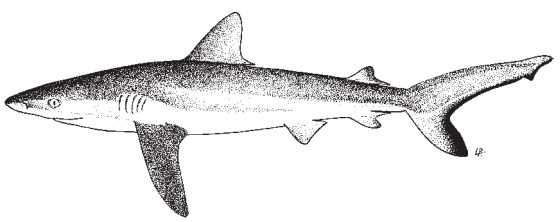


Fig. 30 ***Carcharhinus amblyrhynchos***

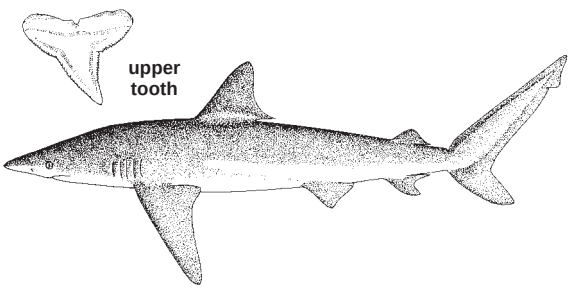


Fig. 31 ***Carcharhinus brachyurus***

20a. Dermal interdorsal ridge present (Fig. 32) . . . . . → ***21***

20b. Dermal interdorsal ridge absent . . . . . → ***27***

21a. Second dorsal fin, pectoral fin, and ventral caudal-fin lobe strikingly black-tipped . . . . . → ***22***

21b. Fins plain or dusky-tipped but not strongly black-tipped . . . . . → ***23***

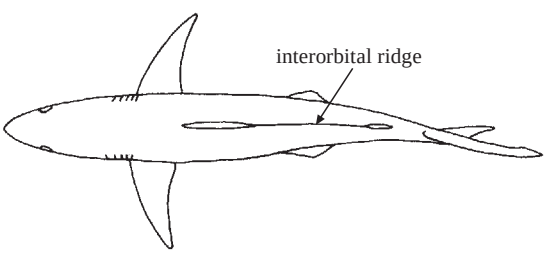


Fig. 32

22a. Second dorsal fin low, with very elongated inner margin over twice fin height; upper anterolateral teeth with strongly serrated cusps; usually only 12 rows of upper anteroposterior teeth (Fig. 33) . . . . . ***Carcharhinus sorrah***

22b. Second dorsal fin higher, with shorter inner margin 1.4 to 1.6 times fin height; upper anterolateral teeth with smooth or weakly serrated cusps; 14 or 15 rows of upper anteroposterior teeth (Fig. 34) . . . . . ***Carcharhinus hemiodon***

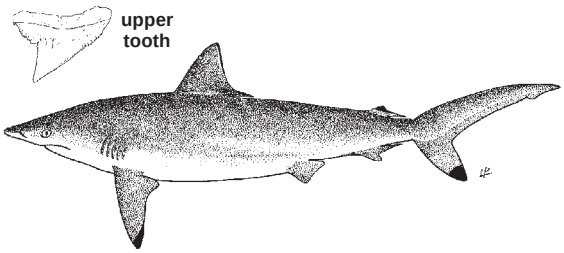


Fig. 33 ***Carcharhinus sorrah***

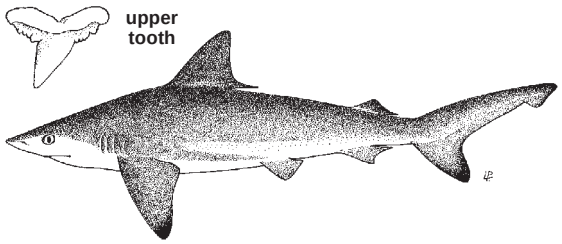


Fig. 34 ***Carcharhinus hemiodon***

23a. First dorsal-fin origin well behind free rear tips of pectoral fins; very coarse serrations or small cusplets on feet of upper anterolateral teeth; inner margin of second dorsal fin very long, usually over twice (but exceptionally down to 1.6) times the fin height (Fig. 35) . . . ***Carcharhinus falciformis***

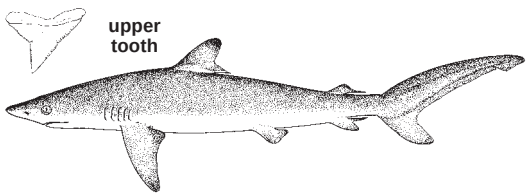


Fig. 35 ***Carcharhinus falciformis***

23b. First dorsal-fin origin over or anterior to free rear tips of pectoral fins; serrations on feet of upper anterolateral teeth small and not very coarse; inner margin of second dorsal fin shorter and generally less than twice the fin height (but up to 2.1 times the fin height in *Carcharhinus obscurus*) . . . . . → ***24***

24a. First dorsal-fin origin in front or over pectoral-fin insertions or at least nearer to them than to free rear tips of pectoral fins (Figs 36 and 37) . . . . . → ***25***

24b. First dorsal-fin origin opposite or somewhat in front of free rear tips of pectoral fin but closer to them than pectoral-fin insertions (Figs 38 and 39) . . . . . → ***26***

25a. Anterior nasal flaps usually low and inconspicuous; distance from nostrils to mouth more than 2.4 times in mouth width; upper anterolateral teeth moderately high, usually in 14 rows; first dorsal fin very high, its height about 1/2 of predorsal length (Fig. 36); interdorsal ridge low . . . . . ***Carcharhinus plumbeus***

25b. Anterior nasal flaps usually high and triangular; distance from nostrils to mouth less than 2.4 times in mouth width; upper anterolateral teeth very high, usually in 15 rows; first dorsal fin lower, its height much less than 1/2 of predorsal length (Fig. 37); interdorsal ridge high . . . . . ***Carcharhinus altimus***

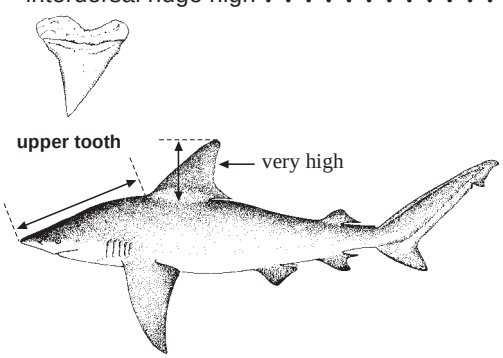


Fig. 36 ***Carcharhinus plumbeus***

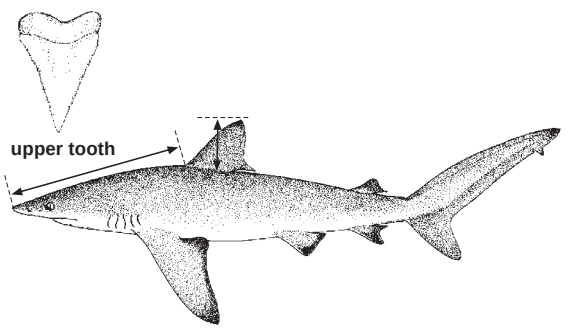


Fig. 37 ***Carcharhinus altimus***

26a. Upper anterolateral teeth relatively high and narrow; pectoral fins nearly straight; first dorsal fin higher and with a nearly straight anterior margin; height of second dorsal fin 2.1 to 3.3% of total length and 1.3 to 1.7 times in inner margin length; precaudal centra 103 to 109 (Fig. 38) . . . . . ***Carcharhinus galapagensis***

26b. Upper anterolateral teeth relatively low and broad; pectoral fins more falcate; first dorsal fin lower and with a rounded anterior margin; height of second dorsal fin 1.5 to 2.3% of total length and 1.6 to 2.1 times in inner margin length; precaudal centra 89 to 95 (Fig. 39). . . . . ***Carcharhinus obscurus***

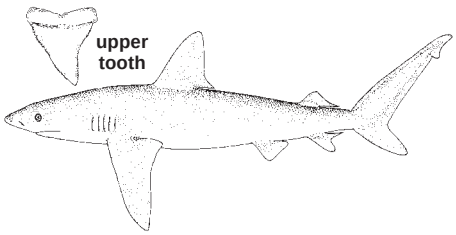


Fig. 38 ***Carcharhinus galapagensis***

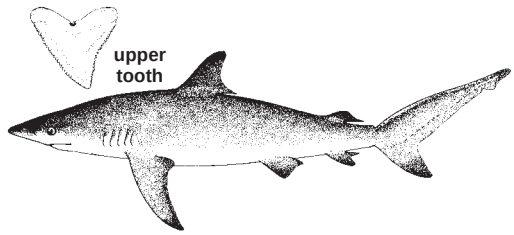


Fig. 39 ***Carcharhinus obscurus***

27a. Entire posterior margin of caudal fin with a narrow but obvious black edge; pectoral, second dorsal, and caudal fins with obvious black tips . . . . . → ***28***

27b. Posterior margin of caudal not black or only partly dusky or black; fins black-tipped or not . . . . → ***29***

28a. First dorsal fin with a broad black blotch at its apex, highlighted below with white (Fig. 40) . . . . . ***Carcharhinus melanopterus***

28b. First dorsal fin with a narrow black edge on its anterior margin but without a black blotch at its apex (Fig. 41) . . . . . ***Carcharhinus cautus***

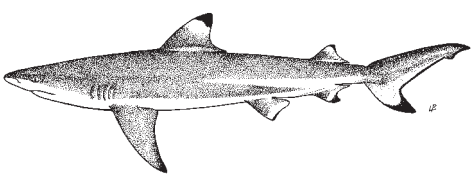


Fig. 40 ***Carcharhinus melanopterus***

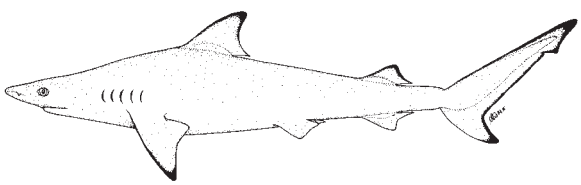


Fig. 41 ***Carcharhinus cautus***

29a. Snout very short and broadly rounded, internarial space usually less than preoral length; upper anterolateral teeth with very broad, triangular cusps and straight to concave distal margins; lower anterolaterals with strongly arched roots (Fig. 42) . . . . . → ***30***

29b. Snout longer and parabolic or wedge-shaped to pointed, internarial space equal to, or greater than preoral length; upper anterolateral teeth with narrow cusps and strongly notched distal margins; lower anterolaterals with nearly transverse roots (Fig. 43) . . . . . → ***31***

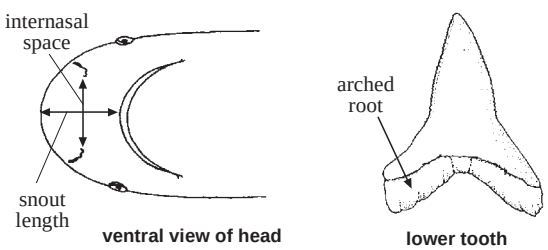


Fig. 42

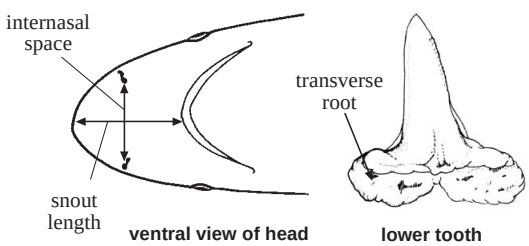


Fig. 43

30a. Usually 11 lower anteroposterior teeth, with extremely broad cusps; first dorsal-fin height more than 3.1 times the second dorsal-fin height; second dorsal-fin margin usually nearly straight; angle of notch in anal fin posterior margin more acute, usually less than a right angle; precaudal centra 89 to 95 (Fig. 44) . . . . . ***Carcharhinus amboinensis***

30b. Usually 12 lower anteroposterior teeth, with moderately broad cusps; first dorsal-fin height more than 3.1 times the second dorsal-fin height or less; second dorsal-fin margin usually concave; angle of notch in anal fin posterior margin more obtuse, usually a right angle or more; precaudal centra 101 to 123 (Fig. 45) . . . . . ***Carcharhinus leucas***

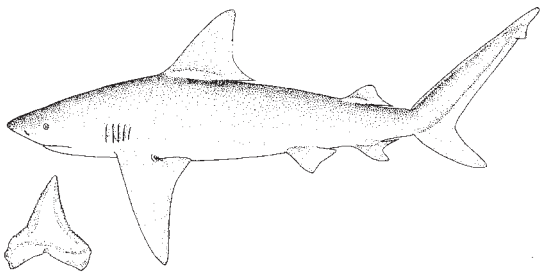


Fig. 44 ***Carcharhinus amboinensis***

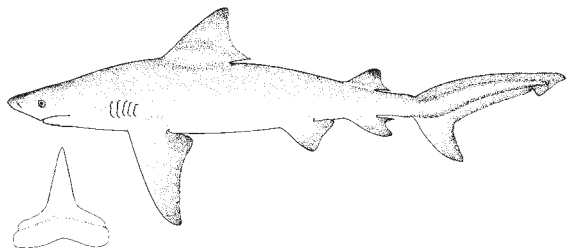


Fig. 45 ***Carcharhinus leucas***

31a. Origin of second dorsal fin well behind anal-fin origin, about opposite its midbase . . . . . → ***32***

31b. Origin of second dorsal fin about over anal-fin origin . . . . . → ***34***

32a. Upper anterolateral teeth with large mesial and distal cusplets and no serrations; inner margin of first dorsal fin extremely long, about 2/3 of fin base; rostrum expanded as a hypercalcified, hardened mass, easily detected by pinching or cutting into the snout (Fig. 46) . . . . . ***Carcharhinus macloti***

32b. Upper anterolateral teeth with distal cusplets and serrations; inner margin of first dorsal fin shorter, 1/2 fin base or less; rostrum not hypercalcified . . . . . → ***33***

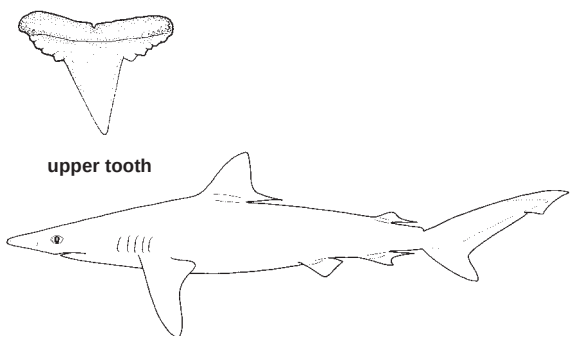


Fig. 46 ***Carcharhinus macloti***

33a. Hyomandibular pores conspicuously enlarged alongside mouth corners; anteroposterior teeth 11-12/11-12; second dorsal fin lower, height 2.2 to 2.5 times in inner margin (Fig. 47) . . . . . ***Carcharhinus borneensis***

33b. Hyomandibular pores not enlarged alongside mouth corners; anteroposterior teeth 13-15/13-14; second dorsal fin higher, height 1.5 to 1.9 times in inner margin (Fig. 48) . . . . . ***Carcharhinus* sp. (= "*Carcharhinus porosus*")**

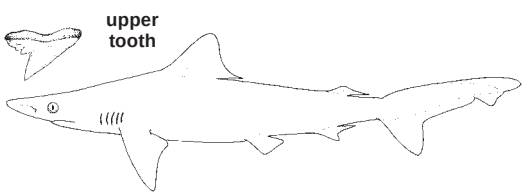


Fig. 47 ***Carcharhinus borneensis***

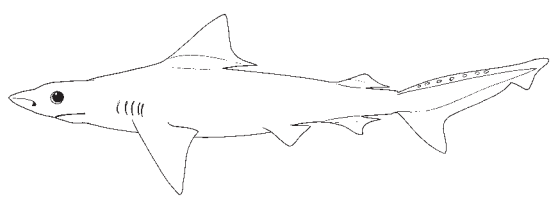


Fig. 48 ***Carcharhinus* sp.**

34a. Upper anterolateral teeth with semioblique cusps and strong cusplets; gill slits shorter, longest 3% of total length; pectoral fins rather broad and triangular, their lengths 1.5 in anterior margin length; fins not black-tipped (Fig. 49). . . . . ***Carcharhinus fitzroyensis***

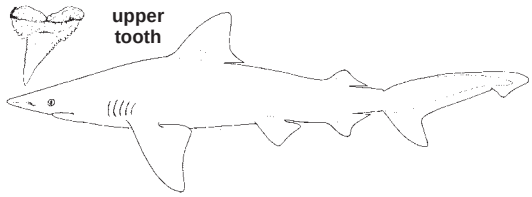


Fig. 49 ***Carcharhinus fitzroyensis***

34b. Upper anterolateral teeth with erect or nearly erect cusps and no cusplets (Fig. 50); gill slits longer, longest usually at least 4% of total length; pectoral fins narrower and falcate, their lengths 1.8 or more in anterior margin length; fins often black-tipped . . . . . → ***35***

35a. Upper labial furrows noticeably elongated and prominent; usually at least 16 rows of upper anteroposterior teeth; first dorsal fin lower, its height over 2.2 times in the interdorsal space; first dorsal-fin origin over or just behind rear tips of pectoral fins (Fig. 51). . . . . ***Carcharhinus brevipinna***

35b. Upper labial furrows shorter and less noticeable; usually 15 or fewer rows of upper anteroposterior teeth; first dorsal fin higher, its height 2.2 times or less in interdorsal space; first dorsal-fin origin over or just behind insertions of pectoral fins . . . . . → ***36***

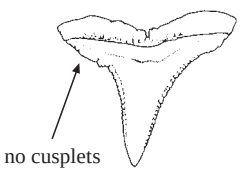
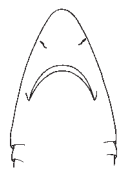


Fig. 50 upper tooth



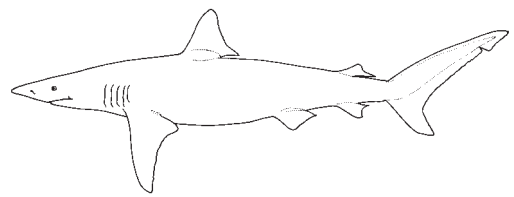
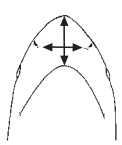


Fig. 51 ***Carcharhinus brevipinna***

36a. Snout rather short and wedge-shaped, internarial space 1 to 1.2 times in preoral snout; second dorsal height 1 to 1.2 times in inner margin length; precaudal centra usually less than 82 (Fig. 52) . . . . . ***Carcharhinus amblyrhynchoides***

36b. Snout longer and pointed, internarial space 1.3 to 1.7 times in preoral snout (Fig. 53); second dorsal height 1.1 to 1.6 times in inner margin length; precaudal centra usually more than 83 . . . . . → ***37***



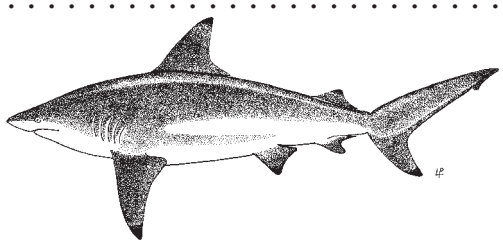


Fig. 52 ***Carcharhinus amblyrhynchoides***

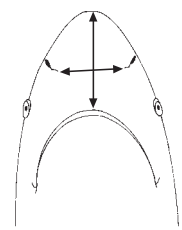


Fig. 53 ventral view of head

37a. Precaudal centra 94 to 102 (Fig. 54) . . . . . ***Carcharhinus limbatus***

37b. Precaudal centra 84 to 91 (Fig. 55). . . . . ***Carcharhinus tilstoni***

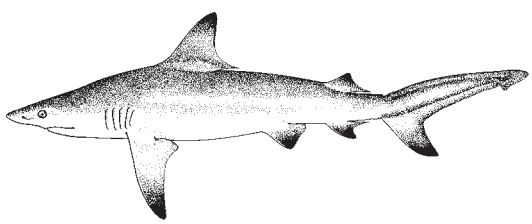


Fig. 54 ***Carcharhinus limbatus***

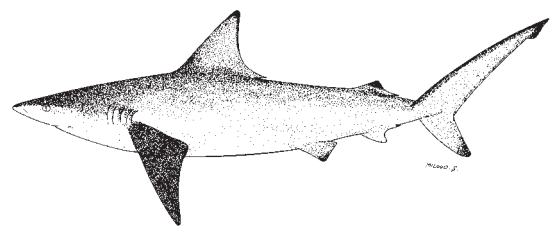


Fig. 55 ***Carcharhinus tilstoni***

List of species occurring in the area

The symbol is given when species accounts are included.

- *Carcharhinus albimarginatus* (Rüppell, 1837)
- *Carcharhinus altimus* (Springer, 1950)
- *Carcharhinus amblyrhynchoides* (Whitley, 1934)
- *Carcharhinus amblyrhynchos* (Bleeker, 1856)
- *Carcharhinus amboinensis* (Müller and Henle, 1839)
- *Carcharhinus borneensis* (Bleeker, 1859)
- *Carcharhinus brachyurus* (Günther, 1870)
- *Carcharhinus brevipinna* (Müller and Henle, 1839)
- *Carcharhinus cautus* (Whitley, 1945)
- *Carcharhinus dussumieri* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus falciformis* (Bibron in Müller and Henle, 1839).
- *Carcharhinus fitzroyensis* (Whitley, 1943)
- *Carcharhinus galapagensis* (Snodgrass and Heller, 1905)
- *Carcharhinus hemiodon* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus leucas* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus limbatus* (Valenciennes in Müller and Henle, 1839
- *Carcharhinus longimanus* (Poey, 1861)
- *Carcharhinus macloti* (Müller and Henle, 1839)
- *Carcharhinus melanopterus* (Quoy and Gaimard, 1824)
- *Carcharhinus obscurus* (LeSueur, 1818)
- *Carcharhinus plumbeus* (Nardo, 1827)
- *Carcharhinus sealei* (Pietschmann, 1916)
- *Carcharhinus sorrah* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus tilstoni* (Whitley, 1950)
- *Carcharhinus* sp. [Compagno, 1988] (= "*Carcharhinus porosus*" of Garrick, 1982 for western Pacific specimens)
- *Galeocerdo cuvier* (Peron and LeSueur in LeSueur, 1822)
- *Glyphis* sp. A [Last and Stevens, 1994] (Queensland)
- *Glyphis* sp. B [Compagno] (Borneo)
- *Glyphis* sp. C [Compagno] (New Guinea, Australia)
- *Lamiopsis temmincki* (Müller and Henle, 1839)
- *Loxodon macrorhinus* Müller and Henle, 1839
- *Negaprion acutidens* (Rüppell, 1837)
- *Prionace glauca* (Linnaeus, 1758)
- *Rhizoprionodon acutus* (Rüppell, 1837)
- *Rhizoprionodon oligolinx* Springer, 1964
- *Rhizoprionodon taylori* (Ogilby, 1915)
- *Scoliodon laticaudus* Müller and Henle, 1838
- *Triaenodon obesus* (Rüppell, 1837)

References

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Garrick, J.A.F. 1982. Sharks of the genus *Carcharhinus*. *NOAA Tech. Rep. NMFS Circ.*, (445)8:194 p.

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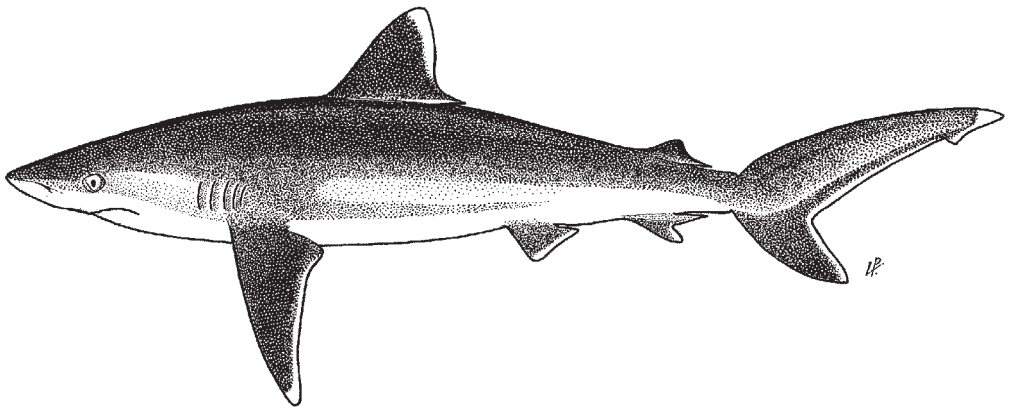
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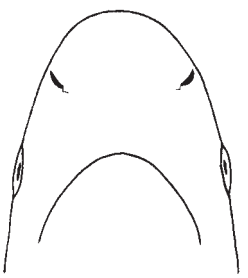
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Carcharhinus albimarginatus (Rüppell, 1837)

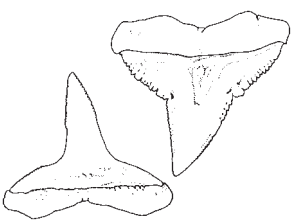
Frequent synonyms / misidentifications: None / *Carcharhinus longimanus* (Poey, 1861); *Triaenodon obesus* (Rüppell, 1837).

FAO names: En - Silvertip shark; **Fr** - Requin pointe blanche; **Sp** - Tiburón de puntas blancas.





ventral view of head



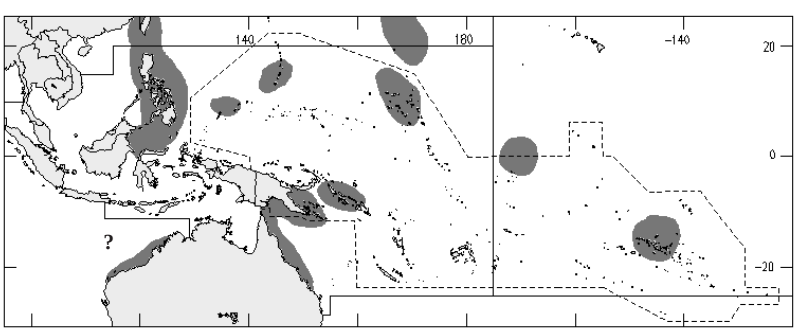
upper and lower tooth near centre

Diagnostic characters: A large, slender to moderately stout shark. **Snout moderately long and broadly parabolic**, its length subequal to or slightly shorter than mouth width and equal to or greater than internasal space; labial furrows very short; anterior nasal flaps very low; spiracles absent; teeth with serrated edges, **upper teeth broadly triangular and erect at front of mouth**, progressively oblique posteriorly, without conspicuous cusplets; teeth in lower jaw erect and stout-cusped, serrated. First dorsal fin moderately high, with a narrowly rounded apex, its origin over inner margins of pectoral fins; **second dorsal fin moderately high**, its origin about opposite that of anal fin, its inner margin less than twice its height, and its posterior margin nearly straight; pectoral fins long and slightly falcate, with narrow, pointed tips. **Interdorsal ridge present. Colour:** dorsal surface dark grey or grey-brown, ventral surface white; **all fins have conspicuous white tips and posterior margins.**

Size: Maximum total length about 3 m; adults mature at 1.6 to 1.99 m; size at birth about 63 to 68 cm.

Habitat, biology, and fisheries: A continental and insular species occurring from the surface to a depth of 800 m, close inshore in lagoons and near island dropoffs or well offshore, but not oceanic. Viviparous, number of embryos 1 to 11. Feeds on both bottom and pelagic fish, including rays and octopi. Can be aggressive to divers and is potentially dangerous. Specific information on fisheries for this species is lacking, but it is presumably taken in areas where it occurs. Probably used fresh and dried-salted for human consumption.

