

- Thompson, C.M. and Sparks, R.E. 1977b. Improbability of dispersal of adult Asiatic clams, *Corbicula manilensis* via the intestinal tract of migratory waterfowl. *American Midland Naturalist* 98: 219-213.
- Walford, P.R. 1946. A new graphic method of describing growth of animals. *Biological Bulletin of the Marine Biological Laboratory, Woods Hole* 90: 141-147.
- Walne, P.R. 1972. The influence of current speed, body size and water temperature on the filtration rate of five species of bivalves. *Journal of the Marine Biological Association of the United Kingdom* 52: 345-374.

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THE LIMPETS OF HONG KONG WITH DESCRIPTIONS OF
SEVEN NEW SPECIES AND SUBSPECIES

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During the course of the malacological workshop the following stations were visited:

- Wu Kwai Sha: a pebble beach, a rocky shore and a mangrove.
- Tolo Channel: Bluff Head (on the northern shore), Gruff Head (on the exposed southern shore) and Channel Rock, surrounded by coral, in the middle of the channel and reached by diving to a depth of 10 m.
- Hong Kong Island: the exposed rocky shore at Wah Fu and the beach and bay at Stanley, the islands of Kat O Chau and Ping Chau, the last with a south-western shore exposed to heavy surf and sheltered to the north east.

Subsequently two supplementary lots of limpets were received from Dr. B.S. Morton and Dr. D.S. Hill, and a further sample with two limpets from an archaeological site on Lamma Island.

The purpose of this paper is to present an annotated list of the known Hong Kong limpets, with descriptions of six new species and subspecies and with comments on some of the genera here treated. One supplementary new species from Taiwan is also described here. The seven holotypes have been deposited at the British Museum (Natural History) London.

SUPERFAMILY FISSURELLOIDEA FLEMING 1822

Three genera of the superfamily Fissurelloidea have been encountered at Hong Kong: *Emarginula*, *Diodora* and *Scutus*. The division of this superfamily into families is a little arbitrary and depends on the importance one gives to the central tooth, to the pharynx and muscle scar, and to the relative dimensions of animal and shell. Five subfamilies are retained here: Fissurellinae Fleming 1822, including the genus *Diodora* Gray 1821, Fissurellidinae Pilsbry 1890, Emarginulinae Gray 1834, including *Emarginula* Lamarck 1801, Scutinae Christiaens 1973, with *Scutus* Montfort 1810, as the type genus by monotypy, and Hemitominae Golikov & Starobogatov 1975.

GENUS *EMARGINULA* LAMARCK 1801.

EMARGINULA BICANCELLATA MONTROUZIER 1860 (Fig. 1)

The specimens of *Emarginula* were recovered from dead coral heads from 10 m

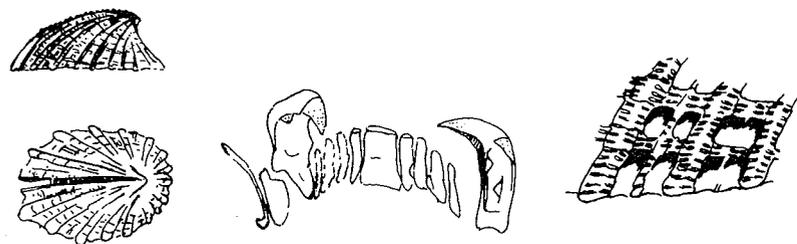


Fig. 1. *Emarginula bicancellata* Montrouzier. Channel Rock, on corals at 10 m depth. Shell 7.5 x 5 x 3 mm; radula and shell detail.

depth near Channel Rock. The biggest (7.5 x 5 x 3 mm) was a dead specimen; the smallest (4.6 x 3 x 1.7 mm) was alive. Both specimens are solid, inside white, outside light buff, with 14 to 16 external nodulose, projecting main ribs, having some smaller intermediate ones. There are approximately 10 well formed concentric ridges, with many small concentric striae visible only under a lens. The shell has a long slit, approximately one fifth of the shell length and a fine selatine with many regular pearls. The apex is at the posterior tenth of the shell.

This species fits none of the seven Japanese species of *Emarginula* described by Kuroda, Habe & Oyama, (1971). From the recent literature and from the excellent book on the Fissurellidae by Thiele (1912) *E. bicancellata* generally agrees with the Hong Kong specimens. I have recently received a further specimen of *Emarginula*, measuring 8.5 x 5.8 x 3.2 mm, from Seribu, North of Djakarta and apparently belonging to the same species as the Hong Kong specimens. Although Art Isle, New Caledonia is the type-locality of *E. bicancellata* a wide distribution for this species is accepted. A study of the radula has not proved helpful in confirming the identification as very few *Emarginula* radulae have been studied hitherto.

In the Paris Museum some specimens in the Jousseume collection from New Caledonia have a very short slit, scarcely visible outside and do not correspond to the description of *E. bicancellata* under which name they are stored. Specimens from the same locality, under the name *E. mariei* Crosse, do so and also correspond to the Hong Kong specimens.

GENUS *DIODORA* GRAY 1821

Of the genus *Diodora* a total of 14 specimens have been collected of which 11 were alive: four from Wu Kwai Sha, rocky shore, six from Gruff Head, one from Bluff Head and three from corals at 10 m depth near Channel Rock.

It is not easy to name these highly variable specimens, belonging to several species. The intraspecific variation and the distribution of the Indo-Pacific species of *Diodora* are inadequately known and the genus is in need of revision. For many localities *Diodora* is not mentioned: Hawaii (Tinker, 1959), Peitaiho (Grabau & King, 1928), Shantung (Yen, 1936), Java (Oostingh, 1923), South Sumatra (Oostingh, 1935), Cape D'Aguilar, Hong Kong (Adal, 1958). Conversely some species appear to have been inventoried for too many countries, e.g. *D. quadriradiata* Reeve, type-locality Philippines, has also been recorded from Dar es Salaam (Spry, 1961), Japan (Kira, 1960) and Queensland, Australia (Cotton, 1959). Other species are generally considered to have a wider distribution. *D. crucifera* Pilsbry from S. Africa has for instance been recorded from the Pliocene of Taiwan (Otuka, 1937). From Sri Lanka I have specimens identical with *D. crucifera* from

Natal.

The radulae of different Hong Kong specimens have been examined but have not proven to be good taxonomic criteria for the separation of the various species. Included here is a short description with figures of the shell and radula of four species.

DIODORA REEVEI SCHEPMAN 1908 (Fig. 2)

A small encrusted keyhole limpet (7.7 x 5.2 x 4 mm) found on corals at 10 m depth near Channel Rock. After cleaning it was found to have, on the posterior side, three well pronounced scaled ribs. I identify it as *D. reevei* Schepman, a new name erected by Schepman (1908) for *D. excelsa* Reeve 1850 (non Reeve & Adams 1848). I consider *D. octogona* (Reeve 1850), *D. nigroocellata* (Reeve 1850) and *D. subcalyculata* Schepman 1908 to be synonyms of this species. *Diodora reevei* is similar to the white *D. delicata* Smith 1899 from Travancore (Sri Lanka). It is also similar to *D. funiculata* Reeve, which has more regular ribs and a larger central radular tooth. The well-known species *D. calyculata* Sowerby from S. Africa and *D. sieboldii* Reeve from Japan are also similar. Probably *D. reevei* possesses a wide Indo-Pacific distribution.

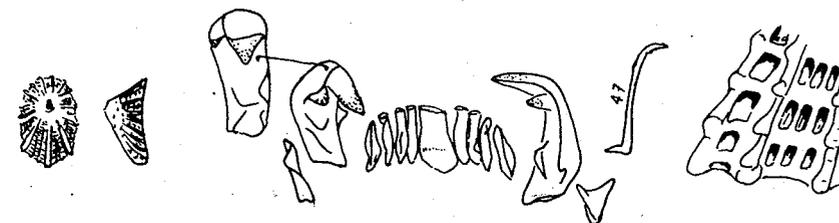


Fig. 2. *Diodora reevei* Schepman. Channel Rock, on corals at 10 m depth. Single specimen 7.7 x 5.2 x 4 mm.

DIODORA SPECIES 1 (Fig. 3)

A single specimen (13.8 x 9.5 x 6.9 mm) collected from Wu Kwai Sha, is high coned, having very characteristic numerous, nearly uniform granulose ribs (37 at the top and 56 at the margin) with approximately 25 white to brown coloured regular grains. Between the main ribs are small black ones having finer grains or pearls, giving the inside a blue shine. Every 4th to 7th riblet is, however, white forming, in total, eight white external rays. The anterior slope of the shell is straight, at an angle of 30° to the vertical; the posterior slope is convex and broken. The keyhole is slightly trilobate and is inside truncated behind. The radula strongly resembles that of *D. singaporensis* as described by Thiele (1891: pl. 27, Fig. 6).

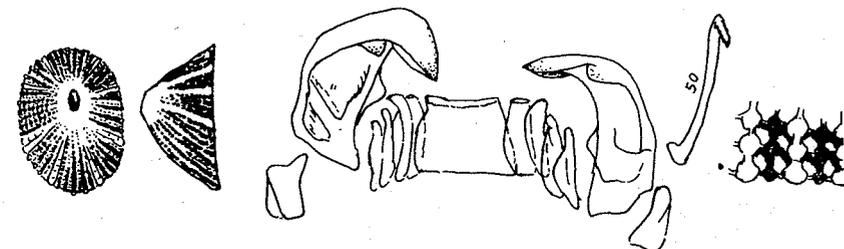


Fig. 3. *Diodora* spec. 1. Wu Kwai Sha. Single specimen 13.8 x 9.5 x 6.9 mm.

