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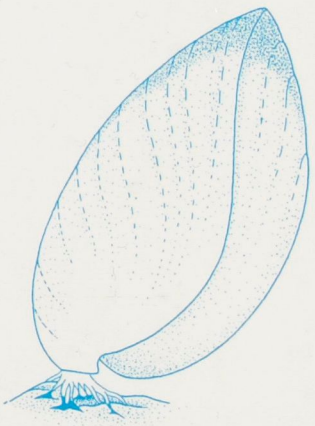
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ZOOLOGIE

1997

Résultats des Campagnes MUSORSTOM

Volume 18



Coordonné par

Alain CROSNIER

Publié avec le concours de l'Université Santa Ursula de Rio de Janeiro et l'Institut français de Recherche scientifique pour le Développement en Coopération (ORSTOM)

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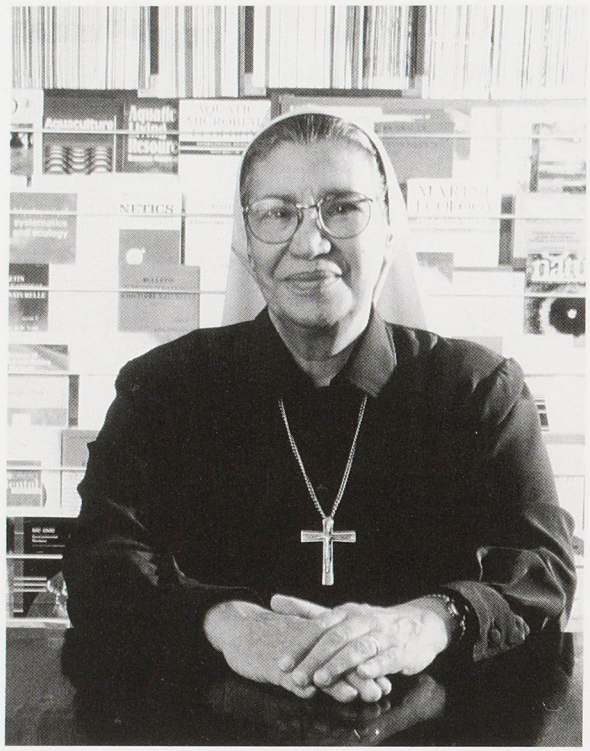
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Ce volume des Résultats des Campagnes MUSORSTOM est dédié à la Mère Fatima Maron RAMOS, présidente de l'Université Santa Ursula, à Rio de Janeiro. Docteur ès Sciences de l'Université Pierre et Marie Curie, la Mère Fatima s'intéresse tout particulièrement aux recherches océanographiques qu'elle développe dans le cadre de l'Université qu'elle préside. Elle a participé à de nombreuses campagnes en mer et, en tant que co-chef de mission, à la campagne MD 55, faite avec le navire océanographique "Marion Dufresne" au large des côtes du Brésil et consacrée, principalement, à l'étude de la faune bathyale ; elle suit les travaux effectués sur cette faune par le Dr Marcos TAVARES, professeur à l'Université Santa Ursula, et elle est l'artisan de la mise en place, à cette même Université, d'un DEA d'Océanographie biologique dont les enseignements sont assurés par des professeurs brésiliens et français. Connaissant de nombreux océanographes français, la mère Fatima, membre actif de la coopération franco-brésilienne en Qcéanographie, s'est également intéressée aux Résultats des Campagnes MUSORSTOM et son Université participe au financement de la publication de ce volume.

Résultats des Campagnes MUSORSTOM

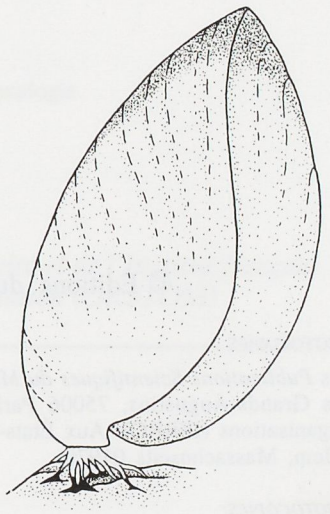
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Tomio IWAMOTO & Nigel R. MERRETT

1

Bryozoa: Lepraliomorpha and other Ascophorina, mainly from New Caledonian waters

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ABSTRACT

This paper describes a fauna of 98 species of ascophorine bryozoans from 1984-89 MUSORSTOM cruises, mainly in the New Caledonian EEZ. Ten of the species occur solely in the Philippines and some species occur in both regions. The fauna is noteworthy for its endemism (57 of the 84 New Caledonian species, i.e., 68%, are endemic) and its high taxonomic novelty, the latter contributing to a clearer appreciation of the taxonomic limits of some genera and families. Two new families (Phorioppniidae, Buffonellodidae), 54 new species, and 16 new genera are described, mostly from New Caledonia; some, from elsewhere, are the consequence of systematic revision. The new genera are: *Xynexecha* (Exechonellidae), *Parkermavella* (Bitectiporidae), *Phorioppnia*, *Oppiphorina*, *Punctiscutella* (Phorioppniidae), *Haswelliporina*, *Mosaicoporina* (Porinidae), *Wrigiana*, *Ijimaia* (Calwelliidae), *Ipsibuffonella*, *Maiabuffonella* (Buffonellodidae), *Macrocamera* (Eminoeciidae), *Pseudoplatyglena* (Euthyrisellidae), *Richbunea* (Celleporidae), *Lifuella* (Phidoloporidae), and *Ptoboroa* (Batoporidae). The most speciose family in the collection is the Phidoloporidae, represented by 7 genera and 19 species. The most speciose genus in the collection is, remarkably, the little-known deep-sea genus *Siphonicytara*, with 6 species, all new, which more than doubles the number of species previously described. Ten of the species in the New Caledonian fauna studied here are shared only with New Zealand, and 4 only with the Philippines.

GORDON, D.P. & D'HONDT, J.-L., 1997. — Bryozoa: Lepraliomorpha and other Ascophorina, mainly from New Caledonian waters. *In*: A. CROSNIER (ed.), Résultats des Campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176**: 9-124. Paris ISBN 2-85653-511-9.

RÉSUMÉ

Bryozoa: Lepraliomorpha et autres Ascophorina, essentiellement des eaux néo-calédoniennes.

Ce travail décrit une faune de 98 espèces de Bryozoaires Ascophorina, recueillies lors des campagnes MUSORSTOM de 1984 à 1989, essentiellement autour de la Nouvelle-Calédonie. Dix de ces espèces n'ont été récoltées qu'aux Philippines, certaines étant communes aux deux régions. Cette faune est remarquable par son endémisme (57 des 84 espèces néo-calédoniennes, soit 68 %, sont endémiques) et son pourcentage élevé en nouveaux taxons, qui ont permis une meilleure délimitation taxinomique de certains genres et familles. Deux nouvelles familles (Phorioppniidae et Buffonellodidae), 54 espèces nouvelles et 16 nouveaux genres sont décrits, pour la plupart de Nouvelle-Calédonie ; la création de certains d'entre eux, provenant d'autres régions, est la conséquence du travail de révision systématique entrepris. Les nouveaux genres sont les suivants : *Xynexecha* (Exechonellidae), *Parkermavella* (Bitectiporidae), *Phorioppnia*, *Oppiphorina*, *Punctiscutella* (Phorioppniidae), *Haswelliporina*, *Mosaicoporina* (Porinidae), *Wrigiana*, *Ijimaia* (Calwelliidae), *Ipsibuffonella*, *Maiabuffonella* (Buffonellodidae), *Macrocamera* (Eminoeciidae), *Pseudoplatyglena* (Euthyrisellidae), *Richbunea* (Celleporidae), *Lifuella* (Phidoloporidae) et *Ptoboroa* (Orbituliporidae). La famille Phidoloporidae présente, dans la collection, la plus riche diversité spécifique, avec 7 genres et 19 espèces. Le genre le plus riche en espèces dans la collection est paradoxalement un genre profond et peu connu, *Siphonicytara*, avec 6 espèces, toutes nouvelles, ce qui correspond à plus du double du nombre des espèces précédemment décrites. Dix des espèces de la faune néo-calédonienne appartiennent aussi à celle de Nouvelle-Zélande, et quatre seulement à celle des Philippines.

INTRODUCTION

This work completes the systematic description of the ascophorine bryozoans collected during recent MUSORSTOM cruises (1984-1989) mainly in New Caledonian waters. Most of the species dealt with in this account may be referred to as lepralioid, i.e., having a cryptocystidean shield with an underlying compensation sac (ascus), but some other ascophorines are also described, not having been previously sorted from the samples. Some of these were physically attached to lepralioid colonies. Following GORDON (1989a), the Ascophorina are regarded as including the Cribrilinidae and related families. VOIGT & HILLMER (1983) have demonstrated the cribrilinid affinities of certain gymnocystal ascophorines (infraorder Hippothoomorpha) and GORDON and VOIGT (1996) have presented evidence that the Cribrilinidae (infraorder Cribriomorpha) are the stem group for some (possibly all) umbonuloid-shielded ascophorines and those lepralioid-shielded taxa that may be derived from them. There is evidence that, in those Cretaceous Cribrilinidae *sensu lato* that had a reduced costal shield, there must have been an ascus proximal to the small area of flexible frontal membrane under the costal area in order for the hydrostatic mechanism to operate. This ascus is retained in gymnocystal and lepralioid ascophorines and is inferred to occur or have been present in those umbonuloid species which have a much-reduced area of umbonuloid shield. Thus the ascus appears to be a symplesiomorphy linking all the ascophorine infraorders.

Some of the species reported on here were collected during the MUSORSTOM 3 cruise to the Philippines, but the vast majority come from New Caledonian waters. Previous reports in this present series have dealt with 40 species of Ascophorina from New Caledonia (GORDON & D'HONDT, 1991; GORDON, 1993a; GORDON & BRAGA, 1994). The present report describes 98 species, of which 84 pertain to the New Caledonian fauna, making a total of 123 New Caledonian ascophorine species taken by these cruises, of which 77 (63%) were new to science. This report also recognises two new families and 16 new genera. This level of diversity has been helpful in evaluating a number of generic boundaries and the relationships between certain lepralioid families.

LIST OF STATIONS

Philippines

ESTASE 2

Station DR 07. — 28.11.1984, 05°56.79'N, 126°14.38'E, 890 m: *Haswelliporina ?venusta.*

MUSORSTOM 3

Station CP 87. — 31.5.1985, 14°00.6'N, 120°19.6'E, 191-197 m: *Conescharellina breviconica.*

Station CP 100. — 1.6.1985, 14°00.0'N, 120°17.6'E, 189-199 m: *Conescharellina breviconica, Conescharellina catella.*
Station CP 101. — 1.6.1985, 14°00.15'N, 120°19.25'E, 194-196 m: *Conescharellina breviconica.*
Station CP 102. — 1.6.1985, 14°00.8'N, 120°17.8'E, 192 m: *Characodoma* sp., *Conescharellina breviconica, Conescharellina catella.*
Station CP 106. — 2.6.1985, 13°47.0'N, 120°30.3'E, 640-668 m: *Conescharellina breviconica, Cruceschareliina japonica.*
Station DR 117. — 3.6.1985, 12°31.3'N, 120°39.5'E, 92-97 m: *Tetraplaria ventricosa, Actisecos regularis, Haswelliporina quinaria, Hemismittoidea ?ennea, Parasmittina serrula, Parasmittina marginata, Parasmittina* sp., *Fedora platydiscus, Characodoma areolata, Characodoma biavicularia, Characodoma glabra, Characodoma parva, Lifuella calyciformis, Reteporellina cruciformis, Triphyllozoon gracile, Conescharellina catella.*
Station CP 139. — 6.6.1985, 11°53.0'N, 122°14.0'E, 240-267 m: *Reteporellina spiramina.*

New Caledonia

BIOCAL

Station DW 08. — 12.8.1985, 20°34.35'S, 166°53.90'E, 435 m: *Haswelliporina multiaviculata, Semihaswellia umbrella, Siphonicytara vittata.*
Station KG 22. — 28.8.1985, 22°46.44'S, 166°19.93'E, 2050 m: *Terminocella perlucens, Mucropetraliella philippinensis.*
Station DW 33. — 29.8.1985, 23°09.71'S, 167°10.27'E, 675 m: Gen. sp. indet., *Haswelliporina multiaviculata, Siphonicytara armata, Siphonicytara vittata, Buffonellodes crosnieri, Ipsibuffonella repens, Galeopsis mimicus.*
Station DW 36. — 29.8.1985, 23°08.64'S, 167°10.99'E, 650 m: *Siphonicytara vittata, Galeopsis mimicus.*
Station DW 38. — 30.8.1985, 22°59.74'S, 167°15.31'E, 360 m: *Tetraplaria* sp., *Phorioppnia nova, Haswelliporina vaubani, Gigantopora oropiscis, Siphonicytara excentrica, Buffonellaria regenerata, Schedocleidochasma* sp., *Rhynchozoon ligulatum, Reteporella defensa, Reteporellina granulosa.*
Station DW 44. — 30.8.1985, 22°47.30'S, 167°14.30'E, 440 m: *Siphonicytara vittata, Iodictyum blandum, Reteporellina spiramina.*
Station DW 46. — 30.8.1985, 23°00.43'S, 167°28.76'E, 775 m: *Emballotheca rara, Lagenipora* sp., *Iodictyum trochus.*
Station DW 51. — 31.8.1985, 23°05.27'S, 167°44.95'E, 700 m: *Haswelliporina multiaviculata, Siphonicytara vittata.*
Station DW 65. — 3.9.1985, 24°47.90'S, 168°09.09'E, 275 m: *Parkermavella minuta.*
Station DW 66. — 3.9.1985, 24°55.43'S, 168°21.67'E, 515 m: *Oppiphorina epaxia, Haswelliporina multiaviculata, Mosaicoporina uniserialis, Mawatarius secundus, Hemismittoidea ennea, Parasmittina glabra, Parasmittina erecta, Smittina asymmetrica, Yrbozoon ringens, Buffonellaria erecta, Buffonellaria regenerata, Galeopsis pentagonus, Iodictyum trochus, Reteporellina spiramina, Harpago dissidens, Trochosodon* sp.
Station CP 67. — 3.9.1985, 24°55.44'S, 168°21.55'E, 500 m: *Parasmittina erecta, Smittina asymmetrica, Galeopsis mimicus, Richbunea gracilis.*
Station DW 70. — 4.9.1985, 23°24.70'S, 167°53.65'E, 965 m: *Haswelliporina multiaviculata, Siphonicytara glabra, Onchoporoides moseleyi.*
Station CP 75. — 4.9.1985, 22°18.65'S, 167°23.30'E, 825 m: *Haswelliporina multiaviculata, Galeopsis mimicus.*
Station DW 82. — 6.9.1985, 20°30.65'S, 166°50.30'E, 440 m: *Hippothyris caledonica.*
Station CP 84. — 6.9.1985, 20°43.49'S, 167°00.27'E, 210 m: *Hippothoa calciophilia, Smittina abyssicola.*
Station DS 98. — 7.9.1985, 21°24.10'S, 166°29.76'E, 2365 m: *Ichthyaria simplex.*
Station KG 101. — 8.9.1985, 21°26.51'S, 166°24.43'E, 1790 m: *Ptoboroa gelasina.*
Station CP 108. — 9.9.1985, 22°02.55'S, 167°05.68'E, 335 m: *Xynexecha pulchra, Phorioppnia cookae, Haswelliporina multiaviculata, Reteporella concinnoides, Reteporella defensa.*
Station CP 109. — 9.9.1985, 22°10.03'S, 167°15.22'E, 495 m: *Haswelliporina multiaviculata, Buffonellaria erecta.*

MUSORSTOM 4

Station DW 149. — 14.9.1985, 19°07.60'S, 163°22.70'E, 165 m: *Conescharellina atalanta.*
Station DW 150. — 14.9.1985, 19°07.50'S, 163°22.10'E, 110 m: *Conescharellina atalanta.*

Station DW 151. — 14.9.1985, 19°07.00'S, 163°22.00'E, 200 m: *Haswelliporina multiaviculata*, *Mucropetraliella serrata*, *Iodictyum* sp.
Station DW 185. — 18.9.1985, 19°06.20'S, 163°29.50'E, 235 m: *Haswelliporina vaubani*, *Haswelliporina quinaria*, *Wrigiana strepsis.*
Station DW 187. — 18.9.1985, 19°08.30'S, 163°29.30'E, 65-120 m: *Calyptotheca* sp., *Pseudoplatyglena mirabilis*, *Osthimosia* sp.
Station DW 220. — 29.9.1985, 22°58.50'S, 167°38.30'E, 505-550 m: *Haswelliporina multiaviculata.*
Station DW 223. — 30.9.1985, 22°57.00'S, 167°30.00'E, 545-560 m: *Rhynchozoon ligulatum.*
Station DW 231. — 1.10.1985, 22°33.70'S, 167°10.50'E, 75 m: *Hippomenella avicularis*, *Rhynchozoon tubulosum*, *Reteporella concinnoides.*

CHALCAL 2
Station DW 72. — 28.10.1986, 24°54.50'S, 168°22.30'E, 527 m: *Microporella lineata.*
Station DW 76. — 30.10.1986, 23°40.50'S, 167°45.20'E, 470 m: *Siphonicytara vittata*, *Galeopsis mimicus*, *Reteporella defensa.*
Station DW 78. — 30.10.1986, 23°41.30'S, 167°59.60'E, 233-360 m: *Macrocamera erecta.*
Station DW 81. — 31.10.1986, 23°19.60'S, 168°03.40'E, 311 m: *Haswelliporina multiaviculata.*

BIOGEOCAL
Station KG 210. — 9.4.1987, 22°44.00'S, 166°30.97'E, 1190 m: *Domosclerus* sp., *Cruceschareliina aster.*
Station KG 211. — 9.4.1987, 22°41.80'S, 166°32.53'E, 975 m: *Cruceschareliina aster.*
Station CP 232. — 12.4.1987, 21°33.81'S, 166°27.07'E, 760-790 m: *Tetraplaria orospinea*, *Haswelliporina multiaviculata*, *Siphonicytara granulosa*, *Cruceschareliina aster.*
Station DW 253. — 16.4.1987, 21°31.75'S, 166°28.73'E, 310-315 m: *Phorioppnia cookae*, *Oppiphorina epaxia*, *Reteporella* sp.
Station CP 260. — 17.4.1987, 21°00.00'S, 167°58.34'E, 1820-1980 m: *Bryosartor* sp., *Semihaswellia ?umbrella*, *Siphonicytara mosaica*, *Ichthyaria simplex*, *Cruceschareliina aster.*
Station KG 261. — 18.4.1987, 21°02.04'S, 167°02.32'E, 1508 m: *Ichthyaria simplex.*
Station KG 262. — 18.4.1987, 21°02.26'S, 167°02.03'E, 1380 m: *Cruceschareliina aster.*
Station CP 265. — 18.4.1987, 21°04.09'S, 167°00.40'E, 1760-1870 m: *Tetraplaria orospinea*, *Siphonicytara mosaica*, *Onchoporoides moseleyi.*
Station KG 267. — 18.4.1987, 21°02.20'S, 166°58.76'E, 1935 m: *Cruceschareliina aster.*
Station CP 272. — 19.4.1987, 21°00.04'S, 166°56.94'E, 1615-1710 m: *Onchoporoides moseleyi.*
Station CP 273. — 20.4.1987, 21°01.53'S, 166°57.41'E, 1920-2040 m: *Ichthyaria simplex.*
Station KG 275. — 20.4.1987, 21°05.80'S, 166°53.14'E, 1959 m: Fam., gen., sp. indet., *Ichthyaria simplex*, *Trochosodon* sp.
Station KG 287. — 27.4.1987, 20°43.01'S, 166°52.53'E, 1560 m: *Ichthyaria simplex.*
Station CP 290. — 27.4.1987, 20°36.91'S, 167°03.34'E, 920-760 m: *Reteporellina projecta.*
Station DW 307. — 1.5.1987, 20°35.38'S, 166°55.25'E, 470-480 m: *Kladapheles gammadeka*, *Richbunea gracilis.*
Station DW 313. — 2.5.1987, 20°58.95'S, 166°59.04'E, 1640-1600 m: *Ichthyaria simplex.*
Station KG 316. — 2.5.1987, 20°48.33'S, 166°53.29'E, 1660 m: *Onchoporoides moseleyi, Conescharellina catella.*
Station CP 317. — 2.5.1987, 20°48.12'S, 166°53.16'E, 1630-1620 m: *Riscodopa* sp., *Ichthyaria simplex*, *Trochosodon* sp., *Cruceschareliina aster.*

MUSORSTOM 6
Station DW 405. — 14.2.1989, 20°29.75'S, 166°41.00'E, 520 m: *Haswelliporina multiaviculata.*
Station CP 419. — 16.2.1989, 20°41.65'S, 167°03.70'E, 283 m: *Haswelliporina quinaria*, *Hippothyris caledonica*, *Parkermavella fidelis*, *Smittoidea maunganuiensis multiporosa*, *Galeopsis pentagonus*, *Iodictyum bicuspidatum*, *Iodictyum trochus*, *Reteporella defensa*, *Reteporella ferox.*
Station DW 421. — 16.2.1989, 20°26.27'S, 166°40.17'E, 245 m: *Haswelliporina quinaria*, *Galeopsis pentagonus*, *Iodictyum illinguum, Reteporella defensa.*
Station DW 431. — 18.2.1989, 20°22.25'S, 166°10.00'E, 21 m: *Puellina harmeri*, *Microporella* sp., *Reteporella orstomia.*

Station CP 465. — 21.2.1989, 21°03.55'S, 167°32.25'E, 480 m: *Haswelliporina multiaviculata*, *Siphonicytara mosaica.*
Station DW 489. — 24.2.1989, 20°48.87'S, 167°05.86'E, 700 m: *Galeopsis lageniporoides.*

SMIB 4
Station DW 37. — 7.3.1989, 24°54.50'S, 168°22.30'E, 540 m: *Haswelliporina multiaviculata*, *Riscodopa parva*, *Galeopsis mimicus.*
Station DW 38. — 7.3.1989, 24°54.50'S, 168°22.00'E, 510 m: *Galeopsis pentagonus.*

SYSTEMATIC ACCOUNT

Suborder ASCOPHORINA Levinsen, 1909

Infraorder CRIBRIOMORPHA Harmer, 1926

Superfamily CRIBRILINOIDEA Hincks, 1879

Family CRIBRILINIDAE Hincks, 1879

Genus and species indet.

Fig. 1

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 33, 675 m.

DESCRIPTION. — Colony presumably encrusting, known only from three ancestrulae partially encrusted by zooids of *Buffonellodes crosnieri* sp. nov. on a bivalve shell. Ancestrulae relatively large, 0.77-0.81 mm long, 0.56-0.72 mm wide, oval, a smooth sloping gymnocyst bordering a field of c. 20 costae; these tapering, with short pinnae whose tips fuse with those of adjacent pinnae leaving spaces between; no pelmatidia (lumen pores). Orifice longer than wide, narrowing proximally, the proximal rim rounded; no condyles; a pair of tubercles present on the distal rim.

REMARKS. — No autozooids are present and it is not possible to identify the species.

Superfamily BIFAXARIOIDEA Busk, 1884

Family BIFAXARIIDAE Busk, 1884

Genus ***DOMOSCLERUS*** Gordon, 1988

TYPE SPECIES. — *Domosclerus piscis* Gordon, 1988.

Domosclerus sp.

Figs 2-3

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn KG 210, 1190 m.

DESCRIPTION. — Small ancestrulate colony 3.6 mm long with the bases of two branches arising from the fronts of zooids. Stem biserial, the zooids alternating back to back. Zooids 0.66-0.75 mm long, c. 0.25 mm wide at the orifice. Frontal shield with sparsely scattered pores over the frontal/distal half of each zooid, either side of a median suture, with fewer pores laterally; peristome not projecting beyond the plane of the frontal shield. Internal primary zooidal chamber low-walled, entirely lacking costae. Some zooids with an adventitious avicularium on the

lateral wall proximally, somewhat projecting. A pair of small avicularia present at the corners of the peristomial orifice; cross-bars lacking from all avicularia. Presumed ancestrula narrow, tapering, evidently transformed into a kenozooid after post-ancestrula zooids formed; kenozooidal orifice flanked by a pair of avicularia.

REMARKS. — Although not identifiable to species, the sole specimen is clearly not conspecific with any of the three *Domosclerus* species reported from New Caledonian waters by GORDON (1993a), as these all had a pair of suboral costae beneath the peristomial rim. The type species, *D. piscis*, lacks such costae, but the primary zooidal chamber is proportionately higher-walled than in the present specimen. The low wall resembles the condition in *Aberrodomus* Gordon, but that genus has avicularia with cross-bars.

Superfamily CATENICELLOIDEA Busk, 1852

Family CATENICELLIDAE Busk, 1852

Subfamily DITAXIPORINAE Stach, 1935

Genus ***BRYOSARTOR*** Gordon & Braga, 1994

TYPE SPECIES. — *Bryosartor sutilis* Gordon & Braga, 1994.

Bryosartor ?sutilis Gordon & Braga, 1994
Figs 4-6

[?]*Bryosartor sutilis* Gordon & Braga, 1994: 59, fig. 1 a-f.

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn CP 260, 1820-1980 m.

DISTRIBUTION. — Southern New Caledonia and northern Norfolk Ridge, 425-1980 m.

REMARKS. — A single incomplete segment was found amongst bryozoan specimens from BIOGEOCAL Stn CP 260 which may represent a second species of *Bryosartor*. Comprising only four complete zooids, these are proportionately slightly longer (0.58-0.68 mm long) and more slender (0.26-0.30 mm wide, with a branch width of 0.38 mm) than the zooids in the type material. The lateral pore-chambers are more widely separated in the new specimen, the costal field is shorter in proportion to zooid length, and the proximal gymnocystal pore is more regularly rounded. The new specimen also represents a depth-range extension. Only more material will determine if this specimen represents a new species.

It should be noted that there is an error in the figure given by GORDON and BRAGA (1994) for the maximum number of zooids in a segment of *B. sutilis* - it should be 16, not 6.

Infraorder HIPPOTHOOMORPHA Gordon, 1989a

Superfamily HIPPOTHOOIDEA Busk, 1859

Family HIPPOTHOIDAE Busk, 1859

Genus ***HIPPOTHOA*** Lamouroux, 1821

TYPE SPECIES. — *Hippothoa divaricata* Lamouroux, 1821.

Hippothoa calciophilia Gordon, 1984

Fig. 7

Hippothoa calciophilia Gordon, 1984: 108, fig. 10 A, pl. 42 A-C. — Ryland & Hayward, 1992: 247, fig. 13 a-b.

Material examined. — **New Caledonia**. Biocal: stn CP 84, 210 m.

Distribution. — New Caledonia: northern Norfolk Ridge, 210 m. New Zealand: Raoul Island (Kermadec Islands), 10-60 m. Australia: Heron Island and Low Isles (Great Barrier Reef), 0-28 m.

Remarks. — This species characteristically occurs on calcareous substrata. Barnacle plates and oyster valves have been previously reported; in the present case the sole colony in the collection co-occurred with *Smittina abyssicola* on the dorsal surface of an erect fenestrate colony of the bryozoan *Smittipora* sp. The midfrontal carina noted by Gordon (1984) in Kermadec *H. calciophilia* is somewhat more developed in the present material, which also has predator boreholes in both autozooids and ovicells.

Infraorder UMBONULOMORPHA Gordon, 1989a

Superfamily ARACHNOPUSIOIDEA Jullien, 1888

Family EXECHONELLIDAE Harmer, 1957

Genus ***XYNEXECHA*** nov.

Diagnosis. — Colony erect, cylindrical, from an encrusting base. Zooids with a tubular peristome and flared rim, the frontal shield comprising a central, evenly perforated area separated from an imperforate (save for areolar pores) periphery by a row of pores that are frequently larger. No avicularia or ovicells. Colony base mostly comprising kenozooids with perforate frontals.

Type Species. — *Xynexecha pulchra* sp. nov.

Xynexecha pulchra sp. nov.

Figs 8-9

Material examined. — **New Caledonia**. Biocal: stn CP 108, 335 m.

Types. — *Holotype*: from Biocal Stn CP 108, 22°02.55'S, 167°05.68'E, 335 m, MNHN-Bry 20021. *Paratype*: same locality as the holotype, MNHN-Bry 19959.

Description. — Colony comprising an erect cylindrical stem from a small encrusting base. Stem ~1.3-1.4 mm diameter, not including projecting peristomes, with zooids arranged more or less in whorls of 4 alternating with the proximal and distal ends of zooids in whorls above and below. Zooids large, 0.84-1.57 mm long and 0.75-1.03 mm wide, with a tubular peristome 0.37-0.45 mm long that has a slightly flared circular to subelliptical rim 0.28-0.36 mm across (outer diameter). Frontal shield comprising a slightly convex evenly perforated umbonuloid field centrally, surrounded by a weakly tubercular imperforate area that has several simple areolae along its margin; seen laterally, the umbonuloid shield appears supported by small buttresses a little above the surrounding cryptocyst, the pores between the buttresses generally transversely elongated. Exterior surface of peristome weakly tubercular like the proximolateral cryptocyst. Primary orifice transversely elliptical (~0.28 mm wide), with no condyles. No oral spines or avicularia. Dimorphic orifices and/or ovicells not apparent in the sole specimen. Simple uniporous mural septula occur in the lateral zooidal walls. The base of the colony comprises

mainly kenozooids. These are smaller in diameter than autozooids; they have a small umbonuloid frontal shield centrally but lack orifices and peristomes.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge, 335 m.

REMARKS. — *Xynexecha* differs from other Recent exechonellids in its erect mode of growth, the occurrence of kenozooids in the encrusting colony base, and in the form of the frontal shield with its distinct, slightly raised umbonuloid area. Some species attributed to *Exechonella* Duvergier, 1924 have tubular peristomes (e.g., *Lagenipora tuberculata* MacGillivray, 1883, and erect *Tubucellaria marginata* MacGillivray, 1895 - see GORDON, 1984), but the frontal shield is not zoned and the pores are initially relatively large and rimmed. In contrast, the type species of *Exechonella*, *E. grandis* (Duvergier, 1921), lacks a tubular peristome, though it does have a raised rim and large frontal pores. It also has an occasional tiny avicularium near the zooidal margin like that in its congener *E. antillea* (Osburn) (see COOK, 1985; FRANSEN, 1986).

Superfamily LEPRALIELLOIDEA Vigneaux, 1949

Family LEPRALIELLIDAE Vigneaux, 1949

Genus ***KLADAPHELES*** Gordon, 1993b

TYPE SPECIES. — *Kladapheles gammadeka* Gordon, 1993b.

Kladapheles gammadeka Gordon, 1993b

Figs 10-11

Kladapheles gammadeka Gordon, 1993b: 208, figs 13-14.

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn DW 307, 470-480 m.
Norfolk Island. N.Z. Oceanographic Institute, NIWA, unregistered slide of material from NZOI Stn G10, southern Norfolk Ridge, 970 m depth.

DISTRIBUTION. — New Caledonia between Ouvéa and Lifou, 470-480 m; southern Norfolk Ridge, 970 m.