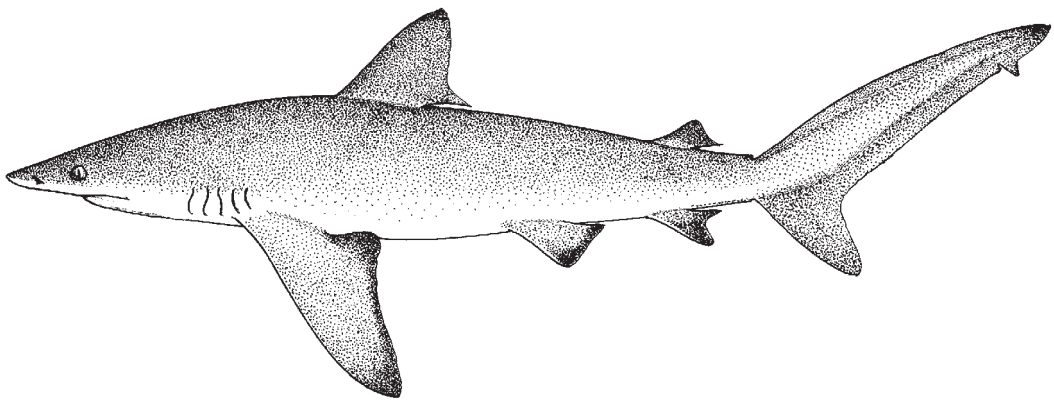
Distribution: In the western Indian Ocean recorded from East Africa, Madagascar and the Red Sea; in the western Pacific off southern Japan, from Taiwan Province of China southwards to Indonesia, and off northern Australia, eastern New Guinea and the Solomon Islands; also known from the eastern Central Pacific.

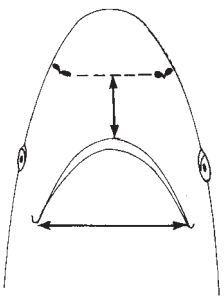


Carcharhinus altimus (Springer, 1950)

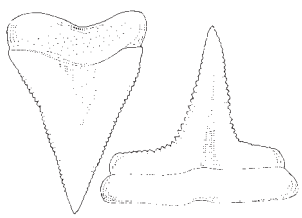
Frequent synonyms / misidentifications: *Carcharhinus radamae* Fourmanoir, 1961 / *Carcharhinus albimarginatus* (Rüppell, 1837); *C. galapagensis* (Snodgrass and Heller, 1905); *C. obscurus* (Lesueur, 1818).

FAO names: En - Bignose shark; **Fr** - Requin babosse (= Réquiem babosse, Area 31); **Sp** - Tiburón baboso.





ventral view of head



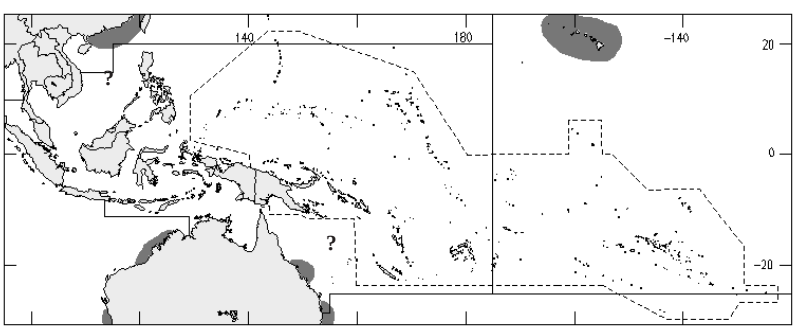
upper and lower tooth near centre

Diagnostic characters: Body slender. **Snout rounded and moderately long,** its length about equal to, or greater than, mouth width, and greater than internasal space; labial furrows very short; **anterior nasal flaps expanded as low, broadly triangular lobes**; spiracles absent; teeth with serrated edges, **upper teeth broadly triangular and erect in front of mouth,** with very high cusps, progressively oblique posteriorly; teeth in lower jaw erect and narrow-cusped. **First dorsal fin moderately high with a narrowly rounded apex, its origin over inner margins of pectoral fins**; second dorsal fin high, its origin about opposite that of anal fin, its inner margin less than 1.5 times the fin-height; **pectoral fins long and not strongly falcate,** broad-tipped but with angular apices. **A high interdorsal ridge present. Colour:** back greyish; belly whitish; inner corners of pectoral fins blackish.

Size: Maximum total length to about 3 m; commonly to 2.4 m; size at birth probably 70 to 90 cm.

Habitat, biology, and fisheries: Usually found in the edges of the continental shelves and uppermost slopes near the bottom, ranging from a depth of 30 to 430 m, but commonly between 80 and 220 m; rare in shallow waters. Viviparous. Bottom-dwelling; feeds chiefly on fishes and cephalopods. Apparently taken on deep-set longlines, also in bottom trawls and probably on hook-and-line and with gill nets. Utilized for fishmeal, liver oil, and shagreen.

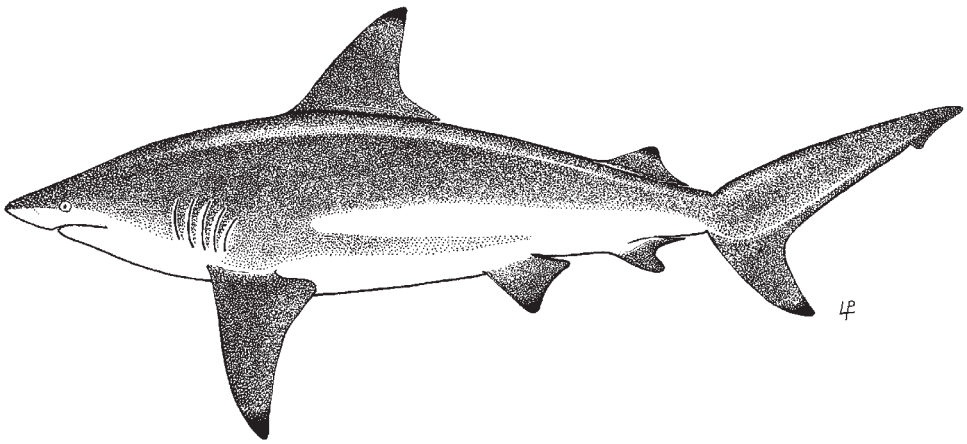
Distribution: Circumglobal, with patchy records in tropical and warm seas.

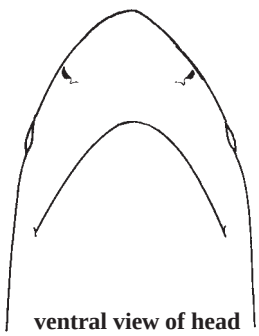


Carcharhinus amblyrhynchoides (Whitley, 1934)

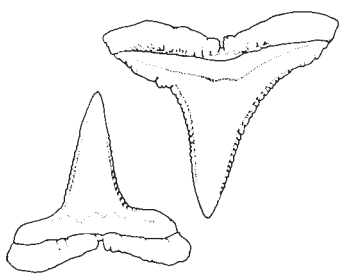
Frequent synonyms / misidentifications: *Carcharhinus pleurotaenia* (Bleeker, 1852) / *Carcharhinus limbatus* (Valenciennes in Müller and Henle, 1839), *C. brevipinna* (Müller and Henle, 1839).

FAO names: En - Graceful shark; **Fr** - Requin gracile; **Sp** - Tiburón grácil.





ventral view of head



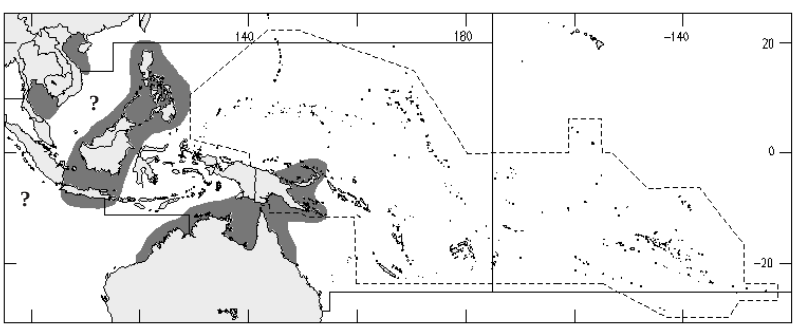
upper and lower tooth near centre

Diagnostic characters: A medium-sized stout shark. **Snout pointed but short, its length less than mouth width, 1.0 to 1.2 times internasal space**; labial furrows very short; anterior nasal flaps very low; no spiracles; upper and lower teeth with serrated edges, including cusps, **upper teeth with narrow** cusps, and no prominent cusplets, not broadly triangular, **cusps of upper anterior teeth erect,** laterals erect to oblique; lower teeth erect and narrow-cusped. **First dorsal fin moderately high,** with an angular or narrowly rounded apex and short inner margin, its origin over inner margins of pectoral fins; origin of second dorsal fin about opposite anal-fin origin; **second dorsal fin moderately high**, its inner margin less than twice its height, its posterior margin concave; pectoral fins moderately long and falcate, with narrow, pointed tips. **No dermal ridge** between dorsal fins. **Colour:** grey or grey-brown on dorsal surface, white or cream below, with a conspicuous band of white on sides from pelvic fins to first dorsal fin; **pectoral, dorsal, and pelvic fins, and ventral lobe of caudal fin black or dusky-tipped**, sometimes inconspicuously so.

Size: Maximum total length about 1.8 m; size at birth about 52 to 55 cm.

Habitat, biology, and fisheries: A poorly known, inshore, coastal pelagic species. Viviparous. Feeds mainly on fish, also crustaceans and cephalopods. Taken on longlines and drifting gill nets; in the area it is caught in the Gulf of Thailand, northern Australia and probably elsewhere where it occurs. Utilized fresh and dried salted for human consumption; fins used in the oriental sharkfin trade; liver oil is processed for vitamins.

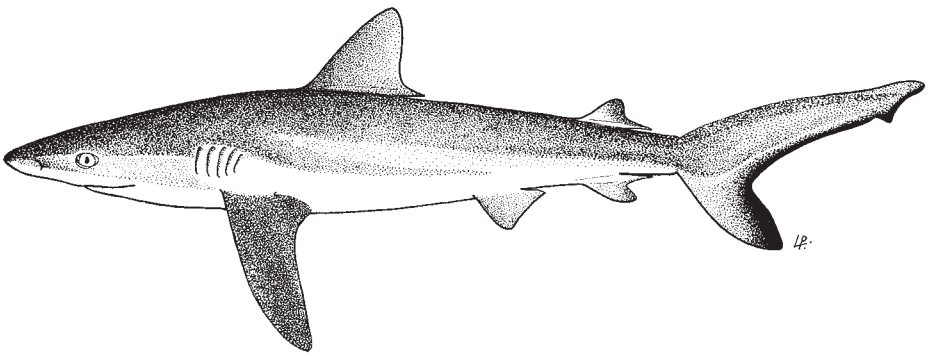
Distribution: In the western Indian Ocean from the Gulf of Aden, southern India and Sri Lanka, in the western Pacific from Viet Nam, Thailand, the Philippines, Java, Borneo, Australia, and New Guinea.

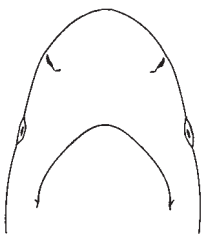


Carcharhinus amblyrhynchos (Bleeker, 1856)

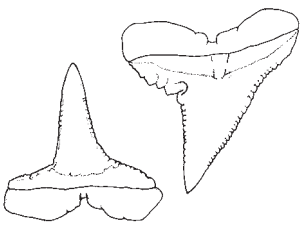
Frequent synonyms / misidentifications: *Carcharhinus menisorrah* (Valenciennes in Müller and Henle, 1839); ? *Carcharhinus wheeleri* Garrick, 1982 / None.

FAO names: En - Grey reef shark; **Fr** - Requin dagsit; **Sp** - Tiburón de arrecifes.





ventral view of head



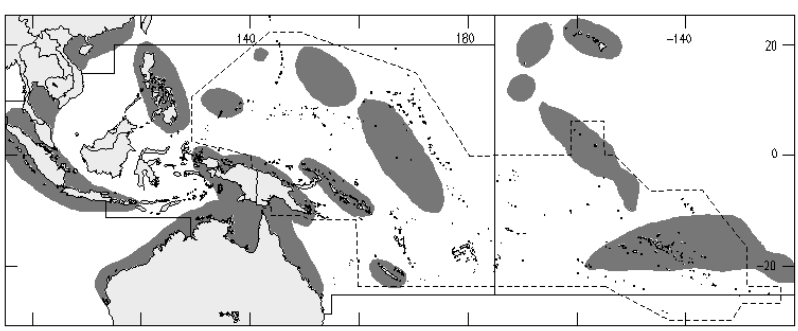
upper and lower tooth near centre

Diagnostic characters: A medium-sized shark. Body rather stout. **Snout broadly rounded,** its length less than mouth width, equal to or somewhat greater than internasal space; labial furrows very short; **anterior nasal flaps very low,** no spiracles; teeth with serrated edges but with cusplets low or absent on upper teeth, always absent on lowers; **upper teeth narrowly triangular, high, moderately narrow and erect-cusped in front of mouth**, **progressively oblique posteriorly**; teeth in lower jaw mostly erect and narrow-cusped. First dorsal fin moderately high and with narrowly rounded apex, its origin over inner margins of pectoral fins; origin of second dorsal fin about opposite anal-fin origin; second dorsal fin moderately high, its inner margin less than 1.5 times the fin height and its posterior margin deeply notched; pectoral fins long and not strongly falcate, with narrow, angular apices. **A weak interdorsal ridge present between dorsal fins, or no ridge. Colour:** dark grey or bronze-grey above, white below; **caudal fin with a conspicuous wide black posterior margin**; undersides of pectoral and pelvic fins with black tips and posterior margins, but fins otherwise not conspicuously black, or white-tipped except for white-tipped first dorsal fin in some individuals.

Size: Maximum total length about 2.55 m; commonly to 1.8 m; size at birth about 50 to 60 cm

Habitat, biology, and fisheries: An inshore shark, most common over coral reefs, often near the bottom. Viviparous, number of young per litter 1 to 6. A bottom-feeding shark, eating small reef fishes and octopuses. Aggressive, particularly when attracted by spearfishing or when cornered by divers: when provoked, gives an exaggerated swimming display, with back arched and pectoral fins thrust downward, followed by a swift attack and bite if the provocation continues. Several divers have been bitten by this shark in the western Pacific, none fatally, and even small diver-operated submarines have been attacked. Fished in Thailand and elsewhere mainly for the flesh and fins.

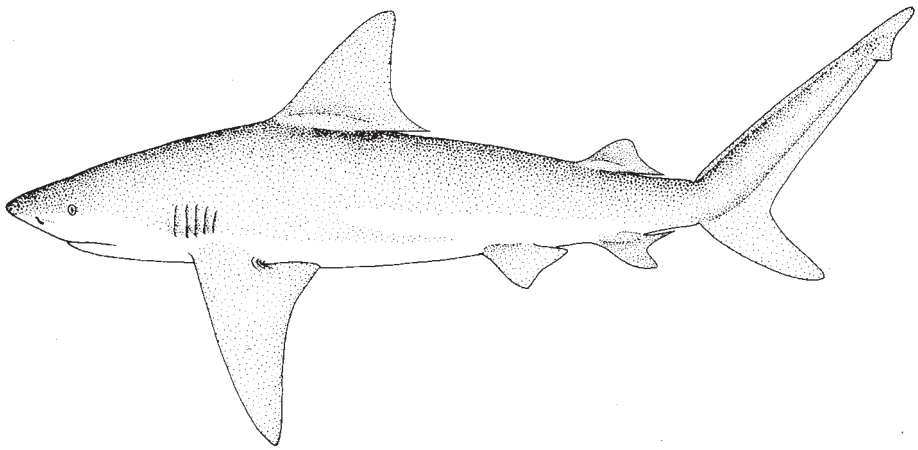
Distribution: Known from Madagascar and the Mauritius-Seychelles area, possibly also from India; also Red Sea to South Africa if *Carcharhinus wheeleri* is synonymized with this species; in the western Central Pacific from Sumatra eastward to the Philippines, Australia, New Guinea, Hawaii, and the Tuamotu Archipelago.

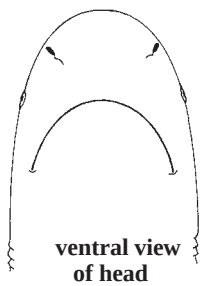


Carcharhinus amboinensis (Müller and Henle, 1839)

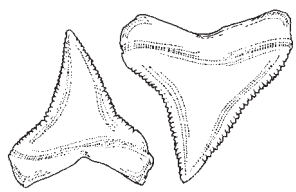
Frequent synonyms / misidentifications: *Triaenodon obtusus* Day, 1878 / *Carcharhinus leucas* (Valenciennes in Müller and Henle, 1839); *Glyphis gangeticus* (Müller and Henle, 1839).

FAO names: En - Pigeye shark; **Fr** - Requin balestrine; **Sp** - Tiburón baleta.





ventral view of head

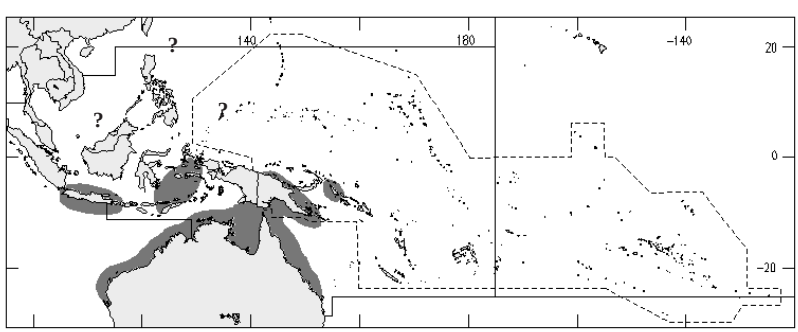


upper and lower tooth near centre

Diagnostic characters: A medium to large, stout-bodied shark. Snout extremely short (usually shorter than distance between nostrils, and much shorter than mouth width), very broadly rounded; labial furrows very short; spiracles absent; nostrils with a low, broadly triangular anterior nasal flap; **teeth in upper jaw triangular, with broad, heavy, serrated cusps,** their outer edges nearly straight in anterior teeth but becoming increasingly concave in lateral teeth; cusps of lower teeth heavy, erect to slightly oblique with serrated edges, their bases strongly arched. **First dorsal fin very high** (its height 3.2 or more times that of second dorsal fin) with a pointed or slightly rounded apex, its origin a little in advance of insertions of pectoral fins; **second dorsal fin low,** with its inner margin about equal to fin height, its posterior margin nearly straight, and its origin slightly in front of anal fin; pectoral fins large, broad, with narrow, pointed tips. **No dermal ridge between dorsal fins**. **Colour:** grey above, light below, tips of fins darker in young, fading in adults.

Size: Maximum total length about 2.8 m, maturing at about 2.1 to 2.2 m; size at birth between about 43 to 53 cm length.

Habitat, biology, and fisheries: An inshore as well as offshore continental species occurring from the surfline to a depth of 150 m. Found in shallow bays and estuaries as well as off open coast but apparently not ascending rivers like *Carcharhinus leucas* or *Glyphis* spp. Viviparous, number of young 3 to 13 per litter. Feeds on a wide variety of demersal and pelagic bony fishes (which are its most important prey), sharks and rays, squid, cuttlefish and octopuses, and lobsters and shrimp. Uncommonly scavenges prey and rarely feeds on marine mammals. Potentially dangerous to people, but not recorded in shark attacks to date and perhaps less inclined to attack people than *C. leucas* because of its narrower prey spectrum. Caught on longlines and in gill nets and utilized fresh and dried-salted.

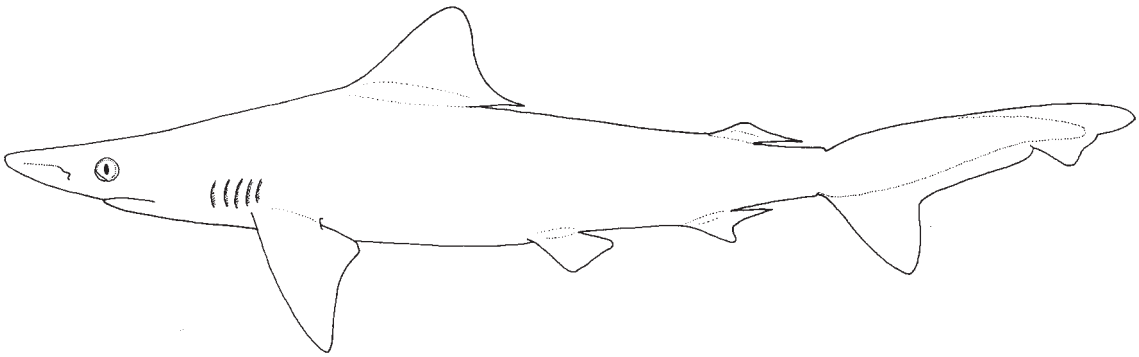


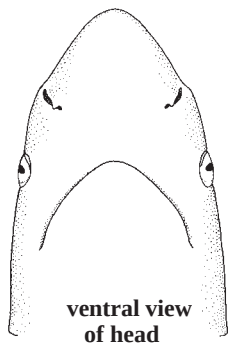
Distribution: Known from off South Africa, Madagascar, the Gulf of Aden, Pakistan, and Sri Lanka; elsewhere from the eastern Atlantic (Nigeria) and western South Pacific.

Carcharhinus borneensis (Bleeker, 1859)

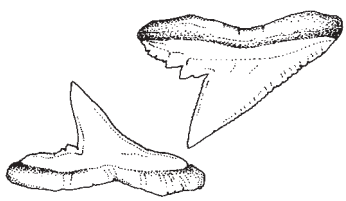
Frequent synonyms / misidentifications: None / None.

FAO names: En - Borneo shark; **Fr** - Requin-tigre houareau; **Sp** - Tiburón de Borneo.





ventral view of head



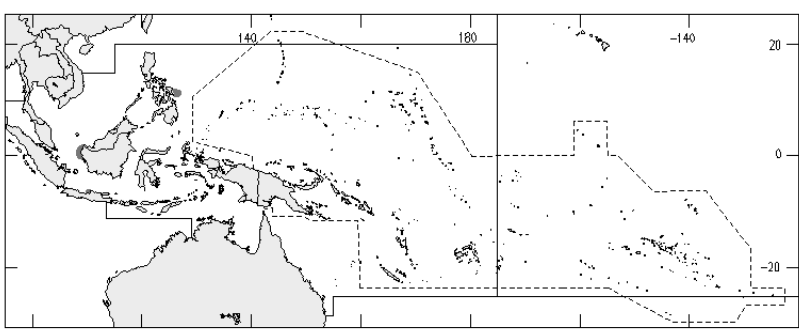
upper and lower tooth

Diagnostic characters: A small shark. Body relatively slender. **Snout very long and pointed**, its length greater than mouth width and distance between nostrils; labial furrows very short; anterior nasal flaps high and narrow, nipple-shaped; spiracles absent; **teeth with serrated edges, those in upper jaw with narrow, oblique cusps and large cusplets on each side of cusp;** teeth in lower jaw with erect to oblique, narrow serrated cusps, weak cusplets or large serrations and transverse roots. First dorsal fin moderately large, with a blunty pointed apex, its **inner margin moderately long, the free rear tip attenuated,** and its origin slightly anterior inner margins of pectoral fins; **second dorsal fin very low, the inner margin over twice the fin height,** fin origin over or slightly behind midbase of anal fin, pectoral fins relatively short, with narrowly rounded or angular tips. **No dermal ridge between dorsal fins**. **Colour:** brown above, white below, tip of first dorsal fin and dorsal caudal-fin margin dusky, paired fins and anal fin with light edges, but markings not conspicuous.

Size: Maximum total length about 70 cm.

Habitat, biology, and fisheries: A rare coastal, inshore, tropical shark, with biology virtually unknown. Apparently rare, but undoubtedly taken in local fisheries.

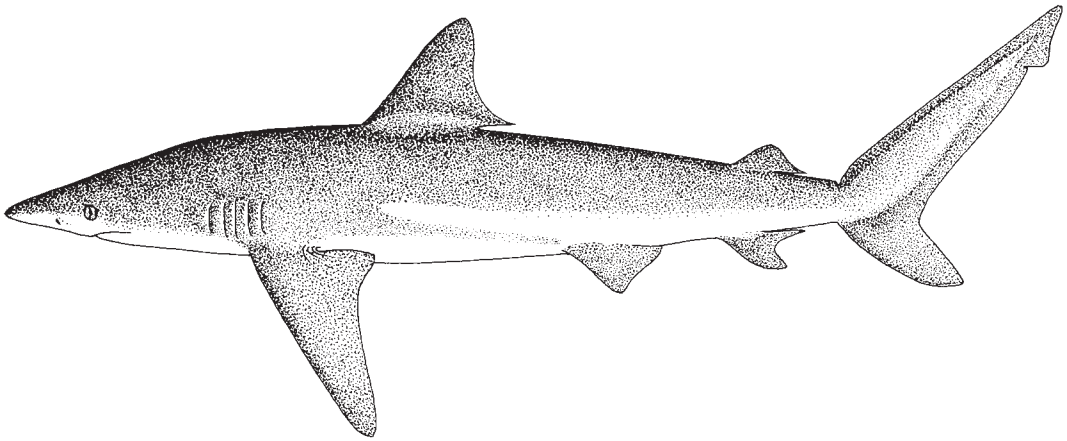
Distribution: Recorded in the Indo-West Pacific from China, Borneo, and possibly from Java and the Philippines.

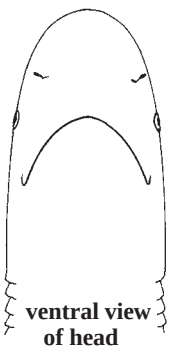


Carcharhinus brachyurus (Günther, 1870)

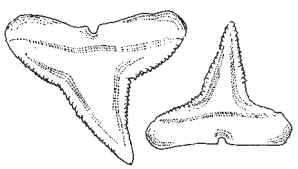
Frequent synonyms / misidentifications: *Carcharhinus remotus* (Dumeril, 1865) / None.

FAO names: En - Copper shark; **Fr** - Requin cuivre; **Sp** - Tiburón cobrizo.





ventral view of head



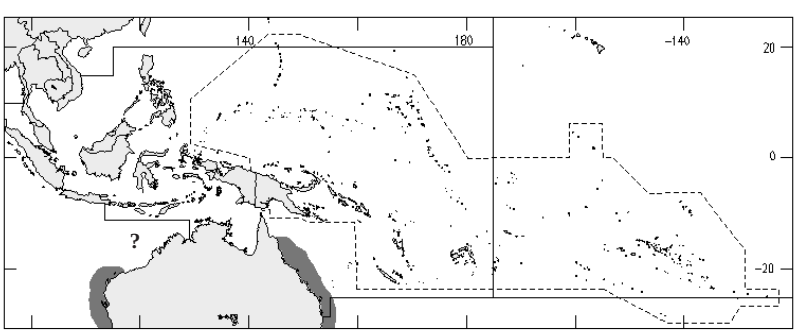
upper and lower lateral teeth

Diagnostic characters: A large shark. Body slender to moderately stout. Snout rounded or broadly angular, its length about equal to, or somewhat smaller than width of mouth, **but greater than internasal space**; labial furrows short; anterior nasal flaps very short to rudimentary; **upper teeth with narrow, mostly oblique, somewhat flexed cusps, well delimited from the tooth bases** and finely serrated; lower teeth with moderately high, narrow, erect to semioblique, weakly serrated, cusps; **gill slits relatively short.** First dorsal fin moderately high, with a nearly straight anterior margin and a narrowly rounded or pointed apex, its origin over inner margins of pectoral fins; second dorsal fin moderately high, with a slightly concave posterior margin and an inner margin much shorter than half the height of fin; its origin over that of anal fin; pectoral fins not strongly falcate, apically pointed. Usually no interdorsal ridge (occasionally a weak ridge present). **Colour:** dark brownish grey above, white below; fins mostly plain, except for dusky tips on pelvic fins, as well as dusky to black tips and rear edges on pectoral fins.