DIODORA SPECIES 2 (Fig. 4)

A single specimen (11.4 x 7.1 x 4.4 mm) was collected from Wu Kwai Sha, and possesses an elongate and compressed shell with a latticed sculpture. Nineteen ribs originate apically and are bordered by a well marked black point. At the margin there are 33 knobbed ribs with some finer intermediate ones. Ten concentric threads, less coarse than the ribs, with some smaller intermediates, form a latticed squared texture. The foramen is small, elongated and a little larger in the middle. The hole-callus is not truncated. The shell is conical, with a slope of 40° and 60° respectively anteriorly and posteriorly. This species is similar to *D. singaporensis* Reeve, as figured by Reeve (1849–50; Fig. 107) (non Fig. 106), and to *D. quadriradiata* Reeve (non Reeve) as figured by Pilsbry (1890: pl. 36, Fig. 12).

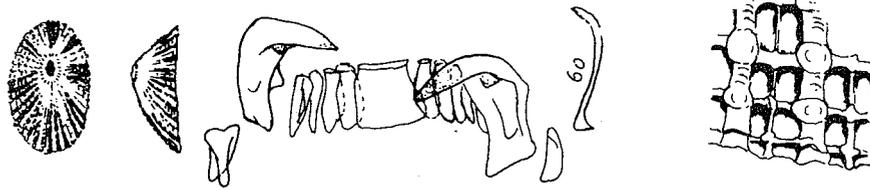


Fig. 4. *Diodora* spec. 2. Wu Kwai Sha. Single specimen 11.4 x 7.1 x 4.4 mm.

DIODORA CRUCIATA GOULD 1846 (Fig. 5)

All the specimens found at Gruff Head resemble *D. cruciata* Gould from the Sooloo Sea. The specimen from Bluff Head also resembles this species but its hole-callus is not truncated as in the other specimens. The keyhole of the Hong Kong specimens is narrower than in *D. cruciata*; it is situated more anteriorly and has in the middle a characteristic small roundish excavation. The surface is sculptured with about 34 elevated, rounded, radiating ribs, alternately larger and smaller, crossed by regularly elevated, slightly imbricated threads, giving a cancellated appearance. At the posterior side, near the margin, there are some supplementary riblets. The colour is greyish, with a well marked blackish Maltese Cross. Apically, around the orifice, the shell is usually white, traversed only by the origins of the four black rays.

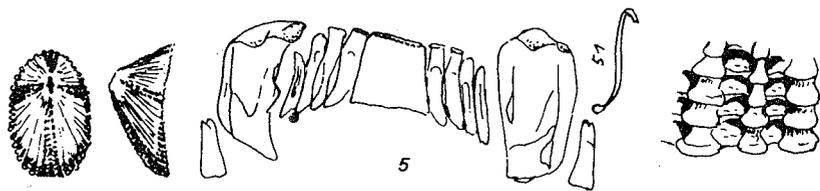


Fig. 5. *Diodora cruciata* Gould. Gruff Head. Shell 12 x 8 x 5.3 mm.

GENUS *SCUTUS* MONTFORT 1810*SCUTUS (SCUTUS) UNGUIS* (LINNAEUS 1758), SUBSPECIES *SINENSIS* BLAINVILLE 1825

Six live specimen, up to 25 mm in length, have been collected from below low water from the rocky shore at Wu Kwai Sha. Kuroda, Habe & Oyama (1971) assign this species the name *Scutus (Aviscutum) sinensis*. Iredale (1940) first reintroduced the name *sinensis* Blainville with the following words: "Sixty years ago E.A. Smith, at that time very inexperienced, used for all the tropical forms *Scutus unguis* Linnaeus, with five varieties,

ignoring all geographical considerations. As Linne's *Patella unguis* has been shown to have nothing to do with this group (sic!) a renomination must be made. . . . *S. sinensis* Blainville is available for the Chinese and Japanese species." At the same time Iredale created the subgenus *Aviscutum* for the tropical *Scutus* with the particoloured mantle. Iredale forgot that *S. unguis* also has a marbled mantle and that other authors have retained the name *S. unguis*, e.g. Pilsbry (1890), Thiele (1912), Schepman (1908). All these date the name *S. unguis* Linnaeus as 1764 and not 1758. It is true that *Patella unguis* was better described in 1764 (*Museum Reginae Ludovicae Ultricae*) than in the *Systema Natura*, 1758, and that the wrong reference of Petiver (to a *Lingula*) was omitted in 1764. However, the original description of *P. unguis* dates from 1758 and a species of Linnaeus should not have been dismissed by Iredale or by a wrong reference.

In my collections there are specimens of *Scutus* from Japan, New Caledonia, Okinawa, Sri Lanka, South Africa, Mocambique, Queensland. Between these there is no essential difference. *Aviscutum* is thus considered to be a junior synonym of *Scutus* and the specific name *S. unguis* Linnaeus 1758 is retained. For a better understanding of the species the subspecies name *sinensis* is also retained.

SUPERFAMILY PATELLOIDEA RAFINESQUE 1815

In this large superfamily four genera have been encountered: *Patella* and *Cellana* are representatives of the family *Patellidae* Rafinesque 1815, and *Collisella* and *Patelloida* are representatives of the family *Acmaeidae* Philippi 1853.

GENUS *PATELLA* LINNAEUS 1758

From an archaeological site at Sham Wan, Lamma Island, I have received from Dr. B. Morton two subfossil limpets. The biggest measures 92 x 70 x 20 mm and is a little more ovate than *P. lowei* d'Orbigny (= *P. aspera* Roding) figured by Pilsbry (1891: pl. 29, Fig. 43–45). The ribs around the apex are all subequal and are not so strongly marked as in Pilsbry's figure. The second specimen (71 x 54 x 21 mm) has the form of the holotype of *P. aspera* Lamarck from unknown habitat, but possibly from the Canary Islands, and which is located in the Geneva Museum. The two specimens have approximately 60 subequal irregular ribs and inside there is a very pronounced and thickened callus and muscle scar as is often the case in old and worn shells.

A.W.B. Powell has identified two other Hong Kong specimens as *Patella flexuosa optima*. In a letter to Dr. Morton he says that the outer edges are broken away, preventing him from seeing the characteristic marginal development of *P. optima*, consisting in all of about ten broad folds, and that the relatively large size of the scar indicates that about 10 to 12 mm of the margin has been broken away. The two specimens here examined have more than 3/4 of the margin undamaged and may be different from those Powell examined. They are certainly different from *P. optima* figured by Powell (1973: pl. 65, Fig. 10 and pl. 100, Fig. 2).

PATELLA (ANCISTROMESUS) FLEXUOSA QUOY AND GAIMARD 1834

A dead specimen, measuring 27.5 x 24 x 5.5 mm, collected from Hong Kong with various other limpets by Dr. D.S. Hill, is directly comparable with *P. stellaeformis* Reeve 1842, as figured by Reeve (1854: spec. 48) under the name *P. pentagona* Born (non Born = *P. granatina* Linnaeus) and is very similar to some other specimens from the Philippines, Taiwan Japan, and even from the Seychelles and Sri Lanka. Cernohorsky (1972) and Powell (1973) use the earlier name *P. flexuosa*. Christiaens (1973) considered *P. flexuosa* a *nomen dubium* but later (Christiaens, 1974), for reasons of nomenclatorial

stability, considered it a *nomen non desiderandum*. Subsequently, however, other authors have used the name *flexuosa*, e.g. Salvat and Rives (1975), and I follow them here.

I have further received from Dr. Morton two large preserved specimens from the lower shore at Stanley Peninsula. They measure 67 x 55 x 16 and 49.5 x 38.5 x 12 mm and are comparable with the figure of *P. optima* (Pilsbry 1927) given by Hirase and Taki (Taki, 1954: p. 57, Fig. 3) for a specimen from Suwasejima, Satsunanshoto, Japan, an island situated less than two degrees south of Yakushima, type locality of *P. stellaeformis* subspecies *optima*, of which the holotype, as far as I am aware, has never been figured. Most authors have kept the large, solid, ovate, depressed *P. optima*, with its dozen low broad radial elevations, as a subspecies of *stellaeformis* (= *flexuosa*) as did Pilsbry (1927).

P. flexuosa has been placed (Christiaens, 1973) in the subgenus *Ancistromesus* Dall 1871, a subgenus having *P. mexicana* Broderip and Sowerby as type species by original designation, and having four aligned unicuspid teeth and a pluricuspid tooth with four cusps.

The radula of the smallest Hong Kong specimen, having a length of 25 mm (or half the shell length), has been examined and proved to be near to other Indo-Pacific specimens. Nevertheless it seems necessary to make a more extensive study of this group and in this to include some other species, or forms, e.g. *P. pica* Reeve 1854 (= *exusta* Reeve), *P. moreli* Deshayes 1863, *P. paumotensis* Gould 1846 and *P. inquisitor* Iredale 1929.

GENUS *CELLANA* A. ADAMS 1869.

Powell (1973), in a worldwide revision of the limpets, introduces for the genus *Cellana* several changes. To avoid more confusion it is useful to note here some preliminary corrections.

The well-known Japanese species *C. nigrisquamata* (Reeve 1854), for instance, is named *C. mazatlandica*, notwithstanding that the last name is *nomen oblitum* and that Article 151 of the I.C.Z.N. recommends that erroneous geographic names should not be reintroduced.

To the common Indian *C. rota* (Gmelin 1791), Powell assigns the name *C. radiata* Born 1778 stating that the shell described and figured by Born is without doubt the common Indian and Ceylonese limpet. However, Brauer (1878), had earlier considered the type of *Patella radiata* Born (non Chemnitz) to be the South-African *C. capensis* (Gmelin), an identification with which I agree, having seen the type in the Vienna Museum. Ray (1948) also unites the South-African with the Indian species, a possible but not proven opinion, which is not followed here.