REMARKS. — Ovicells are lacking from both the type and BIOGEOCAL specimens, but a re-examination of bryozoan material from the type locality has yielded a specimen with a single ovicell. This forms a smooth-surfaced bulge distal to the orifice, flush with the surface of the fertile zooid but raised somewhat above the next zooid in the series and somewhat offset from it. Membranes and opercula are lacking, but it appears that the ovicellular opening is below the level of the zooidal operculum. In the sole MUSORSTOM specimen one of the adventitious avicularia is larger than the others in the colony but of the same general form.

Infraorder LEPRALIOMORPHA Gordon, 1989a

Superfamily SMITTINOIDEA Levinsen, 1909

Family BITECTIPORIDAE MacGillivray, 1895

Genus ***HIPPOTHYRIS*** Osburn, 1952

TYPE SPECIES. — *Hippothyris emplastra* Osburn, 1952.

Hippothyris caledonica sp. nov.

Fig. 12

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 82, 440 m.
MUSORSTOM 6: stn CP 419, 283 m.

TYPES. — *Holotype*: part of a colony from MUSORSTOM 6 Stn CP 419, 20°41.65'S, 167°03.70'E, 283 m, MNHN-Bry 20030.
Paratypes: MNHN-Bry 19969 from the same locality as the holotype; MNHN-Bry 19970 and MNHN-Bry 20033, both from BIOCAL Stn DW 82, 20°30.65'S, 166°50.30'E, 440 m.

DESCRIPTION. — Colony encrusting, forming multiple layers. Zooids large, 0.96-1.18 mm long and 0.66-0.94 mm wide (periancestrular zooids as small as ~0.66 mm × 0.40 mm), subquadrate to subhexagonal, the frontal shield with 3-4 rows of pseudopores surrounding an extensive imperforate area suborally; ca. 3-4 small areolae distributed along each lateral margin. Orifice wider than long, attaining 0.25 mm width in the largest zooids, with a gently concave proximal rim and tiny condyles in the corners. No oral spines. Avicularia paired, adjacent to the orifice, with a very thin cross-bar and an acute rostrum that is directed distally. Ovicell subglobular, at least two-thirds of the frontal area with scattered pores and secondary calcification encroaching distally. Ancestrula resembling later zooids, ~0.56 mm long and 0.40 mm wide.

DISTRIBUTION. — New Caledonia: between Ouvéa and Lifou, 283-440 m.

REMARKS. — *Hippothyris* is a small genus, but the number of known species is slowly increasing, especially from the New Zealand-New Caledonian region. The type species is known from Baja California and north Chile (OSBURN,1952; MOYANO,1991); *H. austrinus* occurs off central Chile (MOYANO, 1991); and *H. aganactete* and *H. ordinaria* are neozelanic (GORDON, 1984, 1989a). All are characterised by large zooids, similar orifices, and an imperforate suboral area.
Hippothyris caledonica differs from the other species in its paired oral avicularia. The present material encrusts three-dimensional substrata mostly comprising homotrematid and other Foraminifera, leaving cavities beneath.

Genus *PARKERMAVELLA* nov.

DIAGNOSIS. — Colony encrusting. Zooids lepralioid, the frontal shield imperforate, with marginal areolar pores only. Orifice with a proximal sinus. Articulated oral spines occur distally. One or more adventitious avicularia occur near the orifice or elsewhere on the frontal shield including the lateral margin. Ovicell prominent or subimmersed, the ectooecial calcification smooth, with numerous perforations that may be rimmed. Secondary calcification, sometimes incorporating small avicularia may encroach upon the distolateral margin of the ovicell.

TYPE SPECIES. — *Lacerna incurvata* Uttley & Bullivant, 1972.

REMARKS. — A new genus is necessary for *Schizomavella*-like species with an imperforate frontal shield and only marginal areolae - the type species of *Schizomavella*, *Lepralia auriculata* Hassall, 1842, and related European species have evenly perforated shields (HAYWARD & RYLAND, 1979). The late Shane PARKER of the South Australian Museum, before his untimely death in 1992, suggested such a new genus. *Parkermavella* is named in honour and recognition of Shane and his work. Apart from the type species, *Parkermavella* includes, *inter alia*, the following Australasian species: *Schizoporella punctigera* MacGillivray, 1883; *Hippomenella curvata* Uttley & Bullivant, 1972 (syn. *Schizomavella trachoma* Gordon, 1989a); *Schizomavella schizoporelloides* Gordon, 1984; and *Schizomavella virago* Gordon, 1989a.

Parkermavella fidelis sp. nov.

Figs 13-14

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 6: stn CP 419, 283 m.

TYPE. — *Holotype*: MUSORSTOM 6: stn CP 419, 20°41.65'S, 167°03.70'E, 283 m, MNHN-Bry 20046. No separate paratypes.

DESCRIPTION. — Colony encrusting, the zooids variable in size and shape from quadrate to elongate-oval; 0.66-1.13 mm long and 0.37-0.96 mm wide, the calcareous surface smooth to tubercular. Areolar pores 3-7, along each lateral margin. Orifice with a broadly U-shaped median sinus, flanked by flattened condyles on the shoulders. Articulated oral spines 5-6. A somewhat columnar, suboral avicularium occurs immediately proximal to the sinus, the palatal surface slanted to face somewhat distally; the rostrum rounded, with a complete cross-bar. Ovicell prominent, smooth, with numerous ectooecial pores; apparently closed by the zooidal operculum. At the proximal end of several zooids is a raised structure with a central concavity; it appears avicularian but in every case it is sealed frontally and typical avicularian structures are not evident.

DISTRIBUTION. — New Caledonia: Loyalty Islands, 283 m.

REMARKS. — The unique holotype specimen of *Parkermavella fidelis* is part of a formerly sheet-like encrustation occurring on a branching stem of *Haswelliporina quinaria* sp. nov. Thus the underside of the colony is largely free of any contact with the substratum. The species name *fidelis* (Latin, faithful) alludes to the geographic distribution of the species in the Loyalty Islands.

Parkermavella minuta sp. nov.

Fig. 15

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 65, 275 m.

TYPE. — *Holotype*: a unique, tiny colony, now fragmented into two parts, from BIOCAL Stn DW 65, 24°47.90'S, 168°09.09'E, 275 m, MNHN-Bry 20052. No separate paratypes.

DESCRIPTION. — Colony encrusting, small. Zooids small, 0.18-0.47 mm long and 0.13-0.32 mm wide, the calcareous frontal shield lightly textured, imperforate, with 3-6 areolar pores along each lateral margin. Orifice with a small rounded sinus, the entrance to which may be slightly constricted, the condyles flattened on the lateral shoulders; articulated oral spines 8, extending almost right around the margin of the anter. Avicularia adventitious, small and oval-shaped, one occurring in the centre of the frontal shield directed proximally and usually another interzooidally, with a thin, minutely ligulate crossbar, the rostrum with lateral shelves constricting the central space. Ovicell subimmersed, with small scattered pores and tubercles, the female orifice flanked by 2 pairs of spines.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge, 275 m.

REMARKS. — Only a single colony 2.2 mm across was found in the collection. Although very small, at least one mature ovicell is present, indicating that the species probably does not attain a significant size.

Family SMITTINIDAE Levinsen, 1909

Genus *SMITTOIDEA* Osburn, 1952

TYPE SPECIES. — *Smittoidea prolifica* Osburn, 1952.

Smittoidea maunganuiensis multiporosa ssp. nov.

Figs 16-17

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 6: stn CP 419, 283 m.

TYPES. — *Holotype*: a preserved colony from MUSORSTOM 6 Stn CP 419, 20°41.65'S, 167°03°70'E, 283 m, MNHN-Bry 20002.

Paratypes: MNHN-Bry 20003, a preserved colony, and MNHN-Bry 20062, a slide, both from the same locality as the holotype.

DESCRIPTION. — Colony encrusting, producing elevated lamellae beyond the immediate area of substratum. Zooids 0.84-1.71 mm long and 0.49-1.34 mm wide, the zooids mostly elongate-rectangular in shape. Frontal shield lightly undular-tubercular, imperforate frontally with numerous marginal areolae. Orifice with a short peristome laterally and proximally; no oral spines. Lyrula not very broad, the alae short to moderately developed, flanked by acicular condyles directed toward the alae. Operculum more or less semicircular with a broadly arcuate proximal edge. Suboral avicularium relatively small, suboval in shape, directed proximally, unequally divided by a cross-bar with a tiny ligula on the rostral side. Ovicell prominent, subglobular, the ectooecium smooth with numerous pores.

DISTRIBUTION. — New Caledonia: north side of Lifou Island, 283 m.

REMARKS. — The present material is very similar to the New Zealand species *Smittoidea maunganuiensis* (Waters). It differs, however, in a number of minor characters that collectively warrant recognition as a new subspecies. These comprise a low peristome between the orifice and the avicularium, the more oval shape of the avicularium, the lack of orificial spines in young marginal zooids, the more numerous ectooecial pores, and the lack of encroaching secondary calcification around the margin of the ovicell.

Genus ***HEMISMITTOIDEA*** Soule & Soule, 1973

TYPE SPECIES. — *Hemismittoidea corallinea* Soule & Soule, 1973.

Hemismittoidea ennea sp. nov.

Figs 18-19, ?20

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 66, 515 m.
?**Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.

TYPE. — *Holotype*: fragments of the same colony from BIOCAL Stn DW 66, 24°55.43'S, 168°21.67'E, 515 m, MNHN-Bry 20071. No separate paratypes.

DESCRIPTION. — Colony encrusting. Zooids small, 0.45-0.55 mm long and 0.26-0.40 mm wide, the frontal shield evenly and lightly textured with small polygonal ridges and depressions, with 7-9 conspicuous areolar pores along the margins. A thin raised peristome present, with a median U-shaped sinus and 9 small spine bases around the distal margin (the actual spines lacking from the present material). Primary orifice with a medium-sized alate lyrula, flanked by acicular condyles directed towards the alae. At the base of the peristome on 1 side is an avicularium; this is directed proximolaterally towards the adjacent margin; the distal half to two-thirds of the acute rostral rim minutely serrate, the palate calcified, a crossbar completely lacking. Ovicell prominent, emplaced upon the frontal shield of the distal zooid, the ectooecium initially smooth, becoming covered with secondary calcification between the numerous small pores which become sunken; the two most proximal pairs of oral spines are retained on each side of the fertile orifice.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge, 515 m. ?Philippines: Mindoro Strait, 92-97 m.

REMARKS. — *Hemismittoidea ennea* has more oral spines than any other species of the genus, i.e., nine (greek, *ennea*). The ovicell differs from other congeners in being evenly covered with secondary calcification. The unique, fertile holotype colony is unusual in having avicularia that lack a crossbar. It is possible that this is because of breakage, but they do not appear broken; nevertheless, all other species of *Hemismittoidea* have

crossbars, as do most smittinids. It is this feature that prevents us from including, with certainty, a small infertile colony of a *Hemismittoidea* from MUSORSTOM 3 Stn DR 117 in the Philippines. It includes periancestrular and later zooids; there are 8-9 oral spines and greatly resembles zooids of *H. ennea* but the avicularia have ligulate crossbars (Fig. 20). If this colony had occurred at the same New Caledonian station as the holotype of *H. ennea*, then we would be more confident of conspecificity.

Genus ***PARASMITTINA*** Osburn, 1952

TYPE SPECIES. — *Lepralia jeffreysi* Norman, 1876.

Parasmittina glabra sp. nov.

Figs 21-22, ?23-24

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 66, 515 m.

TYPES. — *Holotype*: a small colony from BIOCAL Stn DW 66, 24°55.43'S, 168°21.67'E, 515 m, MNHN-Bry 20063.

Paratypes: 3 fragments from the same locality in a separate well on the holotype slide.

DESCRIPTION. — Colony encrusting. Zooids 0.35-0.58 mm long and 0.20-0.52 mm wide, with smooth frontal shield and 5-9 conspicuous round areolar pores along the margins. Frontal shield rising to a peristomial rim that has a median sinus and 7-8 distal spine bases (spines not attached in the present material). Primary orifice with a medium-sized alate lyrula (~0.041 mm wide) and a pair of subacute non-acicular condyles directed towards the alae. Avicularia paired, 1 either side of the peristome, each directed lateroproximally towards the adjacent margin; with a tiny semicircular opesia separated by the crossbar from a minutely and irregularly serrate acute rostrum. Ovicell prominent, emplaced upon the distal frontal shield, the ectooecial surface almost smooth, with numerous pores that have slightly raised rims.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge, 515 m.

REMARKS. — From the same station is additional material (three fragments from another colony) that may belong to the same species (Figs 23-24). Though infertile, it is extremely similar in general appearance and orificial characteristics (6-7 oral spines, however), but differs in its slightly larger zooidal size and therefore proportionately wider lyrula (~0.085 mm) (Fig. 24), and the fact that one of the paired avicularia is frequently directed distally (Fig. 23).

Parasmittina marginata (Canu & Bassler, 1929)

Figs 25-26

Smittina trispinosa - OKADA, 1929: 28, text-fig. 13. Non Johnston, 1838.
Smittina reticulata - CANU & BASSLER, 1929: 337, pl. 39, figs 9-10. Non J. MacGillivray, 1842.
Smittina ophidiana var. *marginata* Canu & Bassler, 1929: 339, pl. 29, figs 4-5.
[?] *Smittina trispinosa* var. *munita* Canu & Bassler, 1929: 341, pl. 41, fig. 5.

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.

DISTRIBUTION. — Japan, Mutsu Bay, Honshu. Philippines, 18-969 m.

REMARKS. — This species is distinctively characterised by the long, narrow and curving, near-midfrontal avicularium that is proximally directed. It is very similar to *Smittoidea pacifica* Soule & Soule, 1973; this species, which has also been illustrated by RYLAND and HAYWARD (1992), has a similar, though much shorter,

avicularium that is placed somewhat more suborally, and in the median position that is characteristic of species of *Smittoidea*. Nevertheless, both species share the characteristically shaped avicularian crossbar which is "angled slightly forward, and may be thickened at the ends so that the opesial premandibular area of the rostrum is reduced to a circle" instead of a semicircle.

Parasmittina serrula Soule & Soule, 1973

Fig. 27

Parasmittina serrula Soule & Soule, 1973: 386, fig. 3 D-F. — GORDON, 1984: 96, pl. 35 B-C. — WINSTON, 1984: 23, fig. 45. — RYLAND & HAYWARD, 1992: 272, figs 23 e-f, 24 a.
Smittina raigii - RHO & SEO, 1986: 40, pl. 10, figs 3-4. Non Audouin, 1826.

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.

DISTRIBUTION. — Hawaiian Islands (type locality on Maui), 3-130 m. Belize and Jamaica, ~15 m. Kermadec Ridge, 55-318 m. Heron Island (Great Barrier Reef), < 20 m. Mindoro Strait, Philippines, 92-97 m. Southern South Korea (no depth given).

REMARKS. — The present material, newly recorded from the Philippines, closely matches published descriptions and illustrations of *P. serrula* from other localities, though differing in details. There is some variation in lyrula width throughout its range, being narrower in Caribbean and Hawaiian populations and wider in Great Barrier Reef and Philippine samples. The present material lacks giant avicularia and the smaller avicularia are not as high-sided as previously described - the latter possibly a consequence of the degree of secondary calcification.

Parasmittina erecta sp. nov.

Figs 28-29

Parasmittina sp. Gordon, 1985: 171, fig. 19.

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 66, 515 m. — Stn CP 67, 500 m.
New Zealand. NZOI Stn K795, 350 m.

TYPES. — *Holotype*: part of a colony from BIOCAL Stn DW 66, 24°55.43'S, 168°21.67'E, 515 m, MNHN-Bry 20069.
Paratypes: MNHN-Bry 20070, from the same location as the holotype; MNHN-Bry 20065, from BIOCAL Stn CP 67, 24°55.44'S, 168°21.55'E, 500 m.

DESCRIPTION. — Colony erect, dichotomously branching in 1 plane, the zooids facing on 1 side only; branch width 0.39-0.94 mm, the zooids in 2-4 series; distance between dichotomies 1.20-2.25 mm. Zooids 0.52-0.66 mm long and 0.24-0.34 mm wide, the frontal shield more or less smooth and imperforate centrally, with ~4-7 areolar pores along each lateral margin. Peristome with a median sinus, bordered distally by 6 oral spines. Primary orifice with a variable medium to broad alate lyrula flanked by curved condyles. Avicularia single or paired, variable in length and orientation; generally the rostrum is narrow and acute with small denticulations and directed proximally; if an avicularium is short (~ half the length of the longer avicularia) and adjacent to the peristome, it may be directed laterally toward the secondary orifice; if placed more proximally, it may be directed proximally or distally or obliquely toward the peristome. Ovicell relatively large, emplaced on the distal frontal shield, with numerous pores in the smooth ectooecium. Dorsal surface faintly textured, with lines marking the zooidal boundaries.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge, 500-515 m. New Zealand: southern end of Kermadec Ridge, 350 m.

REMARKS. — GORDON's (1985) record of this species from the southern Kermadec Ridge was based on a single worn fragment. Nevertheless, close comparison of the Kermadec and Philippine colonies confirms that they are conspecific.

Parasmittina sp.

Figs 30-31

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 3: stn DR 117, 97-92 m.

DESCRIPTION. — A single young colony only 1.26 mm diameter, encrusting, the marginal zooids tending to suberect, the ancestrula occluded. Largest zooidal dimensions 0.28-0.34 mm long, 0.18-0.26 mm wide. Frontal shield more or less smooth, rising to a suboral peristome with a median U-shaped pseudosinus. Areolar pores sparse, usually only 1-2. Primary orifice with a broad alate lyrula; no condyles. Oral spines 6. Adventitious avicularia single or paired, small and oval with a low, lightly crenulated rostral rim, the mandibular pivots considerably projecting, approaching each other quite closely; avicularia set near the lateral margins of the zooid where the peristome starts to rise, directed obliquely laterally.

REMARKS. — It has not been possible to determine the species from such a small specimen, but the small oval avicularia are very distinctive and generally rare in *Parasmittina* species, so it should be possible to relate the specimen to larger, fertile colonies should they be discovered.

Genus ***SMITTINA*** Norman, 1903

TYPE SPECIES. — *Lepralia landsborovii* Johnston, 1847.

Smittina asymmetrica sp. nov.

Figs 32-34

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 66, 515 m. — Stn CP 67, 500 m.

TYPES. — *Holotype*: dome-shaped colony from BIOCAL Stn CP 67, 24°55.44'S, 168°21.55'E, 500 m, MNHN-Bry 20005.

Paratypes: MNHN-Bry 20067, and MNHN-Bry 20061, both from BIOCAL Stn DW 66, 515 m.

DESCRIPTION. — Colony encrusting, able to form multiple layers by frontal budding, resulting in a dome-shaped colony 9 mm diameter and 5 mm high. Zooids subquadrate to subhexagonal, sometimes wider (0.45-1.01 mm) than long (0.60-0.98 mm); at the growing margin the frontal shield appears convex and higher than the lateral margins, rising to an elevated peristomial orifice. Later in ontogeny the margins become raised vertically to the level of the peristomial rim; as a consequence the frontal shield appears considerably sunken and the hypostegal coelom is relatively spacious. Frontal shield varies from lightly textured at the colony margin to somewhat tubercular in the older parts; evenly, but not densely, perforated by relatively large pseudopores. Peristomial orifice subpyriform with a spatulate suboral avicularium set in the peristomial sinus; beneath is a very broad lyrula whose alae almost touch the adjacent acicular condyles. No oral spines. Ovicell large, prominent, occupying most of the frontal area and hypostegal coelom of the next distal zooid, the peristomial orifice angled asymmetrically to one side, as is the outer of two suboral avicularia set within it; the innermost avicularium is aligned with the zooidal axis; ovicellular ectooecium regularly and evenly perforated.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge, 500-515 m.

REMARKS. — *Smittina asymmetrica* is a very striking species insofar as zooidal characters are concerned, notably the raised margins and asymmetrical female peristomial orifice with two suboral avicularia, the one above the other.

Smittina abyssicola (Harmer, 1957)

Figs 35-36

Porella abyssicola Harmer, 1957: 946, pl. 65, figs 8-10.

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn CP 84, 210 m.

DISTRIBUTION. — Indonesia: Halmahera, Mollucca Islands, 1089 m. New Caledonia: Loyalty Islands, 210 m.

REMARKS. — The present material occurs on the abfrontal side of a fenestrate species of the bryozoan *Smittipora* sp. Although infertile, it accords very well with HARMER's (1957) description and illustrations, including of the elevated peristome, broad lyrula, and ligulate avicularian crossbar.

Family MAWATARIIDAE Gordon, 1990

Genus *MAWATARIUS* Gordon, 1990

TYPE SPECIES. — *Prostomaria inexspectabilis* Gordon, 1985.

Mawatarius secundus sp. nov.

Figs 37-41

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 66, 515 m.

TYPES. — *Holotype*: a branching, fertile, colony fragment from BIOCAL Stn DW 66, 24°55.43'S, 168°21.67'E, 515 m, MNHN-Bry 20043.

Paratype: two fragments, one ancestrulate, from the same locality as the holotype, MNHN-Bry 20055.

DESCRIPTION. — Colony erect, uniserial, dichotomously branching in 1 plane. Zooids 0.66-0.87 mm long and 0.36-0.47 mm wide, mostly all facing in the same frontal direction; from a position adjacent to the proximal end of the orifice, each zooid produces a daughter zooid (or 2 zooids at bifurcations) at an angle - thus the orientation of the zooids imparts a zigzag appearance to each branch. Frontal shield densely and minutely granular, with sparse pseudopores and faint longitudinal ridges. A secondary orifice, composed of a short peristomial rim, is fluted around the inner face of the rim and has a pseudosinus. At a deeper level, not readily visible frontally, is the primary orifice, with an anvil-shaped lyrula; the adjacent corners of the poster slightly projecting and flattened, forming condylar surfaces. Nor oral spines or avicularia. Ovicell appearing as a small bulge externally, the surface calcification resembling that of the frontal shield, opening into the peristome above the primary orifice. Ancestrular zooid erect and claviform, proximally tapering.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge, 515 m.

REMARKS. — *Mawatarius secundus* is only the second species of the genus (hence the specific name) to be described. It differs from the type species in having a deeper poster and prominent lyrula and the zooidal orifices mostly facing in the same direction (alternate orifices in *M. inexspectabilis* in some cases face at right angles to each other).

Although the ancestrula is present in one of the paratype fragments of *M. secundus*, it was not attached to any substratum. It otherwise resembles that of the type species which has a short chitinous ring at the proximal end attaching it to a flat pad of calcium carbonate. There are no accessory rootlets or encrusting kenozooids.

Family PETRALIELLIDAE Harmer, 1957

Genus ***MUCROPETRALIELLA*** Stach, 1936

TYPE SPECIES. — *Lepralia ellerii* MacGillivray, 1869.

Mucropetraliella philippinensis (Canu & Bassler, 1929)

Fig. 42

Petraliella philippinensis Canu & Bassler, 1929: 261, pl. 35, figs 3-11.
Mucropetraliella philippinensis - HARMER, 1957: 710, pl. 45, figs 19-21. — DUMONT, 1981: 635. — WINSTON, 1986: 21. — D'HONDT, 1986: 705.

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn KG 22, 2050 m.

DISTRIBUTION. — Red Sea, < 30 m. Japan, 73-146 m. Philippines, 34-621 m. Sumbawa Island, Indonesia, 0-36 m. New Caledonia, 40-2050 m.

REMARKS. — The specimen from BIOCAL Stn KG 22 was represented by a single tiny infertile colony. The depth at which it was taken is greater than indicated by previous records. HARMER (1957) described the orificial sinuses as almost closed, whereas they are rather more open in the present specimen, but this is a character likely to vary. Certainly the lyrula is characteristically short and wide in the BIOCAL specimen, conforming to HARMER's description, but there are also bases of four small oral spines, not previously reported for *M. philippinensis*. These spines are extremely short, however, occurring low within the orifice and are easily overlooked. The BIOCAL specimen does have the characteristic paired lateral avicularia and the arc of small avicularia distal to the orifice, but lacks the occasional larger avicularia.

On the underside of the sole colony in the collection is an ancestrula of the catenicellid bryozoan *Terminocella perlucens* (Harmer) - it is identical to later zooids in morphology and is separated by a thin chitinous joint from a short calcified stalk attached to the substratum. This represents a new station record for *T. perlucens*, reported earlier by GORDON (1993a) from four other BIOCAL stations (505-1395 m).

Mucropetraliella serrata (Livingstone, 1926)

Fig. 43

Petralia vultur var. *serrata* Livingstone, 1926: 95, pl. 6, figs 7-10.
Mucropetraliella serrata - HARMER, 1957: 718, pl. 46, fig. 8, text-fig. 6. — D'HONDT, 1986: 705.

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 4: stn DW 151, 200 m.

DISTRIBUTION. — New Caledonia, north of Belep Islands, 200 m, and Chesterfield Bank, 15-19 m. Also Sri Lanka, Philippines, Torres Strait, Queensland, Great Barrier Reef, 0-201 m.

REMARKS. — Only one small colony fragment occurred in the collection. It may have been transported from a shallower depth.

Genus ***RISCODOPA*** Gordon, 1989a

TYPE SPECIES. — *Mucropetraliella cotyla* Cook & Chimonides, 1981.

Riscodopa parva Gordon, 1989a

Riscodopa parva Gordon, 1989a: 57, pl. 30, figs C-E.

MATERIAL EXAMINED. — **New Caledonia**. SMIB 4: stn DW 37, 540 m.

DISTRIBUTION. — New Zealand: northwest slope of North Island, Challenger Plateau, Bounty Trough, 477-4059 m. Norfolk Ridge: New Caledonia to Norfolk Island, 540-831 m.

REMARKS. — A single colony 3.19 mm diameter occurred in the collection. This is only the second record of this abyssal species, which thus ranges from 24°54.5'S to 45°21.1'S.

Riscodopa sp.

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn CP 317, 1630-1620 m.

DESCRIPTION. — Colony tiny, discoidal, ~1.35 mm diameter. Zooids somewhat shield-shaped, with a U-shaped arrangement of relatively large drop-shaped foramina on the frontal shield, with another foramen suborally at the open end of the U. Orifice evidently lacking a lyrula or denticles, the operculum high-arched (0.098-1.30 mm long) with a straight proximal rim. No obvious oral spines. A pair of lateral-oral avicularia adjacent to the orifice, the mandible similar in shape to the operculum but half the length. Ancestrular zooid central, the opesial diameter 0.18 mm. Ovicells not present.

DISTRIBUTION. — New Caledonia: South Loyalty Basin near Lifou, 1620-1630 m.

REMARKS. — Only a single tiny colony occurred in the collection. It had become dried and, as a consequence, was collapsed by surface-tensional effects during dehydration. Thus the zooidal features are somewhat distorted. The overall form of the colony is as for the other two species of the genus, but the paucity, size, and distribution of frontal pseudopores is unusual. More specimens are needed to characterise this species adequately.

Superfamily SCHIZOPORELLOIDEA Jullien, 1883

Family SCHIZOPORELLIDAE Jullien, 1883

Genus *HIPPOMENELLA* Canu & Bassler, 1917

TYPE SPECIES. — *Lepralia mucronelliformis* Waters, 1899.

Hippomenella avicularis (Livingstone, 1926)

Fig. 44

Lepralia tuberculata var. *avicularis* Livingstone, 1926: 93, pl. 5, figs 1-3.
Hippomenella spatulata Harmer, 1957: 1095, pl. 72, figs 27, 31. — POWELL, 1967: 378, text-fig. 106 a-f, pl. 17, fig. d. — D'HONDT, 1986: 735, pl. 8, fig. 6. — RHO & SEO, 1986: 40, pl. 9, figs 1-3.
Hippomenella avicularis - HAYWARD & COOK, 1983: 81, fig. 19G.

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 4: stn DW 231, 75 m.

DISTRIBUTION. — Cheju-do, southern South Korea (depth not given); New Caledonia, Loyalty Islands and Chesterfield Plateau, 0-75 m; Australia: Surprise Shoal, Great Barrier Reef, 51 m (type locality), and Port Jackson, New South Wales; South Africa: eastern continental shelf and slope, 90-780 m.

REMARKS. — The present material comprised one small infertile colony fragment.

Family LANCEOPORIDAE Harmer, 1957

Genus ***EMBALLOTHECA*** Levinsen, 1909

TYPE SPECIES. — *Eschara quadrata* MacGillivray, 1880.

Emballotheca rara sp. nov.

Figs 45-46

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 46, 775 m.

TYPES. — *Holotype*: a single preserved colony from BIOCAL Stn DW 46, 23°00.43'S, 167°28.76'E, 775 m, MNHN-Bry 19996.

Paratypes: MNHN-Bry 19997, a preserved colony, and MNHN-Bry 20044, three dried colonies on a slide, all from the same locality as the holotype.

DESCRIPTION. — Colony encrusting, forming a small multilamellate nodule up to ~6 mm high and 5 mm diameter, over the underlying substrate (frequently a small coral fragment), the oldest zooids occurring at the apex of the nodule. Zooids 0.71-1.00 mm long and 0.47-0.98 mm wide, somewhat quadrate in outline, frequently parallel-sided, a thin raised line of calcification indicating the boundary between zooids. The presence of long buds at the colony margin indicates multizooidal budding. Some zooids lack orifices. Zooidal frontal shield evenly perforated by small pseudopores except for two areas suborally and proximally. Inconspicuous areolar pores, a little larger than pseudopores, occur along the lateral margins. Orifice wider (0.20-0.32 mm) than long, with a variably convex proximal rim and a pair of long, horizontal, acicular condyles. No oral spines. Avicularia tiny, borne singly beside the orifice or on either side, with a thin, complete cross-bar, the rostrum rounded, directed obliquely towards the centre of the frontal shield. Ovicells relatively large, occupying two-thirds of the frontal shield of the distal zooid, though not especially conspicuous; the skeletal surface perforated much like the frontal shield except for an imperforate area midproximally, and, on the most mature ovicell in the colony, at least one of the thin raised ridges characteristic of the family and genus. Ovicells contain single embryos, 0.28 mm maximum diameter.

DISTRIBUTION. — Northern Norfolk Ridge, 775 m.

REMARKS. — The nodular form of the colony and the tiny lateral-oral avicularia are distinctive features of this species.

Genus ***CALYPTOTHECA*** Harmer, 1957

TYPE SPECIES. — *Schizoporella nivea* var. *wasinensis* Waters, 1913.

Calyptotheca sp.

Figs 47-48

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 4: stn DW 187, 65-120 m.

DESCRIPTION. — Unique juvenile colony encrusting a segment of the bryozoan *Nellia tenella* (Lamarck). Zooids 0.32-0.53 mm long and 0.20-0.42 mm wide, separated by thin raised ridges. Zooidal frontal shield more or less evenly perforated by pseudopores, with low ridges between the pores; marginal areolae the same size as pseudopores, sparsely distributed at the corners of the zooid. Orifice with a broad shallow sinus and tiny condyles. No oral spines. Avicularia and ovicells absent from the young colony.

DISTRIBUTION. — Northern New Caledonia, near Belep Islands, 65-120 m.

REMARKS. — Without ovicells and avicularia, it is impossible to comment further on the affinities of this species. On the basis of the morphology of the neanic zooids it could equally be a species of *Hippoporina*.