Size: Maximum total length about 2.9 m; matures at between 2 to 2.5 m, with females somewhat larger than males; size at birth about 60 to 70 cm.

Habitat, biology, and fisheries: A coastal and offshore shark, preferring temperate to tropical waters. Viviparous, number of fetuses 13 to 20. Feeds on bottom-dwelling bony fishes, including gurnards, flatfishes, hakes, puffers, sea catfishes, jacks, and mullets; also on rays, small sharks, squids, and cuttlefishes. Dangerous or potentially dangerous to man, known to have been implicated in shark attacks on people in other areas. Little is recorded on the use of this species, but it is undoubtedly caught and used for human consumption. It is taken in bottom trawls, by line gear, and by sports anglers.

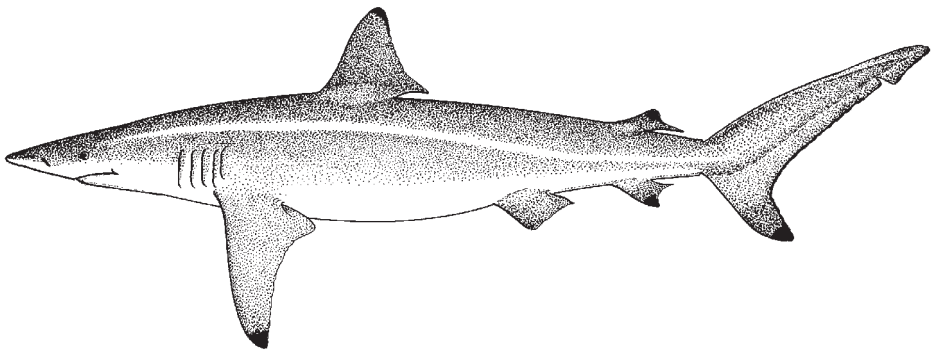
Distribution: Nearly circumglobal in temperate, subtropical and some tropical seas (California, South America, West and South Africa, the Mediterranean, Japan, China, New Zealand, Australia).

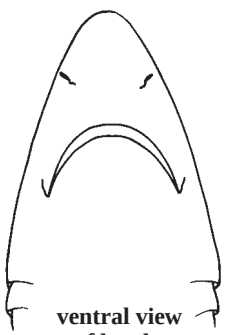


Carcharhinus brevipinna (Müller and Henle, 1839)

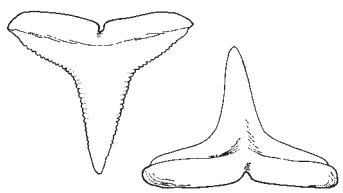
Frequent synonyms / misidentifications: *Aprionodon brevipinna* (Müller and Henle, 1839); *Carcharhinus johnsoni* Smith, 1951 / *Carcharhinus limbatus* (Valenciennes in Müller and Henle, 1839); *C. amblyrhynchoides* (Whitley, 1934).

FAO names: En - Spinner shark; **Fr** - Requin tisserand (= Requiem tisserand, Area 31); **Sp** - Tiburón aleta negra.





ventral view of head



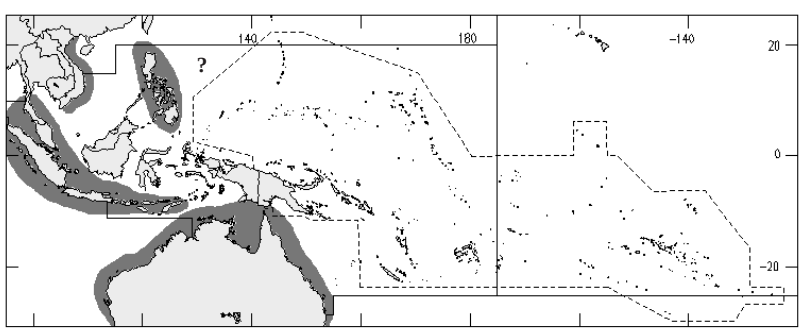
upper and lower tooth near centre

Diagnostic characters: A slender-bodied medium to large-sized shark. **Snout pointed and long**, its length equal to or greater than mouth width and greater than internasal space; **labial folds short, but usually the upper pair longer and more prominent** than in other *Carcharhinus* species from the area; anterior nasal flaps rudimentary, very low; **upper and lower teeth nearly symmetrical and very similar,** with mostly erect, very narrow cusps; uppers with entirely or partly serrated edges, **lowers smooth**; **gill slits relatively long.** First dorsal fin with a narrowly rounded apex, **its origin above or slightly behind free rear tips of pectoral fins;** second dorsal fin high, its inner margin less than twice the height of fin, its origin about over that of anal fin; pectoral fins falcate and with pointed tips. **No dermal ridge between dorsal fins. Colour:** grey on back, white below, **with a conspicuous white band on sides;** second dorsal, anal, undersides of **pectorals and lower caudal-fin lobe black or dark grey-tipped in subadults and adults**, but unmarked or nearly so in small individuals (below 1 m).

Size: Maximum total length about 2.8 m (mature adults); commonly to 2.5 m; size at birth about 60 to 80 cm.

Habitat, biology, and fisheries: An active, fast-swimming shark, often making vertical spinning leaps out of the water, as a feeding technique in which the shark spins through a school of small fish with open mouth and then breaks the surface. Viviparous, number of embryos about 6 to 15. Feeds mostly on small schooling fishes, also squid, small sharks, and rays. Caught with drifting gill nets and longlines. Utilized fresh and dried salted for human consumption, fins probably used in the oriental sharkfin trade, and livers for vitamin oil production.

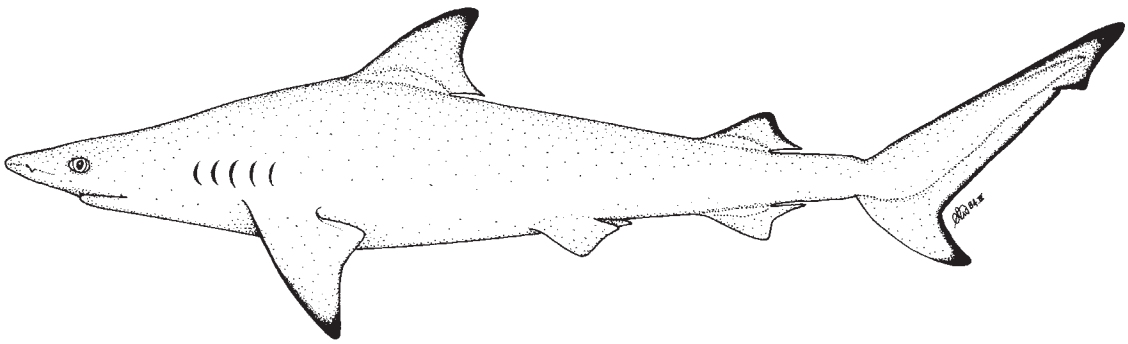
Distribution: Known in the western Indian Ocean from South Africa to Madagascar and the Mauritius-Seychelles area, the Red Sea, Gulf of Oman, and southern India; in the western Pacific from southern Japan, Viet Nam, Indonesia, Australia, and possibly the Philippines; also found in the eastern Atlantic and the Mediterranean, but apparently absent from the eastern Pacific.

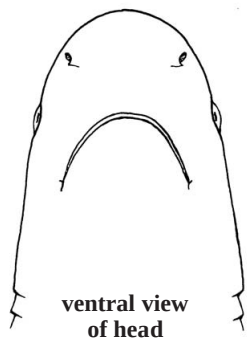


Carcharhinus cautus (Whitley, 1945)

Frequent synonyms / misidentifications: None / *Carcharhinus melanopterus* (Quoy and Gaimard, 1824).

FAO Names: En - Nervous shark; **Fr** - Requin nerveux; **Sp** - Tiburón nervioso.





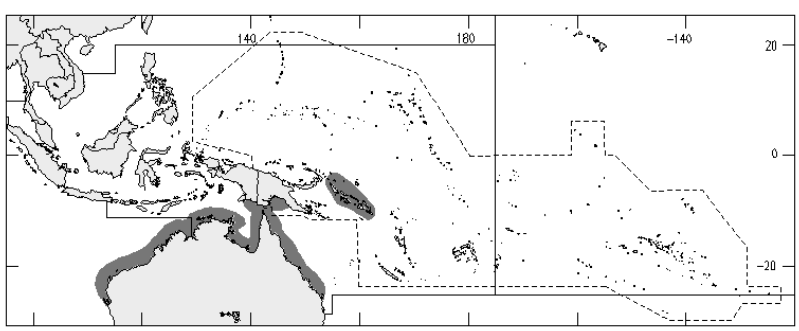
ventral view of head

Diagnostic characters: A small to medium-sized shark. Body moderately stout. Snout very short and broadly rounded, its length less than mouth width and about equal to distance between nostrils; labial furrows very short; anterior nasal flaps with a stout, broad lobe; spiracles absent; teeth with serrated edges, **those in upper jaw with narrow semioblique to oblique cusps and low basal cusplets**; teeth in lower jaw with erect or semierect narrow cusps and serrated edges. First dorsal fin moderately large, with a narrowly rounded or pointed apex, its origin over inner margins of pectoral fins, its free rear tip short; **second dorsal fin high,** its inner margin much less than twice the fin height, its origin over or slightly anterior to anal-fin origin; pectoral fins moderately long, with narrowly rounded or pointed tips; rear tip of anal fin ending well in front of lower caudal-fin origin. **No dermal ridge between dorsal fins. Colour**: grey or light brown above, white below; dorsal, caudal and pectoral fins with black margins, expanded apically to black tips on caudal-fin lobes and pectoral fins; probably a conspicuous white band on flank.

Size: Maximum total length about 1.5 m, adult females 1.2 to 1.5 m; size at birth between 35 and 39 cm.

Habitat, biology, and fisheries: The nervous shark is a little-known South Pacific reef shark that may have a wider distribution. It apparently lives in shallow water on the continental and insular shelves, but may range in deeper water. Skittish and timid when approached by people, hence the vernacular name “nervous shark”. Presumably viviparous. Feeds on small fishes, including lizardfish and smelt-whiting (*Sillago*), and crabs. Probably harmless or minimally hazardous to people. Taken in small numbers in northern Australia for its meat.

Distribution: In the eastern Indian Ocean and western South Pacific off Australia (Queensland, western and northern Australia), Ugi and the Solomon Islands.

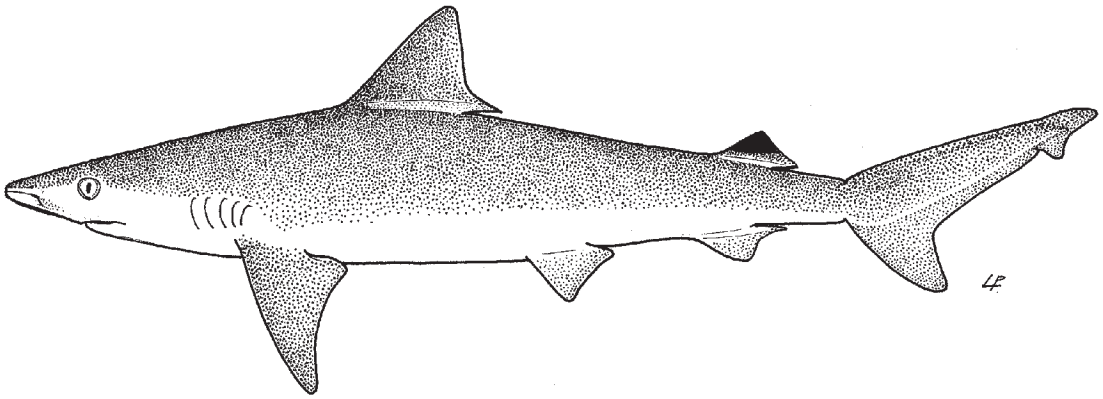


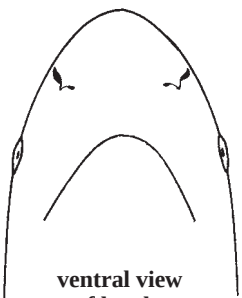
Remarks: This species is similar to the blacktip reef shark, *Carcharinus melanopterus*, but lacks the conspicuous highlighted black blotch on its first dorsal fin, and has lower vertebral counts.

Carcharhinus dussumieri (Valenciennes in Müller and Henle, 1839)

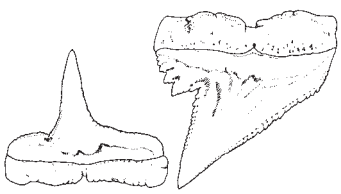
Frequent synonyms / misidentifications: *Carcharhinus menisorrah* (Valenciennes in Müller and Henle, 1839); *C. tjutjot* (Bleeker, 1852) / *Carcharhinus sealei* (Pietschmann, 1916).

FAO names: En - Whitecheek shark; **Fr** - Requin à joues blanches; **Sp** - Tiburón cariblanco.





ventral view of head



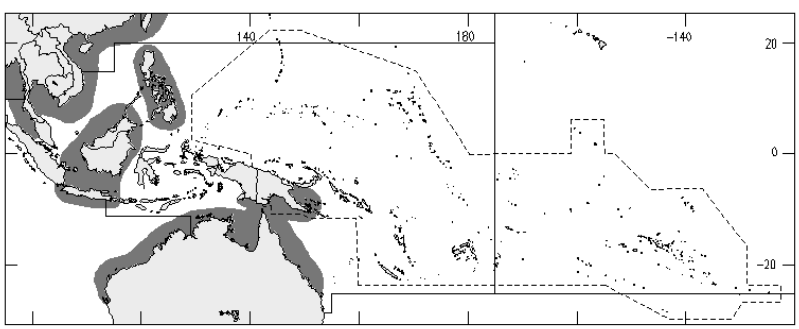
upper and lower tooth near centre

Diagnostic characters: A small shark. Body moderately stout. **Snout moderately long and broadly parabolic or wedge-shaped,** its length usually shorter than mouth width but subequal to the internasal space; labial furrows very short; anterior nasal flaps expanded; spiracles absent; gill slits short; teeth with serrated edges, **upper teeth with narrow-based, strongly oblique cusps and strong, serrated cusplets**; teeth in lower jaw erect to oblique, without cusplets, serrated and narrow-cusped; **first dorsal fin** moderately high, with an angular apex, posteroventrally sloping, straight posterior margin, and short inner margin, **not falcate**; origin of first dorsal fin over pectoral fin inner margins; origin of second dorsal fin about opposite that of anal fin; second dorsal fin high, its inner margin less than 1.5 times the fin height and its posterior margin concave; pectoral fins short and not strongly falcate, with narrow, angular apexes. An interdorsal ridge present or occasionally absent on back. **Colour:** back greyish or grey-brown, belly whitish; **a black spot on the second dorsal fin is the only conspicuous marking.**

Size: Maximum total length about 90 cm; size at birth about 35 to 40 cm.

Habitat, biology, and fisheries: A common, but little-known shark of the continental and insular inshore waters. Viviparous, number of young 1 to 4, usually 2. Feeds primarily on fish, also crustaceans and cephalopods; harmless to people. Caught with drifting gill nets and longlines in artisanal and smallscale industrial fisheries and is commonly marketed for its meat for human consumption.

Distribution: Occurs from the Persian Gulf eastward to Thailand, China, southern Japan, Java, Borneo, and probably New Guinea and northern Australia.

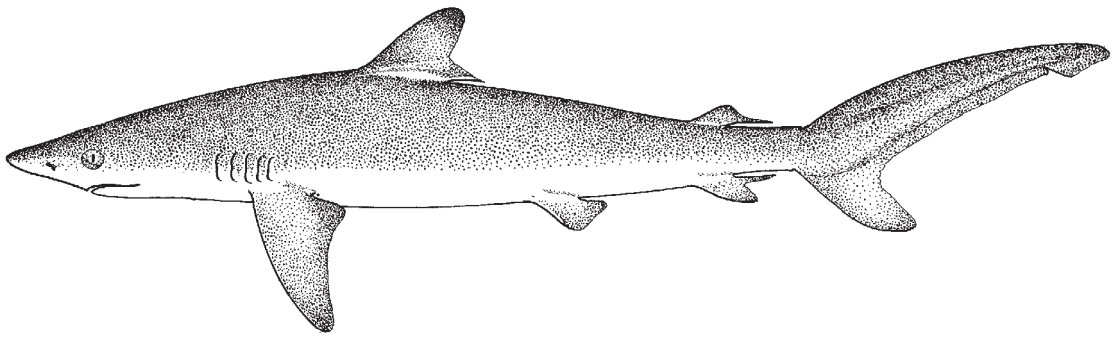


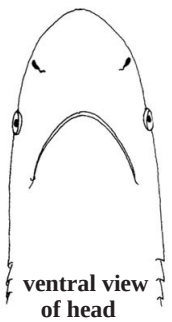
Remarks: This species is very similar to the blackspot shark, *Carcharhinus sealei* but has a triangular rather than falcate first dorsal fin, more numerous upper teeth, a broader mouth, broader pectoral fins, and less numerous vertebrae.

Carcharhinus falciformis (Bibron in Müller and Henle, 1839)

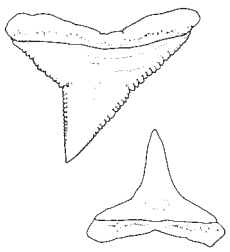
Frequent synonyms / misidentifications: None / None.

FAO names: En - Silky shark; **Fr** - Requin soyeux (= Réquiem soie, Area 31); **Sp** - Tiburón jaquetón.





ventral view of head



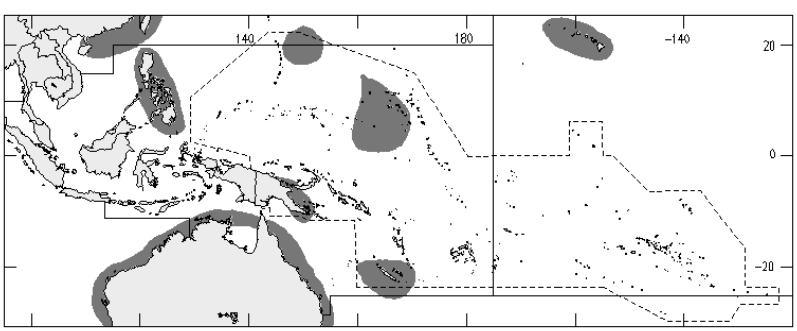
upper and lower tooth near centre

Diagnostic characters: A large shark, with an elongate and slender body. Snout narrowly rounded, moderately long, equal to or slightly shorter than mouth width, but longer than internasal space; labial furrows very short; anterior nasal flaps low, rudimentary; spiracles absent; **upper teeth with relatively narrow cusps well delimited from the heavy, serrated bases, their outer edges notched**; teeth in lower jaw erect, their edges only slightly serrated. First dorsal fin moderately high, its apex rounded, **its origin behind the free rear tips of pectoral fins**; second dorsal fin very low, its posterior lobe noticeably long and slender, **its inner margin twice the height of fin,** its origin about over that of anal fin; **pectoral fins long and falcate,** more so in adults than in young; **interdorsal ridge present. Colour:** back dark grey, greyish brown or bluish black (in life); belly greyish or white.

Size: Maximum total length 3.5 m; commonly to 2.5 m; size at birth 57 to 87 cm.

Habitat, biology, and fisheries: Inhabits oceanic waters near and beyond the continental slopes, but also found in coastal waters. Lives usually near the surface, but occurs sometimes at considerable depths (to 500 m). Viviparous, number of young 2 to 14 per litter. Feeds chiefly on fishes, including tunas, squids, and pelagic octopuses. Very quick in its movements, it often causes damage to the catch and gear in tuna fisheries. Reported to be dangerous to humans. This species is very commonly taken by pelagic longline fisheries, but is also taken in fixed bottom nets and probably also drifting gill nets. Its meat is used fresh or dried-salted for human consumption, its hide for leather, its fins for shark-fin soup, and its liver is extracted for oil, which has a high Vitamin A content.

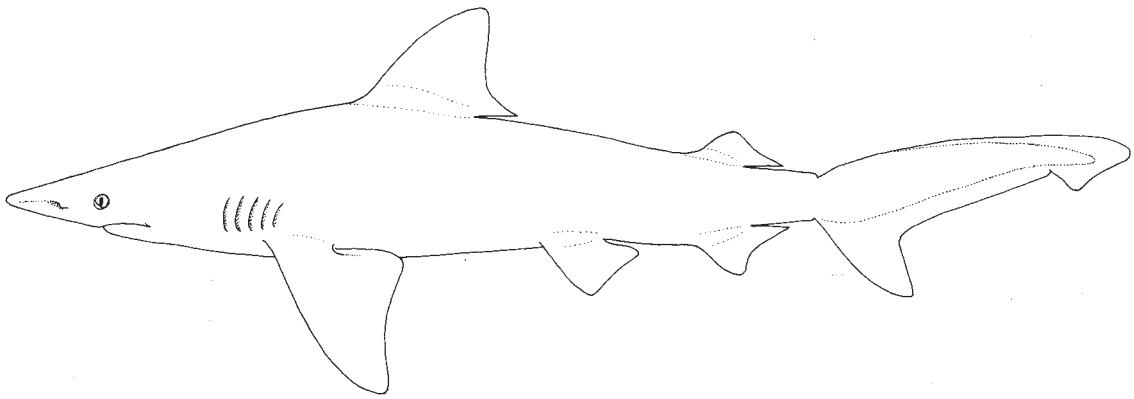
Distribution: Circumglobal in tropical and subtropical seas; in the western Atlantic from Massachusetts to southern Brazil, in the eastern Atlantic from Madeira to northern Angola, in the Indian Ocean off East Africa, Red Sea, Gulf of Oman and South India, widespread in the western Pacific (including Japan and New Zealand), and in the eastern Central Pacific from southern Baja California to Peru.

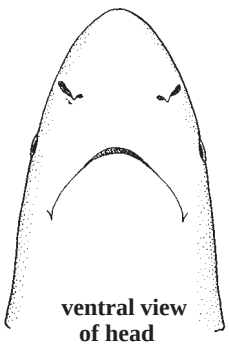


Carcharhinus fitzroyensis (Whitley, 1943)

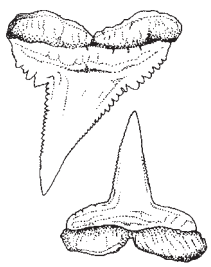
Frequent synonyms / misidentifications: None / None.

FAO names: En - Creek whaler; **Fr** - Requin baleinier; **Sp** - Tiburón ballenero.





ventral view of head



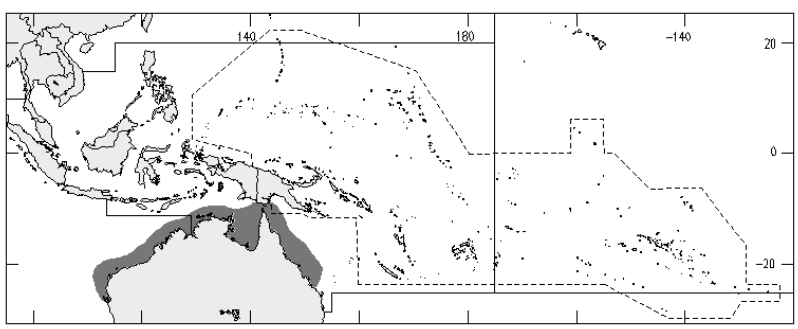
upper and lower tooth

Diagnostic characters: A small to medium-sized shark. Body moderately stout. **Snout long and parabolic**, its length greater than mouth width and distance between nostrils; labial furrows very short; anterior nasal flaps moderately low, nipple-shaped; spiracles absent; **teeth with serrated edges**, those in upper jaw with narrow, semierect and oblique high cusps**,** and crown feet with coarse serrations and small cusplets; teeth in lower jaw with erect, narrow, partly serrated cusps, and transverse roots. **First dorsal fin moderately large, with a pointed or narrowly rounded apex,** its inner margin short, and **its origin over or usually slightly anterior to inner margins of pectoral fins**; second dorsal fin large and high, the inner margin 1.5 times the fin height, fin origin about over anal-fin origin**, pectoral fins moderately large, broad and triangular**, with narrowly rounded apices. **No dermal ridge between dorsal fins**. **Colour:** bronze above, fading to greyish brown after death and in preserved specimens; light below, without conspicuous markings on fins; no conspicuous white band on flanks.

Size: Maximum total length about 1.35 m; matures at 80 to 90 cm; size at birth about 50 cm.

Habitat, biology, and fisheries: A little-known tropical shark of the Australian littoral, found inshore and offshore on the continental shelves from the intertidal to a depth of at least 40 m. Feeds primarily on teleost fishes, also on crustaceans. Taken in small numbers off northern Australia, and is used for human consumption.

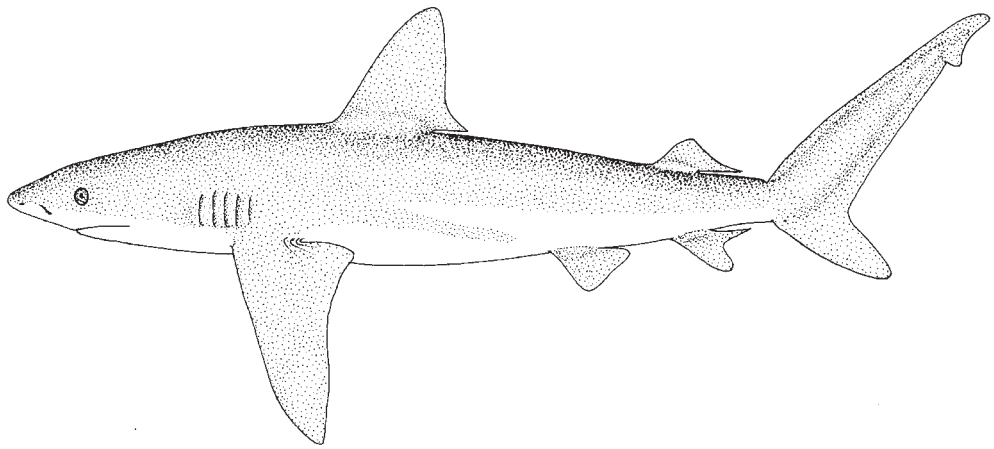
Distribution: Western Pacific off Australia (Queensland, northern and northwestern Australia).

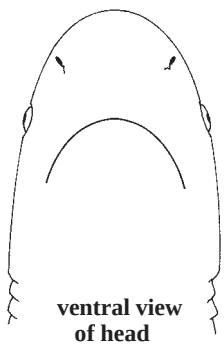


Carcharhinus galapagensis (Snodgrass and Heller, 1905)

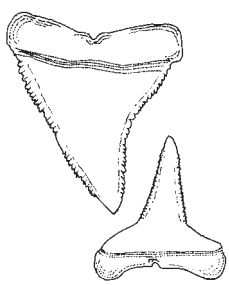
Frequent synonyms / misidentifications: None / None.