For a species from the Red Sea, Powell introduces the name *Cellana eucosmia* Pilsbry 1892, which was a *nomen novum* for *P. variegata* Reeve 1854 (= a good Japanese species with Australia given as the wrong locality), non *P. variegata* Reeve 1842 (= a good *Cellana rota* from the Red Sea). Powell gives as his reason that Dall had correctly localized *P. variegata* Reeve 1854 as coming from the Red Sea and that Pilsbry (1895) switched his *eucosmia* without reason to a Japanese *Cellana*. Powell omits two facts here: first, Dall (1871) correctly localized *P. variegata* Reeve 1842 and put *P. variegata* Reeve 1854 erroneously in synonymy. Second, Pilsbry (1895) did not switch without reason. In the original description of the new name *eucosmia* Pilsbry (1891-92) admits that some of the given localities of *P. variegata* Reeve 1854 (non 1842) are incorrect. The same year Taylor (1892) retained the name *C. eucosmia* only for the Japanese species and it is self-evident that later Pilsbry (1895) made the same correction. Later, Pilsbry (1901

a) notes that *P. grata* has similar contours as *C. eucosmia*, but he did not put them in synonymy. Only later did Johnson (1964) choose a lectotype for *C. grata* (Gould 1859), which is an unfigured species often taken for *Collisella dorsuosa* (Gould 1859). He showed that *Cellana grata* has priority over *C. eucosmia* and *C. stearnsii* with which it is identical. It is perhaps regrettable that Johnson did not consider *C. grata* to be a *nomen oblitum*, and that he did not keep *C. eucosmia* as the valid name. Nevertheless it is clear that the name *C. eucosmia* can not be retained for a Red Sea species as suggested by Powell.

From Hong Kong, two species of *Cellana* have been collected: *C. toreuma* and *C. grata* (= *C. eucosmia*).

CELLANA TOREUMA (REEVE 1855)

Shell long-oval, depressed, thin, apex anterior, finely striated, colour excessively variable, being dotted, mottled, rayed or uniform. Found at midtide on exposed rocks, by preference on smooth horizontal surfaces. Animal often grazing, even at low water, with mantle protruding from beneath the shell, and easily detachable from the rocks. Pluricuspid tooth with small endocone (see Fig. 6). At Ping Chau the species is very common and up to 45 mm in length. The type locality of Monterey given by Reeve (1855, spec. 69) is erroneous. *P. amussitata* Reeve (China, Philippines) (Pilsbry, 1895) and *P. affinis* Reeve (New Zealand in error) (Tomlin and Peile, 1925) are considered to be synonyms.

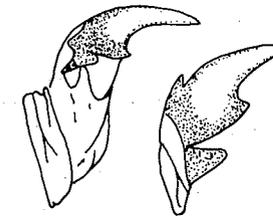


Fig. 6. *Cellana toreuma* (Reeve). Ping Chau. Pluricuspid tooth detached from radular ribbon and cusps detached from toothbase.

CELLANA GRATA (GOULD 1859)

Shell conical, oval, with granulate ribs and a well pronounced callus. Generally dark orange-brown with usually 11 or 12 not always well defined brown rays. Animal with greenish mantle, very tough, well attached to very exposed vertical rocks at high water. Radula length v.s. shell length varies between 2.8 : 1 and 4.3 : 1. The big cusp of the pluricuspid tooth is regular in form (Fig. 7). Fifteen specimens were collected from

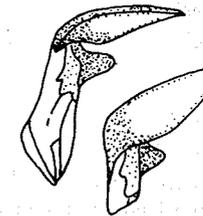


Fig. 7. *Cellana grata* (Gould). Ping Chau. Pluricuspid tooth as in Fig. 6.

Ping Chau (up to 52 mm in length), 16 specimens from Gruff Head and one small specimen from Wah Fu. The type of *Patella grata* (Gould, 1859) measures 30 x 24 x 14 mm, while the lectotype (Johnson, 1964: pl. 19, Fig. 1,3) measures 27 x 22 x 14 mm.

This species has been figured by Schrenck (1867: pl. 14, Fig. 4,5) under the name *P. amussitata* Reeve (non Reeve = *C. toreuma*). Other synonyms are: *Helcioniscus eucosmia* Pilsbry 1892 (non Powell 1973), *P. variegata* Reeve 1854 (non 1842) and *Patella (Helcioniscus) stearnsii* Pilsbry 1891 which Taylor (1894) believes to be a young *C. nigrisquamata* Reeve.

GENUS *COLLISELLA* DALL 1871

Collisella Dall 1871 was erected as a subgenus of *Acmaea* for species possessing a marginal tooth. Those with one small marginal tooth (= uncinus) belong to the section *Collisella sensu stricto* (*A. pelta* as type by original designation) and those with two marginal teeth belong to the section *Collisellina* (*A. saccharina* as type by original designation). This last name is a synonym of *Patelloida* which has for a long time been separated from *Collisella* as a good genus. The former, *Collisella*, has also been elevated to generic rank. Other subgenera of *Collisella* do not possess an uncinus (e.g. *Notoacmea* Iredale 1915, *Parvacmea* Iredale 1915, *Atalacmea* Iredale 1915, *Naccula* Iredale 1924 and *Simplacmaea* Christiaens 1975). In my opinion the presence or absence of a small marginal tooth is not a generic character. Similarly in the genera *Patella* and *Patelloida* no generic distinction is made between species either possessing or not a vestigial central tooth.

The generic name *Collisella* was first employed by Habe (1944) who also erected the subgenera *Conoidacmea* and *Kikukozana*, and was followed by American authors such as McLean (1971). The definition of the genus is as follows: marine, patelliform gastropod with ctenidia and no pallial branches, with two lateral teeth the exterior of which is bicuspid and a radula with or without a small uncinus.

Generally the genus has a Pacific distribution. No Australian authors have recorded a true *Collisella* from their country possibly because the uncini were unseen. In a provisional revision of the *Acmaeidae* (Christiaens, 1975), mention was made of several Australian *Collisella sensu stricto*: *C. crucis*?, *C. granulosa*, *C. mixta*, *C. onychitis*, *C. subundulata*. The genus is not recorded from New Zealand.

COLLISELLA (COLLISELLA) LUCHUANA (PILSBRY 1901) *ERICAE* NOV. SUBSPEC. (Fig. 8)

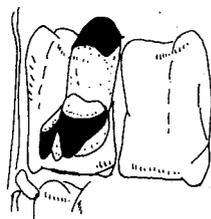


Fig. 8. *Collisella luchuana ericae*, nov. subspec. Stanley. Single row from radula, the right side showing the ventral plate without teeth.

The description of *Patella luchuana* Pilsbry 1901 (from the Hirase collection) for a species from the Loo-Choo (= Riukiu) Islands, Japan is insufficiently detailed to allow unconditional identification of the species Pilsbry promised to figure in a subsequent paper.

In June 1901 Pilsbry did figure other new described Japanese species but omitted *P. luchuana*. It is not impossible that all the specimens had been returned to Yoichira Hirase. A few years later the latter considered *P. luchuana* a species of *Helcioniscus* (= *Cellana*), probably because of its inner iridescence, and gave Loo-Choo as the type locality for the new species (Hirase, 1907). His son, Shintaro Hirase, figured (Hirase, 1934) under the name *luchuana* a white specimen with a brown margin, without a marked central area, having externally light brown spots with some inconspicuous rays. Taki and Hirase (1954) write that the plates of Hirase's book constitute a unique record of some of his original specimens lost in the war. The figure (pl. 57, Fig. 1) given by Taki and Hirase is different from that given by recent authors and may represent one of the syntypes. Habe (1957) placed *luchuana* in the genus *Collisella* and gave a crude figure of the radula. Later, notwithstanding the fact that Moskalev (1970) considered *luchuana* to be a good species, Habe (1964; 1970) put *luchuana* in synonymy with *C. heroldi*. Recently I have received a dead specimen of *luchuana* from the Loo-Choo Islands (Plate 1, D) which is very different from those from the Pusan coast, Korea, and Suma coast, Japan and which I reidentified as *C. luchuana* (Christiaens, 1976) and which, in their turn, are all different from those collected in Hong Kong. From what precedes, it can be concluded that *C. luchuana* is a very variable species over the total span of its range. Alternatively the Loo-Choo species may be different.

From Hong Kong a single specimen was collected at Gruff Head attached to a vertical, very exposed rock around high water (Plate 1, B). Two others were collected at Wah Fu, and many were found at Ping Chau (Plate 1, C) where in sheltered condition the maximum dimensions are 17 x 13 x 5 mm. A number of others were collected from the quay and vertical rocks at Stanley (Plate 1, A). The specimen from Gruff Head is light coloured, yellow, while the others are more depressed, more irregular or even polygonal with a darker callus, not always impressed or calloused, bordered by a brown ocre or yellow margin. Contrary to the description of Pilsbry, the interior is never bluish or livid white. The ratio of shell height to shell length is between 0.29 : 1 and 0.45 : 1; the ratio of shell length to shell width varied between 1.22 : 1 and 1.47 : 1. The ratio of width to the length of the ventral plate of the radula is also variable (1 : 1.61 to 1 : 2.22). Some Hong Kong specimens resemble *C. mixta* (Reeve) and *C. onychitis* (Menke) (Plate 1, G) from Australia. The ventral plates of the Australian species are much longer and attain, even in *C. mixta* from Port Philip, a width to length ratio of 1 : 3.07. Figure 8 illustrates the radula of a specimen from Stanley. The big inner cusp of the bicuspid tooth is less rounded than that of specimens from the Suma Coast and less sharper than those from the Pusan Coast. Kuroda (1941) lists *C. luchuana* from Taiwan.

A further comparison of *C. luchuana* with *C. uncinata guadelupa* Christiaens 1976 from Guadeloupe (Plate 1, E), *C. gallensis* (Winckworth 1928) from Sri Lanka (Plate 1, F) and *Collisella* sp. from Singapore (Plate 1, H) shows how similar these species are. *Acmaea kolarovai* Grabau and King 1928, from Peitaiho and considered by Golikov and Scarlato (1967) to be *Collisella heroldi*, seems to be a subspecies of *luchuana*.

Taking into account all these differences, I consider the Hong Kong species to be a new subspecies of *luchuana* and is here designated *ericae* (dedicated to Erica Hoeffler). It is possible that more material from the Mid-Pacific will link some Australian species of *Collisella* with the northern *C. luchuana* and its subspecies. The holotype (Plate 1, A) is deposited at the British Museum (Natural Histor) and has the registration number 1977169.