Family TETRAPLARIIDAE Harmer, 1957

Genus *TETRAPLARIA* Tenison-Woods, 1879

TYPE SPECIES. — *Tetraplaria australis* Tenison-Woods, 1879.

Tetraplaria orospinea sp. nov.

Figs 49-52

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn CP 232, 760-790 m. — Stn CP 265, 1760-1870 m.

TYPES. — *Holotype*: a colony segment from BIOGEOCAL Stn CP 232, 21°33.81'S, 166°27.07'E, 760-790 m, MNHN-Bry 20028.

Paratype: encrusting base and a detached segment of the same colony from BIOGEOCAL Stn CP 265, 21°04.09'S, 167°00.40'E, 1760-1870 m, MNHN-Bry 20037.

DESCRIPTION. — Colony erect, jointed, from a small encrusting base. Encrusting basal zooids 0.56-0.81 mm long and 0.28-0.55 mm wide, the frontal shield granular and evenly perforated with pseudopores except suborally. Orifice a little wider than long, with a short rounded median sinus and inconspicuous flattened condyles at the corners; bases of 6 oral spines around the distal rim. Erect parts of colony arising from interzooidal kenozooids, the segments at least up to ~5 mm long and 0.85 mm diameter and comprising up to 16 zooids; these not arranged in distinct longitudinal series but forming a clockwise spiral up the segment. Erect zooids relatively large, 0.81-1.22 mm long and 0.41-0.74 mm wide, the frontal shield and orifice as for the encrusting zooids, except that oral spines may be reduced to 4 in number. No avicularia. Ovicells or dimorphic orifices not encountered in the limited material.

DISTRIBUTION. — New Caledonia: South Loyalty Basin, 760-1870 m.

REMARKS. — Although only limited material of this species occurred in the collection (two segments and an encrusting base), it is distinctive enough to be recognised as new. It is readily distinguished from other species by the relatively large size of the zooids and especially the small oral spines, apparently unique in the genus, occurring both in encrusting and erect zooids.

Tetraplaria ventricosa (Haswell, 1881)

Figs 53-54

Onchopora ventricosa Haswell, 1881: 36, pl. 1, fig. 3.
Tetraplaria ventricosa - HARMER, 1957: 1053, pl. 69, figs 1-4 (*cum syn.*). — D'HONDT, 1986: 706. — HAYWARD, 1988: 318.

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.

DISTRIBUTION. — Philippines, Indonesia, Timor, Andaman Islands, Sri Lanka, Seychelles, Mauritius, India, Queensland, New Caledonia, Fiji, 0-97 m.

REMARKS. — HARMER (1957) included a number of species in the synonymy of *T. ventricosa*, but these probably need checking. For example, the present material accords very well with *Diploecium simplex* Kirkpatrick, 1888, but the orificial sinus of this species seems narrower, and the zooids less ventricose, than indicated by HARMER for *T. ventricosa*. HARMER also suggested that *Onchopora mutica* Busk, 1855 might be a senior synonym of *T. ventricosa*, but regarded the small holotype specimen of *O. mutica* as being inadequate to provide clear evidence of conspecificity. Scanning electron micrographs of the uncoated holotype [micrographs kindly supplied by P.J. CHIMONIDES, The Natural History Museum, London] suggests that *O. mutica* is indeed a senior synonym of *T. ventricosa* but not of *D. simplex*. Careful SEM comparisons need to be made between all of the species attributed to *T. ventricosa*. This is beyond the scope of the present study, so HARMER's synonymy is provisionally accepted here.

Tetraplaria sp.

Figs 55-56

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 38, 360 m.

DESCRIPTION. — Colony evidently erect and articulated, the sole specimen in the collection being proximally tapered; this segment almost 0.45 mm long and ~0.91 mm diameter, comprising approximately 30 zooids (some incomplete) arranged more or less in 5 longitudinal series. Zooids relatively broad, generally transversely diamond-shaped, 0.56-0.75 mm long and 0.56-0.81 mm wide. Frontal shield evenly perforated by pseudopores except immediately suborally and along the lateral margins. Orifice with a wide-V-shaped sinus that may be somewhat rounded, with condylar processes at the corners. No oral spines *per se*, but some orifices appear to have had 2-4 tiny ephemeral spines, judging from the tiny holes around the distal margin or some orifices. Avicularia and ovicells not present.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge, 360 m.

REMARKS. — The sole specimen almost certainly represents a new species but we hesitate to name it on the basis of the limited material.

Family PHORIOPPNIIDAE nov.

DIAGNOSIS. — Colony erect and branching, with circular stems from an encrusting base or with articulated segments and basally rooted. Zooids with a pseudoporous lepralioid frontal shield and raised margins. Areolar pores small, sparse, commonly paired proximally. Zooidal orifice with a wide poster, condyles weak or absent. Articulated oral spines absent. No avicularia. Female zooids, orifices, and ovicells sometimes enlarged, the ectooecial surface punctuated like the zooidal frontal shield and covered by the epitheca of the hypostegal coelom.

REMARKS. — A new family is proposed for the following four genera: *Phorioppnia* gen. nov. (Holocene), *Quadriscutella* Bock & Cook, 1993 (Oligocene-Holocene), *Punctiscutella* gen. nov. (Oligocene), and *Oppiphorina* gen. nov. (Holocene). Justification for this family is given below.

Genus ***PHORIOPPNIA*** nov.

TYPE SPECIES. — *Phorioppnia cookae* sp. nov.

DIAGNOSIS. — Colony erect, rod-like, non-articulated, the direction of zooidal budding producing longitudinal rows trending clockwise up the stem. Zooidal frontal shield evenly, though sometimes sparsely, pseudoporous, with small areolar pores at the proximolateral corners and raised interzooidal ridges. Orifices dimorphic. The

zooidal orifice lacking obvious condyles, the poster tapering and rounded. No oral spines. No avicularia. Ovicells prominent though not large, the ectooecial surface resembling the frontal shield, the maternal orifice transversely broadly elliptic, the ovicell closed by the broad maternal operculum.

Phorioppnia cookae sp. nov.

Figs 57-59

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn CP 108, 335 m. BIOGEOCAL: stn DW 253, 310-315 m.

TYPES. — *Holotype*: a single fertile stem from BIOGEOCAL Stn DW 253, 21°31.75'S, 166°28.73'E, 310-315 m, MNHN-Bry 20058.

Paratypes: MNHN-Bry 19961, an ancestrulate colony with three stems, attached to a hydroid, from BIOCAL Stn CP 108, 22°02.55'S, 167°05.68'E, 335 m; MNHN-Bry 20059, three stems from the same locality as the holotype.

DESCRIPTION. — Colony erect, comprising unbranched rod-like stems, 0.67-1.10 mm diameter. Up to 3 stems arise from a common periancestrular base; the longest stem in the collection (detached) is 1 cm long. Cross sections of the stems show them to be quadriserial but the zooids are not arranged in parallel longitudinal series; rather the series slant slightly obliquely in a clockwise direction around the axis. Ancestrula 0.64 mm long and 0.38 mm wide, longitudinally oval in outline, semierect and attached by ?extrazooidal calcification that envelopes a hydroid stem. Periancestrular zooids 0.66 mm long and ~0.46 mm wide. Postancestrular zooids organised into stems immediately beyond the periancestrular zooids, large, as small as 0.67 mm long near the ancestrular region, generally 1.22-1.43 mm long and 0.62-0.75 mm wide; frontal shield lepralioid, evenly, if somewhat sparsely, perforated by pseudopores, the proximolateral part of the shield appearing somewhat sunken in relation to the raised zooidal margin. Areolar pores a little larger than the pseudopores are sparse; one pair occurs proximally, and 2-3 occur along each lateral margin, usually at the widest part of the zooid and adjacent to the orifice. Orifice somewhat pyriform, the rounded poster about one-third the orificial length, not clearly delimited from the anter by any condyles. No oral spines. No avicularia. Female zooids about the same size as autozooids but the orifice extremely broad and elliptical, with a somewhat thicker, upturned proximal rim. Ovicell somewhat prominent and recumbent, wider than long, the skeletal surface punctuated like the frontal shield, the opening closed by the maternal operculum.

DISTRIBUTION. — New Caledonia: South Loyalty Basin, 310-335 m.

REMARKS. — There are a number of ascophorines in the southwestern Pacific that have hippoporine orifices, i.e., with a broad rounded poster, and evenly pseudoporous frontal shields, several of which have been attributed to *Hippoporina* (e.g., BROWN, 1952; POWELL, 1967; GORDON, 1984, 1989a). As GORDON (1994) has pointed out, however, *Hippoporina*, newly included in the Bitectiporidae, has characteristic 'smittinid' ovicells, with both ovicellular layers calcified and unfused and relatively large foramina in the ectooecium. This is in contrast to 'schizoporellid' ovicells in which both ovicellular layers may be fused and/or the ectooecial surface resembles the pseudoporous frontal shield. Accordingly, most, if not all, of the southwest Pacific species previously attributed to *Hippoporina* need reclassifying (cf. BOCK & COOK, 1993).

BOCK and COOK (1993) included their new genus *Quadriscutella* in the Euthyrisellidae, noting a resemblance to *Tropidozoum* Harmer which also has articulated colonies, raised zooidal margins, and dimorphic orifices. On the other hand, there are significant differences between these two genera, as BOCK and COOK also pointed out (viz, the methods of branching and brooding and the presence of an extrazooidal basal coelom in *Tropidozoum*). The type genus of Euthyrisellidae, *Euthyrisella* Bassler, is so very different from *Quadriscutella*, however, that we are persuaded to conclude that any similarities to that family are superficial, especially since there are species in the MUSORSTOM collections that appear even further unrelated to the Euthyrisellidae but have morphological characters in common with *Quadriscutella*.

One such example is *Phorioppnia cookae*. It is evidently related to *Quadriscutella*, which it resembles in having a sparsely perforated frontal shield, raised zooidal margins, similarly distributed areolar pores (especially the proximal pair), and dimorphic orifices. By contrast, *Quadriscutella* typically has enlarged female zooids and ovicells (not just orifices), composite orificial rims in autozooids, and kenozooidal branch points (not seen in the limited New Caledonian material). On the basis of these distinctions, we have no hesitation in establishing a new genus, *Phorioppnia*. [*Phorioppnia* is an anagram of *Hippoporina*.]

Another erect hippoporine species in the MUSORSTOM collection, *Hippoporina epaxia* Gordon, 1984, though lacking dimorphic orifices, has raised zooidal margins and appears related. A new genus, *Oppiphorina*, is established for it (see below). There are some similarities between *O. epaxia* and the articulated species *Quadriscutella punctata* Bock & Cook, 1993 which, though it has branch-site kenozooids, lacks the reproductive dimorphism and characteristic 'tetra-composite' orifices of the other species of *Quadriscutella*. Accordingly, we propose ***Punctiscutella*** gen. nov., with the type species *Punctiscutella punctata* (Bock & Cook, 1993).

On the basis of these four genera, we propose a new family, Phorioppniidae (Oligocene-Holocene), distributed from New Caledonia and the Kermadec Ridge to the Challenger Plateau (New Zealand) and southeastern Australia.

Phorioppnia cookae is named for Patricia L. COOK (Research Associate, The Museum of Victoria, Melbourne) in recognition of her outstanding contribution to a knowledge of Bryozoa.

Phorioppnia nova sp. nov.

Figs 60-61

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 38, 360 m.

TYPES. — *Holotype*: a single stem from BIOCAL Stn DW 38, 22°59.74'S, 167°15.31'E, 360 m, MNHN-Bry 20056.

Paratype: MNHN-Bry 20054, from the same locality as the holotype.

DESCRIPTION. — Colony erect, rod-like, 0.8-0.9 mm diameter, the zooids arranged in 6 series, each series slanting slightly obliquely in a clockwise direction up the stem. Zooids 0.73-1.07 mm long and 0.39-0.66 mm wide; frontal shield mostly evenly, though sparsely, pseudoporous, the areolae about the same size as the pseudopores and distributed as in *P. cookae*, the lateral rims raised slightly. Orificial characters as for *P. cookae*, except for smaller dimensions. Ovicells not present.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge southwest of the Île des Pins, 360 m.

REMARKS. — Although infertile, the single fragment of this species very closely resembles *P. cookae*, even in the way the longitudinal series of zooids trends gently clockwise up the stem (in contrast to those of *Oppiphorina*, for example). The zooids of *P. nova* are smaller than those of *P. cookae*, however; postancestrular zooids (the only ones available in the limited material of *P. nova*) do not overlap in zooidal length, and scarcely overlap in zooidal width.

Genus ***OPPIPHORINA*** nov.

TYPE SPECIES. — *Hippoporina epaxia* Gordon, 1984.

DIAGNOSIS. — Colony erect, rod-like, non-articulated, from an encrusting base; the direction of zooidal budding producing longitudinal rows trending anticlockwise up the stem. Zooids with an evenly pseudoporous frontal shield and slightly elevated interzooidal ridges. Orifice with a broad rounded poster barely delimited from the anter by a pair of weak condyles. No oral spines. No avicularia. Ovicells subimmersed but prominent, more or less evenly perforated and resembling the zooidal cryptocyst, closed by the zooidal operculum.

Oppiphorina epaxia (Gordon, 1984)

Figs 62-64

Hippoporina epaxia Gordon, 1984: 76, pl. 25 C-D.

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 66, 515 m.
BIOGEOCAL: stn DW 253, 310-315 m.

DISTRIBUTION. — New Zealand: Raoul and Curtis Islands (Kermadec Ridge), 18-440 m. New Caledonia: South Loyalty Basin and northern Norfolk Ridge, 310-515 m.

REMARKS. — A new genus is introduced here for *Hippoporina epaxia* Gordon, 1984, distinguished from *Hippoporina sensu stricto* by the 'pseudoporous' ectooecium and erect rod-like growth. *Oppiphorina epaxia* begins life as an encrusting colony of ramifying biserial 'runners'; zooids in the encrusting phase can produce ovicells (GORDON, 1984). In contrast to *Phorioppnia*, zooidal orifices are not dimorphic and the direction of zooidal budding is such that the longitudinal rows slant slightly obliquely anticlockwise up the stem. *Oppiphorina epaxia* resembles *Punctiscutella punctata* (see above) in zooidal and ovicellular characters, but lacks the branch-site kenozooids and articulations of that genus and species.

Hippoporina powelli Gordon, 1989a may possibly be included in *Oppiphorina*, but until ovicells are found in this species the generic attribution remains uncertain.

Oppiphorina is an anagram of *Hippoporina*.

Family, genus and species indet.

Fig. 65

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn KG 275, 1959 m.

DESCRIPTION. — Colony erect, rod-like, the stem quadriserial, more or less circular in cross section. Zooids large, weakly calcified and fragile, 1.07-1.13 mm long and 0.32-0.42 mm wide, alternating in back-to-back pairs; frontal shield convex, the surface somewhat tubercular and imperforate except for a broadly transversely crescentic band of pores across the middle of the shield. Evidently a pair of similar-sized areolar pores proximally, and 1-2 such pores along each lateral margin. Orifice relatively large, subcircular, the broad poster barely delimited from the anter by a pair of tiny structures at the sides of the orifice. No oral spines. No avicularia. Ovicells not seen.

REMARKS. — The sole material comprises a few tiny stem fragments. The orifice and operculum are hippoporine but it is not possible to ascribe the specimen to a family with any certainty.

Family PORINIDAE d'Orbigny, 1852

REMARKS. — The relationships of the family Porinidae to other lepralioid ascophorines is uncertain. Although porinids are characterised by erect colonies of spiraminate zooids, the family is currently best accommodated in the superfamily Schizoporelloidea. Frontal shields of porinids are pseudoporous, with the pores completely penetrating the shield, as in schizoporellids. The ovicells also appear similar, insofar as the outer layer of ovicellular calcification resembles that of the frontal shield with which it is continuous. Two other families, the Margarettidae and Siphonicytaridae, have a similar colony form and have ascopores that externally resemble the spiramina of porinids. The Porinidae appear to be related more closely to the former of these two families, which shares a similar type of frontal shield. Overall, the Porinidae and Margarettidae have more in common with schizoporelloidean families like Tetraplariidae and Phorioppniidae than the Siphonicytaridae, which have only a marginally areolate frontal shield and, though lepralioid, are constructed more like the umbonuloid family Tessaradomidae.

Genus *HASWELLIPORINA* nov.

TYPE SPECIES. — *Haswellina multiaviculata* Gordon, 1984.

DIAGNOSIS. — Colony erect, branching, from a small encrusting base that includes at least a few autozooids, no rootlets. Branches cylindrical, the zooids quincuncial or regularly whorled, with both peristomes and spiramina tubular and projecting. Frontal shield externally not regularly pseudoporous, the pores tending to be small, and denser near the zooidal margins. Primary orifice with weak, rounded sinus. Small scattered avicularia associated with frontal shields and peristomes. Ovicells peristomial, somewhat concealed but detectable externally as bulges. Pore-chambers tubular, especially axially.

REMARKS. — A new genus is established here for *Haswellina sensu* GORDON (1984). *Haswellina* Livingstone, with type species *Myriozoum australiensis* Haswell, 1881, was interpreted by UTTLEY (1956) to be both generically and specifically distinct from *Spiroporina vertebralis* Stoliczka, 1865 and GORDON (1984) followed him in this. Previously, CANU (1913), BASSLER (1935), and BROWN (1952) among others, synonymised *S. vertebralis* and *M. australiensis*. UTTLEY (1956) rejected this synonymy, treating *Spiroporina* as a junior synonym of *Porina* d'Orbigny, 1852, but retaining *Haswellina* as a genus of Schizoporellidae. BROWN's (1952) concept of *Spiroporina* was based, not on STOLICZKA's (1865) Miocene species, but on Recent New Zealand species belonging to *Galeopsis* Jullien *in* JULLIEN & CALVET, 1903 (see GORDON 1984). It is now clear that UTTLEY (1956) made the same error concerning *Haswellina*.

Thanks to the courtesy of Dr Norbert VÁVRA, the opportunity was taken to examine the type specimen of *Spiroporina vertebralis* Stoliczka, held at the Naturhistorisches Museum, Vienna. Non-type specimens of *Porina gracilis* (Lamarck) (courtesy of the late Shane PARKER, South Australian Museum, Adelaide) and of so-called *Haswellina australiensis* (Haswell) (courtesy of Mary Spencer Jones, Natural History Museum, London) were also examined. The conclusions from this examination are:

1. *Spiroporina vertebralis* and *Haswellina australiensis* are not conspecific, as UTTLEY (1956) rightly asserted, but they are congeneric. The latter species differs primarily in that the peristomial avicularia occur only on the projecting proximal rim; in *S. vertebralis* the rim scarcely projects and the avicularia occur around the entire rim.

2. *Spiroporina* Stoliczka, 1865 may be considered a synonym of *Porina* d'Orbigny, 1852, as BROWN (1958) rightly concluded. *Spiroporina* differs only in having zooids in whorls - in every other respect the genera are identical. BROWN (1958) went so far as to reduce *S. vertebralis* to a subspecies of *Porina gracilis*. In our opinion, *Porina vertebralis* and *P. australiensis* may be considered full species.

3. There still remain, however, species that resemble *Porina* but present a distinct "facies". For these species a new genus, *Haswelliporina*, is established here. The most immediately obvious, though variable, distinction is that of pseudopore size and density, so that *Haswelliporina* zooids appear less obviously porous that those of *Porina* in which they are coarser and more evenly distributed. Also, in *Haswelliporina* both the peristomes and spiraminal pores are tubular and projecting, with only a few avicularia in the actual peristomial rim, and the colony base is slightly more extensive, incorporating encrusting autozooids, than we have seen in *Porina* species.

Apart from the type species, the following species are here included in *Haswelliporina*: *Haswelliporina quinaria* sp. nov., *Haswellina vaubani* d'Hondt, 1986, *Spiroporina brevitubulata* Harmer, 1957, *S. venusta* Harmer, 1957.

Haswelliporina multiaviculata Gordon, 1984

Fig. 66

Haswellina multiaviculata Gordon, 1984: 74, pl. 25, A; 1985: 177, fig. 27.

MATERIAL EXAMINED. — **New Zealand**. N.Z. Oceanographic Institute: stns K795, southern Kermadec Ridge, 350 m, and K840 (*holotype* slide H-273), near Macauley Island, 398-412 m.

New Caledonia. BIOCAL: stn DW 08, 435 m. — Stn DW 33, 675 m. — Stn DW 51, 700 m. — Stn DW 66, 515 m. — Stn DW 70, 965 m. — Stn CP 75, 825 m. — Stn CP 108, 335 m. — Stn CP 109, 495 m.
MUSORSTOM 4: stn DW 151, 200 m. — Stn DW 220, 505-550 m.
CHALCAL 2: stn DW 81, 311 m.
BIOGEOCAL: stn CP 232, 760-790 m.
MUSORSTOM 6: stn DW 405, 520 m. — Stn CP 465, 480 m.
SMIB 4: stn DW 37, 540 m.

DESCRIPTION. — Colony erect, dendroid, attaining > 22 mm in height and > 17 mm lateral spread (as indicated by the largest specimens in the collection). Stems up to 2.5 mm thick at the base; branch tips are 0.5 mm minimum diameter, with zooids arranged in quincunx in 6 longitudinal series. Zooids ~0.74-0.88 mm long and ~0.56 mm wide, the frontal shield relatively smooth, moderately perforated by pseudopores, with no clear boundaries between zooids. Zooidal peristomes up to 0.49 mm long, generally shorter, with an internal peristomial diameter of 0.094-1.13 mm; the spiraminal opening as a short tube ~1.32-0.30 mm proximal to the base of the peristome where it curves into the frontal shield. Primary orifice suborbicular, a little wider (0.11) than long. Adventitious avicularia common, of 2 kinds - tiny sessile or papilliform subcircular ones (occasionally borne at the tips of long projections), and larger ones (~0.13 -0.15 mm) with long acute rostra; both kinds may occur on the peristomes, with 2-3 set into or just below the rim. Ovicells peristomial, appearing externally as a bulge in the frontal shield distal to each fertile peristome.

DISTRIBUTION. — New Caledonia: D'Entrecasteaux Reefs to Loyalty Islands and northern Norfolk Ridge, 311-965 m. New Zealand: Kermadec Ridge, 350-412 m; Three Kings Islands, 205-516 m.

REMARKS. — There are numerous colonies and fragments in the MUSORSTOM samples, giving a more complete picture of the characters of this species than indicated in the limited New Zealand material, hence a full description is given above. There are some differences in the New Caledonian material - zooids are a little larger overall with longer peristomes, and the distance between the spiraminal opening and peristome base greater than in the Kermadec specimens. On the other hand, orificial width, length of the larger avicularia, and internal diameters of zooids and peristomes are the same in the New Caledonian and Kermadec populations. We therefore conclude that they are conspecific. *Haswelliporina multiaviculata* has a similar surface appearance to *H. brevitubulata* (Harmer) which, however, lacks acute-mandibled avicularia.

Haswelliporina vaubani (d'Hondt, 1986)

Figs 67-68

Haswellina vaubani d'Hondt, 1986: 729, pl. 1, figs 5-6.

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 38, 360 m.
MUSORSTOM 4: stn DW 185, 235 m.

DESCRIPTION. — Colony erect, branching, the branches in the present material 6-serial, 0.75-0.87 mm diameter, some curving outwards and upwards. Zooids whorled, the length of each zooid (0.69-0.75 mm) equivalent to the distance between whorls, the maximum external width of each zooid being the branch circumference divided by the numbers of whorls (i.e., 0.39-0.46 mm wide). Frontal shield perforated by numerous small pseudopores, often in small sulci, that penetrate the innermost thin layer of calcification surrounding the zooidal coelom. Zooidal peristomes tubular, projecting 0.18-0.35 mm from the zooidal surface, the internal diameter 0.13-0.15 mm; at the base of the peristome a short tubular spiramen. Peristomial rim incorporating 2-3 tiny acute avicularia with complete crossbar; similar avicularia occur sparsely on the frontal shield, along with occasional larger spatulate avicularia directed proximally. Zooidal pore-chambers tubular, most obviously expressed axially in cross-sections and at growing tips.

DISTRIBUTION. — New Caledonia: d'Entrecasteaux Reefs, 235-460 m.

REMARKS. — The present material adds to the description given by D'HONDT (1986), who described material with larger zooids in only four series. It is superficially similar in external appearance to *H. multiaviculata* but may easily be distinguished by its whorled zooids and spatulate adventitious avicularia.

Haswelliporina quinaria sp. nov.

Figs 69-70

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.
New Caledonia. MUSORSTOM 4: stn DW 185, 235 m.
MUSORSTOM 6: stn CP 419, 283 m. — Stn DW 421, 245 m.

TYPES. — *Holotype*: a single dried colony from MUSORSTOM 6 Stn CP 419, 20°41.65'S, 167°03.70'E, 283 m, MNHN-Bry 20010.
Paratypes: MNHN-Bry 19965, 19966, 20109, all from the same locality as the holotype. — MNHN-Bry 20106, from MUSORSTOM 3 Stn DR 117, 12°31.3'N, 120°39.5'E, 97-92 m.

DESCRIPTION. — Colony erect (the largest colony 19 mm high), with cylindrical stems dichotomously branching at irregular intervals and angles (frequently at right angles), stem diameter between zooidal peristomes 0.45-0.70 mm (depending on the number of zooids in each whorl) in younger parts of branches, thickening to ~1.15 mm near the base of the colony. Zooids generally arranged in whorls of 5, sometimes 4 (especially for ovicelled zooids), or even 3, the zooids in each whorl alternating with those above and below; zooids ~0.84-0.96 mm long and ~0.35 mm wide. Frontal shield lepralioid, the inner face evenly perforated, the pore diameter greater in the innermost skeletal layer; externally initially relatively smooth and sparsely perforated with tiny pseudopores, with a single row of slightly larger areolar pores along the common interzooidal furrow; becoming more densely porous and lacking interzooidal boundaries in older zooids. Primary orifice subpyriform, longer (0.14 mm) than wide (0.10 mm), with no clear distinction between anter and poster owing to a lack of condyles. Peristome initially a low ridge encircling the primary orifice, with longitudinal ridges on its inner face; becoming very long (up to 0.49 mm along the dorsal side) and tubular, typically with 3 evenly spaced small acute-mandibled avicularia, apically directed, in the peristomial rim; maximum rim diameter (including avicularia) 0.25 mm. At the base of the peristome, on its proximal side is a short-tubed circular spiramen. Tiny adventitious avicularia, frequently papilliform, occur sparsely on the frontal shield and the side of the peristomial tube, each with an acute rostrum and complete cross-bar. Ovicells peristomial, visibly externally as densely perforated bulges distal to each of the zooidal peristomes in the same whorl.

DISTRIBUTION. — Philippines: Mindoro Strait, 92-97 m. New Caledonia: north of the Belep Islands and between Ouvéa and Lifou, 235-283 m.

REMARKS. — *Haswelliporina quinaria* is very similar to *H. vaubani* (d'Hondt, 1986) discovered at 450-460 m south of the d'Entrecasteaux Reefs, but *H. vaubani* has zooids that attain a larger size and relatively large spatulate avicularia borne frontally. Such avicularia are absent from all of the many colonies and colony fragments of *H. quinaria* in the samples.

Haswelliporina ?venusta (Harmer, 1957)

Figs 71-73

Spiroporina venusta Harmer, 1957: 851, pl. 56, fig. 12.

MATERIAL EXAMINED. — **Philippines**. ESTASE 2: stn DR 07, 890 m.

DESCRIPTION. — Sole colony erect, branching, from a small encrusting base 5 mm diameter that is mostly kenozooidal/aviculiferous with some incorporated autozooids; maximum length of colony 12 mm. Main stem and branches thick throughout - ranging from 1.96 mm above the base to a minimum thickness of 1.39 mm. Zooids

not whorled; zooid length and width difficult to determine externally; zooidal internal diameter maximally 0.34 mm. Frontal shield with small, scattered pseudopores of which some are in short, thin sulci. Zooidal peristomes extending not more than 0.30 mm from frontal surface, the rim relatively thin when new, with c. 3 tiny oval avicularia set below the rim; internal diameter of peristome 0.15 mm. Spiramen opening c. 0.15-0.19 mm proximal to the base of the peristome, on a slight eminence, not a tubular projection. Avicularia of two sizes: small oval avicularia about the same diameter as the spiramen opening (c. 0.047-0.056 mm), and larger oval/subspatulate avicularia 0.13-0.19 mm long, both kinds with a complete crossbar and well-developed palate. Ovicells not detected.

DISTRIBUTION. — Indonesia: near Halmahera, 1089 m. Philippines, 890 m.

REMARKS. — HARMER's (1957) description was based on a sole fragment, mostly comprising the small encrusting base. As a consequence (and because the sole holotype specimen cannot be borrowed), it is not possible to be certain of conspecificity with the Philippine specimen which is further developed. Importantly, both specimens have the same two kinds of avicularia, of the same form and dimensions, and the distance between the spiramen opening and the base of the peristome is the same. In contrast, the internal diameter of the peristome in the Indonesian specimen, as measured from HARMER's illustration, is only c. two-thirds that of the Philippine one.

Genus *MOSAICOPORINA* nov.

TYPE SPECIES. — *Porina tricephala* Gordon, 1985.

DIAGNOSIS. — Colony branching, erect and cylindrical or repent and uniserial. Zooidal frontal shield perforated by small pseudopores, the surface minutely mosaic-like and with scattered papillae, some of which may be aviculiferous. Peristomes long, incorporating the spiraminal tube, the peristomial rim with tiny kenozooids and/or avicularia. Primary orifice with sinusoid poster. Ovicell presumed to be peristomial.

Mosaicoporina uniserialis sp. nov.

Figs 74-75

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 66, 515 m.

TYPE. — *Holotype*: unique colony fragment from BIOCAL Stn DW 66, 24°55.43'S, 168°21.67'E, 515 m, MNHN-Bry 20107. No separate paratypes.

DESCRIPTION. — Colony repent, branching and uniserial, raised above the substratum by conical extensions of the basal wall beneath the peristomial area, each zooid producing at least 2 daughter zooids (sometimes 4) by distal budding. Zooids long (0.94-1.23 mm), nearly parallel-sided and 0.37-0.40 mm wide. Frontal shield sparsely but evenly perforated by small pseudopores, the surface (including the basal surface) minutely but distinctively mosaic-like, with flattened polygonal areas delimited by a shallow network of grooves; scattered papillae occur frontally and laterally, but not basally. Zooidal peristome fairly long (up to 0.6 mm), flaring a little at the rim, the internal transverse diameter at the rim up to 0.15-0.18 mm; spiraminal tube incorporated into the peristome and opening at the rim; the rim edge with up to 8 holes, evidently representing the tiny chambers of kenozooids. Primary orifice with a sinusoid poster; no condyles. Avicularia not apparent. Ovicells not present.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge, 515 m.

REMARKS. — A new genus is introduced here for two species of Porinidae that are characterised by the distinctive minutely mosaic surface of the frontal shield as well as the incorporation of the spiraminal tube into the peristome. The type species, known only from a single station north of Raoul Island on the Kermadec Ridge, is

semi-erect, with triserial branches fusing with the substratum wherever they come into contact with it. The colony of *M. tricephala* occurs on small calcareous fragments; early astogeny results in an erect stem attached directly to the substratum with neither rootlets nor lateral spread of encrusting zooids. The unique holotype colony of *M. uniserialis* is not affixed to a substratum, so the method of attachment is unknown.