FAO names: En - Galapagos shark; **Fr** - Requin de Galapagos; **Sp** - Tiburón de Galápagos.





ventral view of head



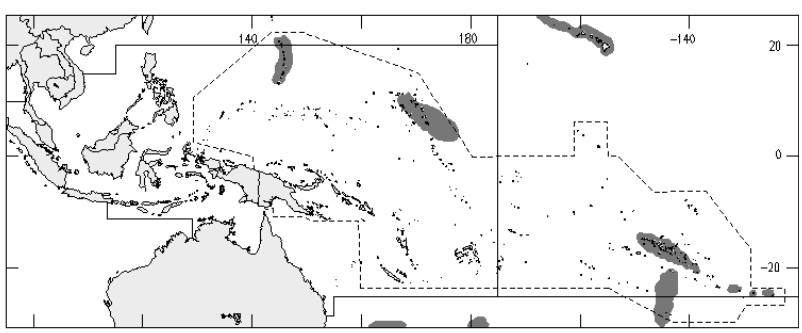
upper and lower lateral tooth

Diagnostic characters: A large shark. Body slender to moderately stout. Snout rounded and short, its length equal to or less than mouth width and about equal to or greater than internarial space; labial furrows short; **anterior nasal flaps rudimentary**; **upper teeth broadly triangular,** erect to moderately oblique, **the anterior ones strongly serrated and with higher, broad cusps not delimited from the bases**; lower teeth with high, narrow cusps and serrations; gill slits relatively short. First dorsal fin rather high, **nearly straight anteriorly,** with a narrowly rounded or pointed apex, **its origin over inner margins of pectoral fins**; second dorsal fin **moderately high, with a concave posterior margin,** its inner margin less than twice the fin height and its origin over or slightly anterior to that of anal fin; **pectoral fins nearly straight** and apically pointed. **A low interdorsal ridge present**. **Colour:** dark grey above, light below, fins plain except for slightly dusky tips in some individuals.

Size: Maximum total length about 3.7 m; commonly to 3 m; size at birth about 57 to 78 cm.

Habitat, biology, and fisheries: A wide-ranging, inshore and offshore shark often preferring the waters around islands to those of the continental shelf. Viviparous, number of fetuses 6 to 16. Feeds on bottom fishes, including basses, flatheads, eels, and flatfishes; also on cephalopods and bivalves. An aggressive species, dangerous to people. No information on utilization or fishing methods are available, but likely to figure in shark fisheries because of its abundance in habitats if prefers.

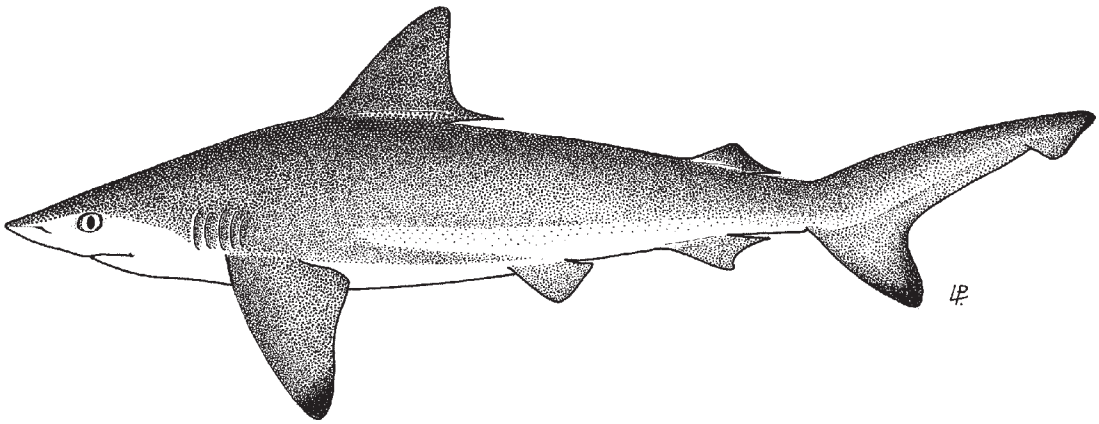
Distribution: Widely distributed in tropical and subtropical seas, but of spotty occurrence in the Pacific and Atlantic, primarily off island groups but offshore in continental waters in the eastern Pacific.

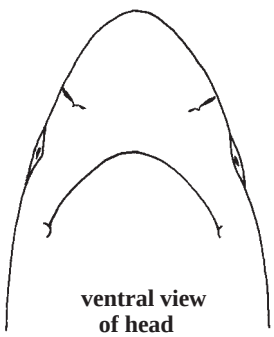


Carcharhinus hemiodon (Valenciennes in Müller and Henle, 1839)

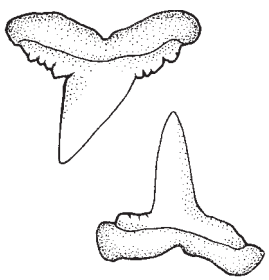
Frequent synonyms / misidentifications: *Hypoprion hemiodon* (Valenciennes in Müller and Henle, 1839) / None.

FAO names: En - Pondicherry shark; **Fr** - Requin baliai; **Sp** - Tiburón de Pondicherry.





ventral view of head



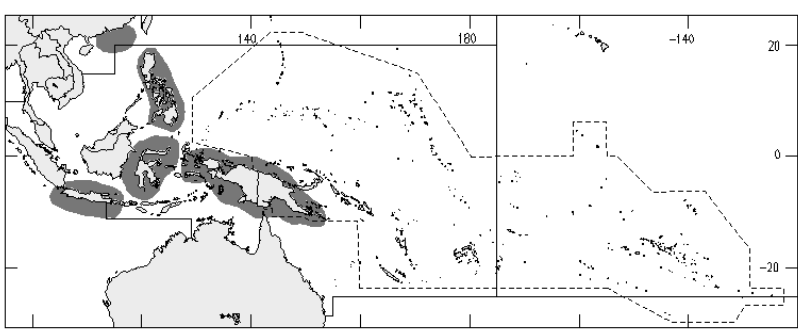
upper and lower tooth near centre

Diagnostic characters: A small shark (maximum size unknown). Body rather stout. **Snout moderately pointed and parabolic**, its length equal to or slightly less than mouth width and greater than internasal space; labial furrows short; **anterior nasal flaps with a short, slender, narrow lobe**; upper teeth with oblique or semioblique, narrow, **unserrated or weakly serrated cusps and strong distal cusplets,** lowers with erect cusps, no cusplets and smooth edges; gill slits relatively short. First dorsal fin with a narrowly rounded apex, its origin just posterior to pectoral-fin base insertions and over inner margins of pectoral fins, its inner margin and free rear tip moderately long; **second dorsal fin moderately high**, **its inner margin attenuated and elongated but less than twice the height of the fin**, its origin slightly behind that of anal fin; pectoral fins weakly falcate and with narrowly rounded tips. **A dermal ridge present between dorsal fins**. **Colour:** grey above, white below, **with the tips of the pectorals, and upper and lower caudal-fin lobes black**; other fins dusky.

Size: Maximum total length uncertain, probably not over 1.5 to 2 m; immature specimens up to 60 cm long, size at maturity unknown.

Habitat, biology, and fisheries: A little-known, wide-ranging, possibly common grey shark of the continental shelves. Has been reported from both river mouths and rivers, including the Saigon River in Viet Nam, but these old records require confirmation. Presumably viviparous. Diet unknown, presumably small fishes, cephalopods, and crustaceans. Not known to be dangerous to humans. Caught in bottom-set gill nets and presumably on long gear. Utilized fresh for human consumption.

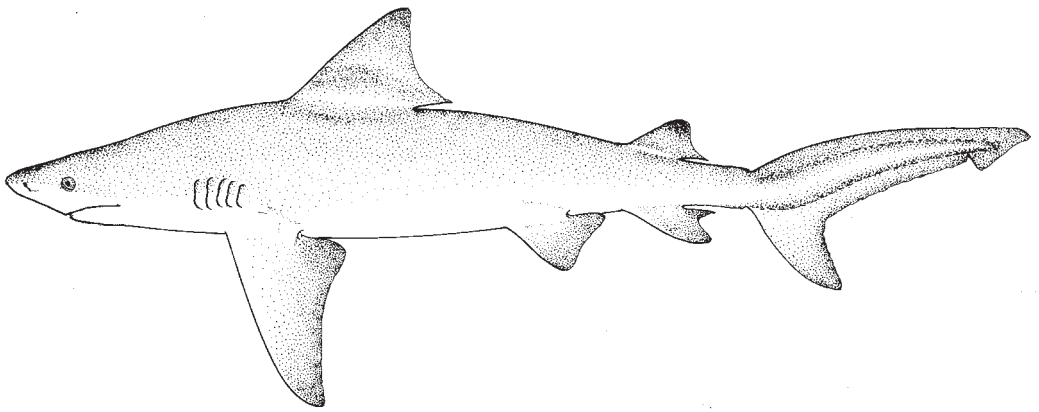
Distribution: Occurs from the Gulf of Oman to Pakistan, India and possibly Sri Lanka; also known in the eastern Indian Ocean and western Pacific from scattered localities from India eastward to Viet Nam, the Philippines, China, and Indonesia.

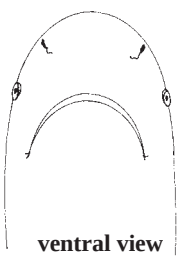


Carcharhinus leucas (Valenciennes in Müller and Henle, 1839)

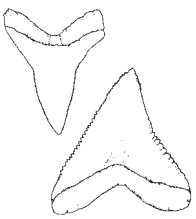
Frequent synonyms / misidentifications: *Carcharhinus zambezensis* (Peters, 1852); *C. vanrooyeni* Smith, 1958 / *Carcharhinus amboinensis* (Müller and Henle, 1839).

FAO names: En - Bull shark; **Fr** - Requin bouledogue (= Réquiem taureau, Area 31); **Sp** - Tiburón sarda.





ventral view of head



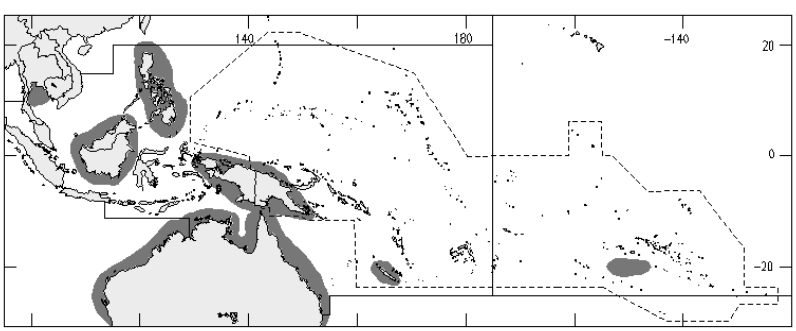
upper and lower tooth near centre

Diagnostic characters: A large, stout shark. **Snout very broadly rounded and extremely short,** its length less than distance between nostrils, and much less than mouth width; labial furrows very short; spiracles absent; nostrils with a low, broadly triangular anterior nasal flap; **teeth in upper jaw triangular, with broad, heavy, serrated cusps,** their outer edges nearly straight in anterior teeth, but becoming increasingly concave to the sides; lower teeth with erect to slightly oblique, heavy cusps with serrated edges and strongly arched bases. **First dorsal fin high and broad with a pointed or slightly rounded apex, its origin a little in advance of insertion of pectoral fins**; **second dorsal fin high with a short posterior lobe,** its inner margin less than the fin height, and its origin slightly in front of that of anal fin; **pectoral fins broad, with narrow pointed tips. No interdorsal ridge. Colour:** back greyish, belly white; tips of fins dark, especially in young individuals.

Size: Maximum total length about 3.4 m; commonly to 2.6 m; size at birth about 60 cm.

Habitat, biology, and fisheries: Predominantly a coastal and fresh-water species inhabiting shallow waters, especially in bays, river estuaries, rivers, and lakes. It tolerates a wide range of salinities, readily penetrates far up rivers and also into hypersaline bays. Usually slow-swimming if active while cruising, this bottom-living shark may develop great speed when chasing its prey. Viviparous, number of embryos up to 12. The young readily tolerate low salinities, and some are born in fresh water. An opportunistic predator with a very wide food spectrum that includes bony fishes, sharks, rays, invertebrates (crabs, shrimps, sea urchins, etc.), marine and freshwater turtles, birds, marine and terrestrial mammals, and carrion. It has large strong jaws and large stout teeth for its size, which enable it to dismember and feed on relatively large prey. Known to be dangerous to people, and possibly one of the most dangerous sharks because of its inshore and fresh-water habitat, large size, powerful feeding structures, and omnivorous habits. Caught mainly with longlines and gill nets and used for its meat, hide, fins, liver oil, and as fishmeal.

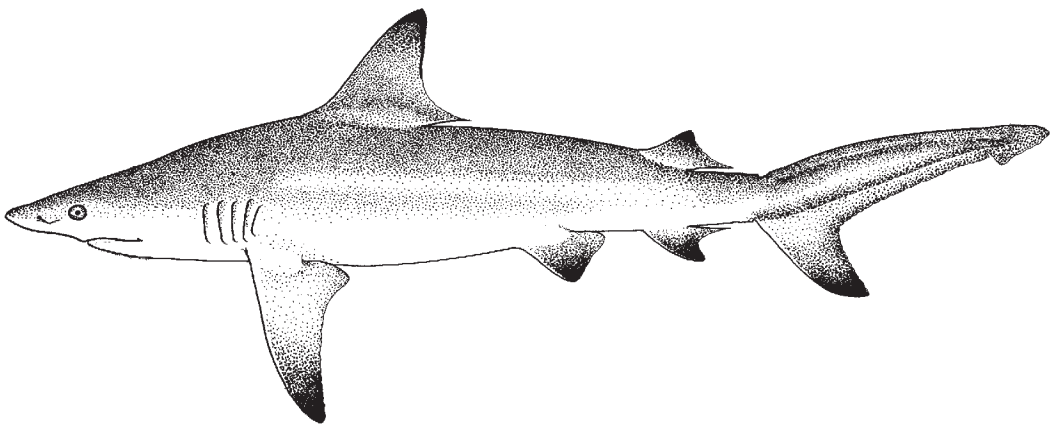
Distribution: Widespread along the continental coasts of all tropical and subtropical seas; also, the most wide-ranging cartilaginous fish in fresh water.

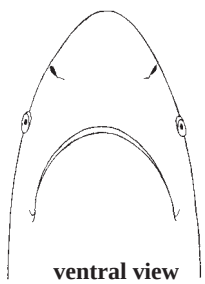


Carcharhinus limbatus (Valenciennes in Müller and Henle, 1839)

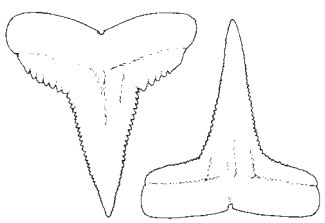
Frequent synonyms / misidentifications: None / *Carcharhinus tilstoni* (Whitley, 1950); *C. brevipinna* (Müller and Henle, 1839); *C. amblyrhynchoides* (Whitley, 1934).

FAO names: En - Blacktip shark; **Fr** - Requin bordé (= Réquiem macuire, Area 31); **Sp** - Tiburón macuira.





ventral view of head



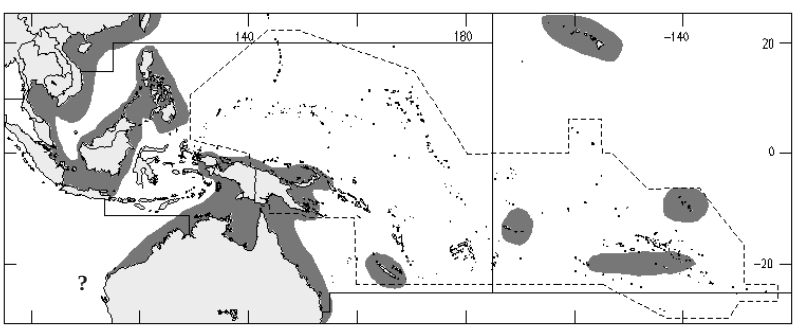
upper and lower tooth near centre

Diagnostic characters: Body fusiform, moderately slender. **Snout long,** about equal to, or slightly less than mouth width, greater than distance between nostrils, its tip narrowly rounded to pointed; labial furrows short; spiracles absent; **upper and lower teeth nearly symmetrical and similar, with erect, narrow cusps and serrated edges**; gill slits moderately long. **First dorsal fin with a pointed or very narrowly rounded apex, its origin above, or slightly posterior to insertion of pectoral fins**; **second dorsal fin high,** its inner margin less than twice the height of fin, and its origin over or slightly in front of that of anal fin; pectoral fins falcate. **No interdorsal ridge. Colour:** back dark grey, ashy blue or dusky bronze; belly white or yellowish white; **a dark band extending rearward along each side to about over origin of pelvic fin**; **tips of pelvic fins with a persistent black spot**; tips of dorsals, anal, pectorals and the lower lobe of caudal fin usually black or dusky in young individuals, but these markings fade with growth.

Size: Maximum total length about 2.5 m; commonly to 1.5 m; size at birth about 60 cm.

Habitat, biology, and fisheries: Inhabits coastal as well as offshore surface waters. A fast-moving shark that sometimes leaps out of the water. Occasionally enters brackish waters, but without a tolerance for fresh water. Viviparous, number of embryos ranging from 1 to 10. Feeds mainly on small schooling fishes; also on rays and squids. Apparently minimally dangerous to people, but can be aggressive when divers are spearing fish. Caught with floating longlines, floating gill nets, and probably other gear. Marketed fresh for human consumption, oil valuable for Vitamin A.

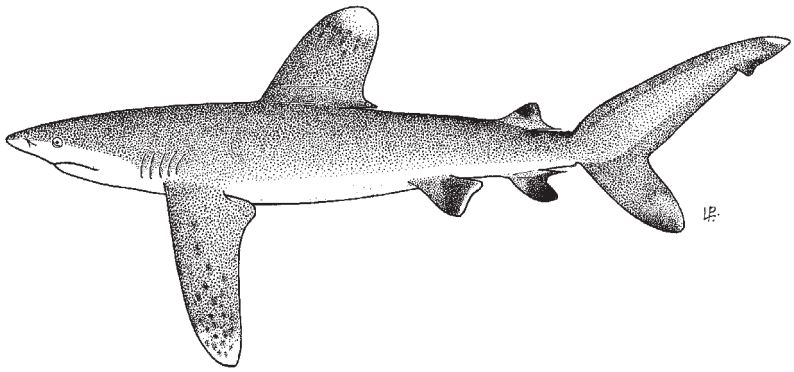
Distribution: Widespread in all tropical and subtropical continental waters.

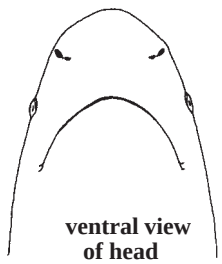


Carcharhinus longimanus (Poey, 1861)

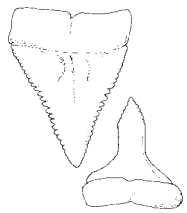
Frequent synonyms / misidentifications: *Carcharhinus maou* (Lesson, 1830) / None.

FAO names: En - Oceanic whitetip shark; **Fr** - Requin océanique (= Réquiem océanique, Area 31); **Sp** - Tiburón oceánico.





ventral view of head

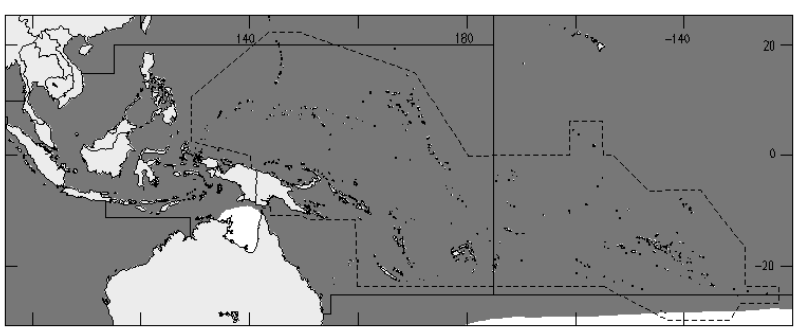


upper and lower tooth near centre

Diagnostic characters: A large, moderately stout shark. **Snout short and broadly rounded,** its length equal to, or somewhat less than, mouth width, and greater than distance between nostrils; labial furrows very short; anterior nasal flaps very low, rudimentary; spiracles absent; teeth with serrated edges, those in upper jaw **triangular with broad, heavy, mostly erect, cusps** nearly symmetrical anteriorly, but becoming increasingly oblique at sides; teeth in lower jaw with erect, heavy cusps and serrated edges. **First dorsal fin noticeably large, with a very broadly rounded apex,** its origin slightly behind insertion of pectoral fins; second dorsal fin high, its inner margin less than twice the fin height, its origin over, or slightly in front of that of anal fin; **pectoral fins very long** (as long as, or even longer than, head) **with broadly rounded, wide tips**; rear tip of anal fin extending nearly to origin of caudal fin. **An interdorsal ridge present. Colour:** back usually dark grey with a bronze tinge, but sometimes brown or bluish; belly whitish, sometimes with a yellow tinge; **tips of first dorsal fin, pectoral fins and lower lobe of caudal fin often white or with white spots** (sometimes absent); ventral surface of pelvic fins, apices of anal and second dorsal fins, and ventral lobe of caudal fin often with black spots; also black or dusky saddle-marks in front of second dorsal fin, upper margin of caudal fin and between dorsal fins (especially in young).

Size: Maximum total length about 3.5 m; commonly to 2.7 m or less; size at birth 60 to 65 cm.

Habitat, biology, and fisheries: Along with the silky shark (*Carcharhinus falciformis*), this is one of the most abundant sharks in warm oceanic waters. It occasionally enters coastal waters, but is more typically found from the edges of continental or insular shelves to far beyond land. This is a slow-swimming species while cruising, but it can be fast in pursuit of prey. Viviparous, number of embryos ranging from 6 to 9. Feeds mainly on fishes (especially scombrids and carangids) and squids; also crustaceans (especially portunid crabs), turtles, and carrion. This species causes much damage to the catch in tuna fisheries, and formerly also to dead whales that were inflated and buoyed after harpooning by the whaling ships. Reported to be dangerous to humans, and prone to investigate divers and swimmers that venture into its offshore habitat. Caught with floating longlines, also drifting gillnets and handlines. Utilized fresh for human consumption, also processed for liver oil; fins probably used for the oriental sharkfin trade.

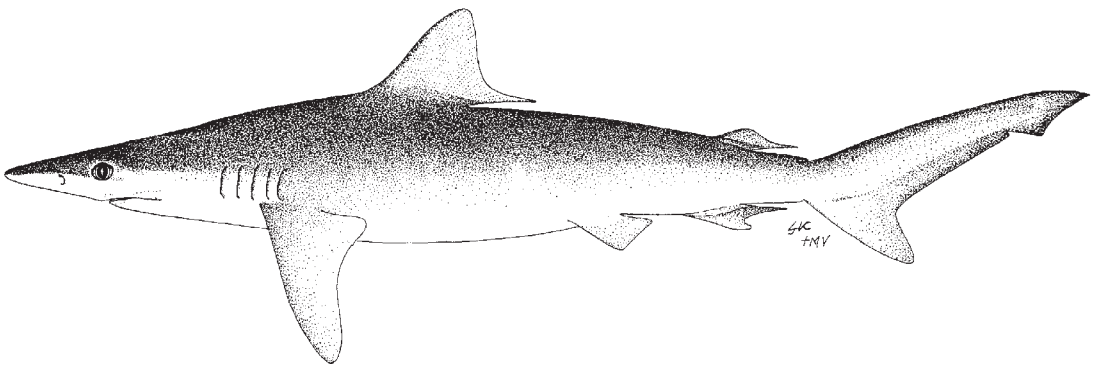


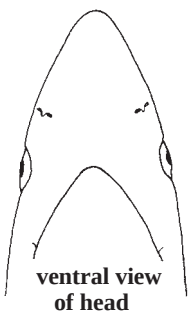
Distribution: Widespread in all tropical and subtropical waters.

Carcharhinus macloti (Müller and Henle, 1839)

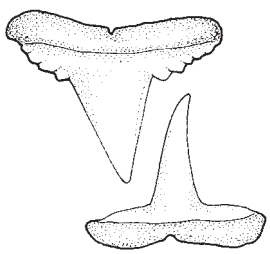
Frequent synonyms / misidentifications: *Hypoprion macloti* (Müller and Henle, 1839) / None.

FAO names: En - Hardnose shark; **Fr** - Requin à nez rude; **Sp** - Tiburón trompudo.





ventral view of head



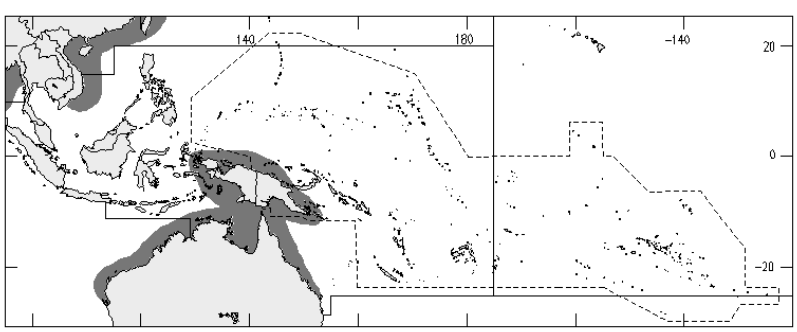
upper and lower tooth near centre

Diagnostic characters: A small shark. Body relatively slender. **Snout very long and narrowly rounded or pointed**, its length greater than mouth width and distance between nostrils; labial furrows very short; anterior nasal flaps with a slender elongate lobe; spiracles absent; **teeth with smooth edges, those in upper jaw with narrow, oblique or nearly erect cusps and strong cusplets on each side of cusp;** teeth in lower jaw with erect to oblique, smooth cusps and no cusplets. First dorsal fin moderately large, with a narrowly rounded or pointed apex, its **inner margin greatly elongated, the free rear tip attenuated,** and its origin over inner margins of pectoral fins; **second dorsal fin very low, the inner margin over twice the fin height,** fin origin slightly behind that of anal fin, pectoral fins relatively short, with narrowly rounded or angular tips; elongated rear tip of anal fin extending nearly to lower precaudal pit. **No dermal ridge between dorsal fins. Colour:** back greyish or grey-brown, belly white; posterior margin of pectoral fins and ventral caudal-fin lobe with an inconspicuous white edge; posterioventral and dorsal margins of caudal fin with a narrow black edge.

Size: Maximum total length below 1 m; size at birth 45 to 50 cm.

Habitat, biology, and fisheries: A common shark of continental waters inshore and offshore down to a depth of 170 m. Viviparous, number of embryos usually 2 (one per uterus). Feeds mainly on fishes, also on cephalopods and crustaceans. Not known to be dangerous to humans. Caught with floating gill nets, also bottom gill nets and longlines. One of the most abundant sharks taken in gill nets (also caught by line gear), but of limited interest to fisheries because of its small size. Utilized fresh and probably dried salted for human consumption.