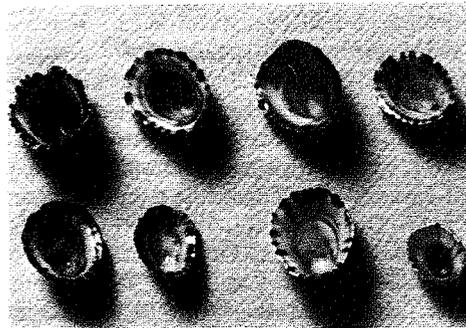


Plate 1

Plate 1. (A) *Collisella luchuana ericae*, nov. subspec. Holotype from Stanley, 13.5 x 10.8 x 5.6 mm. (B) *C. luchuana ericae*, from Gruff Head. (C) *C. luchuana ericae* from Ping Chau. (D) *C. luchuana*, locotype from Loo Choo, Japan. (E) *Collisella uncinata* (?) *guadelupa* from Guadeloupe. (F) *Collisella onychitis* from W. Australia. (H) *Collisella* sp. from Singapore.

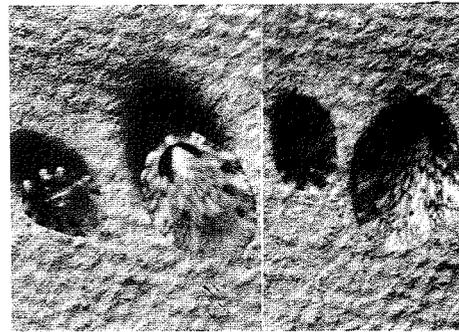


Plate 2

Plate 2. (A), (C) *Siphonaria corallina*, nov. spec. Channel Rock, holotype. (B), (D) *Collisella cellanica*, nov. spec. Channel Rock, holotype.

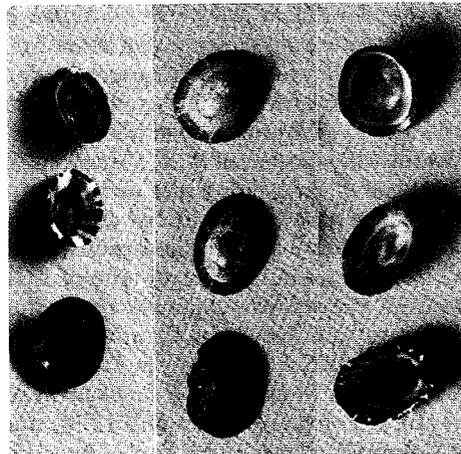


Plate 3

Plate 3. (A) *Patelloida pygmaea*, forma *typica*. Wuh Fa, Hong Kong, (B), (C) *Acmaea neglecta* aff. Ping Chau. (D) *Patelloida flammea marrowi* aff. Ping Chau. (E), (F) *Patelloida bombayana* aff. Ping Chau. (G) *Patelloida crucis* aff. Ping Chau. (H), (I) *Patelloida* sp. Wu Kwai Sha.

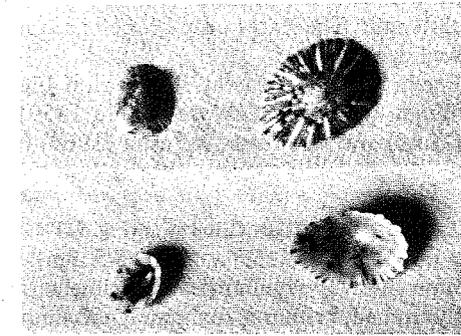


Plate 4

Plate 4. (A), (C) *Patelloida toloensis*, nov. spec. Channel Rock, holotype. (B), (D) *Siphonaria acmaeoides paulae*, nov. subspec. Stanley. Holotype 16.1 x 11.5 x 5 mm.

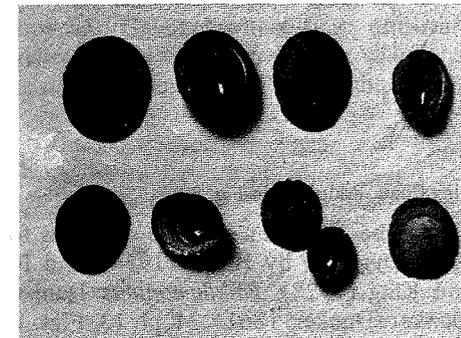


Plate 5

Plate 5. (A) *Collisella schrenkii*. Ping Chau, sheltered side. (B), (C) *idem*, exposed side. (D) *idem*, Gruff Head. (E), (F) *idem*, Wu Kwai Cha, jetty. (G), (H) *idem*, Wu Kwai Sha, rocky shore. (I) *idem*, Stanley.

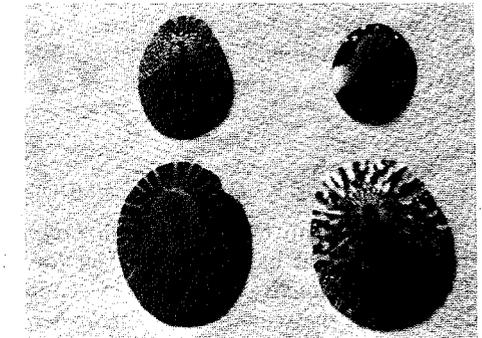


Plate 6

Plate 6. (A) *Collisella heroldi*. Ping Chau. (B) *Collisella mortoni*, nov. spec. Wu Kwai Sha, holotype. (C) *Collisella formosa*, nov. spec. Northern Taiwan, holotype. (D) *Collisella heroldi* aff. Northern Taiwan.

COLLISELLA (COLLISELLA) DORSUOSA (GOULD 1859)

From the eastern coast of the Stanley peninsula and from Ping Chau at high water strongly attached to very exposed vertical rocks and on the upperside of rock crevices, were collected 24 specimens of *C. dorsuosa* usually found in groups of three to five.

The callus is dark brown to black, often with irregular marks under the apex. The interior is blue-green with a small brown margin with or without brown spots. The radula length approximates shell length. The outer cusp of the bicuspid tooth is big and hooked outside. The uncinus is well developed.

Patella olivacea Gmelin 1791 (Schroeter, 1784: pl. 6 Fig. 1) is synonymous, this name being a *nomen oblitum*. *Acamaea dorsuosa* (Gould 1859) has often been mistaken for *Cellana grata* (non Gould) and *vice versa*. Johnson (1964) has, however, defined the status of both species.

COLLISELLA (COLLISELLA) HEROLDI (DUNKER 1861) (Fig. 9; Plate 6 A)

A single specimen of *C. heroldi* (15.5 x 11.6 x 5.5 mm) was found at Ping Chau. Dr. D.S. Hill collected two other very similar dead specimens from an unknown locality.

The shell is slightly arched, with approximately 50 undulating ribs and 100 concentric growth lines. The callus not clearly delimited, colour inside bluish. The ventral plates of the radula overlap slightly. A trace of an old central tooth is visible. The bicuspid tooth has a big hooked cusp directed outwards.

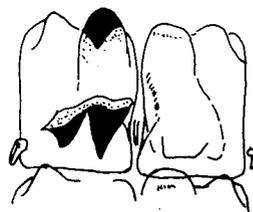


Fig. 9. *Collisella heroldi* (Dunker). Ping Chau. Radula as in Fig. 8.

There is no reason to retain *Conoidacmea* Habe 1944 as a separate subgenus for this species that has been mistaken for *Patelloida pygmaea* by Hirase (1934), and for *Acmaea testudinalis* var. *minor* by Grabau and King (1928). *Patella conulus* Dunker, described at the same time as *Patella heroldi* Dunker (Dunker, 1861: 24, pl. 13, Figs. 19 and 13), is a synonym. Pilsbry (1901 a; 1901 b: pl. 19, Fig. 10, 11) erected the variety *signata*.

COLLISELLA (COLLISELLA) MORTONI NOV. SPEC. (Fig. 10; Plate 6 B)

A single specimen collected from Wu Kwai Sha attached to pebbles at mid-tide with *Patelloida* spp. The species has been figured by Habe (1970: pl. 4, Fig. 22) under the name *Notoacmea concinna*. The present species, though similar to a *Patelloida*, can be assigned to *Collisella* as an examination of the radula has shown. The radula is also different from all the known species of this genus. The shell has more than 100 granulate ribs, with approximately 10 grains on each rib. The apex of the shell is blunt and lightly eroded. The external colour is dark brown with 10 white spots anteriorly and two very broad white radial bands behind. The brown colour of the outside gives a blue shine inside, with a narrow black margin. The callus is chocolate-brown. The ventral plate of the radula is squarish. The outer cusp of the bicuspid tooth is very small. The specific name *mortoni* is in honour of Dr. Brian Morton, organiser of the workshop. The holo-

type measures 12 x 10.1 x 3.3 mm and has the registration number 1977168 in the British Museum (Natural History). The radula is shown in Figure 10.

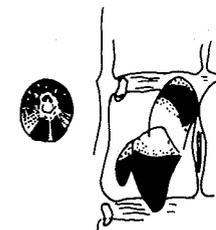


Fig. 10. *Collisella mortoni*, nov. spec. Wu Kwai Sha. Holotype 12 x 10.1 x 3.3 mm, with half radula-row.

COLLISELLA (COLLISELLA) CELLANICA NOV. SPEC. (Fig. 12; Plate 2 B,D)

A single specimen collected at 10 m depth from Channel Rock, Tolo Channel. The shell is ovate, depressed, thin, translucent, narrower in front, inclined, having a black top and an anterior apex. Approximately 40 fine diverging axial striae, more pronounced backwards with opaque white blotches, irregular in shape. Dimensions 7 x 5 x 1.5 mm. Inside there is a whitish spatula with an opaque white spot bordered in front by pinkish-brown; the rest of the spatula is mottled. The margin possesses numerous fine brown lines. The radula is shown in Figure 12.

No known species of *Collisella* resembles this species, except *Patelloida punctata* Quoy and Gaimard whose type, unfortunately, is missing from the Paris Museum. The new species resembles a young *Cellana*, hence the name *cellanica*. The holotype has the registration number 1977166 of the British Museum (Natural History).