Genus *SEMIHASWELLIA* Canu & Bassler, 1917

TYPE SPECIES. — *Porina proboscidea* Waters, 1889.

Semihaswellia umbrella sp. nov.

Figs 76-77

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 08, 435 m.
BIOGEOCAL: stn CP 260, 1820-1980 m.

TYPES. — *Holotype*: fragment of a fertile colony from BIOCAL stn DW 08, 20°34.35'S, 166°53.90'E, 435 m, MNHN-Bry 20111.
Paratype: an infertile colony from the same locality, MNHN-Bry 19964.

DESCRIPTION. — Colony erect and branching (maximally 7-8 mm high in the present material), the single stem attached directly to the substratum without rootlets or basally encrusting zooids, the top of the stem with four branches arising near each other, curving outwards in half umbrella-like fashion, the zooids opening on the lower face. Stem 1.37-1.51 mm diameter, the branches 1.09-1.23 mm diameter, the zooids arranged in 2-3 longitudinal series. Zooids very large, 1.50-2.76 mm long and 0.66-0.94 mm wide, the frontal shield lepralioid, the outer surface densely granular with sparse pseudopores and slightly larger areolar pores along the interzooidal furrows. Zooidal peristomes very prominent, up to 1.36 mm long (generally shorter), with flaring circular rims 0.47-0.57 mm external diameter, the internal peristomial diameter 0.20-0.34 mm; outer surface of peristomial tube granular, with low longitudinal ridges that continue onto the rim giving it a slightly corrugated appearance. Spiraminal tube prominent, extending to 0.38 mm long, with a circular opening 0.094-0.113 mm internal diameter. Primary orifice with a sinusoid poster and no condyles, 0.28-0.34 mm wide. Ovicell fairly prominent, subglobular, 0.72 mm wide, occurring behind the peristome and opening into it.

DISTRIBUTION. — New Caledonia: Loyalty Islands, 435-1980 m.

REMARKS. — It is not certain if the colony fragment from BIOGEOCAL station CP 260 belongs to this species. It has the same overall branch and zooidal dimensions; however, the branching is somewhat more open and there are avicularia, which are lacking in the type specimens. The avicularia are subcircular with a broadly triangular rostral area and delicate cross-bar. They occur singly adjacent to some of the spiramina.

Semihaswellia is a little-known genus. Apart from the type species (*S. proboscidea*), there are currently two nominal Recent species (*S. sinuosa* Canu & Bassler, 1928: Gulf of Mexico; *S. sulcosa* Canu & Bassler, 1930: Galápagos) and three nominal fossil species (*S. exilis*, *S. tripora*, and ?*S. clara* - all species of CANU & BASSLER, 1920 from the Paleogene of North America). With the exception of *S. sulcosa*, it is likely that none of them is congeneric with the type species, but all need thorough study using modern techniques. *Semihaswellia proboscidea* was collected at 823 m depth off St Thomas in the U.S. Virgin Islands by the *"Challenger"* Expedition. It has not been collected since. Scanning electron micrographs (courtesy of Mr P.J. CHIMONIDES, The Natural History Museum, London) show that the New Caledonian material is unquestionably congeneric. The specimen from BIOGEOCAL Stn CP 232 resembles the *"Challenger"* material even more closely in having avicularia; these, however, do not occur dorsally, as in *S. proboscidea* (according to WATERS, 1899), and occur closer to the spiramen.

Family ACTISECIDAE Harmer, 1957

Genus *ACTISECOS* Canu & Bassler, 1927

TYPE SPECIES. — *Actisecos regularis* Canu & Bassler, 1927.

Actisecos regularis Canu & Bassler, 1927

Figs 78-81

Actisecos regularis Canu & Bassler, 1927: 11, pl. 1, fig. 13. — CANU & BASSLER, 1929: 517, pl. 66, figs 1-4, text-fig. 215. — HARMER, 1957: 856, pl. 60, figs 12, 16. — COOK, 1966: 208.

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.

DISTRIBUTION. — Philippines, 84-104 m. Indonesia, 82-88 m.

REMARKS. — The affinities of the Actisecidae are not clear. Superficially, the zooids, their orifices, and peristomes resemble those of some species of *Exechonella*, and HARMER (1957) described the operculum as 'membraniporine'. An ultrastructural examination was made of the interior of the frontal shield in the present material to ascertain whether or not it is umbonuloid. Apart from a faint line indicating a ring scar, there is no convincing trace of umbonuloid microstructure. The genus and family are provisionally included in the superfamily Schizoporelloidea until more information is forthcoming.

HARMER (1957) described the ancestrula as somewhat conical, which it is in the present material. The orifice is subcircular, with a median cusp on the proximal rim.

Family GIGANTOPORIDAE Bassler, 1935

Genus *GIGANTOPORA* Ridley, 1881

TYPE SPECIES. — *Gigantopora lyncoides* Ridley, 1881.

Gigantopora oropiscis sp. nov.

Figs 82-83

[?]*Gigantopora polymorpha* - GORDON, 1984: 78, pl. 26, D. Non Busk, 1884.

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 38, 360 m.
New Zealand. N.Z. Oceanographic Institute, NIWA, unregistered slide of material from NZOI Stns K826, K828, K840, northern Kermadec Ridge, 390-490 m.

TYPE. — *Holotype*: unique specimen from BIOCAL Stn DW 38, 22°59.74' S, 167°15.31' E, 360 m, MNHN-Bry 20031. No separate paratypes.

DESCRIPTION. — Colony erect, presumably from an encrusting base, the unique holotype specimen comprising a single stem 7.8 mm long and 2.09 mm diameter (including projecting peristomes), the zooids arranged in 4-5 longitudinal series. Zooids large, 0.94-1.34 mm long (measured from one proximal corner to the proximal edge of the avicularium on the same side) and 0.67-0.96 mm wide, the lateral rims slightly thickened and raised. Frontal shield evenly perforated by pseudopores in the proximal half, tending to imperforate and minutely

tubercular suborally. Primary orifice subcircular, ~0.21 mm diameter, the poster about one-third the length, delimited from the anter by small condyles. Peristomial complex conspicuous, comprising a frontally very broad bridge with a surface of small tubercles; at each side of the peristomial bridge is an avicularium - each is somewhat frontally directed, toward the apex of the peristome, with an acute rostrum and complete cross-bar, a narrow palatal cleft continuing under the cross-bar; externally, the avicularian chamber has several pores frontolaterally; between the proximal edge of the peristome and the frontal shield is a subhemispherical spiramen that is little seen when zooids are viewed *en face*. Ovicell somewhat recumbent on the distal zooid, with a relatively thick bounding rim; the skeletal surface tubercular and imperforate centrally, but with a number of pores peripherally.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge southwest of the Île des Pins, 360 m. New Zealand: northern Kermadec Ridge, 390-490 m.

REMARKS. — The present material is distinguished from other species of *Gigantopora* in the southwest Pacific by the broad frontal extent of the peristomial bridge that largely conceals the spiramen when zooids are viewed *en face*, as well as by details of the avicularia and ovicell. The New Caledonian specimen resembles infertile encrusting New Zealand material from the northern Kermadec Ridge mistakenly attributed by GORDON (1984) to *Gigantopora polymorpha* (Busk). The Kermadec material resembles *G. oropiscis* in zooidal and orificial dimensions, in the lack of a non-protruding spiraminal rim, and in the general appearance of the zooids and peristomial orifice. The frontal extent of the peristomial bridge is proportionately not as great as in the New Caledonian specimen; also the avicularian palatal cleft is mostly quite open in the Kermadec zooids, except for one zooid in which it is as narrow as in *G. oropiscis*. On balance, we conclude that the Kermadec specimens are probably conspecific, and reflect differences between zooids in encrusting and erect parts of colonies. Only the finding or more material from both areas will settle the matter.

The species name, *oropiscis*, is derived from the Latin *os*, *oris*, mouth, and *piscis*, fish, alluding to the resemblance of the peristomial orifice to the gaping mouth of a fish.

Family MICROPORELLIDAE Hincks, 1879

Genus *MICROPORELLA* Hincks, 1877

TYPE SPECIES. — *Eschara ciliata* Pallas, 1766.

Microporella lineata Canu & Bassler, 1929

Microporella lineata Canu & Bassler, 1929: 332, pl. 40, fig. 5. — GORDON, 1984: 102, pl. 39, A.

MATERIAL EXAMINED. — **New Caledonia**. CHALCAL 2: stn DW 72, 527 m.

DISTRIBUTION. — Philippines, near Luzon, 192 m. New Caledonia, northern Norfolk Ridge, 527 m. New Zealand, Kermadec Ridge, 140-500 m.

REMARKS. — This is only the third record of this species, which extends from 13°20'N to 33°02'S, and 192-527 m. It is easily distinguished by its uniserial colony form.

Microporella sp.

Figs 84-88

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 6: stn DW 431, 21 m.

DESCRIPTION. — Colony encrusting. Zooids 0.33-0.42 mm long and 0.22-0.28 mm wide, the frontal shield evenly distributed with small tubercles and pseudopores. Orifice with a smooth proximal rim and 6 oral spines.

Ascopore denticulate, non-reticulated. Avicularia single, originating adjacent to the ascopore but appearing more proximally when ontogeny is complete, almost at the half-way point near the lateral margin and directed laterally. Ovicell not encountered.

DISTRIBUTION. — New Caledonia: west of Ouvéa Island, 21 m.

REMARKS. — This species is represented by a single tiny ancestrulate colony occurring on *Reteporella orstomia* sp. nov. It greatly resembles the specimen illustrated by GORDON (1984) from the Kermadec Ridge that was attributed to *Microporella ciliata*. This species, which has been accorded a wide distribution around the world is, however, unlikely to be found beyond ports and harbours in the Australasian region. Both the Kermadec and Ouvéa specimens were infertile. It is likely that, when fertile material of this species is found, it will provide evidence that this represents a new species.

It is interesting to note that in newly developed zooids the pseudopores are reticulate, as in *Fenestrulina*. The proximal rim of the orifice may also have minute irregularities, but these denticulations are smoothed over as ontogeny is completed.

INCERTAE SEDIS

Family CALWELLIIDAE MacGillivray, 1887

Genus *ICHTHYARIA* Busk, 1884

TYPE SPECIES. — *Ichthyaria oculata* Busk, 1884.

Ichthyaria simplex sp. nov.

Figs 228-230

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DS 98, 2365 m.
BIOGEOCAL: stn CP 260, 1820-1980 m. — Stn KG 261, 1508 m. — Stn CP 273, 1920-2040 m. — Stn KG 275, 1959 m. — Stn KG 287, 1560 m. — Stn DW 313, 1640-1600 m. — Stn CP 317, 1630-1620 m.

TYPES. — *Holotype*: an alcohol-preserved, ovicelled, incomplete colony (ancestrula and rootlets lacking) from BIOGEOCAL Stn DW 313, 20°58.95'S, 166°59.04'E, 1640-1600 m, MNHN Bry-19991.

Paratypes: two small colonies in the same container as the holotype and from the same locality, MNHN Bry-19994; other colonies from BIOCAL Stn DS 98, 21°24.10'S, 166°29.76'E, 2365 m, MNHN Bry-19995; BIOGEOCAL Stn CP 260, 21°00.00'S, 167°58.34'E, 1820-1980 m, MNHN Bry-19992; BIOGEOCAL Stn KG 287, 20°43.01'S, 166°52.53'E, 1560 m, MNHN Bry-19993.

DESCRIPTION. — Colony erect, unilaminar and biserial, unbranched, exceedingly delicate and flaccid, to 8 mm high, not including rhizoids, maximum width 0.80 mm and a thickness of c. 0.17 mm. The sides of the colony more or less parallel except where it tapers proximally towards the ancestrula. Zooids alternating, 0.77-1.16 mm long and 0.37-0.39 mm wide, increasing in length along the colony distally, with a high-arched orifice that has a straight proximal rim. Distal to the orifice is a median short stumpy, non-articulated spine flanked by a pair of septular pores on each side. The septular pores continue along the lateral margins, connecting the visceral and hypostegal coeloms. Proximal to the orifice is a pair of windows in the frontal calcification; these may be unequal, or even single in zooids near the ancestrula. Presumed ascopore large, open, off-centre. At the junction where three zooids abut, 3-4 interzooidal communication pores can be seen in face view in the lateral wall, between two of the zooids, which slants at a low angle at this point. Ovicell large, recumbent on the frontal face of the distal zooid, 0.54 mm long and 0.41 mm wide, the endooecium lightly calcified, the ectooecium entirely membranous, opening widely above the zooidal operculum. Rhizoids, originating from septular pores, descend the lateral margins of the

colony on both sides, converging with those from the ancestrula to form a tangle of dichotomously forking rootlets.

DISTRIBUTION. — New Caledonia, Loyalty Basin and around Lifou, 1508-2365 m.

REMARKS. — Zooids typically have an oval hole in the frontal shield on the side adjacent to the median axis. At first it was thought these were predator bore-holes, but they appear to occur in each zooid. It is difficult to be certain but they appear to be ascopores. Certainly the suboral pores are not ascopores, being of the same construction as the lateral septular pores and occluded with tissue centrally.

Five species of *Ichthyaria* are recognised here - the type species and *I. profunda* d'Hondt, 1981 both occur in deep water off Uruguay, and *I. plana* (David & Pouyet, 1986) occurs in the western Indian Ocean. *Onchopora grimaldii* Jullien & Calvet, 1903 and *O. picoensis* Jullien & Calvet, 1903 each have a toothed crescentic ascopore but the pattern of budding is characteristic of *Ichthyaria*. Insofar as the shape of the ascopore is a variable character in microporellid genera, we regard the pattern of budding as having greater taxonomic significance and so include the two species of JULLIEN and CALVET in *Ichthyaria*, but both species need re-examining. *Ichthyaria simplex* represents the first record of the genus in the Pacific. Unusually, however, *I. simplex* has an offset oval ascopore, whereas *I. oculata* and *I. plana* have a circular ascopore (HARMER, 1902; DAVID & POUYET, 1986) and *I. profunda* has a slit-like ascopore.

The Calwelliidae are not very speciose. Five genera have been accepted in recent years (*Calwellia* W. Thomson, 1858; *Ichthyaria* Busk, 1884; *Malakosaria* Goldstein, 1882; *Onchoporella* Busk, 1884; *Onchoporoides* Ortmann, 1890) and two more are introduced below. *Onchoporoides* is monotypic and none of the others has more than five species. The genera are reasonably well circumscribed with the possible exception of *Ichthyaria* and *Onchoporoides*. The latter could be viewed as a laterally expanded *Ichthyaria*. *Onchopora plana* David & Pouyet, 1986 (here included in *Ichthyaria*, *Onchopora* being a junior synonym of *Margaretta* Gray), links the two genera. It is 2-3-serial and also has a circular ascopore. There has been some doubt over the generic allocation of *Calwellia uniserialis* Powell, 1967. GORDON (1989a) pointed out similarities with *Ichthyaria* - the species is here included in a new genus introduced below.

One other species, *Brettia ijimai* Okada, 1921, attributed by SILÉN (1941) and subsequent authors to the savignyellid genus *Halysisis*, represents a new, sixth, genus of Calwelliidae. Thanks to the courtesy of Dr Ji Eun SEO (Woosuk University, Republic of Korea), it has been possible to examine material of this species, which OKADA (1921, p. 26, text-fig. 4) illustrated very well. The species is uniserial and branching, lightly calcified, with a sinus instead of an ascopore. The presence of a pair of uncalcified windows adjacent to the sinus and a typical calwelliid ovicell (i.e., calcified endooecium and membranous ectooecium) give evidence of a calwelliid affinity. For this species, which ranges from Korea through Japan to the Bonin (Ogasawara) Islands, we propose the new generic name *Ijimaia*, and the new combination *Ijimaia ijimai* (Okada).

Genus ***WRIGIANA*** nov.

TYPE SPECIES. — *Wrigiana strepsis* sp. nov.

DIAGNOSIS. — Colony erect, dichotomously branching, jointed, anchored by rootlets. Zooids with a narrow caudate portion proximally; strictly biserial in internodes and budded more or less back to back, but the dilated part of the zooid may be skewed so that the zooids in a branch face more or less in the same direction. Orifice semicircular, with short oral tubercles, and suboral foramina and an ascopore. Ovicell conspicuous, opening above the operculum, the ectooecium entirely membranous.

Wrigiana strepsis sp. nov.

Figs 231-233

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 4: stn DW 185, 235 m.

TYPES. — *Holotype*: an alcohol-preserved colony 11 mm high, from MUSORSTOM 4 Stn DW 185, 19°06.20'S, 163°29.50'E, 235 m, MNHN Bry-19960. No other types.

DESCRIPTION. — Colony erect, dichotomously branching, jointed, anchored by rootlets, attaining 11 mm height and 12 mm lateral spread. Zooids 0.67-1.14 mm long (including cauda, 0.07-0.41 mm long) and 0.20-0.23 mm wide, somewhat claviform in shape with a tapering caudal portion. Zooids biserial, arranged more or less back to back, with the proximal half or more of each zooid base attached to the dorsal side of its parent, but the zooids often skewed so as to face somewhat in the same direction, though this is variable. New branches originate with a single zooid that has a very short caudal portion and chitinous joint proximally. This zooid originates behind the orifice or on a distolateral shoulder of the parent zooid. The second zooid of a branch is budded back-to-back from the first via a long caudal portion attached to almost the entire proximal half of the parent zooid. Both the parent and first daughter zooids of a branch bud zooids distally, re-establishing branch biseriality. Orifice semicircular, high-arched, with 4 distal spine-like tubercles; suborally, a pair of foramina and a median ascopore. Ovicell conspicuous, c. 0.33 mm long and 0.32 mm wide, the entooecium with longitudinal striations, the endooecium entirely membranous.

DISTRIBUTION. — New Caledonia, east of the Belep Islands, 235 m.

REMARKS. — It is clear that *Calwellia uniserialis* Powell, 1967 belongs to this genus. As POWELL (1967) pointed out, although the branches appear uniserial, each zooid has a tubular caudal portion that occurs along the dorsal side of the alternate zooidal dilatation to insert on the zooid below. Zooids in the branches face the same way, adding to the impression of uniseriality. *Wrigiana uniserialis* (Powell) comb. nov. is known only from 549 m depth in the vicinity of the Three Kings Islands, New Zealand, thus the genus ranges from the Belep Islands to the Three Kings Islands.

In having a narrow caudal portion to the zooid, *Wrigiana* resembles *Calwellia* which, however, has zooids arranged back to back in regularly alternating decussate pairs. The name *Wrigiana* is derived from the Anglo-Saxon noun *wrigian*, turn, twist, wry, alluding to the frequent skewing of the zooidal dilatation. The name of the type species, *strepsis*, is a Greek feminine noun meaning a turning or twisting.

Genus *ONCHOPOROIDES* Ortmann, 1890

TYPE SPECIES. — *Carbasea moseleyi* Busk, 1884.

Onchoporoides moseleyi (Busk, 1884)

Carbasea moseleyi Busk, 1884: 56, pl. 33, fig. 4. — LEVINSEN, 1909: 75, 264.
Flustra moseleyi - JELLY, 1889: 102.
Onchoporoides moseleyi - ORTMANN, 1890: 12. — GORDON, 1989a: 64, pl. 35 A (*cum syn.*).

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 70, 965 m.
BIOGEOCAL: stn CP 265, 1760-1870 m. — Stn CP 272, 1615-1710 m. — Stn KG 316, 1660 m.

DISTRIBUTION. — New Caledonia and northern Norfolk Ridge, 965-1870 m; New Zealand (Kermadec Ridge to Solander Trough), 526-2677 m.

REMARKS. — The specimen from BIOGEOCAL Stn KG 316, Loyalty Basin, is the northernmost record of this monotypic genus, of which the type locality is the Kermadec Ridge northwest of Macauley Island.

Family BUFFONELLODIDAE nom. nov.

DIAGNOSIS. — Colony encrusting. Zooids with an imperforate frontal shield. Orifice with a median sinus or broad poster; the latter may have a median convexity. Avicularium adventitious, single, borne suborally or

frontally on the shield, the crossbar complete. Ovicell with a smooth imperforate endooecium and membranous ectooecium.

REMARKS. — A new family name is introduced here to replace the Buffonellidae Jullien, 1888, based on *Buffonella* Jullien, 1888, preoccupied by *Buffonella* Keferstein, 1868 (Amphibia). The Buffonellodidae is related to the Lacernidae Jullien, 1888 (see PARKER & GORDON, 1992), from which it differs in lacking frontal-shield pores, and possibly the Eminooeciidae Hayward & Thorpe, 1988, which differs in ovicellular and other details. Included genera are *Aimulosia* Jullien, 1888, *Buffonellodes* Strand, 1928, *Ipsibuffonella* gen. nov. (see below), and *Maiabuffonella* gen. nov. (type species *Buffonellodes madrecilla* Gordon, 1989a, characterised by a personate ovicell and laterofrontal avicularium).

Genus ***BUFFONELLODES*** Strand, 1928

TYPE SPECIES. — *Buffonella rimosa* Jullien, 1888.

Buffonellodes crosnieri sp. nov.

Figs 1, 89-90

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 33, 675 m.

TYPES. — *Holotype*: an encrusting colony on a piece of bivalve shell from BIOCAL Stn DW 33, 23°09.71'S, 167°10.27'E, 675 m, MNHN-Bry 20191; gold-coated.

Paratypes: parts of the same colony, MNHN-Bry 20179, uncoated.

DESCRIPTION. — Colony encrusting, somewhat linear in form, with a pluriserial lobe extending outward from the ancestrular region on each side. Ancestrula occluded in present material but evidently had a small opesia encircled by spines, 0.37 mm long and larger overall than the two immediately succeeding daughter zooids (one middistal, the other extending laterally to the right of where the ancestrula and other daughter zooid join) which range from 0.30-0.32 mm long and 0.20-0.26 mm wide; later zooids can attain 0.75 mm long and 0.70 mm wide. Frontal shield smooth, rising to the peristome that surrounds the orifice. Interrupting the peristomial ridge distally are 3 articulated spines. Primary orifice with a median, shallow V-shaped sinus flanked by ledge-like condyles. A median suboral avicularium present, set in the peristomial rim, oval in shape with a complete crossbar, the chamber symmetrically developed from concealed septular pores on each side. Ovicell somewhat recumbent on the distal zooid, with a smooth presumed endooecium and membranous ectooecium. Small basal pore-chambers present around the distolateral margins.

DISTRIBUTION. — New Caledonia, southwest of Île des Pins, 675 m.

REMARKS. — Unlike *B. rimosa*, several species, including *B. crosnieri*, have a low peristome surrounding the orifice. *Buffonellodes crosnieri* also differs in its linear colony form, the small shallow sinus, and the triplet of oral spines.

The species is named for Alain CROSNIER, in recognition of his unstinting efforts in bringing the results of the MUSORSTOM cruises to publication.

Genus ***IPSIBUFFONELLA*** nov.

TYPE SPECIES. — *Ipsibuffonella repens* sp. nov.

DIAGNOSIS. — Colony encrusting, uni- to pluriserial. Zooidal frontal shield imperforate. Areolar pores lacking. Orifice with a broad arcuate poster, condyles scarcely developed. No peristome or oral spines. Avicularium

suboral, median. Ovicell globular, the endooecium smooth, imperforate; ectooecium membranous; ovicell not closed by zooidal operculum.

REMARKS. — *Ipsibuffonella* is established for *I. repens* sp. nov. from the northern part of the Norfolk Ridge near New Caledonia. The genus differs from *Buffonellodes* chiefly in lacking articulated oral spines and a distinct orificial sinus flanked by ledge-like condyles.

Ipsibuffonella repens sp. nov.

Figs 91-92

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 33, 675 m.

TYPES. — *Holotype*: Preserved colony from BIOCAL Stn DW 33, 23°09.71'S, 167°10.27'E, 675 m, MNHN-Bry 19971.

Paratypes: MNHN-Bry 19972 (preserved) and MNHN-Bry 20042 (dried), both from the same location as the holotype.

DESCRIPTION. — Colony encrusting, ramifying, uni- to pluriserial, seldom exceeding more than 4 zooids across. Zooids relatively long, sometimes claviform with a caudate proximal portion; 0.88-1.4 mm long, and 0.54-0.75 mm wide across the dilated portion of the zooid. Frontal shield smooth, imperforate, quite convex with the sides sloping to the interzooidal furrow or the substratum where the zooidal margin may flatten a little at the edge. No marginal areolar pores, but a tiny pair of pseudopores is associated with the avicularian umbo, 1 on either side; in transparency, the avicularium chamber is seen to originate from a tiny, concealed, uniporous septulum a little beyond each pseudopore. Orifice a little wider than long, with a broad arcuate poster; no separate condyles *per se*, the proximal edges of the distal oral rim serving as foci of articulation where they encounter the lateral corners of the poster. No oral spines. Suboral avicularium median, occurring on the distal face of an associated umbo, with a rounded rostrum and thin crossbar. Ovicell prominent, a little longer than wide, the endooecial surface smooth, imperforate, the ectooecium membranous; not closed by the zooidal operculum.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge, south of Île des Pins, 675 m.

REMARKS. — *Ipsibuffonella* differs from *Buffonellodes sensu lato* in the uniseriality of parts of the colony (hence *ipsi-*, from *ipsos*, Greek, ivy) and the particular combination of zooidal characters. For example, the type species of *Buffonellodes*, *B. rimosa* Jullien, 1888, has, by contrast, oral spines, marginal areolae, an orificial sinus, and well-developed condyles (GORDON, 1984; HAYWARD, 1991).

Several colonies occurred on the inner concave surface of a bivalve shell. Microscopic examination of several alcohol-preserved zooids by transmitted-light microscopy revealed stages of spermatogenesis in one colony; other colonies had well-developed embryos in the ovicells. The colonies were collected in the month of August (1985).

Family EMINOOECIIDAE Hayward & Thorpe, 1988

Genus *MACROCAMERA* nov.

TYPE SPECIES. — *Macrocamera erecta* sp. nov.

DIAGNOSIS. — Colony erect and rigid, dichotomously branching, the zooids facing on one side. Zooidal frontal shield imperforate, with sparse areolar pores. Orifice with a wide V-shaped poster delimited from the anter by condyles. No oral spines. Suboral avicularium present, the crossbar complete. Female zooid with somewhat wider orifice; ovicell huge, the ectooecial surface resembling the frontal shield; not closed by the zooidal operculum.

Macrocamera erecta sp. nov.

Figs 93-94

MATERIAL EXAMINED. — **New Caledonia**. CHALCAL 2: stn DW 78, 233-360 m.

TYPES. — *Holotype*: a fertile colony (preserved) from CHALCAL 2 Stn DW 78, 23°41.30'S, 167°59.60'E, 233-360 m, MNHN-Bry 19968.

Paratypes: a fertile colony (MNHN-Bry 19973) and a slide of dried branch fragments (MNHN-Bry 20029), both from the same locality as the holotype.

DESCRIPTION. — Colony erect, rigid, dichotomously branching from a short base up to 4.0 mm diameter; from the base arises a short stem ~3-4 mm high and ~2.5 mm diameter that branches outwards more than upwards, dichotomising at intervals of 2.8-4.0 mm; the branches between axils narrowing from 1.62 mm (near main stem) to 0.79 mm (outermost) diameter. Zooids in 4-7 (rarely more) longitudinal series, facing on the underside of the branches, i.e., facing the substratum. Zooids 0.47-0.68 mm long and 0.32-0.40 mm wide (range of maximum widths), the frontal shield lightly creased with short low ridges and depressions, imperforate, with up to 5 small areolar pores placed irregularly on the shield between the margins and the centre; newly formed zooids clearly delineated by thin raised lines along the interzooidal boundaries. Orifice about as wide (0.11-0.13 mm) as long, with a broad V-shaped poster separated from the anter by condyles, each with a transverse furrow. No oral spines. A median suboral avicularium present, the crossbar complete, the opesia a transverse slit, the rostral area almost an equilateral triangle the rostral foramen near-circular; directed proximally. No other avicularia. Female zooids always occurring at the extreme lateral margins of branches and facing laterally; ovicell huge, up to 0.56 mm wide and long, deep-bodied, displacing the chamber of the next zooid in the series; the calcareous surface like that of the frontal shield, the secondary calcification and outer epitheca continuous with those of the distal zooid; female orifice typically a little wider (0.13-0.15 mm) than autozooidal orifices; ovicellular opening not closed by the zooidal operculum. Abfrontal branch surface marked by thin lines (vibices) delineating zooidal boundaries.

DISTRIBUTION. — New Caledonia: northern Norfolk Ridge, 233-360 m.

REMARKS. — *Macrocamera* is established for the above new species from New Caledonia and for *Schizomavella pansa* from Fiordland, New Zealand (243-253 m). *Macrocamera pansa* comb. nov., though infertile, is clearly very similar to the type species, differing in zooidal details (more areolar pores, avicularium a little further from the orifice) and in the pattern of branching. Though a new genus is clearly required, the family placement poses some difficulty. The branching habit and huge ovicell are reminiscent of the Phorioppniidae (see earlier in this paper), but all phorioppniids recognised here have zooids opening all around the stem, none has avicularia, and all have at least some pseudopores in the frontal shield. The family Eminooeciidae was established by HAYWARD and THORPE (1988) for *Eminooecia* Hayward & Thorpe, 1988 and *Isoschizoporella* Rogick, 1960, together embracing five Antarctic species. Morphological features cited as characteristic of the family included a non-pseudoporous frontal shield, adventitious avicularia, and the association of the ovicell with "avicularian polymorphs or inferred homologues". The latter structures appear not to be homologous, however. Although avicularian chambers may develop concurrently alongside the ovicell in *Isoschizoporella*, the distal avicularium chamber is not continuous with the ovicellular coelom. It is evident from their illustrations that the ovicell in *Eminooecia* is indeed the ovicellular coelom - "Distally, the two layers of the ovicell are widely separated" (HAYWARD & THORPE, 1988: page 7, fig. 2); the avicularian chamber illustrated in their figure 5 (*Ibid.*, page 13) is separate from the ovicellular coelom enclosed between the endooecial and ectooecial layers. A further significant distinction between *Eminooecia* and *Isoschizoporella* is that the ectooecium is wholly calcified in the former but frontally membranous in the latter. In this regard, *Isoschizoporella* more closely resembles buffonellodids (see above), even though they lack avicularia associated with the ovicell. Although *Macrocamera* lacks a capacious ovicellular coelom, it is here tentatively allied with *Eminooecia* on the basis of similarities in the frontal shield, the suboral avicularium, external ovicellular calcification, and erect habit.

The generic name is derived from the Greek *makros*, long, and *kamara* (Latin, *camera*), a chamber.

Superfamily EUTHYRISELLOIDEA Bassler, 1953

Family EUTHYRISELLIDAE Bassler, 1953

Genus *PSEUDOPLATYGLENA* nov.

TYPE SPECIES. — *Pseudoplatyglena mirabilis* sp. nov.

DIAGNOSIS. — Colony erect, cellariiform, with chitinous joints, the circular stems with a median abaxial non-projecting keel. Zooidal frontal shield imperforate with conspicuous marginal areolae. Orifice with broad subconvex poster and stout blunt condyles, with a broad suboral subhypostegal coelom protected by a stout crescentic bar supported by buttresses. No oral spines. No avicularia. Ovicell unknown.