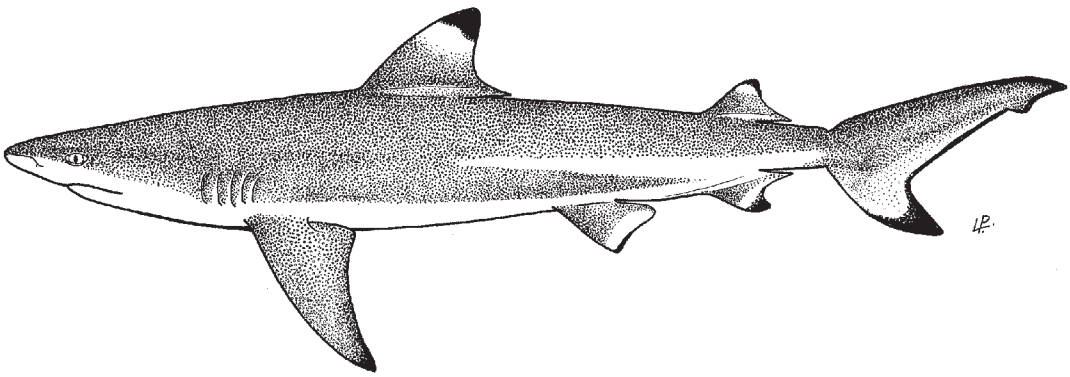
Distribution: Occurs off Kenya and Tanzania, possibly the Gulf of Aden, and from Pakistan eastward to New Guinea, northern Australia, China, Taiwan Province of China and southern Korea and Japan.

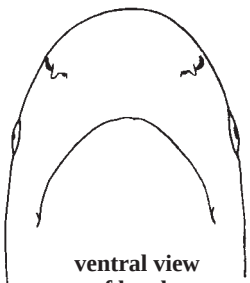


Carcharhinus melanopterus (Quoy and Gaimard, 1824)

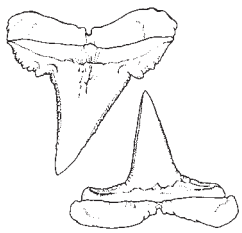
Frequent synonyms / misidentifications: *Hypoprion playfairi* (Günther, 1870) / None.

FAO names: En - Blacktip reef shark; **Fr** - Requin pointes noires; **Sp** - Tiburón de puntas negras.





ventral view of head



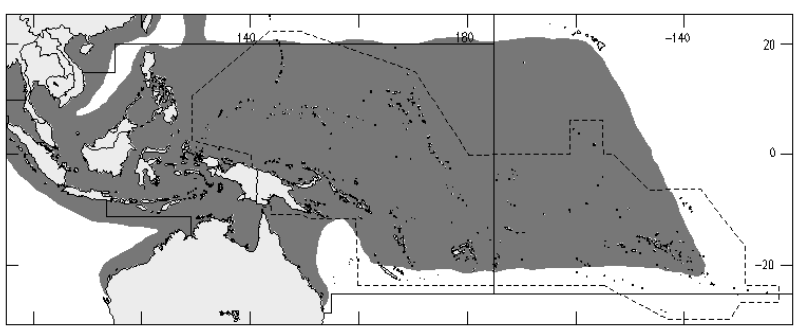
upper and lower tooth near centre

Diagnostic characters: A small to medium-sized shark. Body moderately stout. **Snout very short and broadly rounded, its length less than mouth width and about equal to distance between nostrils**; labial furrows very short; anterior nasal flaps with a stout, broad lobe; spiracles absent; teeth with serrated edges, **those in upper jaw with narrow semioblique to oblique cusps and low basal cusplets**; teeth in lower jaw with erect or semierect narrow cusps and serrated edges. First dorsal fin moderately large, with a narrowly rounded or pointed apex, its origin over inner margins of pectoral fins, its free rear tip short; **second dorsal fin high,** its inner margin much less than twice the fin height, its origin over or slightly anterior to anal-fin origin; pectoral fins moderately long, with narrowly rounded or pointed tips; rear tip of anal fin ending well in front of lower caudal-fin origin. **No dermal ridge between dorsal fins. Colour: yellow-brown on dorsal surface,** underside white; **all fins conspicuous with black or dark brown tips** also anterior and posterior dark edging on pectoral fins and upper lobe of caudal fin; **a prominent black tip of first dorsal fin set off abruptly by a light band below it**; a conspicuous dark band on flanks, extending rearward to pelvic fins.

Size: Maximum total length about 2 m; commonly to 1.6 m; size at birth between 33 to 50 cm.

Habitat, biology, and fisheries: A common inshore and sometimes offshore shark, on continental and insular shelves; prefers shallow water on and around coral reefs. May occur in brackish and even fresh water, but does not occur in tropical lakes and rivers far from the sea. Viviparous, number of young 2 to 4 (commonly 4). A bottom and midwater feeding shark that feeds on small bony fishes (including mullets), octopuses and small sharks. It has been definitely recorded as having attacked humans without provocation, but it should not be regarded as particularly dangerous because of its small size. May be aggressive when divers are spearfishing. Apparently regulary caught in fisheries where it occurs, including off of Thailand. The meat is used fresh and dried salted for human consumption, and for its liver oil.

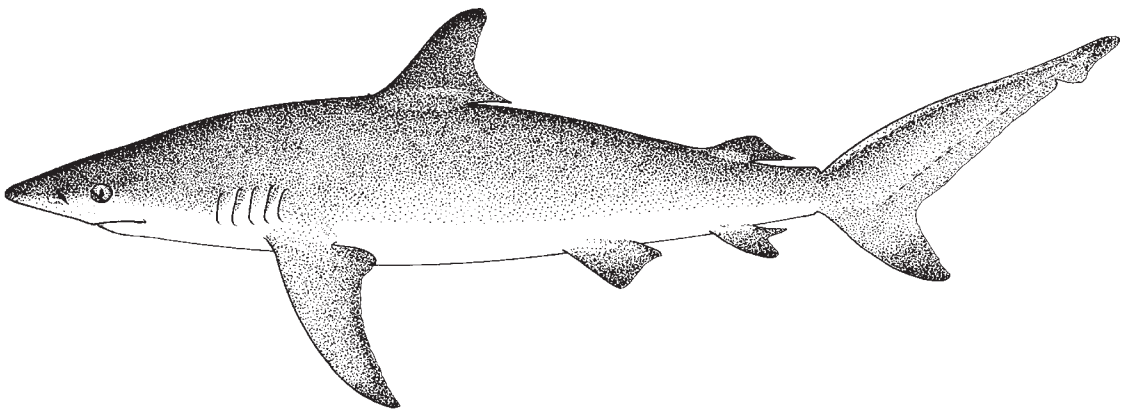
Distribution: Wide-ranging from South Africa, the Red Sea, Pakistan, India eastward to the western Central Pacific; also in the eastern Mediterranean Sea as an invader from the Red Sea through the Suez Canal.

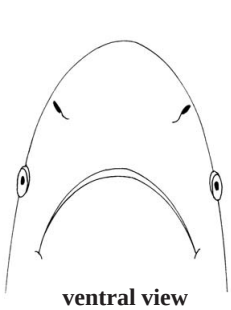


Carcharhinus obscurus (LeSueur, 1818)

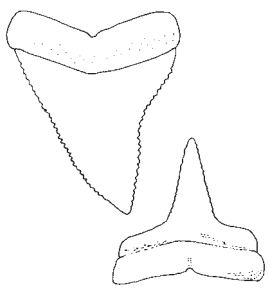
Frequent synonyms / misidentifications: *Carcharhinus iranzae* Fourmanoir, 1961 / None.

FAO names: En - Dusky shark; **Fr** - Requin sombre (= Réquiem de sable, Area 31); **Sp** - Tiburón arenero.





ventral view of head



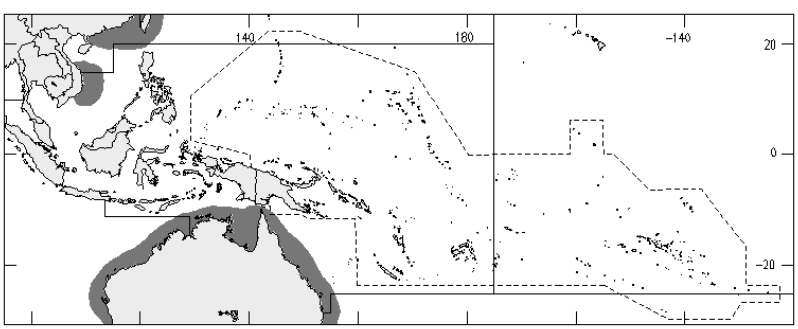
upper and lower tooth near centre

Diagnostic characters: Body slender to moderately stout. Snout rounded and short, its length equal to or less than mouth width and greater than or about equal to internasal space; labial furrows short; **anterior nasal flaps rudimentary**; **upper teeth broadly triangular**, erect to moderately oblique, anterior teeth with strongly serrated broad cusps not delimited from the bases; lower teeth with low, narrow, serrated cusps; gill slits relatively short. **First dorsal fin relatively low, with a broadly arched anterior margin** and a narrowly rounded or pointed apex, **its origin about over free rear tips of pectoral fins**; **second dorsal fin also moderately low, with a nearly straight posterior margin, an inner margin nearly or quite twice the fin height,** and its origin about over that of anal fin; pectoral fins falcate and apically pointed. **A low interdorsal ridge present. Colour:** blue-grey, lead-grey above, white below; tips of pectoral and pelvic fins, as well as lower lobe of caudal fin and dorsal fins often dusky in young, plain in adults.

Size: Maximum total length about 3.64 m; matures at about 2.8 m; size at birth about 70 cm to 1 m.

Habitat, biology, and fisheries: A semi-pelagic shark occurring from inshore waters to the outer continental shelf. Viviparous, number of embryos 6 to 14. Feeds chiefly on fishes, including scombrids, clupeids, serranids, trichiurids, bluefish, wrasses, anchovies, grunts, barracudas, sharks and rays, also squids, octopi, gastropods, shrimps, crabs, and carrion. Reported to be dangerous to humans, but attacks in the area are unverified. Regularly caught with longlines and probably gill nets, also hook-and-line and set bottom nets; utilized fresh, dried-salted, frozen and smoked for human consumption; hides used for leather; fins for shark-fin soup; liver oil extracted for vitamins.

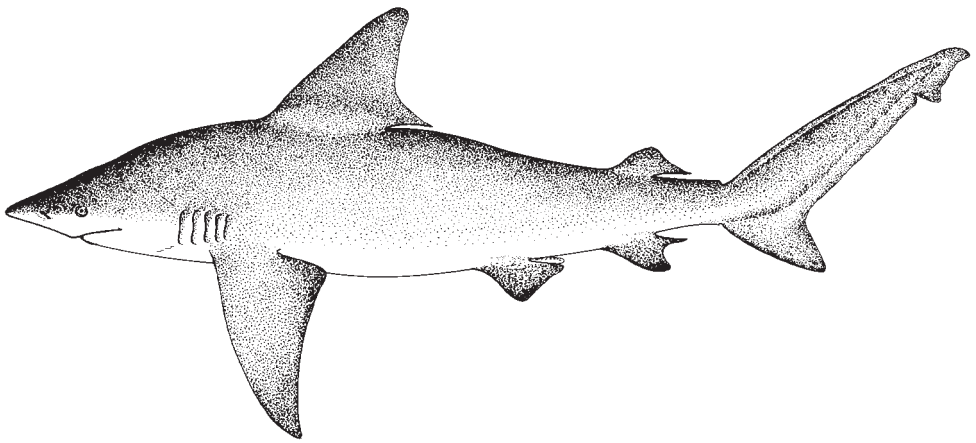
Distribution: Wide-ranging, but with a patchy distribution in tropical and subtropical seas; in the western Central Pacific more confined to the marginal parts of the area (Japan, China, Viet Nam, Australia).

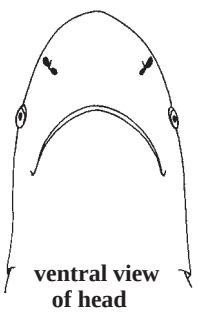


Carcharhinus plumbeus (Nardo, 1827)

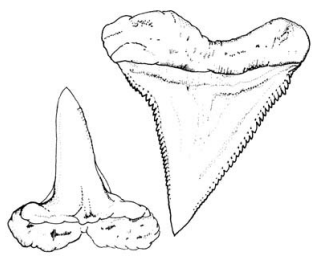
Frequent synonyms / misidentifications: *Carcharhinus milberti* (Valenciennes in Müller and Henle, 1841) / None.

FAO names: En - Sandbar shark; **Fr** - Requin gris (= Réquiem plombe, Area 31); **Sp** - Tiburón trozo (= Tiburón de Milberto).





ventral view of head



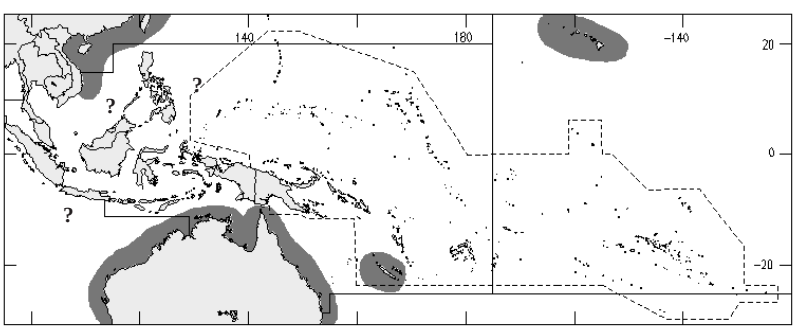
upper and lower tooth near centre

Diagnostic characters: A medium-sized, comparatively stout shark. **Snout broadly rounded and short,** its length less than width of mouth but greater than distance between nostrils; spiracles absent; **teeth finely serrate, those in upper jaw broadly triangular** and erect to slightly oblique, with broad, heavy cusps; lower teeth with narrow, erect cusps. **First dorsal fin triangular, very high** (height of fin twice the length of snout in adults), **with a pointed or narrowly rounded apex, its origin over insertions of pectoral fins**; origin of second dorsal fin about opposite that of anal fin, its inner margin less than twice the fin height; pectoral fins long and broad, their corners narrowly rounded or pointed. **Interdorsal ridge present. Dermal denticles widely spaced, their free edges without definite teeth. Colour:** back grey, or rarely brown; belly whitish.

Size: Maximum total length about 2.4 m, records to 3 m uncertain; size at birth 60 to 75 cm.

Habitat, biology, and fisheries: A coastal species usually found over sandy or muddy bottoms; often coming near estuaries but sometimes occurring in oceanic waters to depths of 280 m. Viviparous, number of young 1 to 14. Feeds mainly on bottom-dwelling animals, including flatfishes, rays, crabs, and snails; also on schooling fishes and squids. Not known to be dangerous to humans. Caught with longlines, hook-and-line, and set-bottom nets and is also fished with rod and reel by sports anglers as a game fish. It is utilized fresh, fresh-frozen, smoked, and dried-salted for human consumption; the hides are prized for leather and other products; the fins are prepared as the base for shark-fin soup; the liver is extracted for oil (rich in vitamins).

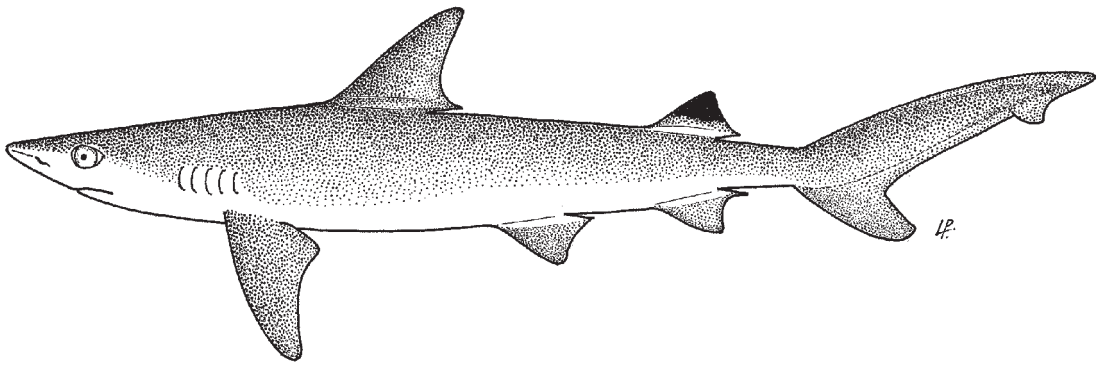
Distribution: Wide-ranging in tropical and subtropical areas of the eastern and western Atlantic, from the Mediterranean Sea, Indian Ocean and western Central Pacific to Hawaii; records from the eastern Central Pacific are uncertain.

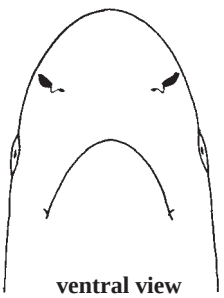


Carcharhinus sealei (Pietschmann, 1916)

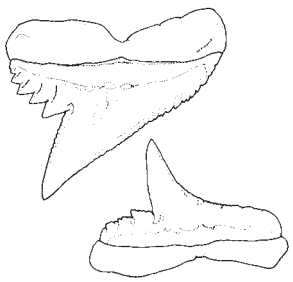
Frequent synonyms / misidentifications: *Carcharhinus menisorrah* (Valenciennes in Müller and Henle, 1839) / *Carcharhinus dussumieri*.

FAO names: En - Blackspot shark; **Fr** - Requin à tache noire; **Sp** - Tiburón alinegro.





ventral view of head



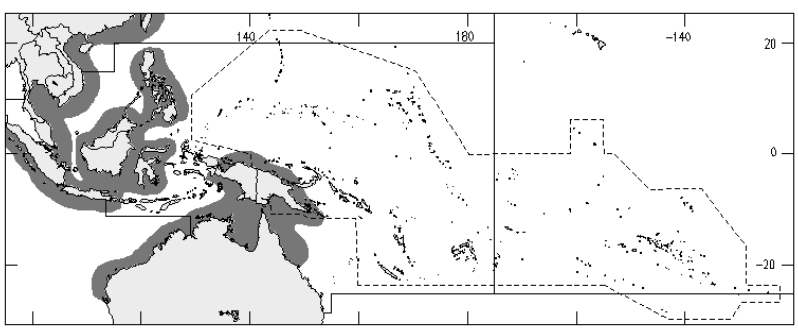
upper and lower tooth near centre

Diagnostic characters: A small, stout to slender-bodied shark. **Snout moderately long and narrowly parabolic or wedge-shaped,** its length usually shorter than mouth width but subequal to the internarial space; labial furrows very short; **anterior nasal flaps expanded**; spiracles absent; gill slits short; **teeth with serrated edges, upper teeth with narrow-based, strongly oblique serrated cusps and strong, smooth-edged cusplets**; teeth in lower jaw erect to oblique, without cusplets, serrated and narrow-cusped; **first dorsal fin moderately high, with an angular apex, notched posterior margin, and short inner margin, strongly falcate**; origin of first dorsal fin over pectoral inner margins; origin of second dorsal fin about opposite or slightly behind that of anal fin; **second dorsal fin high,** its inner margin less than 1.5 times the fin height and its posterior margin concave; pectoral fins short and strongly falcate, with narrow, angular apexes. **An interdorsal ridge present or occasionally absent on back**. **Colour:** back greyish or grey-brown, belly whitish; **a black spot on the second dorsal fin is the only conspicuous marking.**

Size: Maximum total length about 95 cm; maturing at 70 to 80 cm; size at birth 33 to 45 cm.

Habitat, biology, and fisheries: A common coastal shark on the continental and insular shelves, from the surf line and intertidal to a depth of 40 m, usually in shallow water. Viviparous, number of young 1 or 2. Feeds on small fish (including sea horses), prawns, and squid. Not known to be dangerous to people. Commonly caught by artisanal and smallscale commercial fisheries as well as sport anglers fishing from the shore. Commonly fished with line gear and gill nets and utilized for human consumption.

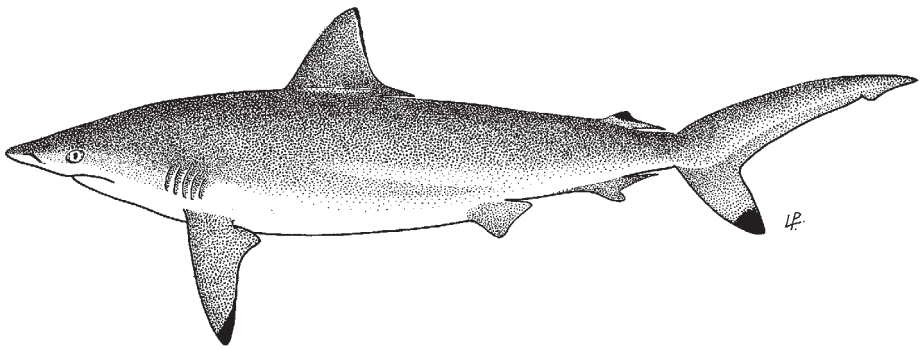
Distribution: Known from South Africa northward to Kenya, Madagascar, the Seychelles, Mauritius, and the southwest coast of India; in the eastern Indian Ocean and western Pacific eastward to China, the Philippines, and New Guinea.

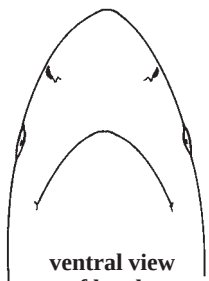


Carcharhinus sorrah (Valenciennes in Müller and Henle, 1839

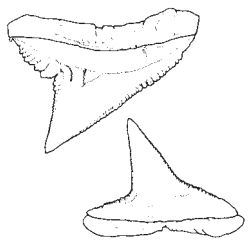
Frequent synonyms / misidentifications: *Carcharhinus bleekeri* (Dumeril, 1865) / None.

FAO names: En - Spottail shark; **Fr** - Requin tachete; **Sp** - Tiburón rabo manchado.





ventral view of head



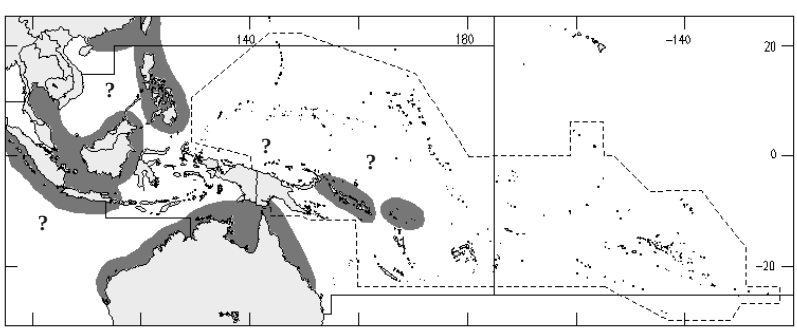
upper and lower tooth near centre

Diagnostic characters: A small to medium-sized shark. Body slender to moderately stout. **Snout moderately pointed, parabolic, and long,** its length equal to or slightly less than mouth width and greater than internasal space; labial furrows short; **anterior nasal flaps with a short, slender, narrow lobe**; **upper teeth with oblique or semioblique, narrow, serrated cusps and strong distal cusplets**; lowers with semierect or oblique serrated cusps and no cusplets; gill slits relatively short. First dorsal fin with a narrowly rounded apex, its origin usually over the pectoral inner margins, its inner margin and free rear tip moderately long; **second dorsal fin low, with a long, attenuated free rear tip and inner margin over twice fin height**; origin of second dorsal fin over or slightly behind origin of anal fin; pectoral fins weakly falcate and with narrowly rounded tips; **a dermal ridge present between dorsal-fin bases. Colour:** grey or grey-brown above, white on belly, with a golden-brown sheen on the area between eyes and gill slits in fresh specimens; **pectoral fins, second dorsal fin, and lower caudal-fin lobe with conspicuous black tips,** first dorsal and upper caudal-fin lobe with black edging. A dark band on flank extending rearwards to pelvic fins.

Sie: Maximum total length to about 1.5 to 1.6 m, possibly to 2.3 m but this is dubious; adults commonly 1.06 to 1.5 cm; size at birth about 50 to 60 cm.

Habitat, biology, and fisheries: A common inshore and sometimes offshore shark, on continental and insular shelves from close inshore and the surface down to a depth of at least 140 m. Often on and around coral reefs, but apparently occurring on other bottom habitats. Viviparous, number of young 2 to 6. Feeds on small bony fishes (including serranids and scombrids) and octopuses. Not known to have attacked people, and probably not particularly dangerous because of its small size. Caught in floating gill nets and on longlines. Utilized fresh for human consumption; fins of large individuals may be used in the oriental sharkfin trade, livers for vitamin oil, and offal for fishmeal.

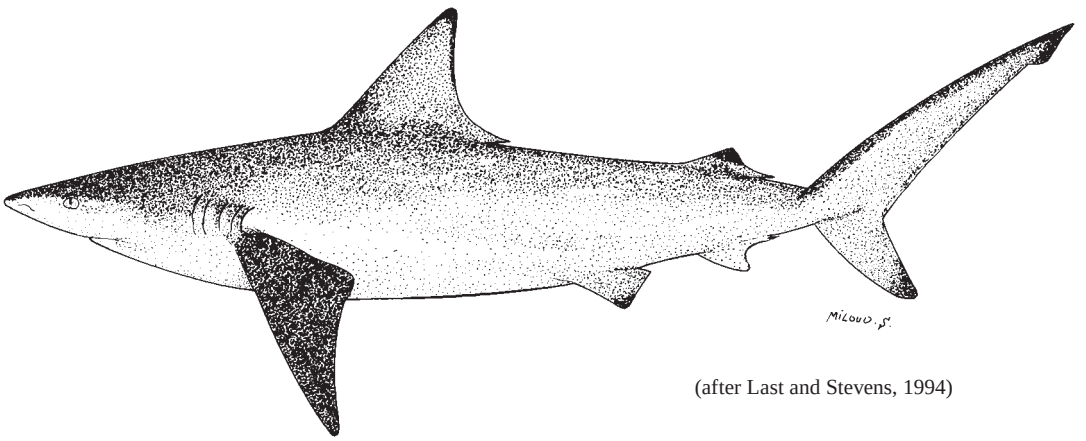
Distribution: Known from Madagascar, possibly South Africa, the Mauritius-Seychelles area, possibly the Gulf of Aden and Oman, western India, and probably Sri Lanka; occurs in the western Central Pacific from China southward to Indonesia and Australia, but without a wide distribution in Oceania.



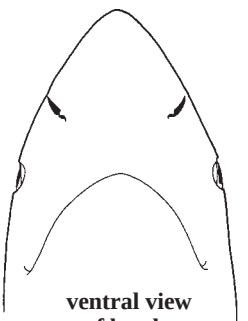
Carcharhinus tilstoni (Whitley, 1950

Frequent synonyms / misidentifications: None / *Carcharhinus limbatus* (Valenciennes in Müller and Henle, 1839); *C. brevipinna* (Müller and Henel, 1839); *C. amblyrhinchoides* (Whitley, 1934).

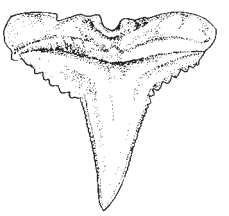
FAO names: En - Australian blacktip shark.



(after Last and Stevens, 1994)



ventral view of head



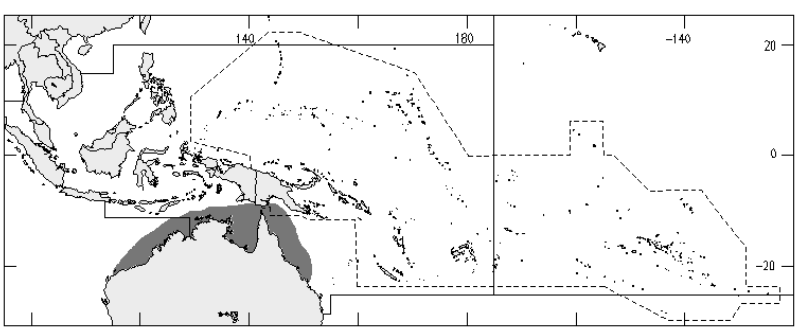
5th tooth from symphysis (upper jaw)

Diagnostic characters: Body fusiform, moderately slender. **Snout long,** about equal to, or slightly less than mouth width, greater than distance between nostrils, its tip narrowly rounded to pointed; labial furrows short; spiracles absent; **upper and lower teeth nearly symmetrical and similar, with erect, narrow cusps and serrated edges**; gill slits moderately long. **First dorsal fin with a pointed or very narrowly rounded apex, its origin above, or slightly posterior to insertion of pectoral fins**; **second dorsal fin high,** its inner margin less than twice the height of fin, and its origin over or slightly in front of that of anal fin; pectoral fins falcate. **No interdorsal ridge. Colour:** back dark grey, ashy blue or dusky bronze; belly white or yellowish white; **a dark band extending rearward along each side to about over origin of pelvic fin**; **tips of pelvic fins with a persistent black spot**.