Fig. 11. *Collisella schrenkii* (Lischke). Ping Chau. Half radula-row.

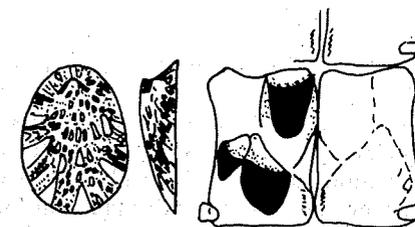


Fig. 12. *Collisella cellanica*, nov. spec. On corals at 10 m depth, Channel Rock. Holotype 7 x 5 x 1.5 mm. Radula as in Fig. 8.

COLLISELLA (NOTOACMEA) SCHRENKII (LISCHKE 1868) (Fig. 11; Plate 5)

Schrenck (1967) erroneously synonymised *Patella granostriata* Reeve, of unknown habitat, with the species known as *C. schrenkii*. *P. granostriata* Reeve resembles *C. schrenkii* and Adams (1868) synonymised it with *Cellana nigrolineata* (Reeve) and Pilsbry (1891-92) synonymised it with *C. amussitata* (Reeve) (non Schrenck) which is a synonym of *C. toreuma*. I consider *P. granostriata* Reeve to be identical with a black species of *Cellana* from the Comores Islands and which is similar to *C. livescens* Reeve. The Japanese *C. granostriata* Schrenck has been separated into two species by Lischke (*Acmaea schrenkii* (Lischke, 1868; 1869, pl. 8, Fig. 1-4) and *Acmaea concinna* (Lischke, 1870)). The form or species *C. schrenkii* differs from *A. concinna* in being more elliptical, more depressed, a more anterior apex, the posterior slope less convex, surface smoother, ribs finer and less granulate, colour less uniform, inner margin lighter coloured with more blotches. These observations are valid for the extreme forms. There exist, however, numerous intermediate forms whose identification is more problematical. Grabau and King (1928) and Yen (1936) only record *C. schrenkii* from China. Here *A. concinna* is synonymised with *C. schrenkii*, *Notoacmea fuscoviridis* Teramachi 1949, and *Notoacmea radula*, *N. nigrans* and *N. teramachii* (three species described by Kira (1961)). These 'forms' are synonymised (see also Kuroda, Habe and Oyama, 1971) with the knowledge that the differences between the extreme forms are very accentuated and that many intermediate forms exist. Neither in habitat nor in the structure of the radula do significant differences exist between them. Living *A. concinna* possess long tentacles, fully half the length of the shell. The trace of the central tooth, which in the figure given by Golikov and Kussakin (1972, Fig. B) cannot be seen, is very characteristic (Fig. 11).

The species is common in Hong Kong. At Wu Kwai Sha the form *concinna* is common, while at Ping Chau the form *schrenkii* is prevalent.

COLLISELLA FORMOSA NOV. SPEC. FROM N. TAIWAN (Fig. 13; Plate 6 C);

In a small collection of limpets received from northern Taiwan, under the name of *Notoacmea concinna*, two specimens have been found with an uncinus and consequently not belonging to the subgenus *Notoacmea*.

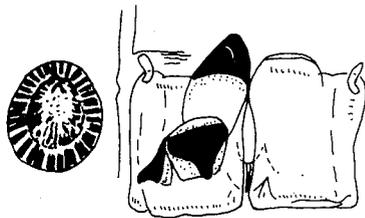


Fig. 13. *Collisella formosa*, nov. spec. Northern Taiwan. Holotype 20.2 x 16.9 x 5.1 mm. Radula as in Fig. 8.

The first specimen (20.6 x 16.9 x 7.6 mm) appears to be a subspecies of *Collisella heroldi* or *C. versicolor* Moskalev 1976. As it is impossible to obtain a specimen of *C. versicolor* from Russia, no decision can as yet be made with regard to this specimen. I have named it *C. heroldi* aff. and illustrate it, with radula, in Figure 14 and Plate 6 D.

The second specimen is assigned the name *Collisella (Collisella) formosa* nov. spec. It measures 20.2 x 16.9 x 5.1 mm. Externally, numerous light granulate ribs are provided with approximately 25 grains per rib. There are 30 white rays on a brown background and between each ray occur three to seven small riblets, in total 186. The ventral plate



Fig. 14. *Collisella heroldi* aff. Northern Taiwan. Half radula-row.

of the radula is squarish. The new species is different from all known *Collisella*, and it is hoped to obtain more specimens from Taiwan (= Formosa, hence the name) and to be able to provide further details. The holotype of *C. formosa* is lodged in the British Museum (Natural History) and has the registration number 1977167. The radula is illustrated in Figure 13.

GENUS *PATELLOIDA* QUOY AND GAIMARD 1834

Oliver (1926) and most Japanese authors consider the genus *Patelloida* to comprise two subgenera: *Patelloida sensu stricto* with *P. rugosa* Quoy and Gaimard 1834 as type by subsequent designation (Gray, 1847), and *Collisellina* Dall 1871, with *P. saccharina* Linnaeus as type by original designation. The main difference between these two subgenera are the seven prominent ribs in *Collisellina*. This sculpture is not a specific character in *P. saccharina* and can not, in my opinion, be a subgeneric character. Some specimens for example of *P. saccharina* do not possess pronounced ribs and others possess ribs exactly as in *P. garrettii* Pilsbry, a species that is very similar to *P. rugosa*.

PATELLOIDA SACCHARINA (LINNAEUS 1758)

In rock pools on Ping Chau were found a number of specimens of this species (up to 20 x 14 x 5 mm), together with *Siphonaria atra* from which some are difficult to differentiate on casual examination. Some specimens resemble var. *lanx* Reeve from Japan. At Wah Fu the collected specimens are smaller and more rounded. On the western coast of the Stanley peninsula, they were collected in abundance on the vertical quay around high water.

Internally, the shell normally possesses seven white rays, a brown callus, and is bluish bordered with a black margin, which may rarely be brown, spotlike or uninterrupted. The outside is eroded and has seven prominent ribs. The secondary ribs are rarely regular, but transitional forms exist.

The radula has two large marginal teeth; the pluricuspid tooth is variable, with a rounded external cusp. In one specimen, having regular ribs, a central tooth was visible.

Synonyms are: *P. pentagona* (Blainville 1825), *P. stella* (Lesson 1830), *P. stellaris* Quoy and Gaimard 1834 (non Reeve), *P. lanx* (Reeve 1855), *P. bellatula* Iredale 1929, *P. paropsis* Iredale 1929, and *P. saccharinoides* Habe and Kosuge 1966.

PATELLOIDA PYGMAEA (DUNKER 1860) (Plate 3 A)

Under the name *Patelloida pygmaea* (Dunker 1860) is here placed a number of limpets found at all the stations visited. These *Patelloida* are very variable and in Plate 3 six Hong Kong forms are shown. The first matches the description of *P. pygmaea* (Dunker 1860), the second is similar to *P. flammea marrowi* Christiaens 1975, and is also somewhat similar to some limpets from South Korea earlier identified as *P. biradiata* Reeve.

The South Korea limpets match the paratype of *P. biradiata* in the British Museum but the type from the China Seas (Reeve, 1855: spec. 142) has a completely different pattern. McLean (1971) considered it a senior synonym of *Collisella vernicosa* (Carpenter 1865) from Central West America.

The third shell is similar to *P. crucis* Auctores (non Tenison-Woods); the fourth resembles *Acmaea neglecta* Schempman 1908, with the interior resembling *C. luchuana* as figured by Taki (1954: pl. 57, Fig. 1). The fifth is similar to *P. bombayana* (Smith 1911) and the last is different from all known limpets. The radulae from all specimens are slightly different and there is no constant character that can be taken as specific. All of these specimens are therefore, provisionally, assigned the name *P. pygmaea*.

Adal (1958) describes a species of *Acmaea* from Cape D'Aguilar, Hong Kong, having patches of brown on a greyish-white background and striations from the apex to the periphery. This may belong to the same variable species. To obtain a better understanding of the Hong Kong species of *Patelloida*, it is necessary to study not only the Japanese but also the South Pacific species. A revision of the genus *Patelloida* is at present being undertaken.

At Channel Rock, a small species of *Patelloida* was found on corals. The middle of the shell, corresponding to the callus area, was detached from the margin which has at the outside approximately 75 regular fine ribs. The depressed yellow shell, and to a lesser extent its radula, distinguish it from other species. As the shell was broken, a description of this possibly new species has not been undertaken. The shell and radula are illustrated in Figure 16.

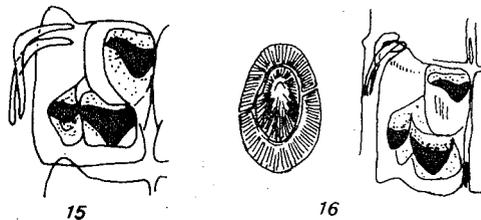


Fig. 15. *Patelloida toloensis*, nov. spec. On corals at 10 m depth, Channel Rock. Half radula-row.

Fig. 16. *Patelloida* spec. On corals at 10 m depth, Channel Rock. Broken specimen 8 x 5 mm, with half radula-row.

PATELLOIDA TOLOENSIS NOV. SPEC. (Fig. 15; Plate 4 A,C)

Five specimens were collected by divers from corals at 10 m depth near Channel Rock. The shell of this new species is translucent, roundish to oval, finely ribbed, smooth, one specimen having eight stronger ribs. Maximum dimensions: 10.3 x 8.3 x 2.9 mm. The colour varies from white to grey outside with rust brown spots aligned in eight radial bands; the inside is whitish, light silvery with a central indistinct callus. The radula shows strong, blunt teeth as in most *Collisella* species of the subgenus *Naccula* and which generally attach to seaplants.

This new species seems similar to that figured by Taki (1954: pl. 56, Fig. 5) under the name *Patelloida striata* Quoy and Gaimard. As Taki gives no description, the Hong Kong species is described as new instead of renaming the species from Nagasaki-Ken and figured by Taki. The holotype (Plate 4 A,C) measures 9.2 x 7.3 x 2.9 mm and has the registration number 1977172 of the British Museum (Natural History).