Pseudoplatyglena mirabilis sp. nov.

Figs 95-102

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 4: stn DW 187, 65-120 m.

TYPES. — *Holotype*: a preserved 10-mm-long colony fragment with a single branch dichotomy, from MUSORSTOM 4 Stn DW 187, 19°08.30'S, 163°29.30'E, 65-120 m, MNHN-Bry 19962.

Paratype: a dry 6-mm-long fragment with part of a branch dichotomy, from the same locality as the holotype, MNHN-Bry 20032.

DESCRIPTION. — Colony erect, cellariiform, jointed, with dichotomous branching. Branches circular, 0.56-0.83 mm diameter, each nearly parallel-sided, with the proximal end abruptly tapering to a single chitinous joint; proximal to the joint is a calcified zooidal chamber that appears to pertain to the zooid distal to the joint. Zooids 0.73-1.01 mm long and 0.24-0.16 mm wide, arranged more or less in 6 longitudinal series. Frontal shield lepralioid, imperforate, the calcareous surface minutely granular/papillate frequently with a low continuous or discontinuous median ridge; lateral margins sloping into an interzooidal furrow in which are variably sized areolae, generally conspicuous. Abaxially there is a median longitudinal ridge; this is flush with the zooidal surface and therefore non-projecting, but on either side is a conspicuous furrow with areolae and deep-set septular pores; the cavity of each furrow is not longitudinally continuous, being crossed by transverse ridges associated with each zooid. Zooidal orifice longer than wide, laterally indented where stout blunt condyles occur, separating the broad subconvex poster from the high-arched anter. The proximal rim of the orifice comprises a stout crescentic bar that is supported by 3-5 buttresses shortly radiating proximally. Beneath this arrangement is a relatively large subhypostegal coelom. Oral spines lacking. No avicularia. Ovicells not present.

DISTRIBUTION. —New Caledonia: north of the Belep Islands, 65-120 m.

REMARKS. —*Pseudoplatyglena* is established here for a new genus whose affinities appear to lie with the Euthyrisellidae. Superficially, *P. mirabilis* remarkably resembles some of the species of the Cretaceous genus *Platyglena* Marsson. This genus was characterised by erect, mostly articulated, colonies; some species were characterised by a suboral costal field superficially resembling the crescentic buttressed suboral bar in *Pseudoplatyglena mirabilis*, and others had a similar median longitudinal ridge on the frontal shield.

Pseudoplatyglena differs significantly, however, in having a strictly lepralioid shield with no trace of costae. Instead, there are features which would seem to ally the genus with some among the Euthyrisellidae, especially *Tropidozoum* Harmer. These include the cellariiform habit, the shape of the orifice (cf. *T. cellariiforme* Harmer), the investing coelom and epitheca around the chitinous joints, the abfrontal keel, and the subhypostegal coelom. The abfrontal keel of *Pseudoplatyglena* differs insofar as it lacks the separate kenozooidal chambers on either side, however; instead, the coeloms adjacent to the keel are merely lateral extensions of the frontal hypostegal coeloms.

There is also no organic connection, via septula, between visceral and hypostegal coeloms as in several of the euthyrisellid genera.

Superfamily SIPHONICYTAROIDEA Harmer, 1957, superfam. nov.

Family SIPHONICYTARIDAE Harmer, 1957

Genus ***SIPHONICYTARA*** Busk, 1884

TYPE SPECIES. — *Siphonicytara serrulata* Busk, 1884.

Siphonicytara armata sp. nov.
Figs 103-105

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 33, 675 m.

TYPES. — *Holotype*: a rooted colony from BIOCAL Stn DW 33, 23°09.71'S, 167°10.27'E, 675 m, MNHN-Bry 19989.

Paratype: part of a colony from the same locality, MNHN-Bry 20114.

DESCRIPTION. — Colony erect, comprising slightly curving, basally rooted, unbranched cylindrical stem to at least 24 mm high and 1.73 mm diameter (not including zooidal peristomes); no discernible abfrontal side. Zooids 8-11-serial in the thickest part of the stem (as at the apex), 0.96-1.16 mm long and ~0.47 mm wide, the zooidal surface granular. The arrangement of orifices, ascopores, areolae, and ridges are best appreciated by examining the stem apex. Here the peristomial orifice (internal diameter 0.15-0.17 mm) is surrounded by a more or less triangular arrangement of ridges and flanked by 3-4 deeply sunken areolar septula. Proximal to the peristome the ascopore, with an areolar pore either side, is set in the middle of a subcircular to heart-shaped ridge; the centre-to-centre-distance from ascopore to peristomial orifice 0.39-0.43 mm; distal half of the ascopore with a hooded surround. Operculum D-shaped, with a small proximal projection at each lateral corner Avicularia single or paired both distolateral and proximolateral to the orifice (thus 2-4 per zooid, and more or less aligned in longitudinal series up the stem), circular in outline, 0.103 mm diameter, with a near-median cross-bar. Ancestrula 1.04 mm long, subtubular, tapering proximally, lacking avicularia and a ridge between the orifice and ascopore.

DISTRIBUTION. — New Caledonia: south of Île des Pins, 675 m.

REMARKS. — *Siphonicytara armata* is distinguished from the other New Caledonian species described below by the lack of a clear abfrontal surface and the disposition of the avicularia. It resembles the Philippine species *S. insolita* (Canu & Bassler, 1929) in the type of avicularia, but those of *S. insolita* are directed laterally outward instead of towards the peristome.

Siphonicytara excentrica sp. nov.
Fig. 106

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 38, 360 m.

TYPE. — *Holotype*: BIOCAL Stn DW 38, 22°59.74'S, 167°15.31'E, 360 m, MNHN-Bry 20122. No separate paratypes.

DESCRIPTION. — Colony an erect cylindrical stem (incomplete in the unique holotype specimen) 1.2 mm diameter (not including zooidal peristomes); an abfrontal side weakly discernible. Zooids 8-serial, 0.90-0.98 mm

long and ~0.39 mm wide with a lightly textured non-granular surface. Peristomial orifice with an internal diameter of 0.15-0.17 mm, mostly placed asymmetrically within the surrounding ridge system owing to the occurrence of a relatively large avicularium on one side; at least one series of zooids (on the side interpreted to be abfrontal) has symmetrical peristomes flanked by a pair of avicularia. Conspicuous areolar pores occur lateral (when one avicularium is present) and proximolateral to the peristome. Ascopore set in a transversely narrow area bounded by a ridge that is continuous or lacking along one side; the distal side of the ascopore slightly hooded; the centre-to-centre distance from ascopore to peristomial orifice 0.45-0.57 mm. Avicularia suboval, 0.20-0.28 mm long, on one or both sides of the peristome, directed to the peristomial orifice and facing obliquely laterally, with a cross-bar delimiting a small opesia from a relatively large palate.

DISTRIBUTION. — New Caledonia: south of Île des Pins, 360 m.

REMARKS. — *Siphonicytara excentrica* is readily distinguished by the occurrence of asymmetrically placed peristomes on a majority of the zooids.

Siphonicytara glabra sp. nov.

Figs 107-108

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 70, 965 m.

TYPES. — *Holotype*: a branching fragment from BIOCAL Stn DW 70, 23°24.70'S, 167°53.65'E, 965 m, MNHN-Bry 20124.

Paratype: from same locality as holotype, MNHN-Bry 20117.

DESCRIPTION. — Colony erect, bifurcating at intervals (5.5 mm in the limited material available, which allows for only 1 measurement), the stem and branches somewhat lensoid in cross section, 0.83-0.98 mm diameter, with a distinct abfrontal surface that is slightly flattened. Zooids 4-serial, 0.81-0.94 mm long and ~0.47-0.53 mm wide, the surface glabrous, becoming finely granular in the oldest zooids. Peristomial orifice (internal diameter 0.13-0.16 mm) bounded by ridges distally and proximally but not laterally; with lateral areolae along each side proximally, the most distal ones often replaced by 1-2 avicularia. Ascopore with a small areolar pore on 1 or both sides, together set between distal and proximal ridges and sometimes a lateral one; the centre-to-centre distance from ascopore to peristomial orifice 0.35-0.41 mm; distal side of ascopore slightly hooded. Avicularia suboval, relatively small, 0.094-0.17 mm long and initially subcolumnar, on 1 or both sides of the orifice (not attached to the peristome) or lacking, directed more or less distally, facing proximofrontally, with a complete crossbar. Abfrontally, there is a sinuously zigzag median longitudinal ridge to which all frontal transverse ridges connect. In the adjacent area between each peristome and the median ridge is an avicularium, similar to those on the frontal side but facing more distinctly proximally and with a more pointed apex.

REMARKS. — *Siphonicytara glabra* resembles *S. vittata* sp. nov. in colony form and in the arrangement of zooids. It differs in having a mostly glabrous zooidal surface, more numerous frontal avicularia, and more proximally directed abfrontal avicularia.

Siphonicytara vittata sp. nov.

Figs 109-111

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 08, 435 m. — Stn DW 33, 675 m. — Stn DW 36, 650 m. — Stn DW 44, 440 m. — Stn DW 51, 700 m.
CHALCAL 2: stn DW 76, 470 m.

TYPES. — *Holotype*: a preserved rooted colony from BIOCAL Stn DW 44, 22°47.30'S, 167°14.30'E, 440 m, MNHN-Bry 19990.

Paratypes: MNHN-Bry 20119, MNHN-Bry 20123, and MNHN-Bry 20128, all from BIOCAL Stn DW 08, 20°34.35'S, 166°53.90'E, 435 m; MNHN-Bry 20113, from the same locality as the holotype; and MNHN-Bry 20129, from CHALCAL 2 Stn DW 76, 23°40.50'S, 167°45.20'E, 470 m.

DESCRIPTION. — Colony erect, bifurcating at intervals of 2.5-9.6 mm, the stems 0.50-1.32 mm diameter (not including zooidal peristomes), with a distinct abfrontal surface that is slightly flattened; basally, the colony is anchored by rootlets that issue from pores on the abfrontal surface only. Zooids mostly 4-serial, in longitudinal series, becoming 6-serial in the thickest stems, 0.68-0.98 mm long and ~0.30-0.49 mm wide, the calcareous surface textured with light irregular ridging. Frontally, the peristomial orifices (internal diameter 0.10-0.15 mm) and ascopores occur between parallel sinuous ridges that are transversely continuous and typically without connecting longitudinal ridges; the arrangement of peristomes is such that they occur in regular series both longitudinally and obliquely; peristomes of the zooids flanking the abfrontal surface are longer and curve round to face more or less frontally. Conspicuous areolar pores occur in a collective furrow on each side proximolateral to every peristome; although slightly offset, the vitta-like furrows off all the zooids in a vertical series are more or less aligned. Ascopore circular, not hooded, with an areolar pore on each side, the centre-to-centre distance from ascopore to peristomial orifice 0.31-0.42 mm. Avicularia very rare frontally. Abfrontally, there is an irregular zigzag ridge to which the frontal transverse ridges join; between that ridge and each adjacent peristome is a small suboval avicularium ~1.23 mm long, slightly elevated, with the rostrum directed laterally outwards, the palate facing obliquely laterally or proximolaterally towards the stem axis.

DISTRIBUTION. — New Caledonia: near Lifou, and south of Île des Pins, 435-700 m.

REMARKS. — *Siphonicytara vittata* resembles *S. formosa* Harmer, 1957, which, however, can achieve a larger size, has longitudinal ridges frontally (i.e., ridges completely surround the peristomes and ascopores), and proportionately larger abfrontal avicularia.

Siphonicytara granulosa sp. nov.

Figs 112-113

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn CP 232, 760-790 m.

TYPE. — *Holotype*: a stem fragment 10 mm long, from BIOGEOCAL Stn CP 232, 21°33.81'S, 166°27.07'E, 760-790 m, MNHN-Bry 20118. No separate paratypes.

DESCRIPTION. — Colony erect, cylindrical and slightly curving, the unique holotype stem 0.73-0.94 mm diameter (not including peristomes); no discernible abfrontal surface. Zooids 1.02-1.28 mm long and ~0.50-0.62 mm wide, the calcareous surface granular; arranged in 5 longitudinal series. Peristomes (internal diameter 0.15-0.17 mm) proportionately longer than in the other New Caledonian species, in a subhexagonal area bounded by low ridges, with 4-6 areolar cavities proximolaterally. Ascopore completely bounded by a ridge, not hooded, with 1-2 areolar pores on each side, the centre-to-centre- distance from ascopore to peristomial orifice 0.47-0.64 mm. Avicularia sporadic, generally occurring singly on a ridge adjacent to a peristome, ~0.12 mm long, the rostrum directed towards the peristome, the palate obliquely proximofrontally.

DISTRIBUTION. — New Caledonia: off the coast near the town of Thio, 760-790 m.

REMARKS. — *Siphonicytara granulosa* is distinguished from *S. armata*, which it most resembles, by its more slender colony form, proportionately longer peristomes, and fewer avicularia.

Siphonicytara mosaica sp. nov.

Figs 114-117

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn CP 260, 1820-1980 m. — Stn CP 265, 1760-1870 m. MUSORSTOM 6: stn CP 465, 480 m.

TYPES. — *Holotype*: branching fragment from BIOGEOCAL Stn CP 265, 21°04.09'S, 167°00.40'E, 1760-1870 m, MNHN-Bry 20127.

Paratypes: MNHN-Bry 20115, from BIOGEOCAL Stn CP 260, 21°00.00'S, 167°58.34'E, 1820-1980 m; MNHN-Bry 20126, from MUSORSTOM 6 Stn CP 465, 21°03.55'S, 167°32.25'E, 480 m.

DESCRIPTION. — Colony erect, dichotomously branching, the stems delicate, only 0.37-0.49 mm diameter. Zooids 2-4-serial, 1.00-1.24 mm long and ~0.22-0.30 mm wide, the peristomes facing laterally or frontally such that there is an abfrontal surface characterised by the absence of peristomes but no other features; zooidal surface distinctively sculptured by a mosaic of polygonal ridges that continue onto the peristome. Stems regularly annulate, the transverse ridges separating peristomes from ascopores being continuous; no longitudinal ridges. Peristomes (internal diameter 0.11-0.13 mm) somewhat projecting, flanked on each side by a linear row of 4-5 areolae. Ascopore circular, not hooded, set immediately proximal to a transverse ridge and with a relatively extensive zooidal surface proximal to it; centre-to-centre distance from ascopore to peristomial orifice 0.37-0.43 mm. No avicularia.

DISTRIBUTION. — New Caledonia: South Loyalty Basin, 480-1980 m.

REMARKS. — This is the most delicate of all known *Siphonicytara* species. In its annular transverse ridges it resembles *S. symetrica* David & Pouyet, 1986 from south of Madagascar, which differs, however, in its larger size and in having avicularia and a smooth zooidal surface.

Superfamily MAMILLOPOROIDEA Canu & Bassler, 1927

Family ASCOSIIDAE Jullien, 1883*

DIAGNOSIS. — Colony discoidal to conical, the basal surface concave. Zooids recumbent to suberect, radiating from the central ancestrular region, the frontal shield imperforate. Orifice with a broad poster delineated by a pair of condyles. No oral spines. Avicularia, if present, typically adjacent to the orifice; the crossbar complete. Ovicell, if present, not unusually large, imperforate, closed by the zooidal operculum. Basal surface of colony composed of the basal or proximobasal parts of autozooids.

REMARKS. — *Ascosia* Jullien, 1883 is usually included in the family Mamilloporidae Canu & Bassler. The type genus of that family, *Mamillopora* Smitt, 1873, while also having discoidal or domed colonies, differs in its minutely perforated enlarged ovicells and dimorphic orifices. JULLIEN's (1883: page 526, as Ascosidae) introduction of the family Ascosiidae appears to have been completely overlooked by later authors, otherwise it would almost certainly have continued in use. For example, SILÉN (1947) argued that the related genus *Fedora* Jullien, 1882 should be excluded from the Mamilloporidae but did not suggest an alternative family. Similarly, LAGAAIJ (1963) declined to suggest a family for *Fedora*. *Mamillopora*, by contrast with *Ascosia*, has enlarged, densely perforated ovicells. In our opinion, the Ascosiidae should be recognised as a separate family of the superfamily Mamilloporoidea, introduced by D'HONDT (1985). Other putative mamilloporid genera should possibly be included in the Ascosiidae but, until there has been a general restudy and redescription of all related genera, we prefer not to comment further.

Genus ***FEDORA*** Jullien, 1883

TYPE SPECIES. — *Fedora edwardsi* Jullien, 1883.

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*This work, though with a publication date of 1882, was not published until 1883. According to Zoological Record for that year (page Moll. 97), JULLIEN's paper was "Read at the Meeting of 26th December, 1881, but not yet received in print at Berlin before August, 1883, and the plates have not yet been seen by the Recorder [Prof. E. VON MARTENS]".

Fedora platydiscus sp. nov.
Figs 118-120

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.

TYPE. — *Holotype*: unique infertile colony from MUSORSTOM 3 Stn DR 117, 12°31.3'N, 120°39.5'E, 97-92 m, MNHN-Bry 20035.

DESCRIPTION. — Colony discoidal, flattened, 3.60 mm maximum diameter. Zooids recumbent, radiating outwards from the central ancestrular region; 0.45-0.72 mm long and 0.20-0.47 mm wide, the frontal shield densely tubercular, the tubercles themselves with minute papillae. Orifice elongate, almost twice as long (0.11-0.17 mm) as wide, the broad rounded poster delimited from the anter by a pair of small angled condyles; orifice laterally flanked by tubercles. Articulated oral spines absent. Avicularia absent. Ovicells not present. Ancestrular opesia (or broken frontal shield?) 0.18 mm long, surrounded by 8 periancestrular zooids. Basal surface of colony somewhat nodular, with convexities indicating the basal surfaces of individual zooids. Zooidal budding taking place from a distobasal pore-chamber on each zooid.

DISTRIBUTION. — Philippines: Mindoro Strait, 92-97 m.

REMARKS. — We are not certain about the generic placement of the present species, which may represent a new genus. The two previously known living species of *Fedora* [*Myriozoum ovum* Smitt, 1873 is unlikely to be conspecific; cf. SILÉN 1947] have more or less conical colonies, but LAGAAIJ (1963) noted some variation in *F. nodosa* Silén from ovoid and spindle shapes to hemispherical and that colonies started life as encrustations on small objects. *Fedora* is the nearest genus in terms of overall morphological characters, especially in the tuberculate frontal shield, lack of ovicells, and the distobasal pore-chambers. SILÉN (1947) called the latter 'special chambers' and speculated on their purpose. LAGAAIJ (1963), observing an apparent rootlet emerging from one chamber, concluded that they give rise to anchoring rhizoids. This is possible, but they must soon become obliterated by the new autozooids that develop around them. In the flattened colony form, *F. platydiscus* is more reminiscent of *Ascosia*, but in that genus the zooids are suberect, with ovicells and proximobasal budding, and lack the distobasal pore-chambers.

The name of the new species is derived from the Greek *platys*, flat, and *diskos*, plate. It should be noted in passing that the spelling of the type species of *Fedora* is given twice by JULLIEN (1883) as *Edwarsi* (*sic*), above the formal description and in the table on page 527, but as *Edwardsi* in the plate captions on page 529. We conclude, therefore, that *Edwarsi* is a *lapsus calami* for *edwardsi*, presumably named for Henri MILNE EDWARDS.

Family CLEIDOCHASMATIDAE Cheetham & Sandberg, 1964

REMARKS. — We here include this family in the superfamily Mamilloporoidea on the basis of the zooidal frontal shield and the shape of the orifice. Although the ovicell, when present, in mamilloporids and ascosiids is closed by the zooidal operculum and the colony form is largely different, a relationship with cleidochasmatids is suggested by the genus *Fedorella* Silén, 1947. This monotypic genus has a similar colony form to *Fedora* but a typically cleidochasmatid ovicell (i.e., minutely porous and tuberculate and not closed by the zooidal operculum). [Puzzlingly, COOK and LAGAAIJ (1976: page 321) listed *Fedorella* among genera with 'frontal' zooidal astogeny (i.e., like *Conescharellina*), but SILÉN's (1947) description and illustrations indicate otherwise.] D'HONDT (1981) also noted a similarity between the orifices in *Characodoma* Maplestone, 1900 (a senior synonym of *Cleidochasma* Harmer, 1957) and *Fedora*. As pointed out by COOK and BOCK (1996), *Characodoma* can be erect and conical from basally encrusting colonies (see also HARMER, 1957).

SOULE *et al.* (1991) revised *Cleidochasma sensu lato*, introducing a number of new genera of Cleidochasmatidae. Several of these have phidoloporid orifices (with a beaded distal arch) and ovicells (with a labellum), however, and should be excluded from the Cleidochasmatidae, as suggested by GORDON (1993b).

Genus *CHARACODOMA* Maplestone, 1900

TYPE SPECIES. — *Schizoporella excubans* Waters, 1881, by synonymy with *Characodoma halli* Maplestone, 1900 (see COOK & BOCK, 1996).

Characodoma areolata (Canu & Bassler, 1929)

Figs 121-122

Gemelliporella areolata Canu & Bassler, 1929: 309, pl. 34, figs 5-6.
Cleidochasma areolatum - HARMER, 1957: 1046, pl. 71, figs 19-21.

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.

DISTRIBUTION. — Philippines, 42-969 m; Indonesia (Makassar Strait), 59-320 m.

REMARKS. — *Characodoma areolata* is represented in the collection by a single specimen. It is a compressed pisiform colony that appears to have encrusted a tiny piece of substratum that is now largely enclosed by it. It closely matches CANU and BASSLER's (1929: pl. 34, fig. 6) illustration, which shows occasional small flattened kenozooidal chambers (possibly loci of frontal budding) associated with some zooids, also present in the MUSORSTOM specimen. The zooids (0.50-0.70 mm long and 0.37-0.51 mm wide) and orifice (0.16-0.19 mm long) overlap in range with those of CANU and BASSLER's specimens or are slightly larger; the avicularium is 0.20-0.25 mm long, rounded at both ends, and with a thin crossbar that may frequently be broken, giving the appearance of mandibular pivots. No zooid had two avicularia on the same side of the orifice, but one zooid has a small avicularium on the opposite side of the orifice from the large one (as seems also indicated in CANU & BASSLER's pl. 34, fig. 5).

Characodoma biavicularia (Canu & Bassler, 1929)

Figs 124-126

Gemellipora biavicularia Canu & Bassler, 1929: 312, pl. 34, fig. 7.

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m. Also USNM 8067, holotype of *Gemellipora biavicularia* Canu & Bassler, 1929, *"Albatross"* Stn 5179.

DESCRIPTION. — Colony encrusting to erect, the latter up to 6.2 mm long, circular to lensoid or almost bilamellar in cross section, 5-6 zooids across (1.98 mm) at the widest part. Zooids 0.56-0.75 mm long, 0.33-0.58 mm wide. Frontal shield evenly granular-tubercular, with up to 10 or more areolar pores along each margin. Orifice distinctly cleidridiate, 0.16-0.19 mm long, tapering proximally. Avicularia of two sizes, the larger lateral-oral, 0.15-0.19 mm long, directed proximally towards the centre of the frontal shield; the rostrum almost an equilateral triangle, as is the proximal part of the mandible that lies across the rostrum, the remainder of the mandible being long and setiform; its total length 0.39 mm. The smaller avicularium suboral, not present on every zooid and may be wanting over an extensive area of the colony; orientated transversely, the tiny semicircular mandible 0.04 mm long. Ovicell globular, densely and evenly perforated.

DISTRIBUTION. — Philippines, 38-104 m.

REMARKS. — The MUSORSTOM material comprises one encrusting and three erect specimens. One of the latter (uncoated) is well preserved, with intact opercula and mandibles. The erect specimens closely resemble CANU and BASSLER's (1929) sole illustration, showing two sizes of avicularia, the larger one lateral-oral, the smaller one suboral. Zooidal dimensions in the present material are larger than cited by CANU and BASSLER, but the species appears very variable. In the present material the emplacement of the larger of the two avicularia varies from laterally adjacent to the orifice to a position subjacent to the sinus. The type specimen from the Smithsonian

Institution appears superficially different in overall zooidal morphology but it is likely this arises from the degree of secondary calcification. HARMER (1957) recorded putative *C. biavicularia*, with delicate erect rooted colonies, in *"Siboga"* samples, but his illustrations indicate a different species in our opinion. Contrary to CANU and BASSLER's description he shows the suboral avicularium as the larger of the two and with an acute mandible.

Characodoma glabra sp. nov.

Fig. 123

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.

TYPE. — *Holotype*: colony encrusting a small piece of shell from MUSORSTOM 3 Stn DR 117, 12°31.3'N, 120°39.5'E, 97-92 m, MNHN-Bry 20050. No separate paratypes.

DESCRIPTION. — Colony encrusting. Zooids 0.37-0.56 mm long and 0.20-0.64 mm wide, each separated from adjacent zooids by a thin marginal groove; frontal shield smooth with sparse granulations and small sparse marginal areolar pores. Orifice 0.11-0.13 mm long, the deep rounded poster almost one third the orificial length, separated from the larger anter by lateral indentations with tiny condylar points. Avicularia 0.066-0.075 mm long, paired or, more usually, single, lateral to the orifice and directed proximofrontally, the crossbar very delicate, the rostrum acute. Ovicell relatively small (0.17-0.21 mm wide), the endooecium relatively thick, its outer surface with small spiky tubercles and small sparse perforations; ectooecium membranous.

DISTRIBUTION. — Philippines, Mindoro Strait, 92-97 m.

REMARKS. — This species is distinguished by the mostly smooth frontal shield, the size and arrangement of the avicularia, and the relatively small, coarse-surfaced ovicell.

Characodoma parva sp. nov.

Fig. 127

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.

TYPE. — The sole colony from MUSORSTOM 3 Stn DR 117, 12°31.3'N, 120°39.5'E, 97-92 m, MNHN-Bry 20051. No separate paratypes.

DESCRIPTION. — Colony small, compressed-pisiform in shape. Zooids very small, 0.26-0.34 mm long and 0.28-0.34 mm wide, the frontal shield coarsely surfaced, with blunt tubercles and relatively large areolae. Orificial poster one-fourth the total orificial length of 0.09-0.11 mm, widely V-shaped, delimited from the larger anter by small condyles. Avicularia paired or single, comprising a suboral one set transversely, the rostral and opesial rims rounded; and frequently and additional one adjacent to the orifice, the acute rostrum directed obliquely proximally toward the lateral margin; the crossbars in both kinds of avicularia relatively stout. Ovicell 0.16-0.21 mm wide, the endooecium with the numerous small tubercles and pores evenly distributed, the ectooecium membranous.

DISTRIBUTION. — Philippines, Mindoro Strait, 92-97 m.

REMARKS. — This species is distinguished by its small colonial and zooidal dimensions and the shape and disposition of the avicularia.

Characodoma sp.

Fig. 128

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn CP 102, 192 m.

DESCRIPTION. — Colony fragment encrusting. Zooids 0.47-0.62 mm long and 0.41-0.57 mm wide, the frontal shield somewhat irregularly surfaced in the proximal half where there are small scattered areolar pores, and granular all over. Orifice a little longer than wide, ovoid in shape, with only the small condylar points differentiating the anter from the broad poster. No avicularia, but a pair of relatively areolar cavities either side of the orifice can appear superficially like tiny avicularia under transmitted light. Ovicells not seen.

DISTRIBUTION. — Philippines, 192 m.

REMARKS. — Only a tiny infertile fragment of this species occurred in the collection. Despite the broad orificial poster, it appears to be a species of *Characodoma*.

Genus ***YRBOZOON*** Gordon, 1989b

TYPE SPECIES. — *Yrbozoon ringens* Gordon, 1989b.

Yrbozoon ringens Gordon, 1989b

Figs 129-131

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 66, 515 m.

DISTRIBUTION. — Norfolk Ridge from New Zealand (South Maria Ridge, 1024-1049 m) to New Caledonia (northern Norfolk Ridge, 515 m).

REMARKS. — Four small colony fragments, two ovicellate or partly so, represent only the second record of this genus and species. They are identical to the sole New Zealand specimen except in the number of oral spines or tubercles, being only two instead of 4-5.

GORDON (1989b) included *Yrbozoon* in the Celleporidae, in which it is very much on the fringe. Having now seen several cleidochasmatids in the MUSORSTOM samples it is apparent that the ovicell of *Yrbozoon* is very similar to that of *Cleidochasma*, comprising a reticulate (but not perforate, however) endooecium and membranous ectooecium. The presence of oral spines in *Yrbozoon* is exceptional in the superfamily Mamilloporoidea, which may indicate that the affinities of *Yrbozoon* lie elsewhere; it may be noted that some of the spines in *Y. ringens* from New Zealand are merely long tubercles and the others appear to be non-articulated. Thus, even including *Yrbozoon* in the Mamilloporoidea need not preclude 'absence of articulated oral spines' as a superfamily characteristic.

Superfamily CELLEPOROIDEA Johnston, 1838

Family CELLEPORIDAE Johnston, 1838

Genus ***BUFFONELLARIA*** Canu & Bassler, 1917

TYPE SPECIES. — *Hippothoa divergens* Smitt, 1873.

Buffonellaria erecta sp. nov.

Figs 132-133

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 66, 515 m. — Stn CP 109, 495 m.

TYPE. — *Holotype*: unique colony, 5.5 mm long, from BIOCAL Stn DW 66, 24°55.43'S, 168°21.67'E, 515 m, MNHN-Bry 20040. No separate paratypes.

DESCRIPTION. — Colony erect, rigid, branching shortly in 1 plane, the stem subcylindrical with zooids facing all around, or partly encrusting the stem of an erect bryozoan and erect parts arising from this. Zooids somewhat porcellanous, 0.50-0.74 mm long and 0.32-0.47 mm wide, the frontal shield imperforate, with tiny sparse areolar pores along the margins. Orifice slightly sunken, wider (0.14-0.15 mm) than long, with a disproportionately small and narrow U-shaped sinus with flattened adjacent orificial shoulders. A suboral avicularium present to 1 side of the sinus, set transversely, with a crossbar, the acute rostrum directed laterofrontally. Ovicell initially recumbent, becoming subimmersed, the tabulate area of endooecium large with marginal pores and short associated furrows, all but the tabula becoming encroached upon by secondary calcification.

DISTRIBUTION. — New Caledonia, northern Norfolk Ridge, 495-515 m.

REMARKS. — This species is uniquely distinguished among living species of the genus by its erect habit; the combination of small sinus, asymmetrical avicularium, and endooecial tabular pores are also distinctive. The encrusting Philippine species *B. indistincta* Canu & Bassler, 1929 has a similar ovicell and suboral avicularium, but has a broader, V-shaped sinus and 1-2 small lateral-oral avicularia additional to the transverse one.

Buffonellaria regenerata Powell, 1967

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 38, 360 m. — Stn DW 66, 515 m.