Size: Maximum total length about 2 m; size at birth about 60 cm.

Habitat, biology, and fisheries: On the continental shelf from close inshore to depths of about 150 m, mainly in midwater or near the surface. Feeds on teleost fishes, also on cephalopods. Until recently, the species was caught with gill nets and longlines for its meat by Taiwanese fisheries in northern Australia. It currently forms the basis of a small Australian gill net fishery (up to 500 t annually).

Distribution: So far only known from northern Australia.



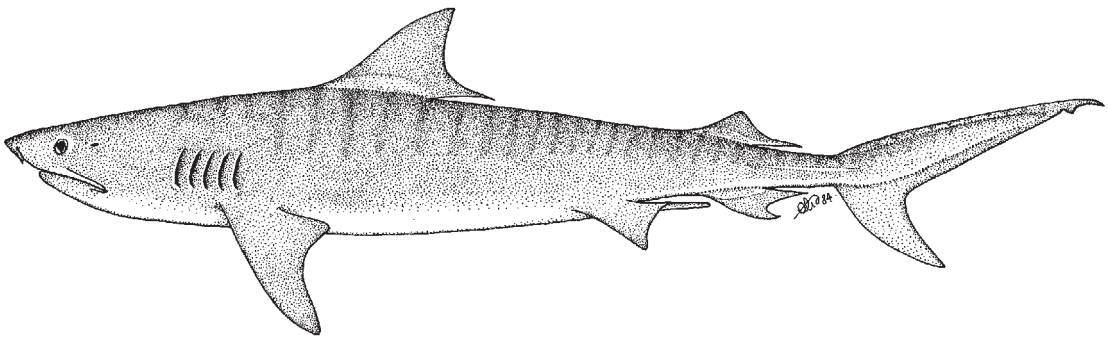
Remarks: This species has only recently been separated from *Carcharhinus limbatus*. At present, these 2 species can be reliably distinguished only on vertebral counts and enzyme systems.

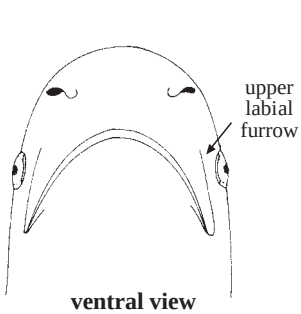
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Galeocerdo cuvier (Peron and LeSueur in LeSueur, 1822)

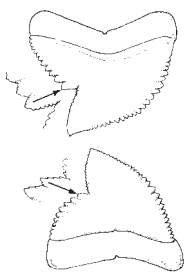
Frequent synonyms / misidentifications: *Galeocerdo arcticus* (Faber, 1829); *G. rayneri* McDonald and Barron, 1868 / None.

FAO names: En - Tiger shark; **Fr** - Requin tigre commun (= Requin tigre, Area 31); **Sp** - Tintorera.





ventral view of head



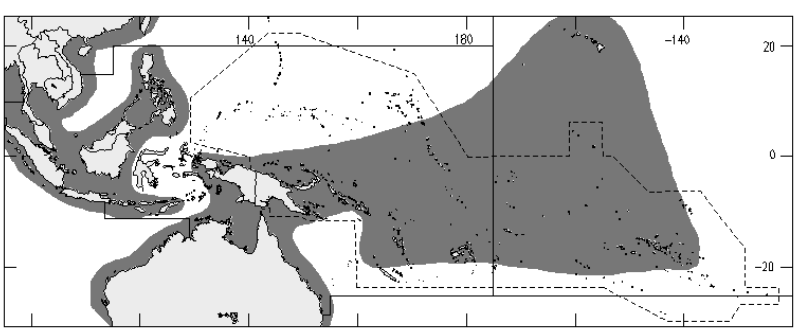
upper and lower tooth near centre

Diagnostic characters: A large, fusiform shark. **Snout very short and bluntly rounded, its length much less than width of mouth**; spiracles small, slit-like, but easily visible; **upper labial furrows about as long as snout, reaching to front of eyes**; **teeth coarsely serrated, their outer edges deeply notched and the tips directed obliquely outward,** their inner edges broadly convex. Second dorsal fin much smaller than first. **A low rounded keel on each side of caudal peduncle. Colour:** back dark grey or greyish brown with dark brown or black rectangular spots often forming bars on sides and fins, but fading with growth.

Size: Maximum total length at least 6.5 m; commonly to 4 m; size at birth between 60 cm and 1.04 m.

Habitat, biology, and fisheries: Inhabits coastal, and offshore waters, near the surface and bottom; often found in shallow waters close inshore, including river estuaries. Ovoviviparous and very prolific with 10 to 82 young in a litter. A voracious, indiscriminate predator feeding on all kinds of fish (including other sharks and rays), marine mammals, turtles, seabirds, sea snakes, squids, conchs, and crabs. Often swallows a variety of undigestible and non-nutritive items, and readily feeds on carrion. Considered among the most dangerous of sharks because of its shallow-water habitat, large jaws and teeth, indiscriminate appetite, and large size; several attacks on people have been recorded for this species. Caught in floating and bottom gill nets and with line gear (including pelagic longlines). Utilized for its high-quality hide, for its fins, liver oil and flesh, and offal for fishmeal.

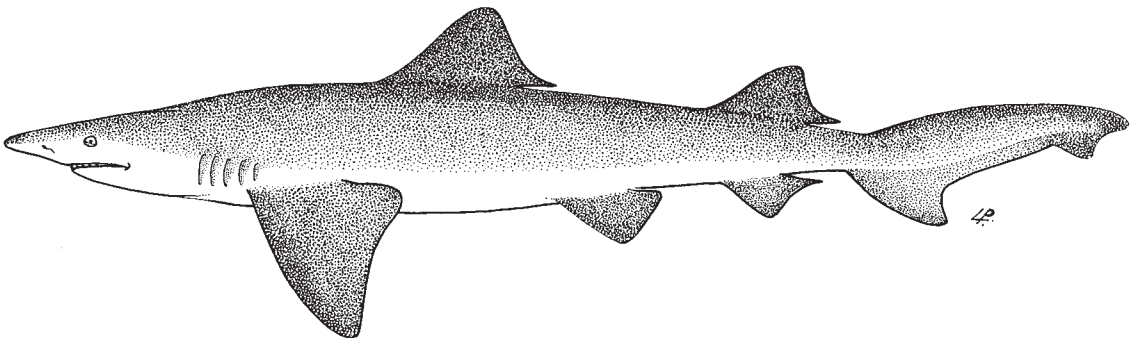
Distribution: Circumglobal in most tropical seas, with seasonal migrations into warm-temperate to temperate seas.

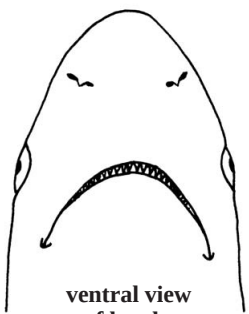


Lamiopsis temmincki (Müller and Henle, 1839)

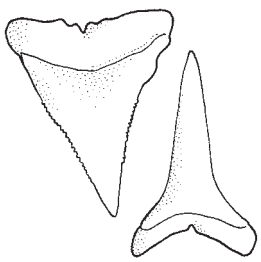
Frequent synonyms / misidentifications: *Carcharhinus temmincki* (Müller and Henle, 1839); *Eulamia temmincki* (Müller and Henle, 1839) / *Negaprion acutidens* (Rüppell, 1837).

FAO names: En - Broadfin shark; **Fr** - Requin grandes ailes; **Sp** - Tiburón aleton.





ventral view of head



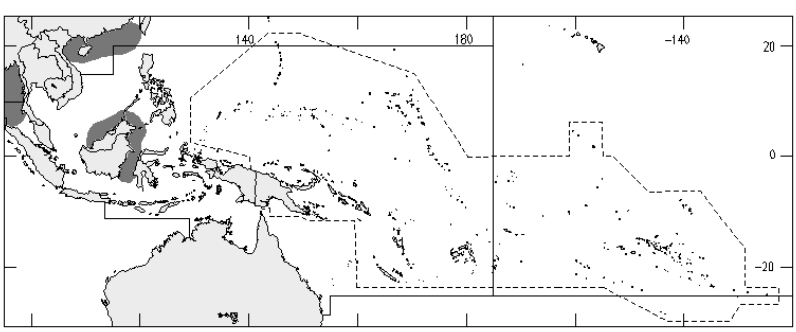
upper and lower tooth near centre

Diagnostic characters: A small to medium-sized shark. Body moderately stout. **Snout moderately long, parabolic in shape**, its length about equal to mouth width and greater than distance between nostrils; labial furrows short; **anterior nasal flaps with a short, broad lobe**; spiracles absent; **teeth in upper jaw with high, broadly triangular, erect to semioblique, serrated cusps,** and no cusplets; **teeth in lower jaw with erect, high, hooked, smooth-edged narrow cusps, and no cusplets.** First dorsal fin moderately large, with a narrowly rounded apex, its origin over inner margins of pectoral fins, its free rear tip moderately long; **second dorsal fin very large, nearly or quite as large as first dorsal**, its inner margin shorter than fin height, its origin anterior to anal-fin origin; **pectoral fins moderately long**, **basally very broad** and not falcate with narrowly rounded tips; **anal fin with posterior margin slightly concave**; **upper precaudal pit a shallow longitudinal depression, not transverse and crescentic. No dermal ridge between dorsal fins,** and no keels on caudal peduncle. **Colour:** grey or yellow-grey above, lighter below; no conspicuous markings.

Size: Maximum total length about 1.7 m; size at birth between 40 and 60 cm.

Habitat, biology, and fisheries: A little-known coastal, inshore, tropical shark. Viviparous, number of young 4 to 8 per litter. Probably feeds on small fishes and invertebrates. Not known to be dangerous to people. Caught in bottom and floating gill nets and with line gear. Meat utilized fresh for human consumption; livers used for vitamin oil.

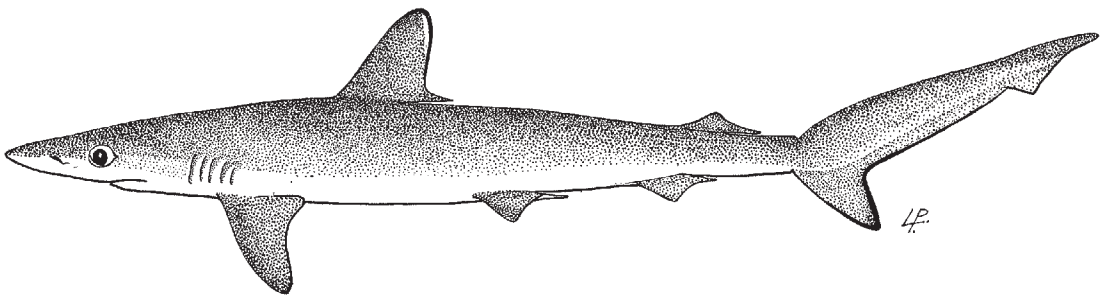
Distribution: Known from scattered localities in the Indian Ocean and western Pacific off Pakistan, India, Burma, Indonesia (Makassar Straits), Sarawak, and China.

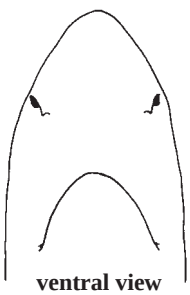


Loxodon macrorhinus Müller and Henle, 1839

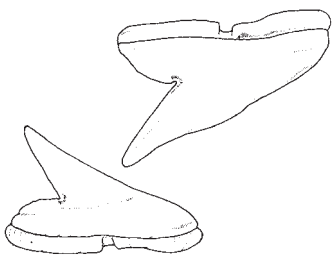
Frequent synonyms / misidentifications: *Scoliodon acutus* (Rüppell, 1837); *S. ceylonensis* Setna and Sarangdhar, 1946 / *Scoliodon laticaudus* Müller and Henle, 1838; *Carcharhinus macloti* (Müller and Henle, 1838).

FAO names: En - Sliteye shark; **Fr** - Requin sagrin; **Sp** - Tiburón ojuelo.





ventral view of head



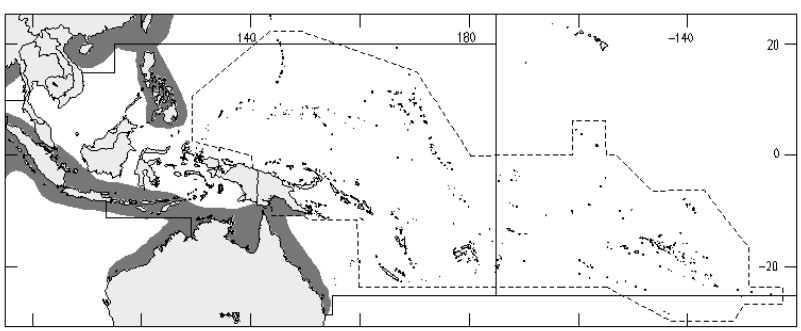
upper and lower tooth near centre

Diagnostic characters: A small, very slender shark. Snout very long, parabolic in shape, its length greater than mouth width and distance between nostrils; **labial furrows very short**; anterior nasal flaps with a short, broadly triangular lobe; **eyes large, with a posterior notch**; spiracles absent; **teeth in both jaws with low, narrow, oblique, smooth-edged cusps, and no cusplets. First dorsal fin small,** its origin behind free rear tips of pectoral fins by a distance greater than length of fourth gill opening, its base 2 or 3 times in distance between pectoral and pelvic-fin bases, its free rear tip moderately long and not reaching backward to pelvic-fin origins; second dorsal fin very small, its height less than 1/3 of that of first dorsal fin, the inner margin elongated and over twice the fin height and **the fin origin usually just behind anal-fin insertion** (occasionally over or slightly in front of it, but far behind anal midbase); **pectoral fins small**, narrow and slightly falcate; **anal fin with a slightly concave posterior margin and long preanal ridges**. Upper precaudal pit transverse and crescentic; no keels on caudal peduncle; interdorsal ridge usually absent. **Colour:** grey above, pale below, fins with pale edges (transparent in life), caudal and first dorsal fins with narrow dark margin, first dorsal fin also with a dusky tip.

Size: Maximum total length about 91 cm; maturing at 73 to 85 cm; size at birth about 40 to 43 cm.

Habitat, biology, and fisheries: Occurs in tropical, coastal, clear waters, near the surface and bottom, inshore and offshore at depths from 7 to 80 m. Viviparous number of young usually 2 in a litter. Feeds on small bony fishes, including anchovies and croakers, and shrimp and cuttlefish. Harmless to people. Caught in artisanal and small scale commercial fisheries with floating and bottom gill nets and with line gear (including pelagic longlines). Utilized fresh for human consumption.

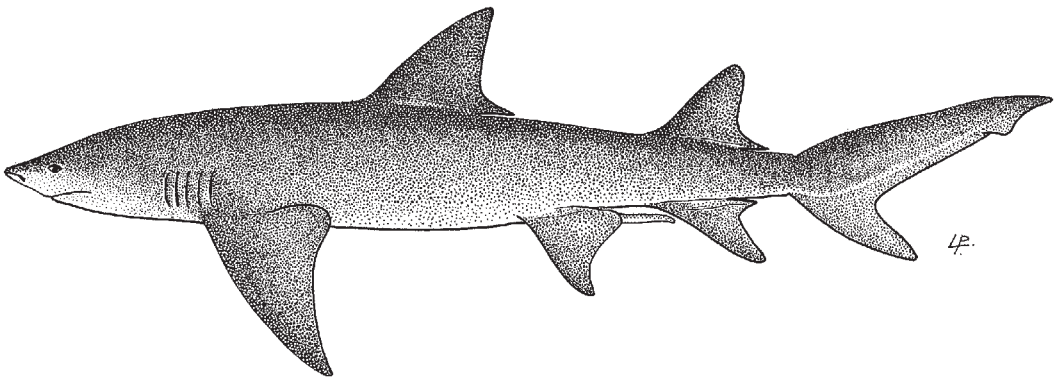
Distribution: In the Indo-West Pacific from South Africa, southern Mozambique, Madagascar, Seychelles and the Red Sea eastward to India, Sri Lanka, Indonesia, China, Taiwan Province of China, the Philippines, and Australia.

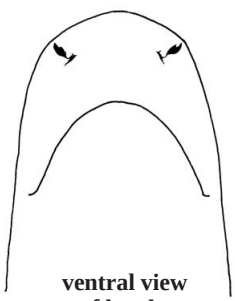


Negaprion acutidens (Rüppell, 1837)

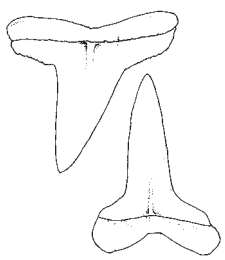
Frequent synonyms / misidentifications: None / *Lamiopsis temmincki* (Müller and Henle, 1839).

FAO names: En - Sicklefin lemon shark; **Fr** - Requin citron faucille; **Sp** - Tiburón segador.





ventral view of head



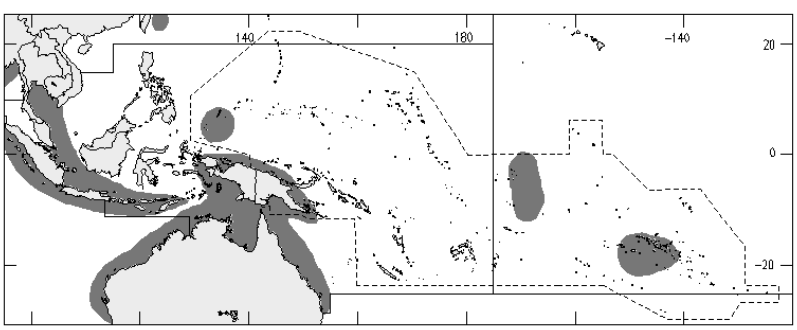
upper and lower tooth near centre

Diagnostic characters: A large, stout shark. **Snout short (shorter than width of mouth) and broad, rounded or obtusely wedge-shaped**; labial folds short; spiracles usually absent; **teeth narrow, their cusps smooth-edged,** erect in anterior part of jaws, but becoming progressively oblique toward the sides; bases of upper teeth smooth or weakly serrated. Origin of first dorsal fin over or behind free rear tips of pectoral fins, closer to these fins than to the pelvic fins; **second dorsal fin nearly as large as the first** (its base more than 3/4 of first dorsal-fin base); pectoral fins broad and strongly falcate, pelvic fins falcate. No dermal ridge between dorsal fins. **Colour:** yellowish brown above, paler below.

Size: Maximum total length about 3 m; maturing at about 2.2 m; size at birth about 50 to 70 cm.

Habitat, biology, and fisheries: Occurs in tropical, shallow inshore and offshore waters near the bottom; often found on and around coral reefs and on sandy plateaus near coral, at depths down to at least 30 m. Viviparous, 12 or 13 young in a litter. A fish-eating shark, but few details of its diet are available from the area. Potentially dangerous because of its large size, powerful jaws and dagger-like teeth; normally inoffensive and sluggish but very aggressive when provoked. Caught in floating and bottom gill nets and on line gear (including floating longlines). Used fresh and dried-salted for human consumption; livers processed for vitamin oil; offal processed for fishmeal; and fins are processed for shark-fin soup base.

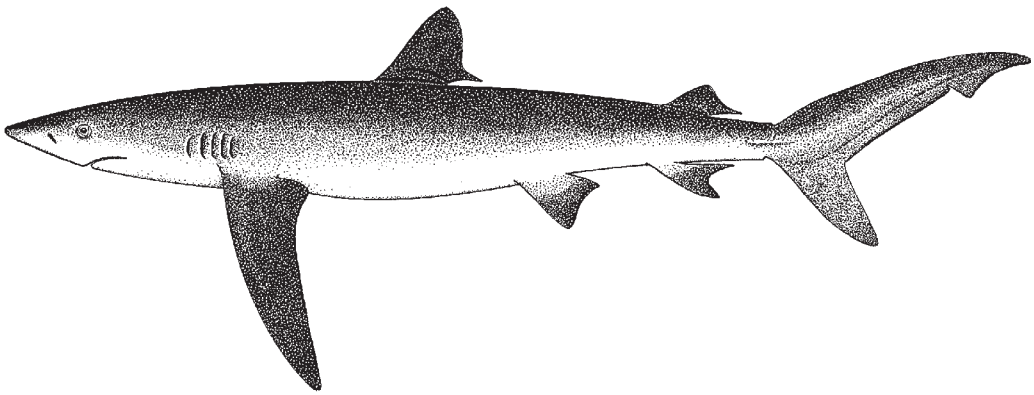
Distribution: Wide-ranging in the Indian Ocean and western Central Pacific, extending from South Africa to the Australian region and Oceania.

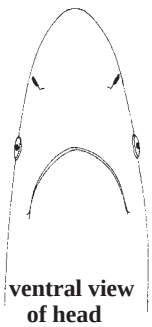


Prionace glauca (Linnaeus, 1758)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Blue shark; **Fr** - Peau bleue; **Sp** - Tiburón azul.





ventral view of head



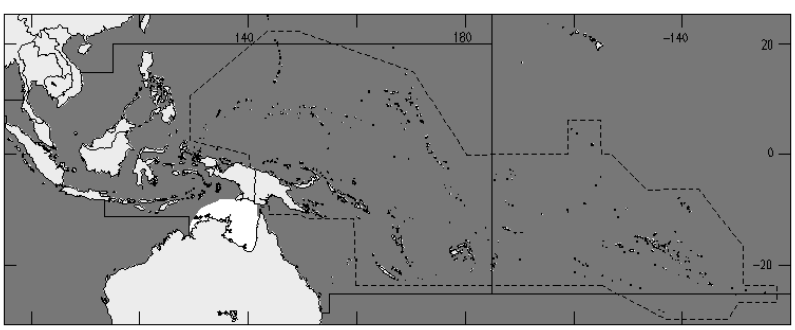
upper and lower tooth near centre

Diagnostic characters: very slender, fusiform shark. Snout long, (its length greater than mouth width) **and narrowly rounded**; upper labial furrows very short; **spiracles absent**; **nictitating eyelids present**; teeth serrated, broadly triangular and curved in upper jaw, narrower in lower jaw; **upper medial tooth very large,** nearly the size of teeth on either side of it (but sometimes absent); **inner gill arches with gill-raker papillae** (visible through open mouth). First dorsal-fin origin well posterior to free rear tips of pectoral fins, **the midpoint of its base closer to pelvic fin than to pectoral-fin origins**; second dorsal fin much smaller than first; **pectoral fins very long, narrow and somewhat falcate. A weak keel present of sides of caudal peduncle.** No interdorsal ridge. **Colour:** in life, **dark blue above, bright blue on sides,** white below, fading to purple blackish after death; tips of pectoral fins and anal fin dusky.

Size: Maximum total length about 3.8 m, though larger specimens (up to 4.8 to 6.5 m) are mentioned on poor evidence in the literature; most specimens below 3.35 m.

Habitat, biology, and fisheries: A slow-cruising, very common oceanic species capable of bursts of speed when excited. Usually well offshore and in the open sea near the surface, but sometimes penetrating coastal waters. Viviparous, litters usually large, ranging from 4 to 63 young. Feeds on a wide variety of bony fishes, small sharks, squids, pelagic crustaceans, and occasionally sea birds and carrion. Sometimes aggressive to people in the water, and considered a dangerous species although attacks on people are relatively uncommon. Usually caught with pelagic longlines and gill nets but also hook-and-lines, pelagic trawls, and even bottom trawls near coasts. It is utilized fresh, smoked, and dried-salted for human consumption; its hides are used for leather; fins for shark-fin soup base; and also for fishmeal and liver oil. This shark is also considered a game fish and taken by sports anglers with rod and reel.

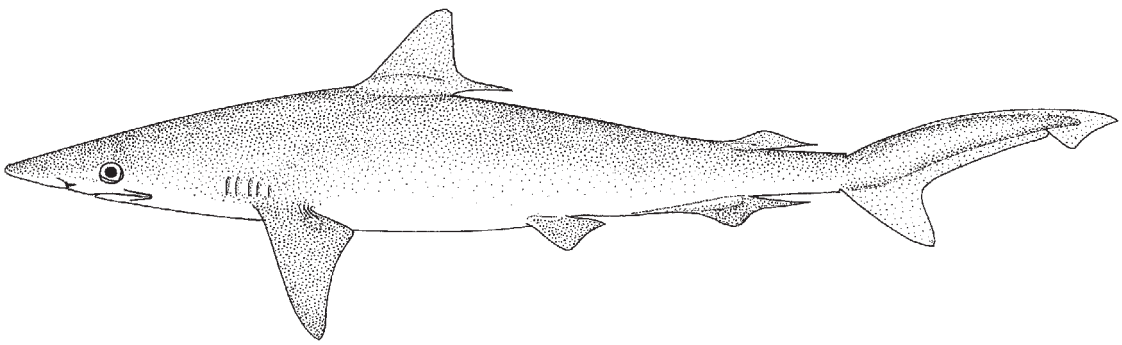
Distribution: Circumglobal in all tropical and temperate seas.

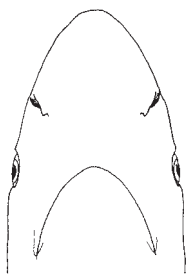


Rhizoprionodon acutus (Rüppell, 1837)

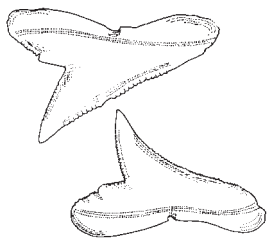
Frequent synonyms / misidentifications: *Scoliodon acutus* (Rüppell, 1837); *S. palasorra* (Bleeker, 1853); *S. walbeehmi* (Bleeker, 1856) / *Rhizoprionodon oligolinx* Springer, 1964; *R. taylori* (Ogilby, 1915); *Loxodon macrorhinus* Müller and Henle, 1839; *Scoliodon laticaudus* Müller and Henle, 1838; *Carcharhinus macloti* Müller and Henle, 1839.