PATELLOIDA LAMPANICOLA HABE 1944 (Fig. 17)

Assigned to the subgenus *Asteracmea* by Habe (1944), *P. lampanicola* has been considered by Kuroda, Habe and Oyama (1971) to be a subspecies of *P. (Chiazacmea) pygmaea*.

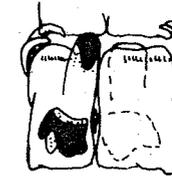


Fig. 17. *Patelloida lampanicola* Habe. Tai Tam Bay near Stanley. Radula as in Fig. 8.

After the workshop Dr. Morton sent a specimen, measuring 7 x 6 x 5 mm, found on *Batillaria* shells at Tai Tam Bay (Stanley). The radula shows few differences with other species of *Patelloida* from Hong Kong; nevertheless *P. lampanicola* is considered to be a good species, very different from typical *P. pygmaea*. From the Yellow Sea, near Kichon, South Korea, I have received from M. Rogers the same species.

PATELLOIDA CONOIDALIS AFF. (PEASE 1868)

Among some beach specimens from Nine Pin Island Hong Kong, which I have received from Dr. D.S. Hill, was found a small white conical specimen, measuring 5 x 4.3 x 2.3 mm and possessing a subcentral apex and a well marked callus with a light yellow shadow under the top. The external sculpture comprises numerous fine riblets, without concentric striae. The white shell, without spotted border, has the same colour as *P. conoidalis* from New Caledonia. The form, on the other hand, is like *P. calamus* from Australia, or a rounded *P. profunda albonotata* from South Africa.

The group including *Patelloida calamus* (Crosse and Fischer 1864), *P. conoidalis* (Pease 1868) and *P. profunda* (Deshayes 1863) with the subspecies *albonotata* (Smith 1901), *mauritanica* Pilsbry 1891, *omanensis* Christiaens 1975 and *ivani* Christiaens 1975, has a wide Indo-Pacific distribution. The small, little worn, Hong Kong specimen is considered to be allied to *Patelloida conoidalis*.

SUPERFAMILY CALYPTRAEOIDEA LAMARCK 1804

In this superfamily two species have been collected from Hong Kong.

GENUS *SIPHOPATELLA* LESSON 1830

SIPHOPATELLA WALSHI (REEVE 1859)

Tryon (1886) considers *Siphopatella* Lesson 1830, as a section of the genus *Crepidula*, with *Ergaea* H. and A. Adams 1854, and *Noicia* Gray 1867, as synonyms. Kuroda, Habe and Oyama (1971) keep *Ergaea* as a valid genus, considering that *C. walshi*, though designated as type-species of *Siphopatella*, was described after the establishment of this genus in 1831, and that, consequently, *Siphopatella* cannot be retained with no type-species. If this rule is accepted, however, *Ergaea* also has to be rejected because *walshi* was established after that name too.

Dr. D.S. Hill collected from empty *Conus* shells from Tai Tam Bay, Hong Kong, three specimens up to 23 mm in length. The distribution of this species as given by Tryon (1886) is: Ceylon, Singapore, China Seas and Japan.

GENUS CREPIDULA

CREPIDULA (CREPIDULA) ONYX SOWERBY 1824

Two small specimens, collected from Tai Tam Bay attached to empty shells by Dr. D.S. Hill, have been identified as *Crepidula onyx*. The colour is dark brown, the septum is white and undulating. The beak, overhanging the anterior margin, is lightly curved to the left. The two specimens are a little like *C. porcelana* (Linnaeus 1758) from S. Africa, and like *C. incurva* (Broderip 1834) from Central West America. The type locality of *C. onyx* is not known. Dall (1871) records it from Monterey, California, but this northern record needs confirmation. *C. onyx* occurs from California to Chile and Chace (1946) comments that the Punta Banda form of *C. onyx* has a leaning towards *C. incurva*, a South American species. The occurrence of *Crepidula* in Hong Kong is not surprising when it is realised for example that *C. fornicata* from the western Atlantic has been introduced into Europe and into the eastern Pacific. Similarly Salvat and Rives (1975) record, for the first time, a species of *Crepidula*, which may be *C. onyx*, from some archipelago's in Polynesia. The maximum length of *C. onyx* is 52.5 mm (from San Diego, California) (own collection).

SUPERFAMILY SIPHONAROIDEA GRAY 1840

GENUS SIPHONARIA SOWERBY 1824

The type-species of the marine pulmonate genus *Siphonaria* is *S. sipho* Sowerby 1824 which is a junior synonym of *S. javanica* (Lamarck 1819). Hubendick (1946) in his excellent systematic monograph of the Patelliformia considers a specimen of *S. javanica* forma *exigua*, now in the Zoological Museum of Uppsala, as the type of *S. laciniosa* (Linnaeus 1758) and consequently considers the type-species of the genus *Siphonaria* to be *S. laciniosa* and not *S. javanica*. This opinion was contested by Morrison (1972), who could not agree with the attempt by Hubendick to locate the lost type-specimen of *laciniosa* because Linnaeus did not indicate that he had ever seen a specimen up to 1767. Morrison also suggested that, whereas the name *laciniosa* was first used by Rumphius (1705 : pl. 40, Fig. C) who was followed by d'Argenville (1742 : pl. 6, Fig. 0 (= pl. 2, Fig. 0 in the 2nd, and pl. 2 Fig. I in the 3d edition of the 'Conchyliologie')), this is a completely different species from *S. javanica*. This species was described by d'Argenville as "le lepas déchiré dans son contour" and by Klein (1753) as "*laciniata irregulariter*". The German translation of Rumphius (1766) named the species *laciniosa* Linnaeus. Morrison (1972) selects Rumphius's figure of the two-eye-spotted species, better known as *S. atra* Quoy and Gaimard, as the lectotype of *laciniosa* Linnaeus (*non sensu* Hubendick). This risks much confusion with the literature of many decades. Despite this reservation, I agree with Morrison in assigning the name *laciniosa* Linnaeus (*non* Hubendick) to the group *S. atra* and to call the type-species of the genus *S. javanica* (Lamarck 1819) (= *S. sipho* Sowerby 1824 = *S. laciniosa sensu* Hubendick 1946 (*non* Linnaeus)).

Morrison further includes under the name *S. laciniosa* (= *atra*) a number of other species, in total 14, which were considered by Hubendick (1946) to be good species. Hubendick (1954) later admitted that the Indian-West Pacific group comprises a number of forms, some of which may be highly variable species, which are connected with one another through a series of transitional forms. Conversely, the dramatic reduction in species by Morrison, seems unjustified and clearly the group needs further research. The number of lateral teeth of the new species group, for example, should vary between 29 (*S. elegans*) and 44 (*S. alba*). To accommodate both opinions and to avoid misidentification of the species, especially *S. laciniosa*, it is suggested that a subspecies name should always

qualify *Siphonaria laciniosa* Linnaeus (*non* Hubendick).

It is not the purpose of this study to revise the Pacific pulmonate limpets and discussion is limited to the Hong Kong area for which Hubendick mentions two species: *S. japonica* and *S. atra*. The genus *Siphonaria sensu largo*, possesses several subgenera, often considered by other authors to be genera but whose generic value is questionable. Most of the genera of Iredale (1940) are synonyms and *Anthosiphonaria* Kuroda and Habe 1971, created for *S. sirius*, a species having the siphonal canal formed by one rib, is also unnecessary as *S. sirius* is probably a form of *S. laciniosa*. Finally, the trend started by Morrison (1972) to reduce the number of *Siphonaria* species has also been undertaken by Allanson (1958) who reduced 12 South African species, considered by Hubendick to be valid, to five. Similarly Cernohorsky (1972) synonymises *S. nuttalli* Hanley 1858 with the Hawaiian *S. normalis*.

SIPHONARIA (SACCULOSIPHONARIA) JAPONICA (DONOVAN 1834)

Many small specimens of this species were collected from Wu Kwai Sha at around high tide level; further specimens were obtained from Wah Fu and Stanely (16.5 mm in length). The species is very abundant at Ping Chau where in warm rock pools the biggest specimens are found (maximum length 23.5 mm). Internally the shell is generally dark chocolate-brown, lustrous, with white spots peripherally.

SIPHONARIA (SIPHONARIA) LACINIOSA (LINNAEUS 1758) (NON HUBENDICK 1946)

Three shell-forms can be distinguished for this species from Hong Kong.

- 1) forma *atra* Quoy and Gaimard 1833. Generally recovered from flat, horizontal intertidal pools and only rarely on vertical faces. Shell with siphon formed by two ribs. The species is very common at Ping Chau and Kat O Chau around mid-tide. The shell has a wide range of variation and many transitional forms exist between *S. atra* and the next two forms to be described. The radula formula of four specimens is approximately 35.1.35. The central tooth is small and bifurcated at the base. The inner laterals have a bifurcated base, a thicker more pronounced top, a small ectocone and a big transparent cusp.
- 2) Forma *sirius* Pilsbry 1894. This form is heavier ribbed than *atra*, with six or more solid white ribs. It occurs on exposed shores. The siphon is formed by one rib. At Wah Fu on very exposed rocks around low tide exclusively occurs forma *sirius*. At Ping Chau I found *sirius* among *atra*, no difference in niche selection being noted. The radula formula given by Hubendick (1946) is 40.1.40; I record 34.1.34. The radula, habitat, shell shape and the occurrence of transition forms suggest that *sirius* is a form of *laciniosa* whereas Morrison (1972) keeps them separate. Adam and Leloup (1939), on the other hand, believe them to be synonyms.
- 3) forma *subatra* Pilsbry 1904. The siphon is formed from three or four coalescing small ribs. This form has only been collected from Ping Chau.