DESCRIPTION. — Colony thinly encrusting. Zooids hyaline, 0.38-0.70 mm long and 0.26-0.37 mm wide, somewhat elongate-rectangular in outline, the frontal shield smooth, imperforate, with no marginal areolar pores, but a small pore proximal to each avicularium. Orifice high-arched, longer (0.084-0.095 mm) than wide, the median sinus very shallow and rounded, flanked by straight shoulders with a small condyle angled across each corner. Avicularia paired, lateral-oral, the crossbar thin, the rostrum rounded, directed obliquely laterofrontally. Ovicell recumbent, the endooecium smooth, exposed in the distal half of the ovicell, the proximal face of the ovicell comprising a transverse band distal to the opening.

DISTRIBUTION. — New Caledonia, northern Norfolk Ridge, 360-515 m. New Zealand, Kermadec Ridge and Three Kings Islands to Cook Strait and Kahurangi Shoals, 10-240 m.

REMARKS. — The present material is very similar to colonies previously described from the New Zealand region. There are minor differences in the depth of the orificial sinus and degree of secondary calcification around the ovicell, and a suboral ridge is normally present in the New Zealand material. Nevertheless, these characters are subject to variation and we conclude that the New Caledonian specimens are not sufficiently distinct to warrant subspecific recognition. Several zooids in the New Caledonian material have bore-holes in the frontal shield. These are 0.037 mm diameter; the predator species is not known.

Genus ***OSTHIMOSIA*** Jullien, 1888

TYPE SPECIES. — *Cellepora eatonensis* Busk, 1881.

Osthimosia sp.

Figs 134-136

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 4: stn DW 187, 65-120 m.

DESCRIPTION (Based on juvenile colonies only). — Colony pisiform, the zooids suberect, squat and barrel-shaped, about 0.28 mm long (0.47 mm including the peristome) and 0.26 mm wide. Frontal shield smooth, with a few areolar pores along each margin. Primary orifice 0.094-0.113 mm wide, orbicular with a small rounded-V-shaped sinus proximally; distinct condyles not present. Peristome encircling the primary orifice, rising to an avicularian column on either side; each avicularium ovoid in shape, with a thin crossbar and a small subacute triangular rostrum; the avicularium surface facing proximolaterally toward the orifice. No other avicularia. Ovicells not present. Ancestrula initially tatiform, subsequently developing a peristome around the former opesia.

DISTRIBUTION. — New Caledonia, northeast of the Belep Islands, 65-120 m.

REMARKS. — Two tiny infertile colonies, one ancestrulate, occurred on stem segments of the quadricellariid bryozoan *Nellia tenella* (Lamarck, 1816). In zooidal characters they resemble specimens from the Kermadec Ridge and New Zealand continental shelf attributed to *Osthimosia bicornis* (Busk, 1881) (GORDON, 1984, 1989a), but which, because of orificial characters, may represent an undescribed species.

Genus *LAGENIPORA* Hincks, 1877

TYPE SPECIES. — *Celleporella lepralioides* Norman, 1868.

Lagenipora sp.

Fig. 137

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 46, 775 m.

DESCRIPTION (Based on a juvenile colony only). — Colony encrusting, the zooids radiating somewhat linearly from the ancestrular region. Zooids recumbent, ~0.38 mm long (including peristome) and 0.25 mm wide, the frontal shield smooth, with a few areolar pores around the margin. Primary orifice 0.06 mm wide, with a broad rounded sinus and non-projecting simple condylar surfaces angled in the corners. Peristome long and tubular, incorporating a median suboral avicularium tube opening at the peristomial rim which flares outwards. 1-2 additional small adventitious avicularia occur near the lateral margins of the frontal shield. Vicarious avicularia and ovicells not seen.

DISTRIBUTION. — New Caledonia, south of Île des Pins, 775 m.

REMARKS. — It is not possible to ascribe the single tiny colony (epizoic on a branch of a buguloidean bryozoan) to a described species. It corresponds to none of the New Zealand region species, which all lack similar adventitious avicularia on the frontal shield.

Genus *GALEOPSIS* Jullien *in* JULLIEN & CALVET, 1903

TYPE SPECIES. — *Galeopsis rabidus* Jullien *in* JULLIEN & CALVET, 1903.

Galeopsis mimicus Gordon, 1989

Figs 138-140

Galeopsis mimicus Gordon, 1989a: 68, pl. 3 D-E.

MATERIAL EXAMINED. — **New Zealand**. New Zealand Oceanographic Institute, holotype H-513, paratype P-729.
New Caledonia. BIOCAL: stn DW 33, 675 m. — Stn DW 36, 650 m. — Stn CP 67, 500 m. — Stn CP 75, 825 m.
CHALCAL 2: stn DW 76, 470 m.
SMIB 4: stn DW 37, 540 m.

DISTRIBUTION. — New Zealand, off the Westland coast, 297-520 m. New Caledonia, South Loyalty Basin to northern Norfolk Ridge, 470-825 m.

REMARKS. — The New Caledonian material gives additional information about this species. Whereas in New Zealand colonies occurred only on aboral spines of *Spatangus multispinus* Mortensen, the present colonies occur on axes of small gorgonians. The shape of the orifice and sinus are identical throughout the range, as is that of the ovicell, which has a characteristically long proximal face with a short labellum. A colony from BIOCAL Stn CP 75 has a relatively large basal disc for this species (2.96 mm maximum diameter) and a colony from CHALCAL 2 Stn DW 76 has rare spatulate avicularia - these are 0.16-0.19 mm long, with a small, very short opesia and a relatively broad round rostrum with an extensive palatal shelf.

Galeopsis pentagonus (d'Orbigny, 1842)

Vincularia pentagona d'Orbigny, 1842, pl. 10, figs 4-6; 1847: 21.
Spiroporina pentagona - BROWN, 1952: 213, figs 148, 149 (*cum syn.*).
Galeopsis pentagonus - GORDON, 1984: 116, pl. 46, A-C (*cum syn.*); 1985: 178, fig. 29; 1989a: 69. — MOYANO, 1985: 90, pl. 1, figs 1-6 (*cum syn.*).

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 66, 515 m.
MUSORSTOM 6: stn CP 419, 283 m. — Stn DW 421, 245 m.
SMIB 4: stn DW 38, 510 m.

DISTRIBUTION. — New Caledonia, 245-515 m. New Zealand, widespread from 40-549 m (also Lower Oligocene to Pleistocene). Tasmania (Late Miocene to present day). Juan Fernandez Island. Magellanic South America, Falkland Islands (Îles Malouines).

REMARKS. — The New Caledonian colonies from MUSORSTOM 6 Stn CP 419 (20°41.65'S) constitute the northernmost record of this long-lived austral species.

Galeopsis lageniporoides sp. nov.

Figs 141-142

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 6: stn DW 489, 700 m.

TYPES. — *Holotype*: a coated colony, now in two fragments, from MUSORSTOM 6 Stn DW 489, 20°48.87'S, 167°05.86'E, 700 m, MNHN-Bry 20041.
Paratype: an unnumbered colony in a separate well of the holotype slide, from the same locality as the holotype.

DESCRIPTION. — Colony encrusting, linear, 2-3 zooids across and branching. Zooids 0.51-0.62 mm long and 0.26-0.28 mm wide, the frontal shield smooth and imperforate with small sparse areolar pores. Orifice suborbicular with a broad shallow sinus delimited by blunt rounded condyles. Lateral-oral avicularia small, ovoid, with a rounded rostrum directed laterally outwards or proximolaterally, the avicularia borne at the corners of a high peristome that forms a bridge across the orifice leaving a large spiraminal opening; the proximofrontal face of the peristomial bridge fairly broad. 1-2 additional avicularia are borne adventitiously near the lateral margins. Ovicell recumbent, with a crescentic or triangular exposure of endooecium with tiny distal pores and associated grooves; the proximal face of the ovicell fairly broad, with a labellum on the lower edge.

DISTRIBUTION. — New Caledonia, north of Lifou, 700 m.

REMARKS. — Neither of the two colonies in the collection is attached to a substratum, which appears to have been a hydroid stem. The larger of the colonies, now in two pieces, was 5.15 mm long and 0.54-0.64 mm wide.

Superficially, this species resembles a species of *Lagenipora* because of the high aviculiferous peristome. No *Lagenipora* species, however, has an ovicellular labellum or a peristomial spiramen.

Genus *RICHBUNEA* nov.

DIAGNOSIS. — Colony erect, branching, the zooids facing on one side. Primary orifice with broad sinus and small condyles, concealed by a tall peristome with an irregular rim in which is set 1-2 columnar avicularia. Large spatulate avicularia may occur frontally and abfrontally. Ovicells recumbent, becoming somewhat immersed in secondary calcification, with a broad tabulate area.

TYPE SPECIES. — *Osthimosia incomposita* Gordon, 1984.

REMARKS. — A new genus is established here for two species of erect celleporids that have long, irregularly rimmed, aviculiferous peristomes and broadly tabulate ovicells. The type species from the Kermadec Ridge, initially included in *Osthimosia*, was later transferred to *Buchneria* Harmer, 1957 (GORDON, 1985), with the suggestion that it might represent a new genus. It has since been established that the type species of *Buchneria*, with an umbonuloid frontal shield, differs in several significant respects from *O. incomposita* (GORDON, 1989c), and a new genus appears justified. Comparison is invited with *Spigaleos* Hayward, 1992, which also forms erect branching colonies with the zooids facing on one side, but the type and only species, *S. horneroides* Waters, has peristomial orifices flush with the colony surface, and median, sessile avicularia. *Richbunea* is an anagram of *Buchneria*. At present, the new genus is known only from the Kermadec and Norfolk Ridges at depths of 135-500 m.

Richbunea gracilis sp. nov.

Figs 143-144

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn CP 67, 500 m.
BIOGEOCAL: stn DW 307, 470-480 m.

TYPES. — *Holotype*: a single colony from BIOCAL Stn CP 67, 24°55.44'S, 168°21.55'E, 500 m, MNHN Bry-20039.

DESCRIPTION. — Colony erect, slender, sparsely branching, the zooids in two longitudinal zigzagging series, with a pair of orifices on one side (one near the branch axis, the other, slightly beyond it, projecting outward laterally) alternating with a similar pair on the other side. Branch width between peristomes 0.46-0.60 mm. Zooids c. 0.67-0.71 mm long and 0.23 mm wide, the surface smooth, with 2-5 small areolar pores along each margin. Primary orifice suborbicular, with a broad shallow sinus separated from the anter by a small pair of rounded condyles, concealed from frontal view by a tall peristome. Peristomial rim irregular, with several processes and a proximal pseudosinus that descends as a sinus groove down the inside of the peristome. A small, columnar avicularium projecting from the peristomial rim next to the pseudosinus, with a complete crossbar and acute triangular rostrum directed frontally. No other avicularia. Ovicell prominent, recumbent, with a large frontal endooecial tabula. Abfrontal surface smooth, with a thin median line, indicating zooidal lateral boundaries, zigzagging along the branch axis. Zooids near the colony base have occluded orifices.

DISTRIBUTION. — New Caledonia between Ouvéa and Lifou, and northern Norfolk Ridge, 470-500 m.

REMARKS. — *Richbunea gracilis* superficially resembles a species of Phidoloporidae, especially in its erect habit and *Iodictyum*-like peristomes, but it lacks a beaded primary orifice and the ovicell is distinctively celleporid. It differs from the type species, *R. incomposita* comb. nov., in its slender colony form with fewer zooidal rows, single columnar avicularium, and absence of spatulate avicularia.

Family PHIDOLOPORIDAE Gabb & Horn, 1862

Genus ***LIFUELLA*** nov.

TYPE SPECIES. — *Lepralia multidentata* Thornely, 1905.

DIAGNOSIS. — Colony encrusting to calyciform. Zooids porcellanous, the frontal shield imperforate, with small areolar pores or these lacking. Orifice with a broadly arcuate poster delimited from the anter by inwardly directed condyles, the distal arch not beaded. Articulated oral spines present in both infertile and fertile zooids. Adventitious avicularia, when present, frequently lateral-oral; the crossbar complete. Ovicell subimmersed, the ectooecium imperforate, usually covered by a smooth layer of secondary calcification; the ovicellular entrance usually widely open, not closed by the zooidal operculum.

REMARKS. — A new genus is established here for the largely tropical to warm-temperate species previously attributed to *Hippoporella*. There has been some debate over the relationships between numerous smooth-shielded, warm-water ascophorines with arcuate posters, the species being variously attributed to *Hippoporella* Canu, 1917, *Lepraliella* Levinsen, 1917, *Hippoporina* Neviani, 1895 *sensu* CANU & BASSLER, 1920, *Cleidochasma* Harmer, 1957, and *Brodiella* Uttley & Bullivant, 1972 (e.g., HARMER, 1957; POWELL, 1967; HAYWARD & COOK, 1983; GORDON, 1984; COOK, 1985). HAYWARD and COOK (1983: 104) commented concerning *Hippoporella* that "this genus includes many tropical species ... that seem to have little in common with the boreal-arctic type species". We agree, hence the establishment of *Lifuella*, named for the type locality of the following species. The putative species of *Hippoporella* with a beaded oral arch should probably be included in *Stephanollona* Duvergier, 1921 (see GORDON, 1994).

Lifuella calyciformis (Philipps, 1900)

Fig. 145

Lepralia calyciformis Philipps, 1900: 446, pl. 43, figs 9, 9a.
Hippoporella calyciformis - HARMER, 1957: 1097, pl. 73, figs 1-5. — HAYWARD, 1988: 322, pl. 10c.

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.

DISTRIBUTION. — New Caledonia, Lifou. Torres Strait. Indonesia, 0-34 m. Philippines, 49-97 m. Mauritius.

REMARKS. — The single specimen in the collection is infertile and the oral spines were detached, but it otherwise closely matches the illustrations of PHILIPPS (1900), HARMER (1957), and HAYWARD (1988), who shows the ligula on the avicularian crossbar. The present specimen has the paired lateral-oral avicularia as shown by PHILIPPS and HAYWARD but these may also occur proximal to the orifice and a third avicularium may occur distally.

Genus ***SCHEDOCLEIDOCHASMA*** Soule, Soule & Chaney, 1991

TYPE SPECIES. — *Schedocleidochasma porcellaniforme* Soule, Soule & Chaney, 1991.

***Schedocleidochasma* sp.**

Fig. 150

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 38, 360 m.
Philippines. Holotype specimen of *Hippoporina planulata* Canu & Bassler, 1929 (Smithsonian Institution, Department of Paleobiology, registration no. 8086, from *"Albatross"* Stn 5147, 38 m, Sulu Archipelago).

DESCRIPTION. — Colony encrusting. Zooids very small, 0.19-0.32 mm long and 0.13-0.28 mm wide, the frontal shield glabrous, even or with low ridges, wholly imperforate except for a single tiny areolar pore near the mid-proximal margin. Orifice longer (0.058-0.077 mm) than wide with a distinct rounded-U-shaped sinus with tiny condylar processes at the entrance; 6 spines bases around the distal rim. No avicularia. Ovicells not seen.

DISTRIBUTION. — New Caledonia, near Île des Pins, 360 m.

REMARKS. — Insofar as the sole colony in the collection is infertile, it resembles *Hippoporina planulata* Canu & Bassler, 1929 (= *Metacleidochasma planulata* comb. nov.). Both species have small, vitreous zooids that are strongly reflective. The orifices of *M. planulata*, however, have beaded rims and lack adjacent oral spines. [*Metacleidochasma planulata*, incidentally, is identical to *M. ovale* Soule, Soule & Chaney, 1991, from Hawaii and thus a senior synonym]. Although not noted in the holotype specimen by CANU & BASSLER (1929), an avicularium was seen that is identical to thus illustrated in *M. ovale*.

Genus ***RHYNCHOZOON*** Hincks, 1895

TYPE SPECIES. — *Lepralia bispinosa* Johnston, 1847.

Rhynchozoon tubulosum (Hincks, 1880)

Figs 146-147

Mucronella (?) *tubulosa* Hincks, 1880: 383, pl. 17, fig. 7.
Rhynchozoon tubulosum - HARMER, 1957: 1064, pl. 65, figs 16-19. — GORDON, 1984: 125, pl. 52, C-E. — HAYWARD, 1988: 336 (part). — D'HONDT, 1986: 703. — RYLAND & HAYWARD, 1992: 294, fig. 32 c-e.

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 4: stn DW 231, 75 m.

DISTRIBUTION. — Sri Lanka. Indonesia, 0-52 m. Philippines, 13-275 m. Queensland. New Caledonia, Chesterfield Islands and Île des Pins, 15-75 m. Kermadec Ridge, Curtis and Raoul Islands, 18-60 m.

REMARKS. — RYLAND and HAYWARD (1992) have commented on the limitations of HARMER's (1957) synonymy of this Indo-Pacific species.

Rhynchozoon ligulatum sp. nov.

Figs 148-149

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 38, 360 m.
MUSORSTOM 4: stn DW 223, 545-560 m.

TYPES. — *Holotype*: a dried colony from BIOCAL Stn DW 38, 22°59.74'S, 167°15.31'E, 360 m, MNHN Bry-20020.
Paratypes: an alcohol-preserved colony from MUSORSTOM 4 Stn DW 223, 22°57.00'S, 167°30.00'E, 545-560 m, MNHN Bry-19998, and a gold-coated colony from the same station, MNHN Bry-20077.

DESCRIPTION. — Colony encrusting, the dorsal surface with short stout basal-wall processes supporting the colony above the substratum in places. Zooids relatively large, 0.74-0.94 mm long and 0.59-0.86 mm wide, with an undular-nodular surface. Primary orifice transversely elongate-oval, with a beaded distal rim and a small pair of rounded condyles that separate the anter from the poster. Surrounding the orifice is a peristome composed of several stout tubercles. Secondary calcification can reduce their relative height; otherwise, with lateral fusion (with some gaps between) they can form a palisade around the orifice, concealing the suboral mucro. Zooidal surfaces with abundant small oval avicularia; these have a crossbar with a stout ligula and an upturned rostral rim. Larger avicularia absent. Ovicells somewhat immersed in secondary calcification, each with a very broad, descending labellum.

DISTRIBUTION. — New Caledonia, southwest of Île des Pins, 360-560 m.

REMARKS. — This distinctive species is easily recognisable from the abundant small ligulate avicularia.

Genus *IODICTYUM* Harmer, 1933

TYPE SPECIES. — *Retepora phoenicea* Busk, 1884.

Iodictyum bicuspidatum sp. nov.

Figs 151-154

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 6: stn CP 419, 283 m.

TYPES. — *Holotype*: an ovicelled branch fragment, gold-coated, from MUSORSTOM 6 Stn CP 419, 20°41.65'S, 167°03.70'E, 283 m, MNHN-Bry 20074.

Paratype: colony fragments, from the same locality as the holotype, MNHN Bry-20183.

DESCRIPTION. — Colony non-pigmented, erect, branching more or less in one plane, exceeding 2 cm in height. Not strictly fenestrate, but anastomoses occur. Branches mostly 2-3-serial, with branch widths ranging from 0.43-2.13 mm. Primary orifice nearly circular, just a little wider than long, without beading of the rim or a proximal sinus. Zooids 0.71-0.84 mm long (orifice to orifice) and c. 0.29-0.43 mm wide, mostly discrete, especially in young branches, clearly outlined by ridges along the zooidal boundaries. Zooidal skeletal surface smooth or faintly subgranular, with 1-2 pairs of marginal pores in the proximal half. Zooids lacking ovicells have a tubular, somewhat projecting peristome that has blunt denticulations around the rim, and a median descending groove that ends in a pseudosinus at the beginning of the shaft. Ovicelled zooids have incompletely tubular peristomes, the distal rim being occupied by an ovicell that is initially prominent and subglobular but later appears recumbent owing to secondary calcification. The frontal face of the ovicell is completely smooth apart from a faint midfrontal depression. There is no labellum. Avicularia occasional, large, borne frontally on ovicelled or non-ovicelled zooids in the median row(s). They occupy most of the frontal surface from which they project prominently. The crossbar is complete but, unusually, the opesia behind the crossbar is narrow to the point of obliteration. The rostrum is lingulate in shape, slightly narrowing in the middle, before expanding and rising distally in a pair of smooth rounded cusps. A palatal shelf occupies about the rostral area. The mandible exactly fits the shape of the rostrum. Dorsal branch surface entirely lacking avicularia, but with transverse vibices.

DISTRIBUTION. — New Caledonia, northwest of Lifou, 283 m.

REMARKS. — *Iodictyum bicuspidatum* is most easily distinguished by its large bicuspid (hence the species name) frontal avicularia. Both this species and the following two species are unusual in being both white and largely non-fenestrate. HARMER (1934), in the most comprehensive treatment of tropical erect phidoloporids to date, described 11 species of *Iodictyum* from Indonesian waters. Of these, only three species were white and only one, pigmented, was open-branched.

A commensal organism, probably a hydrozoan, may be associated with this species. Some of the colony fragments have slit-like gaps in the calcification along zooidal margins, indicating that stolons of the epizoite are mostly covered over by the calcification of the bryozoan. Circular openings at zooidal corners, larger than areolar pores, indicate where hydroid stems emerged.

Iodictyum blandum sp. nov.

Figs 155-157

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 44, 440 m.

TYPES. — *Holotype*: unique colony from BIOCAL Stn DW 44, 22°47.30'S, 167°14.30'E, 440 m. No separate paratypes.

DESCRIPTION. — Colony reticulate, shaped overall like a convex clam shell, the zooids opening on the concave face, 11 mm high; unpigmented. Zooids 2-3-serial in trabeculae 0.58-1.04 mm wide. Fenestrae ranging from 0.59-2.60 mm long and 0.20-0.66 mm wide. Both faces of the colony and the zooidal surfaces glabrous, relatively smoothly textured, and blandly lacking many distinctive features. Primary orifice lacking beading on distal rim. Peristome with internal diameter of c. 0.094-0.113 mm, with peristomial sinus in proximal rim the descends as a spiramen within the rim; some peristome rims with crenulations. Avicularia rare; occasional relatively large avicularia occur proximolateral to the peristome, the long acute rostrum directed past the pseudosinus. No fenestral avicularia. Ovicell fairly immersed, with a short labellum and lateral flanges, and a short slit-like pore extending onto the labellum. Abfrontal surface of colony lightly textured, with thin ramifying vibices and rare avicularia like the acute suboral ones frontally.

DISTRIBUTION. — New Caledonia: west of Île des Pins, 440 m.

REMARKS. — This species is characterised by its particularly bland appearance, including the striking paucity of polymorphs.

Iodictyum illinguum sp. nov.

Figs 158-160

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 6: stn DW 421, 245 m.

TYPES. — *Holotype*: an ovicelled colony, gold-coated, from MUSORSTOM 6 Stn DW 421, 20°26.27'S, 166°40.17'E, 245 m, MNHN Bry-20182.
Paratype: colony fragment, from the same locality as the holotype, MNHN Bry-20048.

DESCRIPTION. — Colony non-pigmented, generally hyaline, erect, branching more or less in one plane, the only complete colony 1 cm in height. Branches mostly biserial, triserial in places, with branch widths ranging from 0.33-1.10 mm. Primary orifice and peristomes as in *I. bicuspidatum*. Zooids 0.71-0.90 mm long (orifice to orifice) and c. 0.33-0.41 mm wide, the frontal shield and boundaries (including the presence of a commensal organism) appearing as in *I. bicuspidatum*. Ovicells also more or less identical, but with a longer and more apparent median depression. Large avicularia occasional frontally, situated in a concavity of each zooid that bears one, with a tapering triangular rostrum, and a short narrow opesia behind the crossbar. Similar avicularia are commoner abfrontally, with generally one on each dorsal kenozooid between transverse vibices.

DISTRIBUTION. — New Caledonia, northeast of Ouvéa, 245 m.

REMARKS. — This species is remarkably similar to *I. bicuspidatum* in colonial and zooidal morphology, but may be readily distinguished on the basis of the avicularia - those of *I. bicuspidatum* being raised, linguiform, bicuspid, and lacking abfrontally, whereas those of *I. illinguum* are depressed, triangular, and present abfrontally. The species name *illinguum* alludes to the lack of an ovicellular labellum.

Iodictyum trochus sp. nov.

Figs 161-164

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 46, 775 m. — Stn DW 66, 515 m.
MUSORSTOM 6: stn CP 419, 283 m.

TYPES. — *Holotype*: a relatively large flabellate colony fragment preserved in alcohol, from MUSORSTOM 6 Stn CP 419, 20°41.65'S, 167°03.70'E, 283 m, MNHN Bry-19985.

Paratypes: colony fragments from the same locality as the holotype, MNHN Bry-20184; a colony fragment from BIOCAL Stn DW 66, 24°55.43'S, 168°21.67'E, 515 m, MNHN Bry-20084.

DESCRIPTION. — Colony non-pigmented, attaining 28 mm height from a basal stem c. 2.0 mm diameter, branching more or less in one plane, with anastomoses, in a flabellate manner. Branches 2-4 serial, with branch widths ranging from 0.41-1.40 mm. Primary orifice orbicular with no beading. Zooids c. 0.59-0.66 mm long (orifice to orifice) and c. 0.28-0.37 mm wide (internal chamber width c. 0.22 mm), with indistinct boundaries and a lightly textured surface calcification. Each zooid has a single minute pore frontally, usually adjacent to an occasional small oval avicularia that is set transversely. It has thin crossbar and orbicular opesia, and a proportionately larger rostrum with a semicircular palatal shelf. Zooids have long, projecting peristomes with circular orifices. These are striking in appearance, with a circlet of short denticulate ridges inside the rim. The denticles from these ridges vary somewhat in the extent to which they project, but each is acute and directed at angle towards the orifice interior. Beneath the medioproximal pair of denticles a sinus groove, not externally obvious, descends the full length of the peristome to the primary orifice. A rare avicularium may be incorporated into the peristomial rim; this is long and acute, curving with the rim on one side where denticles are lacking; the crossbar is a ridge, with a sunken opesia on one side and an elongate palatal foramen on the other beyond which is a palatal groove. Ovicells difficult to see; set near the bottom of the peristomial tube and largely concealed by secondary calcification. Dorsal branch surface evenly and lightly rugose with smooth depressions and ridges and occasional obliquely set vibices ridges; no abfrontal avicularia.

DISTRIBUTION. — New Caledonia, northwest of Lifou, south of Île des Pins, and Norfolk Ridge, 283-775 m.

REMARKS. — The radiate peristomial openings of this species are particularly striking and are alluded to in the epithet *trochus*, from Greek *trochos*, a wheel. One other noteworthy characteristic of this species is the intimate association of a commensal epibiont, which forms a ramifying stolon along the frontal axis of each branch. The stolons are covered over by zooidal calcification but gaps in this are apparent, along with circular openings, nearly the same size as the small oval avicularia, at zooidal margins. The association between commensal begins immediately after larval settlement. The ancestrula is sac-shaped, with an opesia in the distal half surrounded by a circlet of five short spines. Periancestrula zooids have ramifying calcified tubes closely adherent to them.

A colony fragment from BIOCAL Stn DW 46 doubtfully belongs to this species. The peristome is more expanded distally, the sinus is apparent at the rim, the frontal zooidal surface has polygonal depressions, and frontal avicularia are not apparent.

Iodictyum sp.

Figs 165-166

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 4: stn DW 151, 200 m.

DESCRIPTION. — Colony reticulate, pigmented. Zooids 2-3-serial in trabeculae 0.43-0.57 mm wide. Fenestrae ranging from 1.24-1.36 mm long and 0.73-0.75 mm wide. Frontal shield relatively smooth with 3-5 areolar pores distributed around its surface. Primary orifice with no beading of the distal rim; poster with a broad rounded sinus medially, separated from the anter by a pair of stout condyles. Peristomial rim raised, lacking spines or crenulations, with a conspicuous pseudosinus and short sinus groove flanked and defined inwardly by a pair of stout tubercles. Avicularia of two kinds: a subcircular avicularium on the frontal shield of most zooids, and a larger sublingulate avicularium on the zooids that occur at the proximal end of each fenestra; the avicularium broader proximally, with a subparallel rostrum that has an extensive palate and is truncated at the tip. Ovicells not seen. Frontal calcification conceals the ramifying stolons of symbiotic hydroids; the openings of the erect hydroid stems visible at the edges of zooids as circular holes intermediate in size between areolar pores and the round avicularia. Abfrontal surface of colony fairly smooth, with thin vibices. No avicularia on the inner sides of fenestrae, only the lateral areolar pores of autozooids.

DISTRIBUTION. — New Caledonia, north of Belep Islands, 200 m.

REMARKS. — This species was represented only by a small, infertile fragment, now in two pieces, one of which is gold-coated. It appears to have been transported from shallower water. The overall colour is pale pink but some peristomes give evidence that the colour in life was deep magenta.

It is probable that the species is new, but the fragment lacks ovicells and is too small to name formally.

Genus *RETEPORELLA* Busk, 1884

TYPE SPECIES. — *Reteporella flabellata* Busk, 1884.

REMARKS. — *Reteporella* is here regarded as encompassing the genus *Sertella* Jullien *in* JULLIEN & CALVET, 1903.

Reteporella concinnoides sp. nov.

Figs 167-171

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn CP 108, 335 m.
MUSORSTOM 4: stn DW 231, 75 m.
MUSORSTOM 6: stn DW 421, 245 m.

TYPES. — *Holotype*: an alcohol-preserved colony from BIOCAL Stn CP 108, 22°02.55'S, 167°05.68'E, 335 m, MNHN Bry-19983.

Paratypes: an alcohol-preserved colony, MNHN Bry-19982, and same dried colony fragments, some gold-coated, MNHN Bry-20193, from the same locality as the holotype. Some dried colony fragments, some gold-coated, from MUSORSTOM 4 Stn DW 231, 22°33.70'S, 167°10.50'E, 75 m, MNHN Bry-20192.

DESCRIPTION. — Colony fenestrate, starting more or less evenly calyciform, then developing more on one side while curving inwardly; the two largest colonies attaining a height of 28 mm and a lateral spread of 35 mm. Within-colony variation is apparent between the two stations, with the deeper-water colonies (BIOCAL Stn CP 108) having a more open construction than a colony from MUSORSTOM 4 Stn DW 231. Thus, two sets of measurements follow, with those from the shallower station given first, separated by a slash from those for the deeper station. Fenestral length: 0.69-1.53 mm, averaging 1.18 mm / 0.97-2.43 mm, averaging 2.03 mm. Fenestral width: 0.26-0.74 mm / 0.41-1.33 mm. Trabecular width: 0.41-0.77 mm / 0.35-0.71 mm. Zooid length (orifice to orifice): c. 0.24-0.31 mm / 0.35-0.45 mm. Zooidal boundaries mostly merge, even in developing zooids, though frontal vibices occur occasionally; zooidal frontal calcification smooth though lightly textured, with inconspicuous small sparse tubercles. Primary orifice beaded, the proximal rim obscured by a short broad lyrula. Peristomial orifice with 6 oral spines (up to 8 in a specimen from MUSORSTOM 6 Stn DW 421) in developing zooids; some of these remain even in well-calcified parts of branches. The proximal rim of the orifice has 3-4 parallel ridges, mostly at the opesial end of the small avicularium that is on the frontal side of the peristome. This is acute and generally slightly curved, adjacent to a conspicuous spiraminal pore. Two kinds of avicularia occur frontally on zooids. An occasional large avicularium, originating adjacent to the small labial avicularium, curves across the front of the zooid at an angle. This is acute with an acute mandible, and a long narrow palatal foramen. More numerous small avicularia occur scattered on the front of zooids; these are narrow, acute, and set at various angles. Ovicell generally immersed in secondary calcification, with a short fissure visible frontally that does not extend onto the well-developed, parallel-sided labellum. Abfrontal surface of branches evenly and lightly rugose with sparse vibices; clusters of sunken small acute avicularia occur abfrontally at each end of a fenestra, as well along the inner face of every fenestra adjacent to 2-3 larger elongate avicularia that have conspicuously toothed rostral margins and an irregularly shaped opesia.