FAO names: En - Milk shark; **Fr** - Requin à museau pointu; **Sp** - Cazón picudo.





ventral view of head



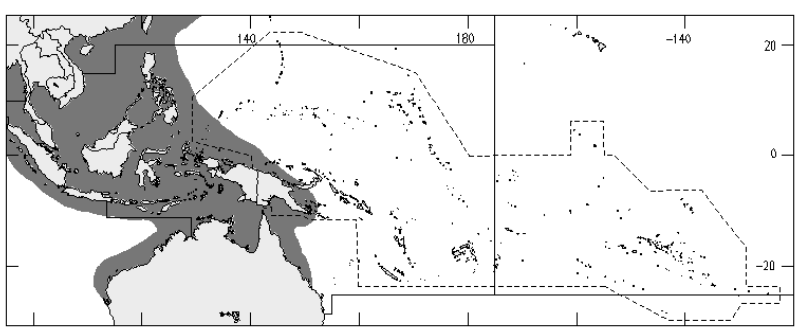
upper and lower lateral teeth

Diagnostic characters: A small, slender shark. Snout long and depressed its length usually greater than width of mouth, its tip narrowly rounded; eyes without a posterior notch; no spiracles; **labial furrows well developed and moderately long, the upper ones about equal in length to eye diameter and ending well behind eyes**; **teeth** similar in both jaws, low-crowned, **oblique and narrow-cusped,** with the outer edges deeply notched and without cusplets, smooth-edged in young but often finely serrated in adults. Origin of first dorsal fin over or posterior to inner corners of pectoral fins, base length of first dorsal fin twice or less in distance between pectoral and pelvic-fin bases, free rear tip usually anterior to pelvic-fin origins; **second dorsal fin smaller than anal fin, its origin far posterior to midlength of anal-fin base; anal fin with slightly concave posterior margin and a pair of long preanal ridges. Colour:** grey or grey-brown above, white below, dorsal and anal fins with dusky or blackish edges, fins slightly darker than back.

Size: Maximum total length about 1 m; a single record of a 1.78 m specimen off Africa (possibly based on some other species); adults maturing at about 75 cm; size at birth about 35 cm.

Habitat, biology, and fisheries: An extremely abundant, small, inshore and offshore shark of the tropics, ranging from the surfline down to a depth of 200 m, and occurring near the surface, as well as near the bottom. Viviparous, with 2 to 8 fetuses in a litter, gestation period about one year. Feeds on small bony fishes and small crustaceans; harmless to people. Very commonly caught inshore in artisanal and smallscale fisheries as well as offshore in fishing fleets. Caught on line gear (including floating longlines set near the coasts), and especially floating and bottom gill nets. Utilized fresh and possibly dried salted for food and for fishmeal.

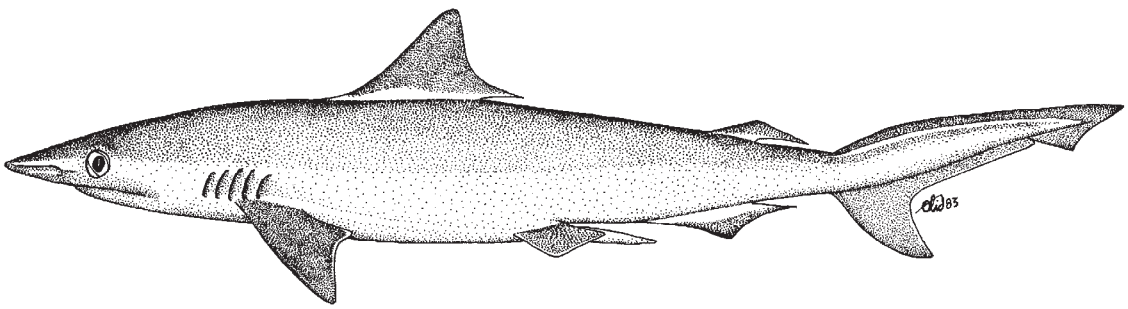
Distribution: In all tropical and subtropical areas of the Indian Ocean and the western Central Pacific (but absent in Oceania); also in the eastern Atlantic off Madeira and from Mauretania to Angola.

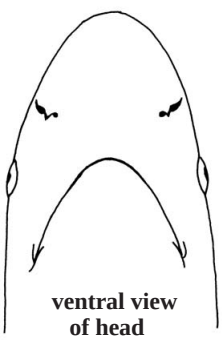


Rhizoprionodon oligolinx Springer, 1964

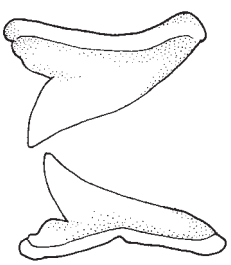
Frequent synonyms / misidentifications: *Scoliodon palasorra* (Bleeker, 1853) / *Rhizoprionodon acutus* (Rüppell, 1837); *R. taylori* (Ogilby, 1915); *Loxodon macrorhinus* Müller and Henle, 1839; *Scoliodon laticaudus* Müller and Henle, 1839; *Carcharhinus macloti* (Müller and Henle, 1839).

FAO names: En - Grey sharpnose shark; **Fr** - Requin aiguille gris; **Sp** - Cazón picudo gris.





ventral view of head



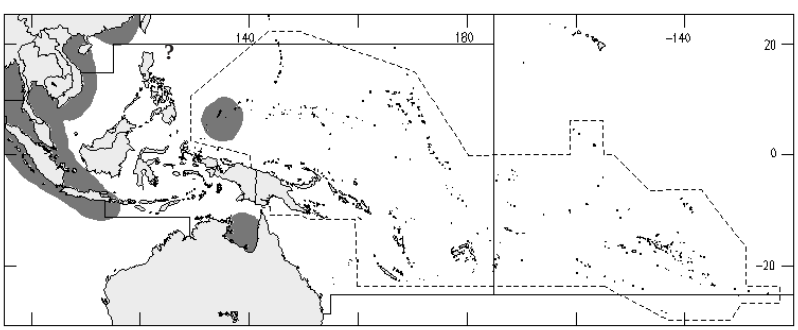
upper and lower lateral teeth

Diagnostic characters: A small, slender shark. Snout long and depressed, its length usually greater than width of mouth, its tip narrowly rounded; eyes without a posterior notch; no spiracles; **labial furrows very short, much less than eye length, ending well behind eyes; teeth** similar in both jaws, low-crowned, **oblique and narrow-cusped**, with the outer edges deeply notched and without cusplets, smooth edged in young but often finely serrated in adults. Origin of first dorsal fin over or posterior to inner corners of pectoral fins, its base length less than 2 times in distance between pectoral and pelvic-fin bases, its free rear tip usually anterior to pelvic-fin origins but occasionally over them; **second dorsal fin smaller than anal fin, its origin far posterior to midlength of anal-fin base**; **anal fin with slightly concave posterior margin and a pair of long preanal ridges. Colour:** grey dorsal and anal fins with dusky slightly darker than back.

Size: Maximum total length about 70 cm; males may mature at 35 cm; size at birth about 20 to 30 cm.

Habitat, biology, and fisheries: A common but little-known littoral, inshore and offshore tropical shark of coastal waters, ranging down to at least depths of 36 m from close inshore. Viviparous, with a yolk-sac placenta; number of young 3 to 5 per litter. Probably feeds on small fishes and invertebrates; harmless to people. Caught with floating and bottom gill nets, and line gear. Utilized fresh and probably dried salted for human consumption, also for fishmeal.

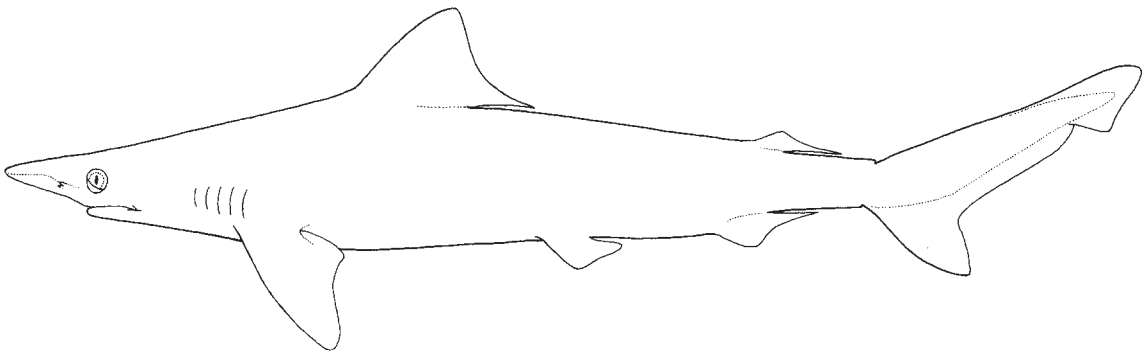
Distribution: In the tropical Indo-West Pacific from the Persian Gulf eastward to Thailand, Indonesia, China, and Japan; also recorded from Australia (Gulf of Carpentaria).

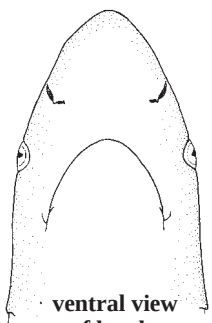


Rhizoprionodon taylori (Ogilby, 1915)

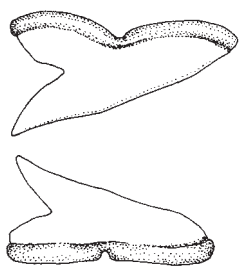
Frequent synonyms / misidentifications: *Protozygaena taylori* (Ogilby, 1915) / *Rhizoprionodon acutus* (Rüppell, 1837); *R. oligolinx* Springer, 1964; *Loxodon macrorhinus* Müller and Henle, 1839; *Scoliodon laticaudus* Müller and Henle, 1838; *Carcharhinus macloti* (Müller and Henle, 1839).

FAO Names: En - Australian sharpnose shark; **Fr** - Requin aiguille réchine; **Sp** - Cazón picudo australiano.





ventral view of head



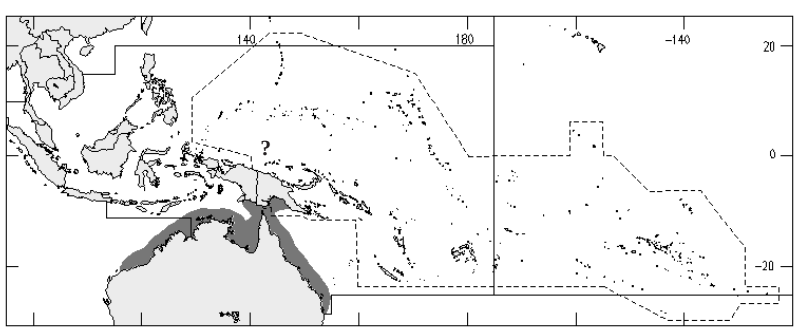
upper and lower tooth

Diagnostic characters: A small, slender shark. Snout long and depressed, its length usually greater than width of mouth, its tip narrowly rounded; eyes without a posterior notch; no spiracles; **labial furrows very short, much less than eye length, ending well behind eyes; teeth** similar in both jaws, low-crowned, **oblique and narrow-cusped,** with the outer edges deeply notched and without cusplets, smooth-edged in young but often finely serrated in adults. Origin of first dorsal fin just anterior or posterior to inner corners of pectoral fins, base length of first dorsal fin twice or less in distance between pectoral and pelvic-fin bases, free rear tip usually anterior to pelvic-fin origins; **second dorsal fin smaller than anal fin, its origin over past 1/3 of anal-fin base; anal fin with slightly concave posterior margin and a pair of long preanal ridges**. **Colour:** brownish grey above, white below, fins light-edged but not conspicuously marked.

Size: Maximum total length about 67 cm, males adolescent at about 41 cm; size at birth about 45 cm.

Habitat, biology, and fisheries: A little-known tropical inshore shark of the Australian continental shelf. Viviparous, with a yolk-sac placenta; number of young 2 per litter. Feeds mainly on fish but also on cephalopods and crustaceans. Locally very common and taken incidentally in mackerel nets, but not used commercially because of its small size.

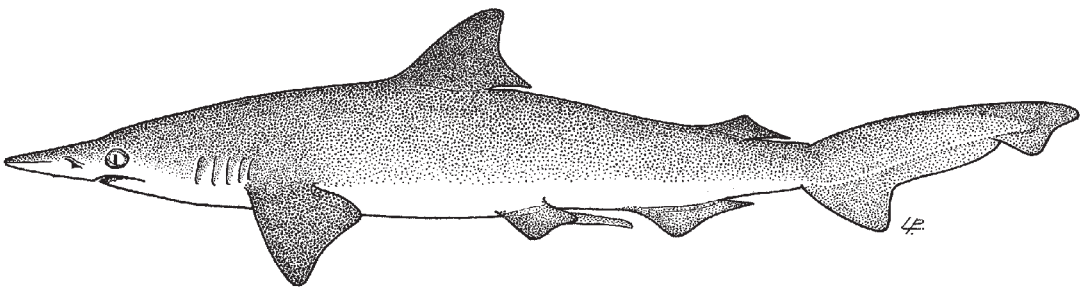
Distribution: Western South Pacific off Papua New Guinea and from northwestern Australia to southern Queensland.

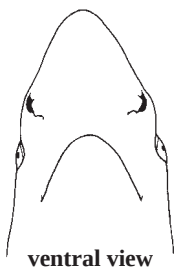


Scoliodon laticaudus Müller and Henle, 1838

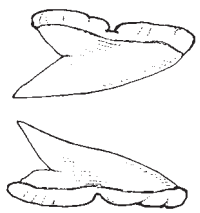
Frequent synonyms / misidentifications: *Physodon mülleri* (Valenciennes in Müller and Henle, 1839); *Scoliodon palasorra* (Bleeker, 1853); *S. sorrakowa* (Bleeker, 1853) / None.

FAO names: En - Spadenose shark; **Fr** - Requin epée; **Sp** - Cazón espadachin.





ventral view of head



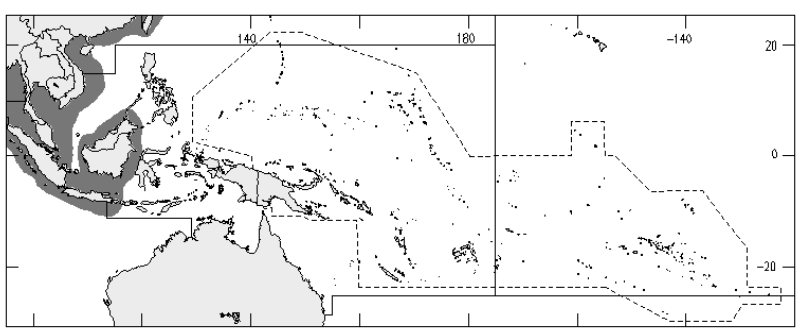
upper and lower tooth near centre

Diagnostic characters: A small shark. Body moderately stout and markedly **compressed**. **Head and snout strongly depressed**; **snout long, narrowly rounded, its length greater than mouth width**; **labial furrows very short;** anterior nasal flaps with a short, narrowly triangular lobe; **eyes moderately large, without a posterior notch**; spiracles absent; **teeth similar in both jaws, oblique and narrow-cusped,** with the distal edges deeply notched **and without cusplets or serrations. First dorsal fin moderately large,** its origin well behind pectoral free rear tips, its base closer to **pelvic than to pectoral-fin bases, and its** free rear tip over or **behind middle of pelvic-fin bases**; **second dorsal fin very small, its height less than 1/3 of that of first dorsal, its inner margin elongated and over twice the fin height, fin origin over** or slightly anterior to anal-fin insertion; pectoral fins small **broad, triangular, and not falcate, originating under or slightly** anterior to fifth gill openings, anal fin with a slightly concave posterior margin and relatively short preanal ridges. Upper precaudal pit transverse and crescentic; no keels on caudal peduncle; no interdorsal ridge. **Colour:** bronzy grey above, white below, fins sometimes darker than body; no conspicuous markings.

Size: Maximum total length about 74 cm, but most individuals smaller; size at birth about 13 to 15 cm.

Habitat, biology, and fisheries: A common tropical shark in coastal waters, often near the bottom in rocky areas. Viviparous, number of young 5 to 14. A small harmless shark, very abundant where it occurs in the area, and forming large schools. Feeds on shrimps, cuttlefishes, and small schooling fishes including anchovies, bregmacerotids, tripauchenids, and Bombay ducks (*Harpodon nehereus*). Caught with hook-and-line, longlines, floating and bottom gill nets, set bottom sets, and traps. Utilized for human consumption, processed into fishmeal, and used for bait for other sharks and bony fishes.

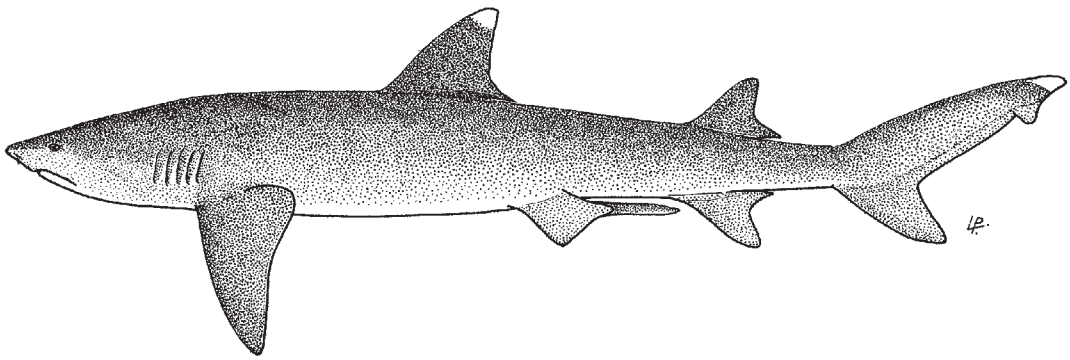
Distribution: In the tropical Indo-West Pacific from the Persian Gulf eastward to Thailand, Indonesia, China, and Japan; also recorded from Tanzania, but absent from Oceania and the Australasian region.

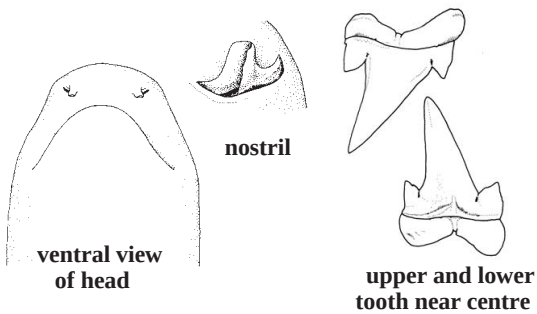


Triaenodon obesus (Rüppell, 1837)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Whitetip reef shark; **Fr** - Requin corail; **Sp** - Cazón coralero trompacorta.



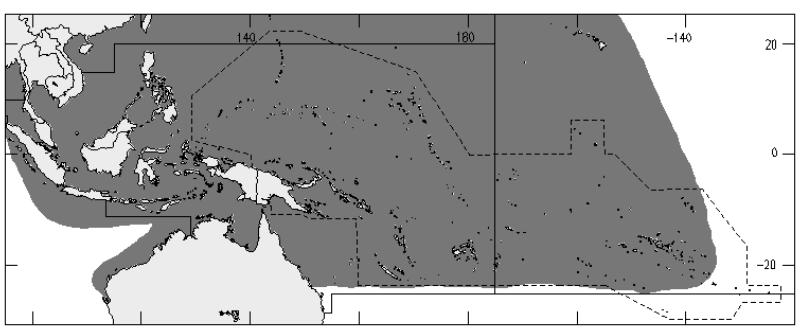


Diagnostic characters: A small to medium-sized shark. Body moderately stout. **Snout very short, broadly rounded, its length much less than mouth width** and equal to or less than distance between nostrils; labial furrows very short; **anterior nasal flaps with a short, truncate, prominent lobe, formed into a partial tube**; spiracles usually absent (small ones present in a few specimens); **teeth in upper and lower jaws with high, narrow, smooth-edged cusps with strong cusplets on each side, no serrations.** First dorsal fin moderately large, with a narrowly rounded apex, its origin well posterior to free rear tips of pectoral fins, **the midpoint of its base closer to pelvic fins than pectoral fins,** and its free rear tip about over pelvic-fin origins; **second dorsal fin very large, about 1/2 the surface of first dorsal fin and over half its height,** its inner margin shorter than fin height, its origin over or slightly anterior to anal-fin origin; pectoral fins moderately long, moderately narrow, slightly falcate, and with narrow tips; anal fin with posterior margin deeply notched; upper precaudal pit transverse and crescentic. No interdorsal ridge, and no keels on caudal peduncle. **Colour:** grey-brown above, sometimes with a few or several dark spots on sides, **first dorsal-fin lobe and dorsal caudal-fin lobe with conspicuous white tips,** second dorsal-fin lobe and ventral caudal-fin lobe often white-tipped; ventral surface cream-white.

Size: Maximum total length 1.7 m; size at birth about 52 to 60 cm.

Habitat, biology, and fisheries: A common shark in tropical, coastal clear waters, usually on or around coral reefs; commonly in holes and crevices, often in shallow water near the bottom, but exceptionally at considerable depths down to 330 m. Viviparous, number of young 1 to 5 in a litter. A common reef shark, feeding on a wide variety of reef fishes including moray eels, squirrelfishes, snappers, damselfishes, parrotfishes, surgeonfish, triggerfishes, goatfishes; also octopuses, lobsters, and crabs. A relatively non-aggressive shark to people in the water, and generally considered as not particularly dangerous. In response to exciting stimuli, especially speared fish, this shark has been known to attack divers, but never with serious results. Caught in floating and bottom gill nets and with line gear, including floating longlines. Utilized fresh for human consumption.

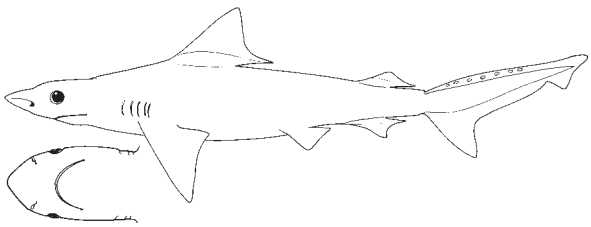
Distribution: Wide-ranging in the Indo-Pacific with an extensive distribution among islands of the tropical Pacific.



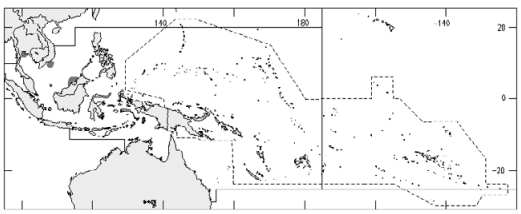
Carcharhinus sp.

En - False smalltail shark.

Maximum total length at least 43 cm, probably attains a maximum length of about 1 m as a term fetus is 34 cm total length and a freeliving individual with an umbilical scar is 37 cm total length. A rare, little-known inshore tropical shark endemic to the area, previously confused with the American smalltail shark, *Carcharhinus porosus* (Ranzani, 1839) but closer to (but distinct from) *C. borneensis*. Presumably viviparous. Probably occurs in local fisheries, but of minor interest. Known only from 3 specimens from Viet Nam (Ho Chi Minh City), Borneo (Baram, Sarawak), and Thailand (Bangkok). Conservation status needs investigation.



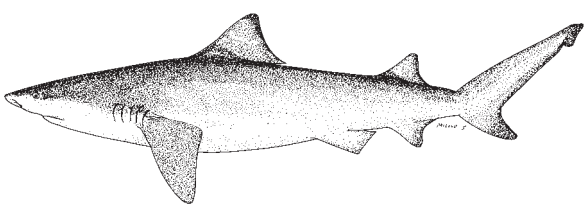
ventral view of head



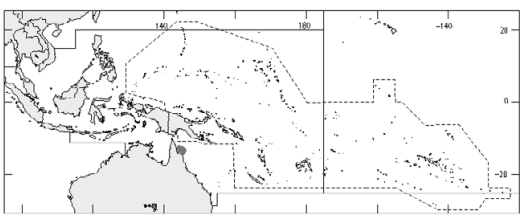
Glyphis sp. A [Last and Stevens, 1994]

En - Queensland river shark.

Maximum total length at least 75 cm (newborn specimen with umbilical scar), probably attains a much larger size. A rare, little-known tropical riverine shark. Probably occurs in local fisheries, but of minor interest. Known from 2 specimens from the lower reaches of the Bizant River in Queensland, Australia, probably in brackish rather than fresh water. Possibly identical with the speartooth shark, *Glyphis glyphis* (Müller and Henle, 1839) which was described from a single stuffed specimen without locality. Conservation status needs investigation.



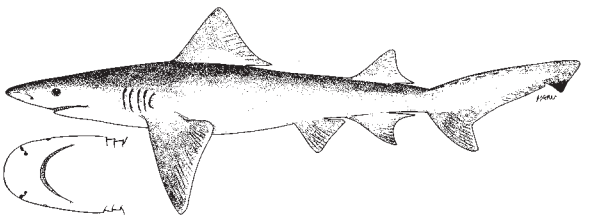
(after Last and Stevens, 1994)



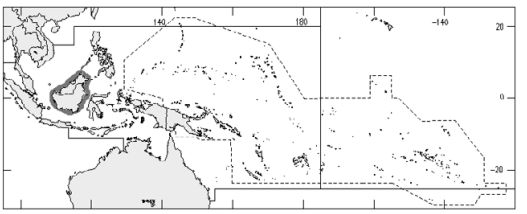
Glyphis sp. B

En - Borneo river shark.

Maximum total length about 81 cm, probably attains a much larger size. A rare, little-known tropical shark. Occurs in local fisheries, but of little interest. Known from Borneo. Conservation status needs investigation.



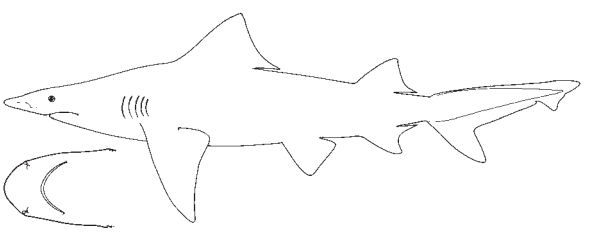
ventral view of head



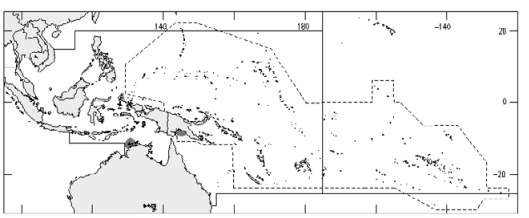
Glyphis sp. C

En - New Guinea river shark.

Maximum total length at least 1.31 m probably larger. A rare, little-known riverine tropical shark. Probably occurs in local fisheries, but of minor interest. A species including 3 specimens from Papua New Guinea and from fresh water in the Adelaide River, Northern Territory, Australia. Jaws of *Glyphis* from Papua New Guinea in estuaries or fresh water near Port Romilly and Bainuru and from fresh water at Alligator Island in the Fly River may be this species or *Glyphis* sp. A. Conservation status needs investigation.



ventral view of head



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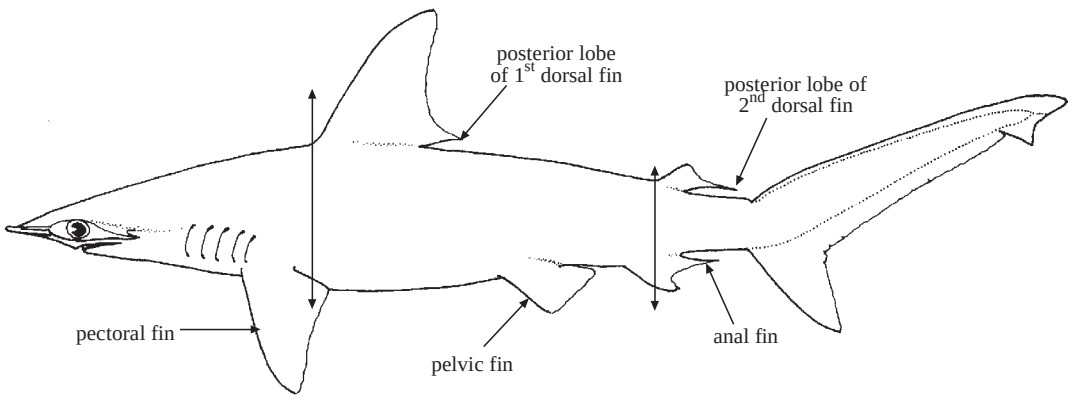
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SPHYRNIDAE

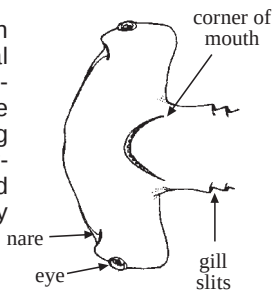
Hammerhead and bonnethead sharks

by L.J.V. Compagno

Diagnostic characters: Medium- to large-sized sharks. Body elongate and moderately slender. **Anterior portion of head much flattened dorsoventrally and widely expanded laterally in "hammer" form, with the eyes at its outer edges;** well-developed nictitating lower eyelids; teeth blade-like, with a single cusp. Two dorsal fins, the first high and pointed, its base much shorter than caudal fin and wholly anterior to pelvic-fin origin; caudal fin strongly asymmetrical, with a well-marked subterminal notch and a small, but well-defined lower lobe. Caudal peduncle not strongly flattened dorsoventrally or widely expanded laterally, without longitudinal ridges but with precaudal pits. **Colour:** back predominantly grey or brassy; belly white.