SIPHONARIA (MOURETUS) ACMAEOIDES PILSBRY 1894, PAULAE NOV. SUBSPEC. (Plate 4 B,D)

S. acmaeoides is a very rare high water species. At Ping Chau one specimen (16 x 11.5 x 4.5 mm) from the sheltered side and one broken specimen. From the eastern side of the Stanley peninsula, three specimens smaller than those from Ping Chau have been collected. The biggest of those from Ping Chau (Plate 4 B,D) is the holotype of the new subspecies and has been deposited in the collections of the British Museum (Natural History), (registration number 1977171). The general form of this subspecies is strongly

reminiscent of *S. acmaeoides* (Pilsbry, 1894) having the apex somewhat posteriorly to the left of the median line. There are about 15 light coloured or fine white radial ribs having between them three to eight striae with brownish red interspaces which possess small dark brown radii or some triangular or lobed forked spots, especially marginally. The edge is sharp and almost smooth; the apex is hooked or lightly eroded. Internally the shell is light white to yellow; centrally the same colour, being in one specimen pale brown-orange. The shell is finer and thinner than the Japanese *acmaeoides*, more elliptical, more bulging at the siphon, lighter coloured and without a marked central area. As in *acmaeoides*, the lateral teeth of the radula are devoid of an ectocone. The radula formula given by Hubendick (1946) for *S. acmaeoides* is 26.1.26 with an unusually broad central tooth. I found 25.1.25 with a normal central tooth. These small differences are not, however, sufficient to create a new species. Though, generally few subspecies of *Siphonaria* are taken into account, I consider the Hong Kong specimens to belong to a new subspecies which I name *paulae*, in honour of P.J.B.Scott.

S. acmaeoides belongs to the subgenus *Patellopsis* Nobre 1882, which is a synonym of *Mouretus* Blainville 1824 (Morrison, 1972). Kuroda, Habe and Oyama (1971), however, use the name *Planesiphon* which is a synonym of *Ductisiphonaria* (McAlpine, 1952).

SIPHONARIA (KERGUELENELLA) CORALLINA NOV. SPEC. (Fig. 18; Plate 2 A,C)

The subgenus *Liriola* Dall 1870, Section *Kerguelenia* Rochebrune and Mabilie 1889, Hubendick (1946) considers to compose five species: the type is *S. lateralis* Gould 1846, the others are *S. stewartiana* Powell 1939, *S. macgillivrayi* Reeve 1856, *S. stowae* Verco 1906, and *S. ? henica* Verrill and Bush 1900.

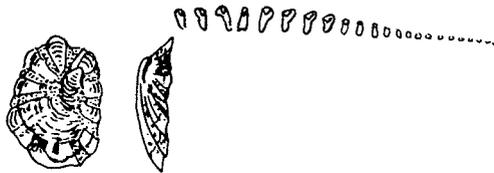


Fig. 18. *Siphonaria corallina*, nov. spec. On corals at 10 m depth, Channel Rock. Holotype 4.3 x 3 x 1 mm, with half radula-row.

Powell changes the name *Kerguelenia* Rochebrune and Mabilie 1889 (non Stebbing 1888) to *Kerguelenella* Powell 1946 which he considers as a genus. He later (Powell 1955), describes a new species (*K. flemingi*) which he assigns to this genus. I consider *Kerguelenella* to be a subgenus having the following principal characteristics: shell thin, either very unsymmetrical or with a greatly recurved apex close to the rear edge.

From 10 m depth near the Channel Rock, five small specimens of a species of *Siphonaria* have been collected from corals and barnacles and the largest having maximum dimensions of 4.6 x 3.3 x 1.1 mm. One radula has been examined. It has 65 rows of teeth with 19 lateral teeth. The radula formula of 19.1.19 is the lowest recorded for the genus *Siphonaria*. The closest species is *S. (Kerguelenella) stowae* with 22 lateral teeth. The height of one row of teeth is 1/18 of the total width. The central tooth is small and the seven inner laterals have the top enlarged, without an ectocone. The shell is transparent, internally white-yellowish with brown-reddish spots. The apex is inclined and recurved to the left, with the apex less than 1/4 of the length to the rear edge. The siphonal canal is large and bulging. About 10 to 12 large, generally white, undulating ribs. The holotype of dimensions 4.3 x 3 x 1 mm, has been deposited in the British Museum (Natural History), (registration number: 1977170).

SIPHONARIA SPP.

Seven other small specimens of *Siphonaria* - four collected at Ping Chau and three dead specimens received subsequently from Dr. D.S. Hill are all difficult to identify.

Two light coloured specimens from Ping Chau, having two strong ribs at the siphon, are similar to *S. rucuaana* Pilsbry 1904 and to *S. guamensis* Quoy and Gaimard 1833. The radula has a very small central tooth and 28 lateral teeth of which the 22 outer laterals have an ectocone.

Two others from Ping Chau are darker and more heavily ribbed. Their shells are similar to *S. asghar* Biggs 1958, from the Persian Gulf, and to *S. normalis* Gould 1846.

The two beach specimens, collected by Dr. Hill are very small, regular, dark-chocolate coloured inside with a light spotted border and resemble *S. cochleariformis* Reeve 1856 and some small dark specimens of *S. normalis*.

One white, irregular, heavily ribbed, specimen from Nine Pin Island and collected by Dr. Hill, is very similar to *S. rosea* Hubendick 1943.

Owing to a lack of material, especially of Indo-Pacific Siphonariidae, and having in mind the observation of Hubendick (1954) that there is wide intraspecific variation in the Siphonariidae, and that it is often difficult to delimit related species from one another, I would not feel justified in erecting new species or subspecies for these seven insufficiently known specimens.

REFERENCES

- Adal, M.N. 1958. A Collection of Molluscs from Cape D'Aguiar. *Hong Kong University Fisheries Journal* 2: 125-127.
- Adam, W., and Leloup, E. 1939. Gastropoda-Pulmonata, Scaphopoda et Bivalvia. Resultats scientifiques du Voyage aux Indes Orientales Neerlandaises. *Memoires du Musee Royal d'Histoire Naturelle de Belgique* 2 fasc. 20: 126 pp.
- Adams, A. 1868. On the species of Caecidae, Corbulidae, Volutidae, Cancellariidae and Patellidae found in Japan. *Annals of Natural History*, 4th ser., 2: 363-370.
- Allanson, B.R. 1958. On the systematics and distribution of the molluscan genus *Siphonaria* in South Africa. *Hydrobiologia* 12: 149-180.
- Argenville, A.J.D.d'. 1742. *L'histoire naturelle éclaircie dans deux de ses parties principales, la lithologie et la conchyliologie*. (1757. 2nd ed.; 1772. 3rd ed.). Paris, Bure l'Aine. pp. 492.
- Brauer, F. 1878. Bemerkungen über die im kaiserlichen zoologischen Museum gefundenen Original-Exemplare zu Born's Testaceis Musei. *Sitzungsbericht en der Kaiserlichen Akademie der Wissenschaften*, Wien 77: 117-192.
- Cernohorsky, W.O. 1972. *Marine Shells of the Pacific*, II. Sydney, Pacific Publications, 411 pp.
- Chace, E.P. 1946. In Burch, J.Q. Family Crepidulidae. *Minutes of the Conchological Club of Southern California* 56: 12-22.
- Christiaens, J. 1973. Revision du genre *Patella* (Mollusca, Gastropoda). *Bulletin du Museum national d'Histoire naturelle* 3 ser., 182. Zoologie, 121: 1305-1392.
- Christiaens, J. 1974. Les Fissurelles Europeennes. III. Le genre *Diodora* Gray, 1821, sensu Iredale, 1915. *Informations de la Societe belge de Malacologie* 3: 39-58.
- Christiaens, J. 1975. Revision provisoire des Mollusques marins recents de la Famille des Acmaeidae (seconde partie). *Informations de la Société belge de Malacologie* 4: 91-116.

- Christiaens, J. 1976. The Family Acmaeidae. First Addendum. *Gloria Maris*, 15: 127–132.
- Cotton, B.C. 1959. *South Australian Mollusca: Archaeogastropoda*. Adelaide, Government Printer. 449 pp.
- Dall, W.H. 1871. On the limpets; with special reference to the species of the West Coast of America, and to more natural classification of the group. *American Journal of Conchology* 6: 227–282. (1870)
- Dunker, W. 1860. Neue Japanische Mollusken. *Malakozoologische Blätter* 6: 221–240.
- Dunker, W. 1861. *Mollusca Japonica descripta et tabulis tribu iconum*. Stuttgart. 36 pp.
- Golikov, A.N. and Kussakin, O.G. 1972. Sur la Biologie de la reproduction des Patelles de la famille Tecturidae (Gastropoda: Docoglossa) et sur la position systematique de ses subdivisions. *Malacologia* 11: 287–294.
- Golikov, A.N. and Scarlato, O.A. 1967. Mollusca of the Possiet Bay (Sea of Japan) and their ecology. *Trudy Zoologia Instituta* 42: 5–154.
- Gould, A.A. 1859. Descriptions of shells collected by the North Pacific Exploring Expedition. *Proceedings of the Boston Society of Natural History* 7: 161–166.
- Grabau, A.U. and King, S.G. 1928. Shells of Peitaiho. In *Handbook of the Society of Natural History, Peking*, 2 (2nd ed.) 281 pp.
- Gray, J.E. 1847. A list of the Genera of recent Mollusca. *Proceedings of the Zoological Society of London* 15: 129–219.
- Habe, T. 1944. On the Japanese Lottiidae (= Acmaeidae). *Venus* 13: 171–187.
- Habe, T. 1957. A reclassification of certain Japanese Prosobranchs. *Proceedings of the Malacological Society of London* 32: 207–208.
- Habe, T. 1964. *Shells of the Western Pacific in color*, II. Osaka, Hoikusha Publishing Co. 233 pp.
- Habe, T. 1970. *Common shells of Japan in color*, III (in Japanese). Hoikusha Publishing Co. Osaka, 223 pp.
- Hirase, S. 1934. *A collection of Japanese Shells*, with illustrations in natural colour. Tokyo. 233 pp.
- Hirase, Y. 1907. *Catalogue of Marine Shells of Japan*. Kyoto, Karasumaru.
- Hubendick, B. 1946. Systematic Monograph of the Patelliformia. *Kungliga Svenska Vetenskapsakademiens Handlingar* 23: 1–93.
- Hubendick, B. 1954. On a small quantity of *Siphonaria* material from Queensland. *Memoirs of the National Museum of Victoria* 19: 1–12.
- Iredale, T. 1940. Marine Molluscs from Lord Howe Isl., Norfolk Isl., Australia and New Caledonia. *Australian Zoologist* 9: 429–443.
- Johnson, R.I. 1964. The recent Mollusca of A.A. Gould. *U.S. National Museum Bulletin* 239: 1–172.
- Kira, T., 1960. *Coloured illustrations of the shells of Japan* (enlarged and revised ed.) Osaka, Hoikusha Publishing Co., 204 pp.
- Kira, T. 1961. On three new species of *Notoacmea*. *Venus* 21: 292–295.
- Klein, J.T. 1753. *Tentamen Methodi Ostracologicae*. Lugduni Batavorum. 177 pp.
- Kuroda, T. 1941. A Catalogue of molluscan shells from Taiwan with description of new species. *Memoirs of the Faculty of Sciences and Agriculture Taihoku Imperial University* 22: 65–216.
- Kuroda, T., Habe, T., and Oyama, K. 1971. *The Sea Shells of Sagami Bay*. Tokyo, Maruzen Co., (English ed.) 489 pp.
- Lischke, C.E. 1868. Diagnosen neuer Meeresconchylien von Japan. *Malakozoologische Blätter* 15: 218–222.
- Lischke, C.E. 1869. *Japanische Meeres-Conchylien*, I. Cassell. 192 pp.