DISTRIBUTION. — New Caledonia, Sarcelle Passage and offshore from Yate, 75-335 m.

REMARKS. — *Reteporella concinnoides* is very similar to *R. concinna* (Gordon, 1984), in colonial, zooidal, and peristomial morphology. The obvious distinguishing feature is the form of the large avicularia, those of *R. concinna* having a conspicuously toothed rostrum that projects directly outwards without curving.

Reteporella defensa sp. nov.

Figs 172-175

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 38, 360 m. — Stn CP 108, 335 m.
CHALCAL 2: stn DW 76, 470 m.
MUSORSTOM 6: stn CP 419, 283 m. — Stn DW 421, 245 m.

TYPES. — *Holotype*: a flabellate colony in the form of a horizontal crescent, attached to the substratum, from MUSORSTOM 6 Stn DW 421, 20°26.27'S, 166°40.17'E, 245 m, MNHN Bry-19974, in alcohol.

Paratypes: four colonies from the same station, not shaped like the holotype but in the same container, from the same locality, MNHN Bry-19975-19978. Dried colony fragments from BIOCAL Stn CP 108, 22°02.55'S, 167°05.68'E, 335 m, MNHN Bry-19979; from CHALCAL 2 Stn DW 76, 23°40.50'S, 167°45.20'E, 470 m, MNHN Bry-20078; and from MUSORSTOM 6 Stn CP 419, 20°41.65'S, 167°03.70'E, 283 m, MNHN Bry-20076 and 20180.

DESCRIPTION. — Colony dendroid; in most of the colonies in the collection it is in the form of a horizontal fan, at right angles to the relatively short 'trunk' by which it is attached to the substratum, with the zooidal orifices facing the substratum; only 1 colony grew straight out from the substratum; colony size up to 42 mm high and 36 mm across. The colony has numerous major branches, all in one plane, joined by short cross-connections that have avicularia but no feeding zooids; in the central part of a colony the branches are 0.59-1.40 mm wide, the cross-connections 0.37-0.62 mm wide. Zooids c. 0.63-0.71 mm long (orifice to orifice), the calcareous surface smooth or faintly textured and somewhat undular, with varices roughly indicating zooidal boundaries. Oral spines 6 in developing zooids, with 0-3 being retained in more calcified zooids; these may be simple or bifurcates, or strikingly cervicorn. The proximal rim of the peristome includes a transversely set oval avicularium with a toothed rostrum; subjacent to the opesia is a labial pore. A pair of oral spines or spine bases frequently flanks the avicularium, even in ovicelled zooids. Apart from a few small areolar pores, the frontal shield is well-endowed with avicularia, which are of two kinds. On some zooids are 1-2 small oval avicularia like the peristomial avicularium, usually elevated, with a denticulate rostral rim. Much more common is an elongate boat-shaped avicularium, with an extensive flat palate and raised rims, that occurs in a range of orientations and sizes from quite small to very large, the latter lying diagonally across the entire frontal surface of the zooid; the opesia is narrow and slit-like, the suboval/subtriangular palatal foramen occupies about one-third the length of the palate, with a small pore beyond; the entire avicularium is raised just above the surface of the autozooid, with the low palatal rims each terminating in an upturned point so that there is a gap distally where the rostral tip would be; the mandible does not project beyond the palate. Ovicell cucullate, with a transverse or subcircular apical foramen in the ectooecium, revealing the endooecial tabula beneath; the entire ovicell becoming soon encroached up by secondary calcification from adjacent zooids. Abfrontal surface divided into irregular sectors by vibices; within each sector are several small pores and small to medium-sized avicularia like the frontal boat-shaped ones. The presence of an ectosymbiotic hydroid is evidenced by the calcified tubes (mostly concealed) and tube openings on the frontal sides of branches.

DISTRIBUTION. — New Caledonia, Ouvéa and Lifou Islands, southeastern New Caledonia, and northern Norfolk Ridge, 245-470 m.

REMARKS. — This species is instantly recognisable by its abundant, distinctively shaped avicularia, and cross branches lacking autozooids. Additionally, however, *R. defensa* is characterised by cervicorn oral spines and cucullate ovicells with a tabula, both features being apparently unique in the genus.

Reteporella ferox sp. nov.

Figs 176-178

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 6: stn CP 419, 283 m.

TYPES. — *Holotype*: a single large colony from MUSORSTOM 6 Stn CP 419, 20°41.65'S, 167°03.70'E, 283 m, MNHN Bry-19981.

Paratype: coated fragment from the holotype colony, MNHN-Bry 20081.

DESCRIPTION. — Colony erect, non-fenestrate, with a few main axes from which dichotomous branches arise, attaining 27 mm height. Main stem maximally 1.3 mm across, the smallest branches biserial, 0.36 mm across. Zooids lacking distinct boundaries between them, the overall surface more or less smooth with gentle irregularities and small sparse areolar pores. Occasional larger round pores between zooids presumably belonging to an epibiotic hydroid in life. Peristomial orifices typically with 5 spine bases (2 on one side, 3 on the other) or these obliterated by secondary calcification; internal diameter of orifice 0.11-0.15 mm wide. Proximal rim with a small oval avicularium medially, the cross-bar with tiny processes on each side, the rostral rim with a few denticulations; the peristomial side of the avicularium with a small cusp. Small avicularia scattered sparsely over the frontal surface of the colony, these with a narrowly tapering acute rostrum. Larger avicularia conspicuous near or at the branch margins; these with the opesial area obliterated by calcification and the distal half (most of the rostrum) serrated and down-curved. Ovicells appearing externally as bulges, generally completely covered by secondary calcification; a small part of the endooecial exposure may be visible proximally. The abfrontal surface of the colony like the frontal surface or a little more crinkly, with tiny scattered pores, and some of the small acute avicularia along the margins.

DISTRIBUTION. — New Caledonia, northeast of Lifou, 283 m.

REMARKS. — *Reteporella ferox* is most easily distinguished by the distinctive large lateral avicularia with toothed, down-curved rostra. Where these are common the branch margins appear quite jagged, hence the specific name *ferox*, Latin, fierce.

Reteporella orstomia sp. nov.

Figs 179-180

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 6: stn DW 431, 21 m.

TYPES. — *Holotype*: an alcohol-preserved colony from MUSORSTOM 6 Stn DW 431, 20°22.25'S, 166°10.00'E, 21 m, MNHN Bry-19984.

Paratypes: dried colony fragments from the same locality as the holotype, MNHN Bry-20082 and 20185.

DESCRIPTION. — Colony erect, to 16 mm high, more or less open-branched but with narrow cross-connections that contain few or no autozooids. Branch width near the originally calyciform base of the colony c. 0.93-1.22 mm, reducing to 0.31-0.75 mm in the distal half. Cross-connections are 0.20-0.34 mm thick. Zooids 0.37-0.47 mm long (orifice to orifice), outlined by thin vibices, with faintly textured, smooth frontal calcification in which are a few small pores. Peristome relatively well developed in neanic zooids, especially laterally, and with 1-2 short processes, the height of the peristome becoming reduced as secondary calcification thickens the frontal shield; the proximal rim of the peristome has a median sinus that descends as a slit-like sinus tube. There is no labial avicularium or pore (spiramen). Frontal avicularia of two kinds, both large, absent from some parts of colonies but occurring in clusters in others. One kind projects frontally in the centre of the zooid, with an acute triangular rostrum that is upturned at the tip; the opesia is short and narrow, the palatal foramen relatively large and suboval. The other, slightly sunken, is on one side of the zooid and directed proximally; the opesia and palatal are as in the other avicularium, but the rostrum is subspatulate, narrowing in the middle before expanding distally,

where it is truncate with upturned tips on each side; its mandible is likewise abruptly truncate. There are no small avicularia. Ovicell with a median longitudinal fissure that does not extend onto the labellum which is turned inward somewhat. Abfrontal surface of branches lightly rugose, with thin vibices and scattered small pores, but no avicularia.

DISTRIBUTION. — New Caledonia, Beautemps-Beaupré Atoll north of Ouvéa, 21 m.

REMARKS. — This species is relatively nondescript, but may be distinguished reasonably easily by the presence of two kinds of large frontal avicularium and the complete absence of abfrontal avicularia.

Reteporella sp.

Figs 181-184

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn DW 253, 310-315 m.

DESCRIPTION. — Sole colony fragment 4 mm long, with 2 broken bifurcations; branch width 0.62-0.85 mm. Colony surface, including abfrontally, regularly dimpled. Zooidal boundaries completely obscured. Peristomes slightly raised above frontal surface, somewhat pyriform with a smooth inner rim; interior diameter of peristome 0.094 mm; a median spiraminal pore delimited by a pair of tubercle-like processes that fuse at their tips; no sinus groove or incorporated avicularium. Oral spines not seen. Tiny oval avicularia occur sparsely on the colony surface, with a short stubby ligula on the rostral side of the crossbar. Ovicell mostly concealed by dimpled secondary calcification, the ectooecial surface smooth with a median slit in its frontal face, the labellum truncate with no lateral flanges. No other characters discernible.

DISTRIBUTION. — New Caledonia, off east coast, NE of Thio, 310-315 m.

REMARKS. — Owing to the small size of the colony fragment it is not possible to determine whether the species is reticulate or open-branching. Its dimpled surface invites comparison with the genus *Malleatia* Jullien *in* JULLIEN & CALVET, 1903, characterised by "ponctuations cupuliformes". Apart from the surface sculpturing, particular similarities with *Malleatia rara* include: mostly concealed ovicell with a short slit frontally and short truncate labellum, apparent absence of oral spines, and small round adventitious avicularia. Details of the peristome differ, however, in that *M. rara* has a median suboral avicularium, so that the labial spiramen tube is offset to one side. In this, *M. rara* resembles *Reteporella malleatia* (Gordon, 1984) from the Kermadec Ridge, which also has oral spines. Thanks to the courtesy of Dr Peter J. HAYWARD (University of Wales, Swansea), it is possible to compare the type species of *Reteporella* (*R. flabellata* Busk, 1884) with *Malleatia rara*. His unpublished scanning electron micrographs of *R. flabellata* show that it has an irregularly beaded distal rim like that of *M. rara*, the form of the ovicell is more or less identical, and the frontal shields of both species are umbonuloid (as in some other phidoloporids - pers. obs., DPG). *Reteporella flabellata* lacks a peristomial avicularium, having instead a median or submedian spiraminal opening (so-called labial pore) like that in the present specimen from BIOGEOCAL Stn DW 253. Overall, then, it is apparent that there is no consistent correlation between the presence of frontal-shield dimpling and the characters of the primary orifice and peristome. Both *Malleatia rara* and the present New Caledonian specimen can be included in *Reteporella* Busk.

Genus ***RETEPORELLINA*** Harmer, 1933

TYPE SPECIES. — *Retepora denticulata* Busk, 1884.

Reteporellina cruciformis sp. nov.

Figs 185-187

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 97-92 m.

TYPES. — *Holotype*: parts of a dried single colony from MUSORSTOM 3 Stn DR 117, 12°31.3'N, 120°29.5'E, 97-92 m, MNHN Bry-20080.

DESCRIPTION. — Colony erect, dichotomously branching, the longest fragment 8 mm high. Branches 0.43-0.84 mm wide, the zooids in 3-4 longitudinal rows, 5 before bifurcations. Zooids 0.41-0.45 mm long (orifice to orifice) and 0.20-0.22 mm wide, with a smooth surface and distinct boundaries. Zooidal peristome long and tubular on non-ovicelled zooids, especially the lateral ones, with an spout-like rim. Primary orifice suborbicular, with a beaded distal rim and a small pair of condyles. The inner rim of the peristomial orifice has a median pseudosinus, that descends as a sinus groove down the inside of the spout where it is flanked by a pair of stout tubercles. At a lower level within the peristome, on the distal face, is another pair of stout tubercles. When seen frontally, the two pairs of tubercles, though at different levels and incompletely cruciform, appear to oppose one another. Neanic parts of colonies may consist entirely of zooids lacking ovicells and frontal avicularia. In contrast, mature parts of colonies have clusters of zooids (ovicelled and non-ovicelled) which each have a large, spatula-shaped, labial avicularium. This tends to curve around in front of the peristomial rim and are directed obliquely forward with the palate facing distally. The avicularian opesia is more or less obliterated; the palatal foramen is elongate-oval, and the rostral rim is roundly subtruncate with the outer corners produced slightly, giving a bicuspid appearance. A similar avicularium, more obviously bicuspid, occurs along the outer lateral margin of many zooids, descending the branch with the rostrum pointing proximally, the palate facing laterofrontally. Ovicells recumbent, becoming covered distally by secondary calcification, with a short rounded labellum beyond which the lateral processes curve round almost to fuse proximally; the median fissure does not extend as far as the labellum. Abfrontal side of branches with the lightly cobbled surface crossed by vibices. A moderately large avicularium occurs below most branch axils, raised or flush with the surface.

DISTRIBUTION. — Philippines, Mindoro Strait, 92-97 m.

REMARKS. — *Reteporellina cruciformis* resembles *R. idmoneoides* Harmer, 1934 and the following new species in having projecting peristomes and large labial avicularia, but may be distinguished from both by the cruciform arrangement of internal peristomial tubercles and the shape of the lateral avicularia.

Reteporellina spiramina sp. nov.

Figs 188-191

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn CP 139, 240-267 m.
BIOCAL: stn DW 44, 440 m. — Stn DW 66, 515 m.

TYPES. — *Holotype*: the largest of five dried colony fragments from BIOCAL Stn DW 66, 24°55.43'S, 168°21.67'E, 515 m, MNHN Bry-20085.
Paratypes: dried colony fragments from MUSORSTOM 3 Stn CP 139, 11°53.0'N, 122°14.0'E, 240-267 m, MNHN Bry-20189, and from BIOCAL Stn DW 44, 22°47.30'S, 167°14.30'E, 440 m, MNHN Bry-20047.

DESCRIPTION. — Colony erect, tending to have one main, curving stem from which dichotomous branches arise, the longest fragment c. 11 mm. Branches 0.43-1.01 mm wide, the zooids in 2-3 (mostly 3) longitudinal rows, 4 before bifurcations. Zooids 0.57-0.78 mm long (orifice to orifice) and c. 0.31 mm wide, with a lightly granular-tubercular surface and distinct boundaries. Zooidal peristome projecting, especially on marginal zooids, the rim irregular; the distal rim of the youngest zooids may bear 3 articulated spines whose bases are discernible in many older zooids. In the middle of the proximal rim of the peristomial orifice is the entrance to a spiraminal tube that descends through a narrow ridge down the inside of the peristome. A large labial avicularium, more or less identical to that of the preceding species, occurs with the same orientation and position in front of the peristome of some zooids, both ovicelled and non-ovicelled. A different-shaped large avicularium occurs along the outer lateral margin of many zooids and below branch axils; this is elongate with gently tapering sides and a rounded rostral tip directed proximally; there is a small palatal foramen by the crossbar, a smaller foramen near the rostral tip, with a

palatal shelf in-between. On the side opposite the avicularium is a concavity of the same size that accommodates the folded-back mandible. Ovicells recumbent, becoming covered laterally by secondary calcification, with a narrow labellum onto which the long median fissure extends; lateral processes do not fuse proximally. Abfrontal branch surface granular, with vibices.

DISTRIBUTION. — Philippines, south of Mindoro, 240-267 m. New Caledonia, Île des Pins and northern Norfolk Ridge, 440-515 m.

REMARKS. — The spiraminal tube and shape of the lateral avicularia distinguish *R. spiramina* from the preceding species.

Reteporellina granulosa sp. nov.

Figs 192-193

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 38, 360 m.

TYPES. — *Holotype*: a single, broken, branch fragment from BIOCAL Stn DW 38, 22°59.74'S, 167°15.31'E, 360 m, MNHN Bry-20079.

DESCRIPTION. — Colony erect, branching dichotomously, the sole fragment (now in two pieces) 6 mm long. Branch width 0.48-0.69 mm, the zooids in 2-3 longitudinal rows. Zooids 0.65-0.79 mm long (orifice to orifice), the surface coarsely granular with thin vibices, the zooidal boundaries not clearly delimited. Zooidal peristome projecting only moderately in marginal zooids, tending to be shortened and lost through secondary calcification, the rim somewhat scalloped by short ridges just inside the rim. No labial pore or avicularium; a median sinus groove occurs down the midline. A large avicularium occurs on the front of a number of zooids, ovicelled and non-ovicelled; this is directed proximally or at a slight angle; the rostrum is elongate-triangular with an extensive palate and small, narrow palatal foramen; the opesia is minute, beyond which there is a subtriangular concavity to accommodate the folded-back mandible. A similar avicularium occurs on the abfrontal surface, behind many of the peristomes. Ovicell recumbent, pyriform, becoming covered by secondary calcification; the median fissure is confined almost entirely to the short, triangular labellum, beyond which the long lateral processes converge below. Abfrontal surface coarsely granular with thin vibices.

DISTRIBUTION. — New Caledonia, southwest of Île des Pins, 360 m.

REMARKS. — This species is distinguished particularly by the characters of the ovicellular labellum and frontal avicularium.

Reteporellina projecta sp. nov.

Figs 194-195

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn CP 290, 920-760 m.

TYPES. — *Holotype*: a very small colony fragment from BIOGEOCAL Stn CP 290, 20°36.91'S, 167°03.34'E, 760-920 m, MNHN Bry-20190.

DESCRIPTION. — Colony erect, branching, the zooids more or less in 2 series, with the interpolation of additional zooids just before a bifurcation. Branch width 0.45-0.6 mm between peristomes which project alternately to left and right of the branch axis. Zooidal width (best determined from the abfrontal side) 0.28-0.33 mm. Peristomes of variable length, the median and near-median ones shorter than the lateral ones that extend up to 0.50 mm from the branch surface. Frontal shield and peristomes with a light granular-tubercular texture. Primary orifice lacking beading of the distal rim. Peristomial orifice bordered by 7 spines distally; on the proximofrontal rim a labial suture descends to a labial pore (spiramen). Typically a small oval avicularium near the base of the peristome on the frontal shield; another such avicularium can occur proximally on the shield; these

can later become occluded. No other avicularia seen. Ovicells not present. Abfrontal surface textured like the frontal side, separated from the frontal surface by a thin varix coursing down the outer side of each lateral zooid; with occasional small round avicularia, these tending to be raised slightly above the surrounding surface.

DISTRIBUTION. — New Caledonia, north of Lifou, 760-920 m.

REMARKS. — Although the sole fragment is small and infertile it is very distinctive and easily recognisable among the relatively small number of described species of *Reteporellina*. The distinctive features are peristomial, i.e., strongly projecting, with seven distal spines, and a long labial suture.

Genus ***TRIPHYLLOZOON*** Canu & Bassler, 1917

TYPE SPECIES. — *Retepora monilifera* MacGillivray, 1860.

Triphyllozoon gracile sp. nov.
Figs 196-200

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn DR 117, 92-97 m.

TYPES. — *Holotype*: the largest stem in a welled slide of fragments from MUSORSTOM 3 Stn DR 117, 12°31.3'N, 120°39.5'E, 92-97 m, MNHN-Bry 20049.
Paratypes: the remaining fragments in the same slide, from same locality as holotype, MNHN-Bry 20049.

DESCRIPTION. — Colony erect, branching, the branches slender, minimally 0.41 mm across, widening to 0.85 mm before a bifurcation. Zooids 2-3-serial, c. 0.45-0.52 mm long, the frontal shield sparsely and lightly granular-tubercular, with no obvious boundaries and small sparse areolar pores. Distal rim of primary orifice lacking beading. Peristomial orifice outwardly symmetrical, with a pair of small oval avicularia with denticulate rostral rim flanking a median spiraminal pore; notwithstanding the outward symmetry, a sinus groove descends to one side of an asymmetrical lyrula internally that has a small ala on one side only. Additional small oval avicularia are scattered sparsely on the frontal surface of branches; occasional larger suboval avicularia with parallel sides occur along the outer margins of the most lateral zooids; no spatulate or munitiform avicularia. Ovicells occurring in vertical rows of 3 or more along the branch axis; trilobed stigma with short lateral arms, the median arm ascending to the apex of the ovicell which is submucronate; proximal edge of ovicell truncate with no lateral flanges. Abfrontal surface separated from the frontal surface by a varix coursing along the sides of the most lateral zooids; the surface like that frontally, with numerous similar avicularia, especially the larger ones, occurring with small pores along the outer edges.

REMARKS. — Because the fragments are broken it is not possible to affirm whether the species is open-branching or loosely fenestrate. If it is fenestrate, it must have the largest fenestrae or open appearance of any species. The symmetrical arrangement of peristomial avicularia is very distinctive, allowing for easy recognition of the species.

Superfamily CONESCHARELLINOIDEA Levinsen, 1909

Family LEKYTHOPORIDAE Levinsen, 1909

Genus ***HARPAGO*** Gordon, 1989

TYPE SPECIES. — *Harpago minutus* Gordon, 1989b.

Harpago dissidens sp. nov.

Figs 201-204

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn DW 66, 515 m.

TYPES. — *Holotype*: a single colony from BIOCAL Stn DW 66, 24°55.43'S, 168°21.67'E, 515 m, MNHN-Bry 20036. No paratypes.

DESCRIPTION. — Sole colony somewhat conical in overall shape, the outline broken by the projecting peristomes, 2.04 mm high and potentially (but for broken peristomes) 2.26 mm maximum diameter. Zooids more or less whorled around the colony axis, the zooids in one whorl nearly alternating with those above and below. Zooids somewhat inflated in appearance, tapering to an outwardly projecting tubular peristome. Frontal shield smooth, glabrous, with 4-5 tiny areolar pores along each margin. Primary orifice 0.15 mm long and 0.19 mm wide with a more-or-less V-shaped sinus flanked and defined by a stout .pair of condyles angled across the proximal corners of the orifice. No peristomial or other avicularia. Ovicells large, sac-like, with an extensive smooth tabular area bordered by a low rim and with a pair of pores at the peristomial end of the tabula. At the broad growing apex of the colony is a small central area of ?extrazooidal calcification in which are tiny septular pores.

DISTRIBUTION. — New Caledonian waters: northern Norfolk Ridge, 515 m.

REMARKS. — It is unfortunate that the sole colony lacks the earliest-formed zooids for it is not possible to be certain if it was encrusting or rooted. In its overall form it closely resembles *Harpago minutus*, but lacks the dimpled calcification of that species and, more importantly, has an ovicellular tabula. This latter feature may be adequate for generic distinction from *Harpago*.

Family BATOPORIDAE Neviani, 1900

REMARKS. — The name Batoporidae Neviani, 1900 has priority over Orbituliporidae Canu & Bassler, 1923.

Genus *PTOBOROA* nov.

TYPE SPECIES. — *Batopora pulchrior* Gordon, 1989a.

DIAGNOSIS. — Colony conical to claviform, with a single axial tube proximally. Zooids more or less alternating in whorls with short, laterally projecting peristomes. Primary orifice circular or nearly so, with a broad rounded poster separated from the anter by a pair of angular condyles; with a pore incorporated into the peristomial rim middistally. Adventitious avicularia tiny, suboval with a pair of mandibular pivots, not associated with the peristome. Ovicell prominent, recumbent, the broad endooecium convex, smooth, the ectooecium laterally calcified, frontally membranous.

REMARKS. — When describing *Batopora pulchrior*, GORDON (1989a) suggested that a new genus might be required for this and some other species that do not strictly conform to either *Batopora* Reuss or *Lacrimula* Cook. A new genus is established here, therefore, for *B. pulchrior*, *B.* sp. (D'HONDT, 1986), and the following new species. It differs from the type species of *Batopora* in being claviform and in lacking interzooidal kenozooids, and from the type species of *Lacrimula* in lacking dimorphic orifices and perforated ovicells.

Ptoboroa is an anagram of *Batopora*.

Ptoboroa gelasina sp. nov.

Figs 205-207

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn KG 101, 1790 m.

TYPES. — *Holotype*: unique colony from BIOCAL Stn KG 101, 21°26.51'S, 166°24.43'E, 1790 m, MNHN-Bry 20038. No separate paratypes.

DESCRIPTION. — Sole colony claviform, comprising a club-like dilatation of autozooids tapering to a narrow axial tube; colony length 1.28 mm, dilatation width 0.92 mm, internal diameter of axial tube 0.11 mm. Entire colony surface dimpled, with reticulate patterning, zooidal boundaries not evident and areolar pores tiny, sporadic. Primary orifice circular, the broad rounded poster occupying the proximal third, separated from the anter by a small pair of condylar ridges angles proximally. Peristomial rim low, with a circular pore middistally. Adventitious avicularia tiny, sparsely distributed, the rim nearly circular, the rostral and opesial areas separated by a pair of mandibular pivots. Ovicells not present.

REMARKS. — The unique holotype specimen is very similar to the type species, *Ptoboroa pulchrior* comb. nov. in most respects. One difference, apart from the dimpled colony surface, is that the axial tube is simple and hollow, whereas in *P. pulchrior* it has internal radial partitions, the significance of which is unknown.

Family CONESCHARELLINIDAE Levinsen, 1909

Genus *CONESCHARELLINA* d'Orbigny, 1852

TYPE SPECIES. — *Conescharellina angustata* d'Orbigny, 1852.

Conescharellina breviconica Canu & Bassler, 1929

Figs 208-211, 214

Conescharellina breviconica Canu & Bassler, 1929: 491, pl. 69, figs 10-17, text-figs 206 G-H, 207 G.

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn CP 87, 191-197 m. — Stn CP 100, 189-199 m. — Stn CP 101, 194-196 m. — Stn CP 102, 192 m. — Stn CP 106, 640-668 m.

DESCRIPTION. — Colony conical, the cone becoming proportionately higher as the colony grows, such that in young colonies the base exceeds the height by c. 15% and in old colonies by c. 10%; the largest colony 3.09 mm diameter and 3.00 mm high. Zooidal orifices arranged quincuncially, their peristomes projecting only around the periphery of the base where they appear as truncated cones. Colony surface with a light granular-tubercular texture, the ridges between peristomes rounded, somewhat tubercular apically in small colonies. Zooidal dimensions as measured at the flat colony base: c. 0.62 mm × 0.20 mm (small colony) to 0.77 mm × 0.40 mm (largest colony). Primary orifice ranges from 0.10-1.66 mm × 0.084-0.13 (small colony) to 0.13-0.19 mm × 0.11-0.17 (largest colony); shape suborbicular, the proximal margin broadly or roundly V-shaped, flanked by a small pair of condyles that may be lacking in some colonies (presumably because of abrasion), set within a smooth thin peristomial rim. Small sparse areolar pores occur between orifices. Avicularia suborbicular, occurring between orifices in interzooidal areas, though not with consistent regularity, with a thin, near-median cross-bar that is often broken. Colony base nearly flat, comprising an outer row of radially arranged autozooids surrounded a "cancellate" (kenozooidal) area that is proportionately smaller (30% of diameter) in the smallest colonies than in large colonies (42-56% of diameter).

DISTRIBUTION. — Central Philippines between 10° and 14°N, 58-969 m.

REMARKS. — This species has not been described since its introduction and so is redescribed here. CANU & BASSLER (1929) gave bottom temperatures for two of the *"Albatross"* stations at which this species occurred, citing 14.3°C at 216 m and 10.4°C at 969 m.

Conescharellina catella Canu & Bassler, 1929

Figs 212-213, 215

Conescharellina catella Canu & Bassler, 1929: 485, pl. 68, figs 8-10, text-fig. 206 C-D. — Harmer, 1957: 732, pl. 47, fig. 5, text-fig. 70 B.

Material examined. — **Philippines**. Musorstom 3: stn CP 100, 189-199 m. — Stn CP 102, 192 m. — Stn DR 117, 92-97 m.
New Caledonia. Biogeocal: stn KG 316, 1660 m.

Distribution. — East of Korea, Sea of Japan, Philippines, Indonesia, 35-421 m; Loyalty Islands, 1660 m.

Remarks. — The present material matches very well the descriptions of Canu and Bassler (1929) and Harmer (1957), except that the radial zooidal rows are slightly oblique in some of our specimens. Our material typically also shows a slight ligulation of the avicularian cross-bar, not mentioned by the previous authors. The largest colony in the collection (from Musorstom 3 Stn CP 102) was 2.89 mm high and 2.64 mm basal diameter. A colony from Biogeocal Stn KG 316 occurred in much deeper water than previously recorded. It resembles the other material except for the lack of avicularia between some of the orifices.

This species is one of several that have zooidal orifices opening along the longitudinal ridges ("costules", in the terminology of Canu and Bassler, 1929), separated by furrows in which there are avicularia. This species is particularly characterised, however, by its offset ovicells that are produced to one side of the ridge and lie partly across a furrow. This character is shared by other species, including *C. striata* Silén, 1947 and *C. brevirostris* Silén, 1947. It is likely that ovicellular displacement is a generic-level character but, at this stage of our knowledge, in the apparent absence of correlated characters, it is not possible to be certain. Ovicells are usually lacking from conescharellinid colonies, but ovicellular displacement can be inferred from the position of the pore, distal to the peristomial orifice, from which ovicells are produced, the pore also being displaced. Notwithstanding, a colony from Biogeocal Stn KG 316 has some of these pores in a median position while others are displaced.

Conescharellina atalanta sp. nov.

Figs 216-218

Material examined. — **New Caledonia**. Musorstom 4: stn DW 149, 165 m. — Stn DW 150, 110 m.

Types. — *Holotype*: colony from Musorstom 4 Stn DW 149, 19°07.60'S, 163°22.70'E, 165 m, MNHN-Bry 20099, gold-coated.
Paratypes: 16 ethanol-preserved colonies from Musorstom 4 Stn DW 150, 19°07.50'S, 163°22.10'E, 110 m, MNHN-Bry 20019.

Description. — Colony a low cone, wider (2.59-3.45 mm) than high (1.43-2.28 mm), the zooidal orifices distributed in subregular radial rows between which are avicularia. Orifices 0.066-0.104 mm diameter, distinctly smaller towards the apex, with thin, fragile condyles defining a U-shaped sinus. Avicularia subcircular to ovoid 0.058-0.094 mm long, with thin, complete cross-bars; avicularia overlapping the autozooidal orifices in size such that, in an eroded colony with orificial condyles and avicularian crossbars lacking, it may be difficult discriminating between orifices and avicularia. Basal surface with an extensive cancellate area occupying 61-70 % of the basal diameter, surrounded by a relatively narrow zone of autozooidal walls. Tiny oval avicularia 0.037 mm long present inside the rims of several cancellae, the cross-bar complete.

Distribution. — New Caledonia, near Belep Islands, 110-165 m.

Remarks. — The species name is derived from the Greek *atalantos*, equal in weight or equal to, alluding to the near similarity in size of orifices and frontal avicularia.

Key characters to look for in quickly discriminating this species from others of the genus are the overlap in dimensions of zooidal orifices and frontal avicularia in combination with the large cancellate area basally.