Habitat, biology, and fisheries: Hammerhead sharks inhabit surface waters in tropical and warm-temperate areas. Small species are confined to coastal waters; juveniles of large species are coastal, while adults are primarily semi-oceanic, although they often approach the coast in search of food. They are voracious predators, feeding mainly on fishes, sharks, rays, and bottom-dwelling animals (some crustaceans and molluscs). A few species are reported dangerous to bathers. Hammerhead sharks are important for fisheries in the area and are used as food and also for the preparation of various subproducts, especially Vitamin A from the liver and soup base from the fins.



ventral view of head

Similar families occurring in the area

None. No other shark family has the characteristic hammer-shaped head of the Sphyrnidae.

Key to the species of Sphyrnidae occurring in the area

1a. Expanded lateral blades of head very narrow and wing-like, with a series of small bumps along edges in front of nostrils; width across head 40 or 50% of total length; nostrils enormously expanded, each nearly 2 times the mouth width (Fig.1) . . . . . ***Eusphyra blochii***

1b. Expanded lateral blades of head relatively broad, not wing-like, and without small bumps along edges in front of nostrils; width across head less than 31% of total length; nostrils narrow, less than 1/2 the mouth width (Figs 2 to 4) . . . **(*Sphyrna*)** → ***2***

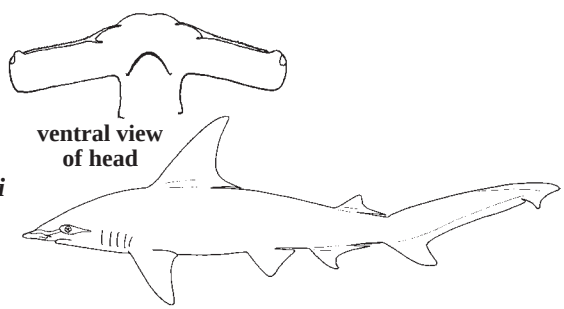


Fig. 1 ***Eusphyra blochii***

2a. Anterior margin of head nearly straight in adults, moderately convex in young; prenarial grooves hardly developed; teeth strongly serrated at all sizes; first dorsal fin markedly falcate; second dorsal fin about 1/3 as high as first, with a short inner margin; posterior margins of second dorsal and pelvic fins deeply concave (Fig. 2) . . . . . ***Sphyrna mokarran***

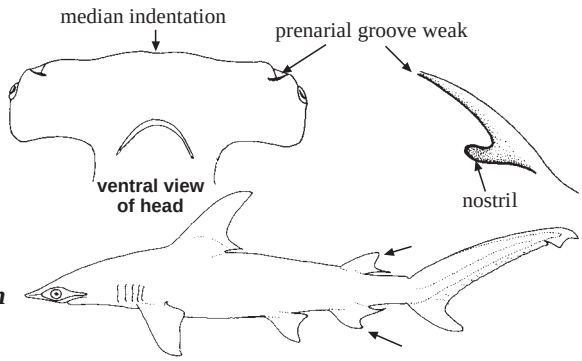


Fig. 2 ***Sphyrna mokarran***

2b. Anterior margin of head moderately convex in adults, strongly so in young; prenarial grooves well developed; teeth generally smooth, but may be finely serrated in adults; first dorsal fin erect or slightly falcate; second dorsal fin less than 1/3 the height of first, with a long inner margin; posterior margins of second dorsal and pelvic fins slightly concave to nearly straight (Figs 3 and 4) . . . . . → ***3***

3a. Median indentation present on anterior margin of head; free rear tip of second dorsal fin nearly reaching upper caudal-fin origin; anal-fin base noticeably larger than that of second dorsal fin (Fig. 3) . . . . . ***Sphyrna lewini***

3b. Median indentation absent from anterior margin of head; free rear tip of second dorsal fin well ahead of upper caudal-fin origin; anal-fin base about as large as that of second dorsal fin (Fig. 4) . . . . . ***Sphyrna zygaena***

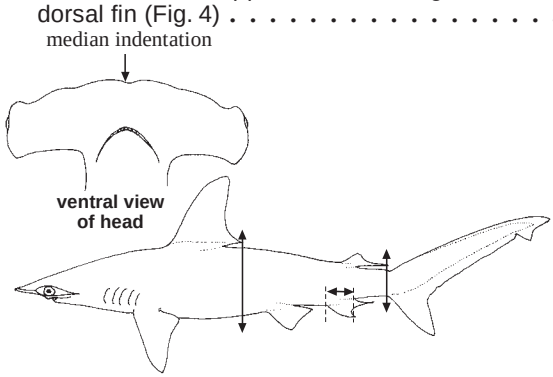


Fig. 3 ***Sphyrna lewini***

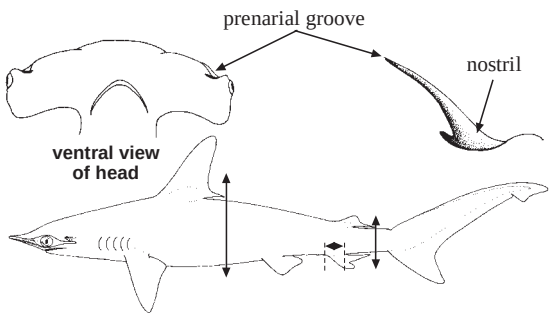


Fig. 4 ***Sphyrna zygaena***

List of species occurring in the area

The symbol is given when species accounts are included.

Eusphyra blochii (Cuvier, 1817)

Sphyrna lewini (Griffith and Smith, 1834)
Sphyrna mokarran (Rüppell, 1837)
Sphyrna zygaena (Linnaeus, 1758)

References

Compagno, L.J.V. 1988. *Sharks of the order Carcharhiniformes*. Princeton, New Jersey, Princeton University Press, 572 p.

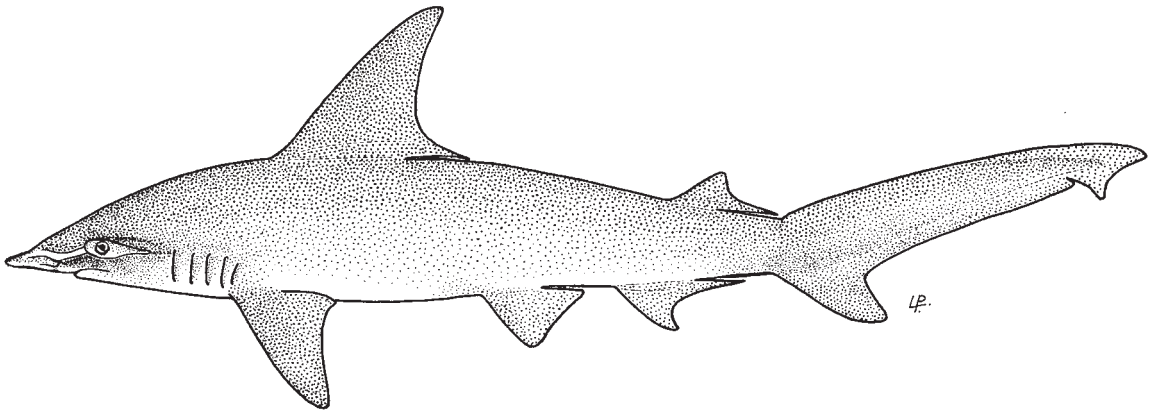
Gilbert, C.R. 1967. A revision of the hammerhead sharks (family Sphyrnidae). *Proc. U.S. Natl. Mus.*, 119:88 p.

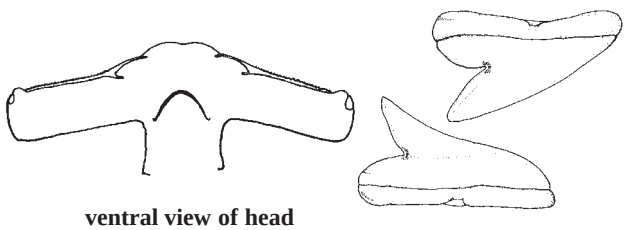
Gilbert, C.R. 1967. A taxonomic synopsis of the hammerhead sharks (family Sphyrnidae). In *Sharks, skates and rays*, edited by P.W. Gilbert, R.F. Mathewson, and D.P. Rall. Baltimore, Johns Hopkins Press, pp. 69-76.

Eusphyra blochii (Cuvier, 1817)

Frequent synonyms / misidentifications: *Sphyrna blochii* (Cuvier, 1817) / None.

FAO names: En - Winghead shark; **Fr** - Requin-marteau planeur; **Sp** - Cornuda planeadora.





ventral view of head

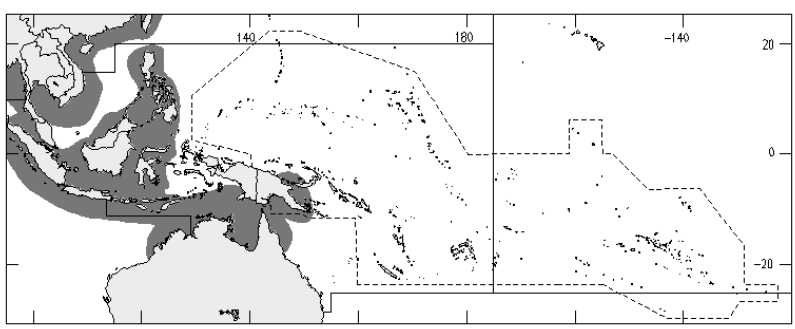
upper and lower tooth

Diagnostic characters: Body elongate and compressed**. Head shaped like a broad arrowhead or a pair of aircraft wings in dorsal or ventral view,** tremendously expanded laterally and relatively narrow from front to back, with width across head 2/5 to 1/2 of total length; anterior contour of head almost V-shaped in young but with lateral wings of head becoming transverse in adults; **a shallow, but distinct indentation, at the midline of head and a very broad, shallow indentation opposite each nostril, the edge of which has a row of low bumps; nostrils greatly elongated, wider than mouth,** with strong prenarial grooves anteromedial to their incurrent apertures; posterior margins of eyes opposite or behind front of mouth; teeth triangular, deeply notched distally, with relatively narrow oblique cusps and unserrated edges. **First dorsal fin very high, strongly falcate**; second dorsal fin small and low, less than 1/3 of height of first, with a greatly elongated inner margin nearly or quite twice the fin height, a free rear tip that nearly or quite reaches upper caudal-fin origin, and a shallowly concave posterior margin; pelvic fins with posterior margin nearly straight; anal-fin base about 1/3 longer than second dorsal fin. **Colour:** grey or grey-brown above, paler below.

Size: Maximum total length about 18.6 m; size at birth between 32 and 45 cm.

Habitat, biology, and fisheries: Found in shallow water on the continental and insular shelves. Viviparous, litters from 6 to 25 young. Feeds mainly on small bony fishes, but also on cephalopods and crustaceans. A small species, probably harmless to people. A common fisheries species in India, Pakistan, Malaysia, and Thailand, and probably elsewhere in its range. Caught with floating gill nets, probably fixed bottom gill nets, with floating longlines, and probably on hook-and-line. Utilized fresh for human consumption; livers yield a high-potency vitamin oil; and offal is probably used for fishmeal.

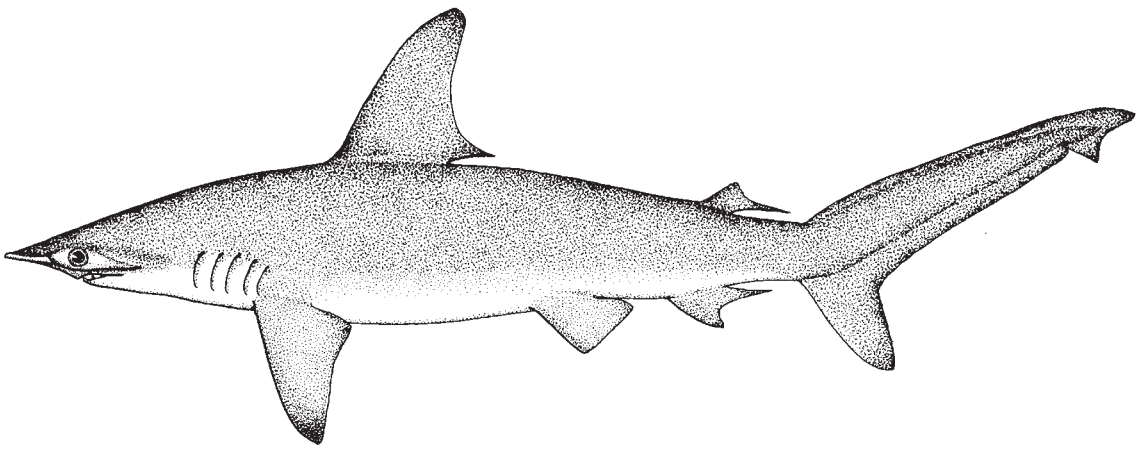
Distribution: An Indo-West Pacific coastal species distributed from the Persian Gulf eastward to Pakistan, India, Sri Lanka, Thailand, Borneo, China, the Philippines, and northern Australia.

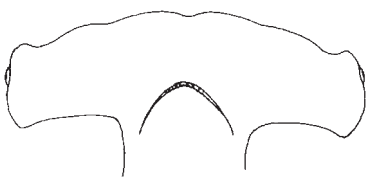


Sphyrna lewini (Griffith and Smith, 1834)

Frequent synonyms / misidentifications: *Sphyrna diplana* Springer, 1941 / *Sphyrna mokarran* (Rüppell, 1837); *S. zygaena* (Linnaeus, 1758).

FAO names: En - Scalloped hammerhead; **Fr** - Requin-marteau halicorne; **Sp** - Cornuda común.



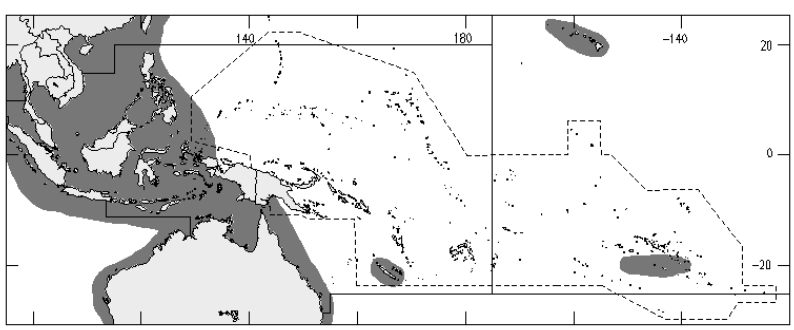


ventral view of head

Diagnostic characters: Body elongate and laterally compressed. Head "hammer"-shaped, **its anterior contour broadly arched in young, but moderately so in adults, with a shallow but distinct indentation at the midline** and a deep rounded depression opposite each nostril; lateral expansions of head very prominent, broad transversely and narrow from front to back; **nostrils with strong prenarial grooves; hind margins of eyes slightly posterior to or nearly opposite front of mouth;** mouth broadly arched; teeth triangular, deeply notched posteriorly, **with smooth or finely serrated edges.** First dorsal fin high, moderately falcate; **second dorsal fin small, less than 1/4 of height of first, with a greatly elongated free rear tip extending backward nearly to upper caudal-fin origin, an inner margin about twice as long as the anterior fin margin** and a shallowly concave posterior margin; pectoral fins short and broad; **pelvic fins with a nearly straight posterior margin;** second dorsal-fin base about 3/5 to 4/5 the length of anal-fin base. **Colour:** uniform grey, greyish brown, or olivaceous above, shading to white below; pectoral fins tipped grey or black ventrally.

Size: Maximum total length about 4.2 m; commonly to 3.6 m; size at birth between 45 and 50 cm.

Habitat, biology, and fisheries: Estuarine and inshore to well offshore and semi-oceanic, with young mostly in coastal waters. Adults solitary, in pairs, or in schools while the young form huge schools. Viviparous, number of young up to 30. Feeds on pelagic fishes, other sharks and rays, squids, lobsters, shrimps, and crabs. Adults considered potentially dangerous but often unaggressive when approached by divers. Probably the most abundant tropical hammerhead, readily available to inshore artisanal and small commercial fisheries as well as to offshore operations. Caught with pelagic longlines, fixed bottom longlines, fixed bottom nets, and even bottom and pelagic trawls; the young are easily caught on light longline gear. The meat is utilized fresh, fresh-frozen, dried-salted, and smoked for human consumption; the fins are used to prepare shark-fin soup base; the hides for leather, the oil for vitamins, and carcasses for fishmeal.

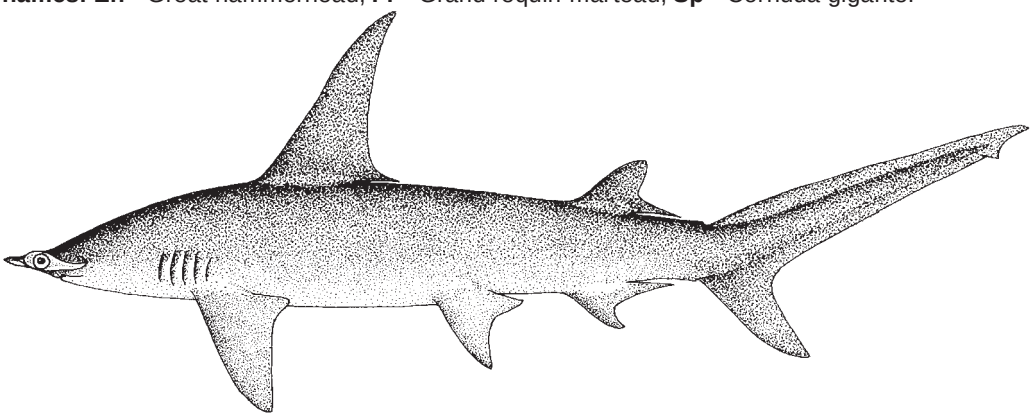


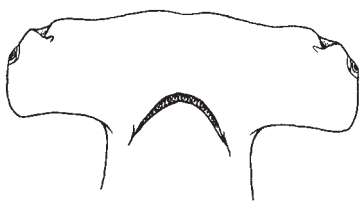
Distribution: Essentially circumglobal in coastal warm temperate and tropical seas.

Sphyrna mokarran (Rüppell, 1837)

Frequent synonyms / misidentifications: *Sphyrna tudes* (Valenciennes, 1822) / *Sphyrna lewini* (Griffith and Smith, 1834); *S. zygaena* (Linnaeus, 1758).

FAO names: En - Great hammerhead; **Fr** - Grand requin-marteau; **Sp** - Cornuda gigante.





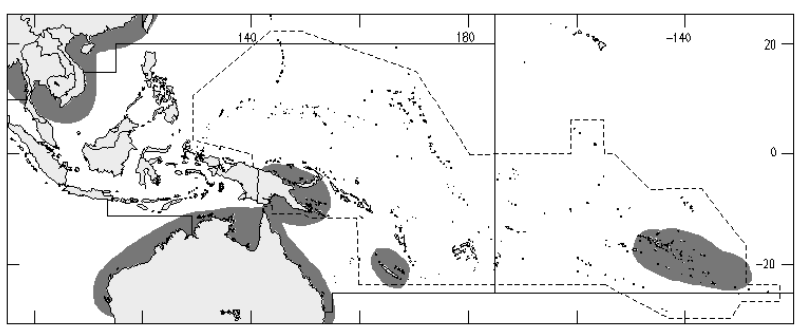
ventral view of head

Diagnostic characters: Body elongate and laterally compressed. Head "hammer"-shaped, **its anterior contour moderately arched in young but nearly straight in adults, with a shallow but distinct indentation at the midline** and a shallow rounded depression opposite each nostril; lateral expansions of head very prominent, broad transversely and narrow from front to back; **nostrils with weak prenarial grooves**; **posterior margins of eyes well anterior to mouth;** mouth broadly arched; teeth triangular, deeply notched posteriorly, **with strongly serrated edges. First dorsal fin very high, strongly falcate; second dorsal fin very large,** with a moderately short inner margin (about equal to anterior fin margin), a free rear tip ending well anterior to upper caudal-fin origin, and **a deeply concave posterior margin;** anal-fin base about as long as second dorsal-fin base; pectoral fins short and broad; **pelvic fins with a deeply concave posterior margin; Colour:** grey or grey-brown above, paler below; fins with dusky tips in young.

Size: Maximum total length between 5.5 and 6 m, and possibly more; commonly between 2.4 and 3.7 m; size at birth between 60 and 70 cm.

Habitat, biology, and fisheries: A powerful coastal and semi-oceanic species coming close inshore, often around and on coral reefs; also occurring near the surface over deep water not far from land. Viviparous, litters from 18 to 38 fetuses. Feeds on bony fishes (including sparids), other sharks, rays, squids, and lobsters. Potentially dangerous to people in the water. Although less abundant than *Sphyrna lewini*, this species is regularly caught in the tropics, with longlines, fixed bottom nets, hook-and-line, and possibly with pelagic and bottom trawls. Utilized for its meat, fresh, fresh-frozen, dried-salted, and smoked for human consumption; for hides, processed into leather; for fins used for shark-fin soup base; for liver oil, processed for vitamins; and carcasses for fishmeal.

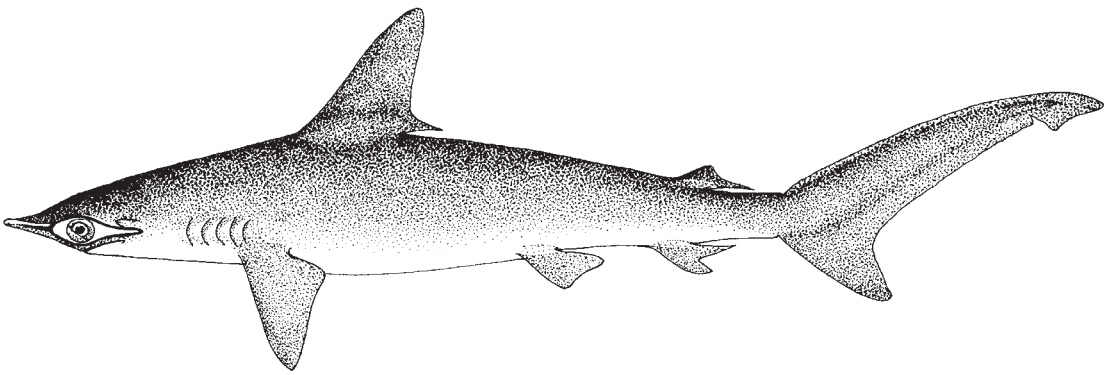
Distribution: Essentially circumglobal in coastal warm temperate and tropical seas.

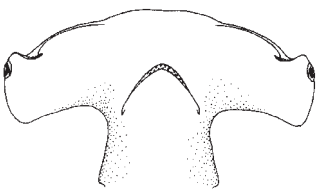


Sphyrna zygaena (Linnaeus, 1758)

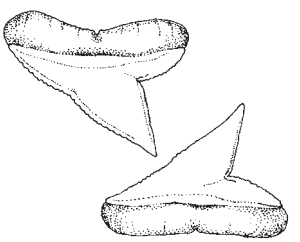
Frequent synonyms / misidentifications: None / *Sphyrna lewini* (Griffith and Smith, 1834); *S. mokarran* (Rüppell, 1837).

FAO names: En - Smooth hammerhead; **Fr** - Requin-marteau commun; **Sp** - Cornuda cruz.





ventral view of head

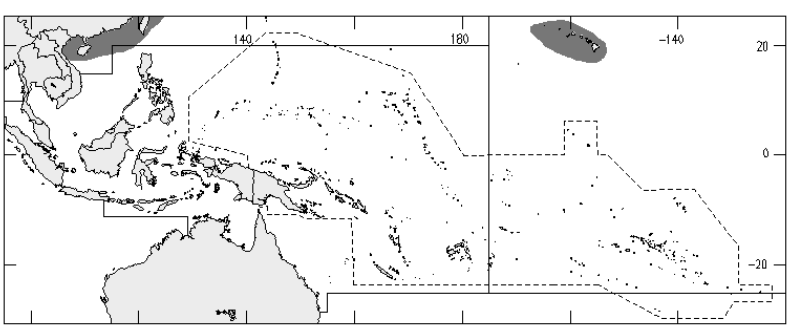


upper and lower tooth

Diagnostic characters: Body elongated and laterally compressed. Head "hammer"-shaped, **its anterior contour strongly arched in young but moderately rounded in adults, without a median indentation** but with a deep rounded depression opposite each nostril; lateral expansions of head very prominent, broad transversely and narrow from front to back; **nostrils with strong prenarial grooves**; eyes large, their horizontal diameter greater than length of shortest (fifth) gill slit, **their posterior margins about opposite mouth or just anterior to it;** mouth broadly arched; teeth triangular, deeply notched posteriorly, **with smooth or finely serrated edges. First dorsal fin high, moderately falcate; second dorsal fin small, with a very long inner margin** (almost twice the anterior fin margin), **a free rear tip ending well anterior to upper caudal-fin origin, and a nearly straight to shallowly concave posterior margin;** anal-fin base slightly longer than second dorsal-fin base; pectoral fins short and broad; pelvic fins with posterior margins straight to shallowly concave. **Colour:** brownish olive, or plain grey above, white or grey-white below; fins nearly plain, dusky or blackish tipped.

Size: Maximum total length probably between 3.7 and 4 m, commonly between 2.75 and 3.35 m; size at birth between 50 and 60 cm.

Habitat, biology, and fisheries: A common to abundant coastal and semi-oceanic species, living close inshore (especially the young) and near the surface in deep water not far offshore. A strong-swimming shark, migrating northward in summer; young often found in large aggregations of hundreds of individuals. Viviparous, litters from 29 to 37 fetuses. Feeds on bony fishes, other sharks, rays, crustaceans, and squids. Potentially dangerous to people. Caught with pelagic longlines, handlines, and even pelagic and bottom trawls. Utilized fresh, dried-salted, and possibly smoked for human consumption; hides are processed for leather; liver oil is extracted for vitamins; fins are processed into shark-fin soup base; and carcasses utilized for fishmeal.



Distribution: Widespread in temperate and tropical seas (western and eastern Atlantic, Mediterranean, western and eastern Pacific); occurs in the western Pacific from southern Siberia to Viet Nam, also southern Australia and New Zealand.

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INDEX OF SCIENTIFIC AND VERNACULAR NAMES

Explanation of the System

Italics : Valid scientific names (genera and species).
Italics : Synonyms (genera and species), misidentifications.
ROMAN : Family names.
ROMAN : Names of divisions, classes, subclasses, orders, suborders, and subfamilies.
Roman : FAO and local names.

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