- Lischke, C.E. 1870. Diagnosen neuer Meeresconchylien von Japan. *Malakozoologische Blätter* 17: 23–29.
- McAlpine, D. 1952. Notes on some Siphonariidae. *Proceedings of the Royal Zoological Society of New South Wales* (1951–52): 40–42.
- McLean, J.H. 1971. In Keen, M. *Sea Shells of tropical West America*. 2nd.ed. Stanford, Stanford University Press. 1019 pp.
- Morrison, J.P.E. 1972. Mediterranean *Siphonaria*: West and East— Old and New. *Israel Journal of Malacology* 3: 51–62.
- Moskalev, L.I. 1970. Gastropod molluscs of the genus *Collisella* (Prosobranchia, Acmaeidae) of the fringing Asian Seas of the Pacific Ocean. (In Russian). *Trudy Instituta Okeanologii* 88: 174–212.
- Oliver, W.R.B. 1926. Australasian Patelloididae. *Transactions of the New Zealand Institute* 56: 547–582.
- Oostingh, C.H. 1923. Recent shells from Japan. Part 1. Gastropoda. *Mededeelingen van de Landbouwhoogeschool* 26: 174 pp.
- Oostingh, C.H. 1935. Beitrag zur Kenntniss der Molluskenfauna von Sud Sumatra. *Archiv für Molluskenkunde* 63: 166–255.
- Otuka, Y. 1937. *Diodora* in Japan. *Journal of the Geological Society of Japan* 44: 939–946.
- Pilsbry, H.A. In Tryon, G.W. *Manual of Conchology*, 1 ser. 1890. Tome 12. Fissurellidae: 140–311, pl. 25–64. 1891–92. Tome 13. Patellidae: 1–195, pl. 1–74.
- Pilsbry, H.A. 1891b. A new species of limpet from Japan. *Patella (Helcioniscus) stearnsii* n.sp. *Nautilus* 4: 100–101.
- Pilsbry, H.A. 1894. Notice of new Japanese Mollusks. II, III. *Nautilus* 8: 9,16.
- Pilsbry, H.A. 1895. *Catalogue of Marine Mollusks of Japan* with descriptions of new species and notes on others collected by Frederck Stearns. Detroit. 196 pp.
- Pilsbry, H.A. 1901a. New Molluska of Japan, the Loo Choo Isl., Formosa and Philippines. *Proceedings of the Academy of Natural History of Philadelphia* 53: 193–210.
- Pilsbry, H.A. 1901b. New Japanese Marine, Land and Freshwater Mollusks. *Proceedings of the Academy of Natural History of Philadelphia* 53: 385–408.
- Pilsbry, H.A. 1927. *Patella stellaeformis optima* n.subsp. *Nautilus* 40: 138–139.
- Powell, A.W.B. 1955. Mollusca of the Southern Islands of New Zealand. *Cape Expedition Series* 15: 1–152.
- Powell, A.W.B. 1973. The patellid limpets of the world (Patellidae). *Indo-Pacific Mollusca*. Vol.3, no 15: 75–205.
- Ray, H.C. 1948. On a collection of Mollusca from the Coromandel Coast of India. *Records of Indian Museum* 46: 87–122.
- Reeve, L.A. 1849–50. *Conchologia Iconica*, VI. Monograph of the genus *Fissurella*. London. 16 pls.
- Reeve, L.A. 1854–55. *Conchologia Iconica*, VIII. Monograph of the genus *Patella*. London. 42 pls.
- Rumphius, G.E. 1705. *D'Amboinsche Rariteitkamer*. Amsterdam. 340 pp.
- Rumphius, G.E. 1766. *Amboinsche Rariteten-Kammer*, oder Abhandlungen aus dem Holländische übersetzt von P.L.S. Muller, vermehret von J.H. Chemnitz. Wien. 49 pls.
- Salvat, B. and Rives, C. 1975. *Coquillages de Polynesie*. Les Editions du Pacifique. Papeete. 381 pp.
- Schepman, M.M. 1908. The Prosobranchia of the Siboga Expedition. 1. Rhipidoglossa and Docoglossa. *Siboga Expeditia*. Leyden. 49 a. Ivre 39. 187 pp.
- Schrenck, L. Von; 1867. *Reisen und Forschungen im Amur-lande in den Jahren 1854–56*.

- II. Zoologie. St Petersburg. 976 pp.
- Schroeter, J.S. 1784. *Einleitung in die Conchylienkenntniss nach Linnaeus*, II. Gebauer, Halle.
- Spry, J.F. 1967. *The Sea shells of Dar es Salaam*. Dar es Salaam, Tanzania Soc. 33 pp.
- Taki, I. 1954. [In] Hirase, S. *An illustrated handbook of shells from the Japanese Islands and adjacent territory*. Revised and enlarged by Taki from Hirase's first ed. 1939. Tokyo, Maruzen Co., 124 pp.
- Taylor, G.W. 1892. Japanese limpets. *Nautilus* 6: 6-7.
- Taylor, G.W. 1894. Note on *Helcioniscus nigrisquamatus*. Rve. sp. *Nautilus* 8: 66-67.
- Thiele, J. 1891. In Troschel. *Gebiss der Schnecken*. II. Berlin. : 249-411.
- Thiele, J. 1912. In Kuester. *Systematisches Conchylien-Cabinet von Martini und Chernitz*. Band 2, Abt. 4 a. Scissu relliden und Fissurelliden. Nurnberg. : 45-96.
- Tinker, S.W. 1959. *Pacific Sea shells* (Hawaii and South Seas), 2nd ed. Vermont, Turtle Co., 240 pp.
- Tomlin, J.R. le B. and Peile, A.J. 1925. Note on the identity of *Patella affinis* Reeve. *Proceedings of the Malacological Society of London* 16: 140.
- Tryon, G.W. 1886. *Manual of Conchology*. 1 ser. Tome 8. Naticidae, Calyptraeidae. 461 pp.
- Winckworth, R. 1928. Marine Mollusca from South India and Ceylon. II. Limpets; *Proceedings of the Malacological Society of London* 18: 133-137.
- Yen, T.C. 1936. The marine gastropods of Shantung Peninsula. *Institution of Zoology, National Academy of Peiping* 3: 165-255.
- Yen, T.C. 1941. A review of Chinese gastropods in the British Museum. *Proceedings of the Malacological Society of London* 24: 170-289.

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THE NERITIDAE (MOLLUSCA; PROSOBRANCHIA) OF HONG KONG

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INTRODUCTION

The Neritidae (Neritacea) are a family of prosobranch gastropods that are tropical in distribution. As a group they are euryhaline and inhabit the sub-littoral, the rocky intertidal, estuaries and freshwater niches. They graze on algae on the rocks and stones of the shore, using their long, many-toothed radula.

Taxonomically the group presents difficulties because some of the species are polymorphic and the variations in colour and pattern of the shell are considerable. The entire family needs taxonomic revision, and it is thought that a morphological study of the shell and the operculum together with ecological data might permit a reappraisal of some of the more variable "species".

The shell is very short-spined, globose in shape, and in some cases almost patelliform. Some species show virtually no traces of the original shell coiling. There is no umbilicus in the Neritidae. The outer lip may be thin and smooth internally or may be thickened and denticulate. The columella may also be denticulate, and it may be extended posteriorly as a flattened parietal shield or callus which may be distinctly granulose or plicate (ridged). The internal septa are apparently absorbed so that internally the shell comprises one large cavity and the animal occupies the main body whorl of the shell. Growth rings are often evident as axial striae across the body whorl, which is often very distinctively marked with prominent spiral cords.

The aperture is closed in life by the semilunate calcareous operculum which is often marked externally by small papillae (granulate). Internally there is a hooked appendage, or apophysis for muscle attachment, and along the inner edge are often a well-developed lateral and a median tooth, or projection. In most species the shape and sculpturing of the operculum is distinctive, although as a taxonomic character it is of limited use within the genus *Clithon*.

Most of the species in this family belong to the genus *Nerita* Linnaeus 1758, and to *Clithon* Montfort 1810, (sometimes called *Neritina* Lamarck 1822) and there are a number of other smaller genera (e.g. *Dostia*). There is considerable synonymy involved and in the reference books of local application (i.e. Dance, 1974; Kira, 1975; Habe, 1975) several different names, both generic and specific, are used. These common synonyms are mentioned in the text. The names here used are those presently accepted at the