Genus *TROCHOSODON* Canu & Bassler, 1927

TYPE SPECIES. — *Trochosodon linearis* Canu & Bassler, 1927.

Trochosodon sp.

Figs 219-220

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn KG 275, 1959 m. — Stn CP 317, 1630-1620 m.

DESCRIPTION. — Colony small, comprising a small, somewhat flattened, central subdiscoidal area 1.11 mm across (minimum colony diameter) composed primarily of 4 autozooids with concave peristomial openings; between each pair of peristomes another, projecting, autozooid and peristome may occur, depending on the stage of growth; width of zooidal projection at the point where it projects from the central area c. 0.37-0.43 mm. Entire colony surface granular-tubercular. Primary orifice with a small U-shaped sinus delimited and flanked by a small pair of condyles. Adapical surface with tiny rootlet pores and suborbicular avicularia, the latter 0.094 mm long with complete cross-bars.

DISTRIBUTION. — New Caledonia: South Loyalty Basin, 1620-1959 m.

REMARKS. — This tiny species is probably new but additional material is needed before it can be properly characterised.

Genus *CRUCESCHARELLINA* Silén, 1947

TYPE SPECIES. — *Cruceschareilina japonica* Silén, 1947.

Cruceschareilina japonica Silén, 1947

Figs 221-223

Cruceschareilina japonica Silén, 1947: 44, text-figs 28-31, pl 1, figs 11-12.

MATERIAL EXAMINED. — **Philippines**. MUSORSTOM 3: stn CP 106, 640-668 m.

DISTRIBUTION. — Kyushu, Japan, 175 m. Central Philippines, 640-668 m.

REMARKS. — A single colony 7 mm maximum length occurred in the collection. This appears to be only the second colony known of the species. It is well preserved and accords in every detail with SILÉN's (1947) description and illustrations, except that the expanded ends of the branches are slightly less expanded than in SILÉN's specimen. The Japanese colony was obtained from a shallower depth, with a recorded bottom temperature of 13.7°C.

Cruceschareilina jugalis Gordon, 1989a, from New Zealand, differs primarily in lacking crescentic kenozooidal openings ('lunoecia'); the primary orifice is proportionately narrower, the avicularian cross-bars are slightly thicker, and there are no elongate avicularia. *Cruceschareilina decussis* (Canu & Bassler, 1929), from the Philippines and Indonesia, has a more regular colony form with narrower branches, the mandibles of the large avicularia are more spatulate, the peristomial margins can vary in shape, and lunoecia, if present, are rare.

Crucescharellina aster sp. nov.

Figs 224-227

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL: stn KG 210, 1190 m. — Stn KG 211, 975 m. — Stn CP 232, 760-790 m. — Stn CP 260, 1820-1980 m. — Stn KG 262, 1380 m. — Stn KG 267, 1935 m. — Stn CP 317, 1630-1620 m.

New Zealand. NZOI: stn F874, 1357 m. — Stn F879, 1267 m. — Stn U198, 1573 m.

TYPES. — *Holotype:* a large colony from BIOGEOCAL Stn KG 267, 21°02.20'S, 166°58.76'E, 1935 m, MNHN-Bry 20096.

Paratypes: two gold-coated colonies from BIOGEOCAL Stn CP 232, 21°33.81'S, 166°27.07'E, 760-790 m, MNHN-Bry 20091. Three colonies from NZOI Stn F879, 37°25.50'S, 177°30.00'E, 1267 m, registration no. P-1089.

DESCRIPTION. — Colony stellate, in the form of a 6-rayed star, the longest radius of which is 3.81 mm (tip of "arm" to centre of colony); "arms" biserial, the zooids alternating; "arm" width at midlength 0.50-0.64 mm. Colony surface granular-tubercular in the centre, smooth elsewhere. Zooid length 0.71-0.79 mm, measured from peristome to peristome. Primary orifice and operculum suborbicular, c. 0.14 mm wide, with a median U-shaped sinus defined and flanked by a pair of condyles. A median pore distally from which ovicells (not seen) presumably bud. Small circular avicularia scattered sparsely on both colony surfaces, 0.037-0.047 mm diameter, with complete cross-bars. Small rootlet pores of the same diameter present centrally on the "apical" surface.

DISTRIBUTION. — New Caledonia, 760-1980 m. New Zealand, 1267-1573 m.

REMARKS. — This is a very striking species. When large numbers occur in a sample the overall visual effect is one of clusters of snowflakes. The regularly stellate colony form immediately distinguishes this species from the others in the genus.

DISCUSSION

A total of 98 species of ascophorine bryozoans is herein recorded, mostly from the infraorder Lepraliomorpha as defined by GORDON (1989a), of which 10 species occurred only at Philippine stations. The most speciose families are: Phidoloporidae, 19 species; Smittinidae, 9 species; Celleporidae, 8 species; and Porinidae, Siphonicytaridae and Conescharellinidae, 6 species each. The most speciose genera are *Siphonicytara* (6 species), *Characodoma*, *Iodictyum*, and *Reteporella* (5 species each), and *Haswelliporina* and *Reteporellina* (4 species each). Of the 84 species occurring in New Caledonian waters it is striking how many are endemic to the area - 57 species (68%). Ten species are shared only with New Zealand (*Parasmittina erecta*, *Oppiphorina epaxia*, *Haswelliporina multiaviculata*, *Riscodopa parva*, *Gigantopora oropiscis*, *Onchoporoides moseleyi*, *Yrbozoon ringens*, *Buffonellaria regenerata*, *Galeopsis mimicus*, *Crucescharellina aster*) (especially in deeper water and along the Kermadec Ridge), 4 species are shared only with the Philippines (*Hemismittoidea ennea*, *Haswelliporina quinaria*, *Reteporellina spiramina*, *Conescharellina catella*), and 13 others have a wider Indo-Pacific distribution.

The diversity of *Siphonicytara* species is quite striking. Only 5 extant species of this distinctive genus have been described previously: one Malagasy, one Philippine, the remainder Indonesian. The New Caledonian fauna more than doubles the number of species.

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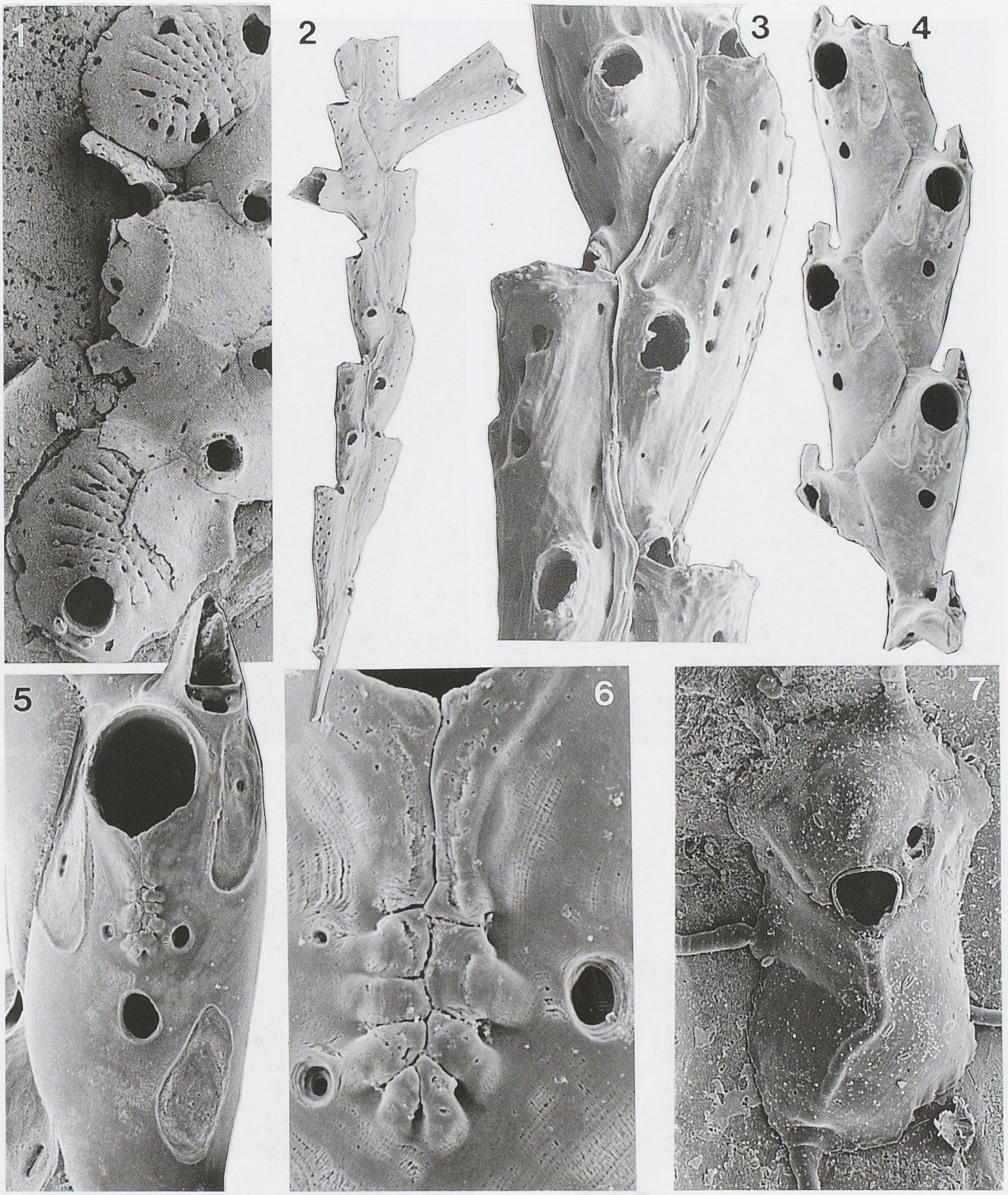
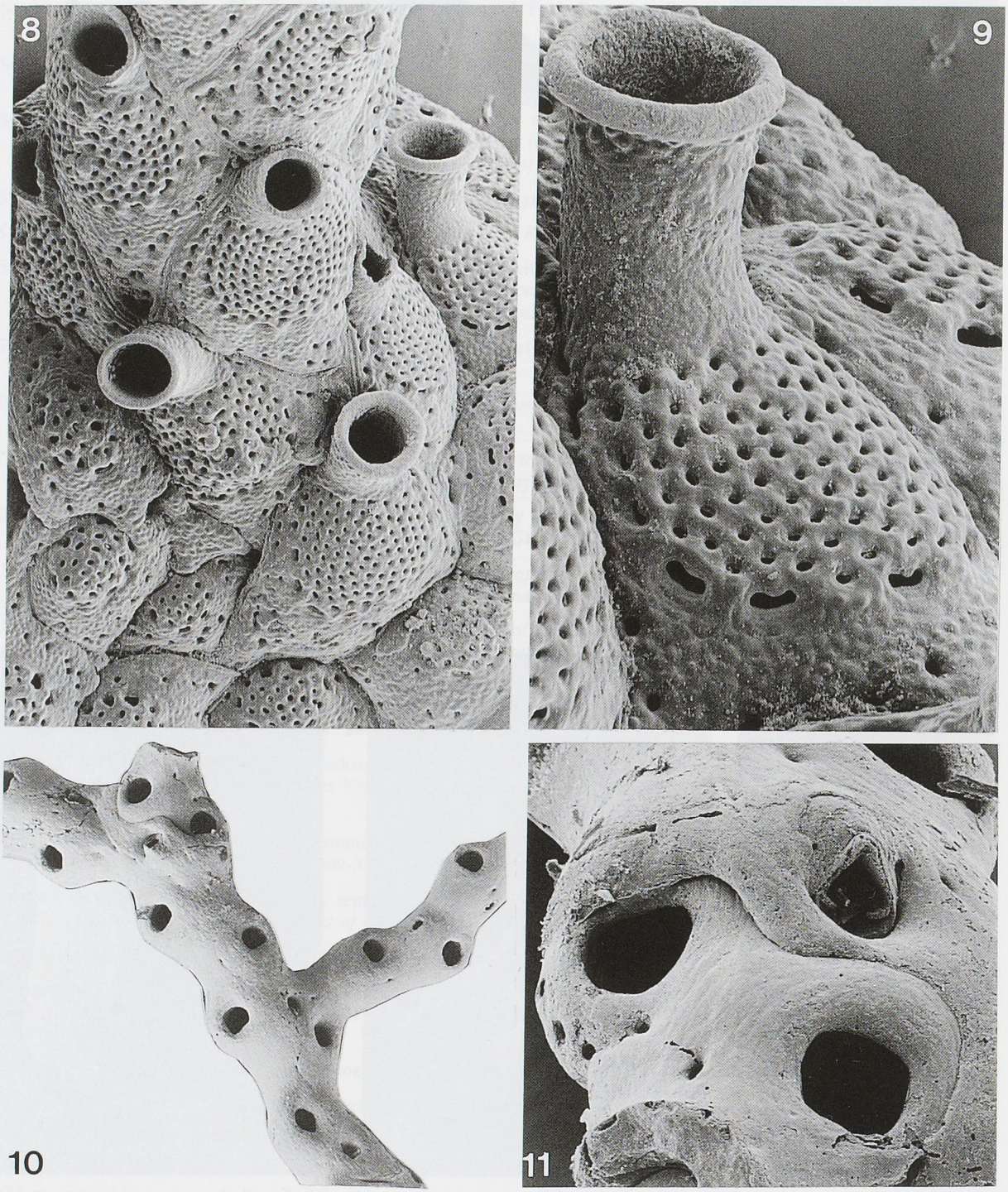


FIG. 1. — Indeterminate cribrilinid ancestrulae, partially overgrown by zooids of *Buffonellodes crosnieri* sp. nov. (x 47). BIOCAL Stn DW 33.

FIGS 2-3. — *Domosclerus* sp.: **2**, Lateral view of small colony (x 28). **3**, Same (x 112). BIOGEOCAL Stn KG 210.

FIGS 4-6. — *Bryosartor ?sutilis* Gordon & Braga: **4**, Single broken segment (x 53). **5**, Single zooid (x 140). **6**, Costal field of a different zooid (x 496). BIOGEOCAL Stn CP 260.

FIG. 7. — *Hippothoa calciophilia* Gordon (x 153). BIOCAL Stn CP 84.



FIGS 8-9. — *Xynexecha pulchra* sp. nov.: **8**, Base of colony, showing kenozooids and the beginning of an erect cylindrical stem (x 94). **9**, A single zooid, with its distinctive frontal-shield morphology and spout-like peristome (x 179). BIOCAL Stn CP 108.

FIGS 10-11. — *Kladapheles gammadeka* Gordon: **10**, Branching colony fragment (x 25). **11**, Oral view of orifices and an avicularium (x 103). BIOGEOCAL Stn DW 307.

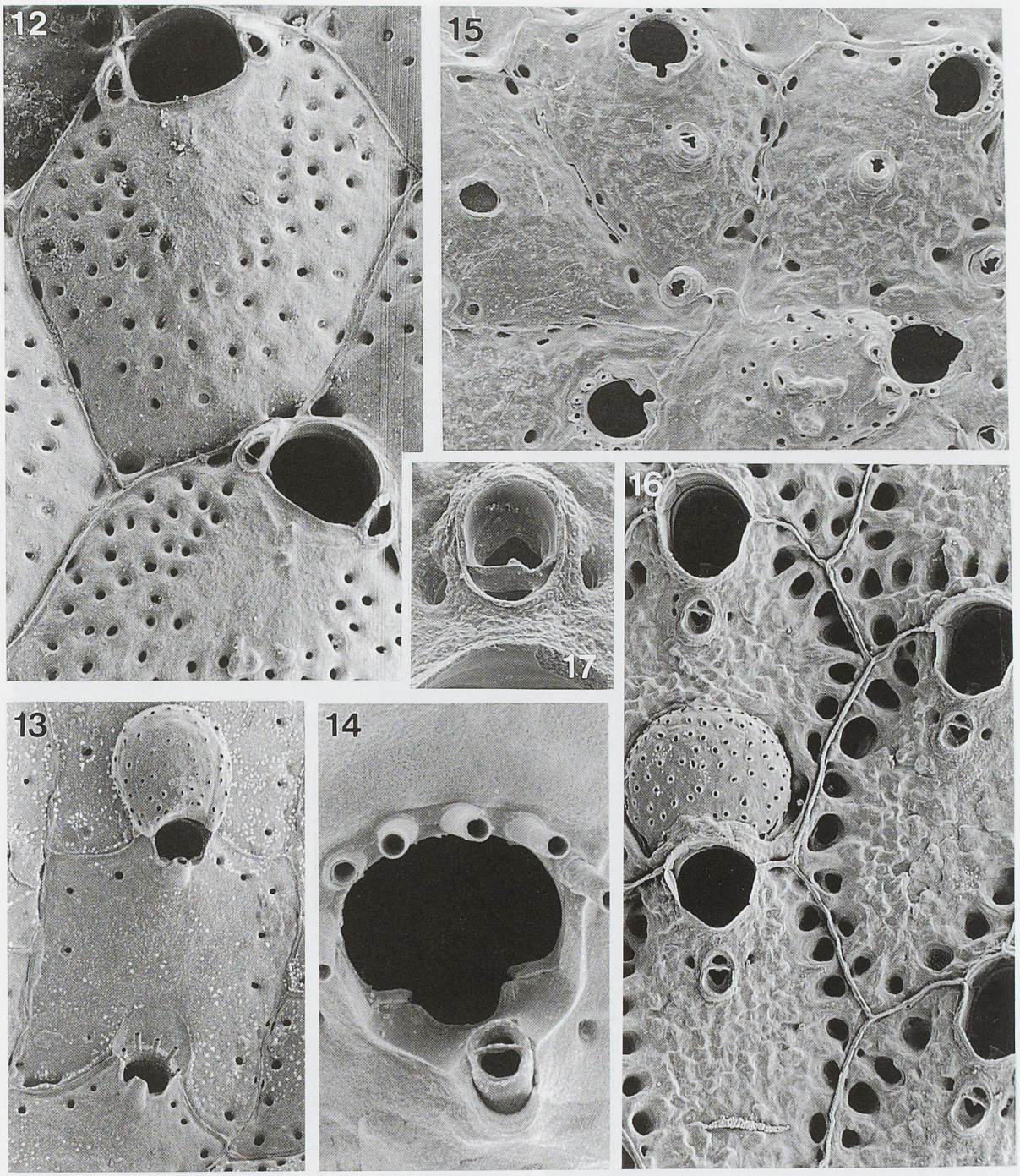
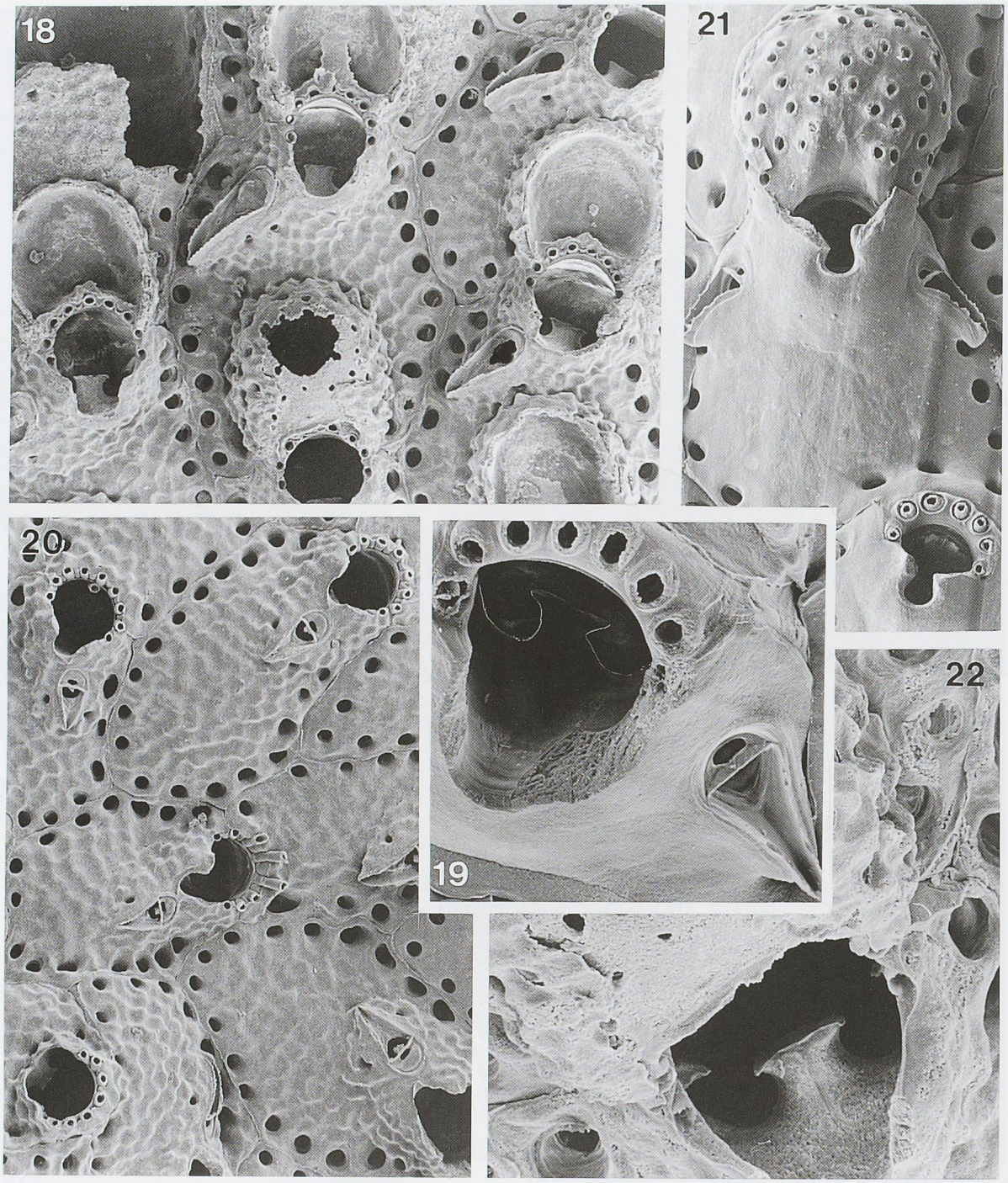


FIG. 12. — *Hippothyris caledonica* sp. nov. (x 70). BIOCAL Stn DW 82.

FIGS 13-14. — *Parkermavella fidelis* sp. nov.: **13**, Ovicelled zooid (x 52). **14**, Autozooidal orifice (x 265). MUSORSTOM 6 Stn CP 419.

FIG. 15. — *Parkermavella minuta* sp. nov.: Several zooids; ovicell at lower right (x 134). BIOCAL Stn DW 65.

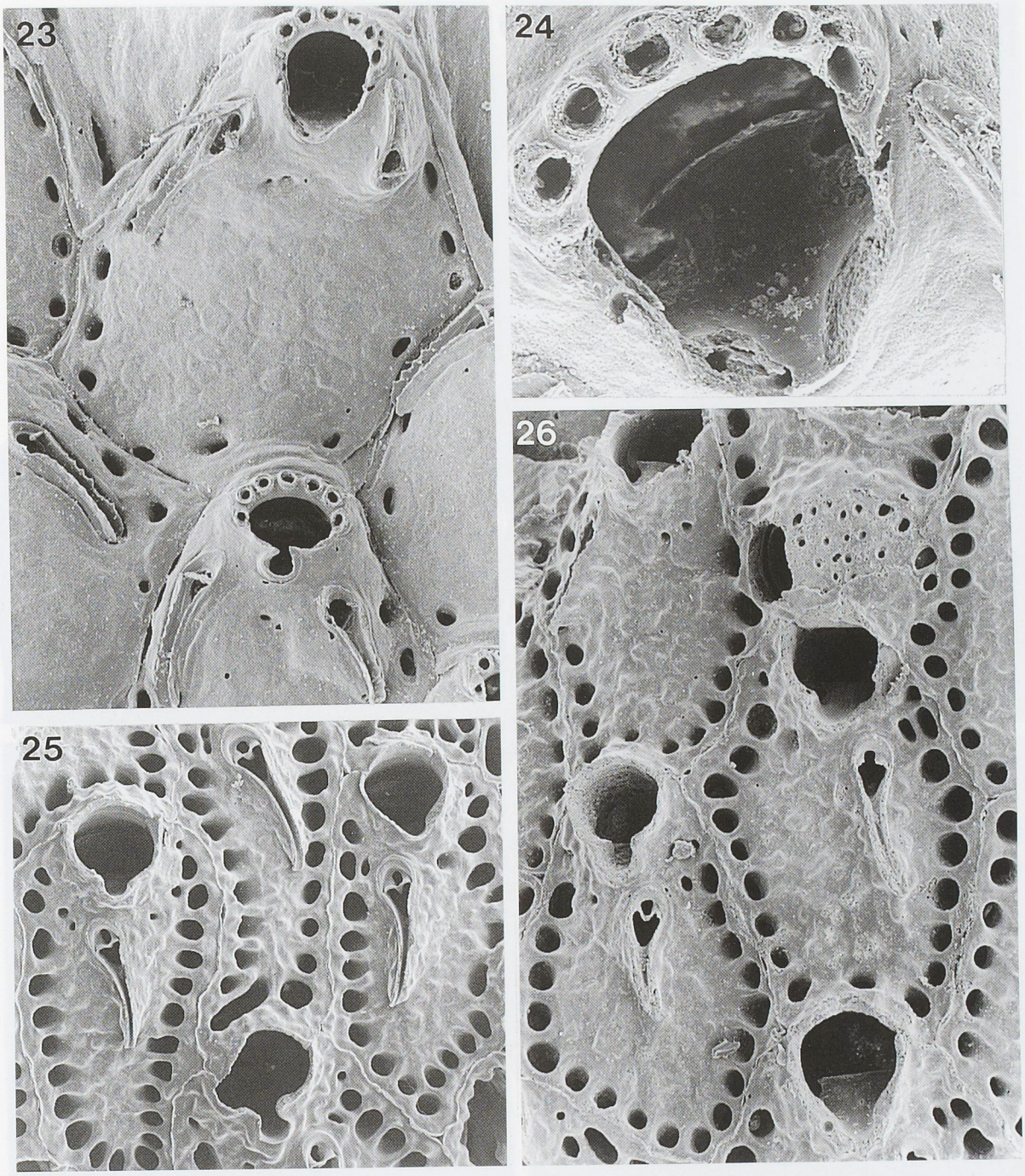
FIGS 16-17. — *Smittoidea maunganuiensis multiporosa* ssp. nov.: **16**, Several zooids, one ovicelled (x 56). **17**, Oral view of avicularium (x 215). MUSORSTOM 6 Stn CP 419.



FIGS 18-19. — *Hemismittoidea ennea* sp. nov.: **18**, Ovicelled zooids (x 98). **19**, Primary orifice and lyrula of ovicelled zooid (x 289). BIOCAL Stn DW 66.

FIG. 20. — *Hemismittoidea ?ennea*: Part of infertile colony (x 98). MUSORSTOM 3 Stn DR 117.

FIGS 21-22. — *Parasmittina glabra* sp. nov.: **21**, Ovicelled zooid (x 137). **22**, Primary orifice and lyrula (x 289). BIOCAL Stn DW 66.



FIGS 23-24. — *Parasmittina ?glabra*: **23**, Autozooids showing disposition of avicularia (x 103). **24**, Primary orifice with lyrula (x 347). BIOCAL Stn DW 66.

FIGS 25-26. — *Parasmittina marginata* (Canu & Bassler): **25**, Autozooids showing characteristically curved avicularia (x 88). **26**, Ovicelled zooid (x 109). MUSORSTOM 3 Stn DR 117.

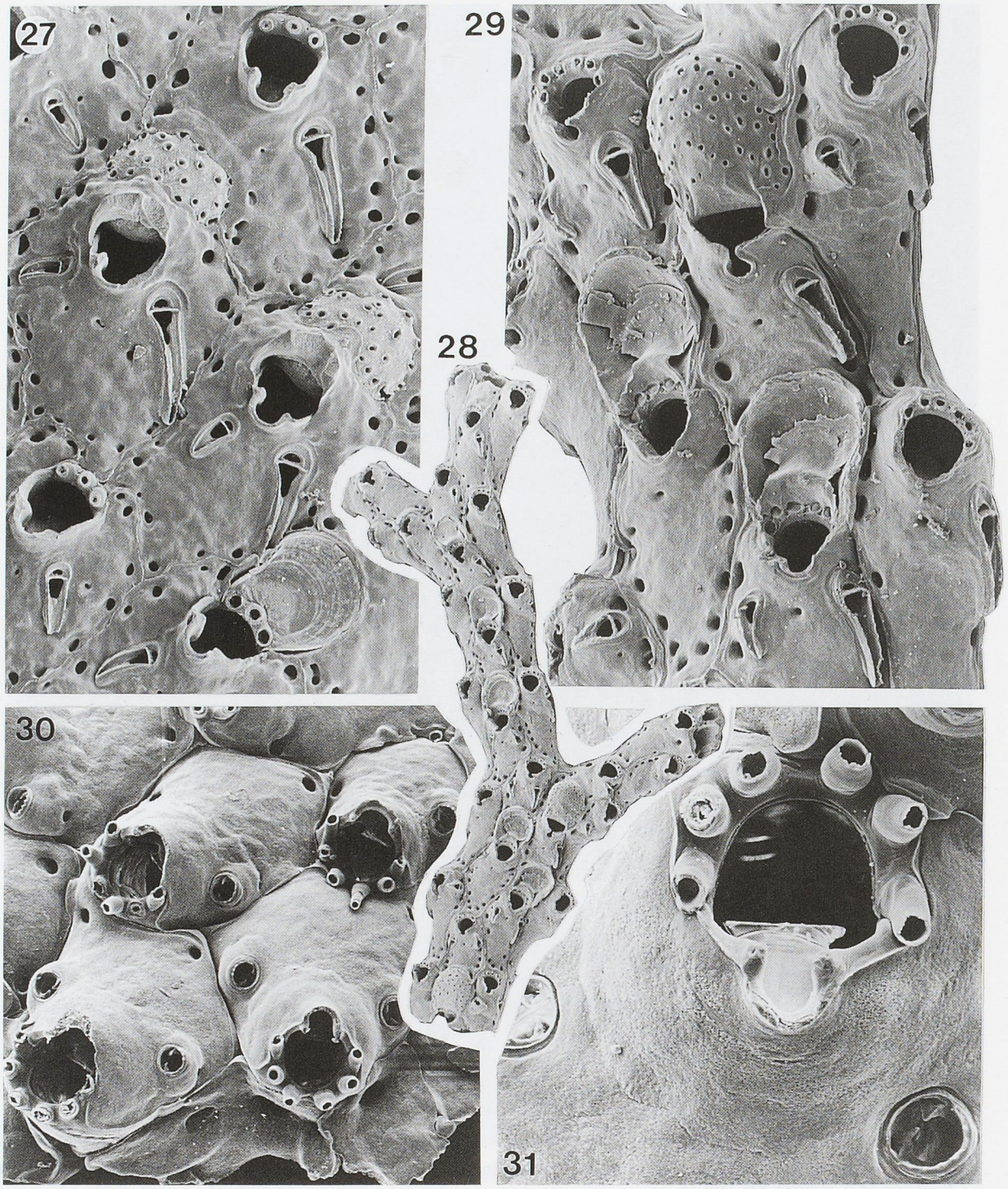
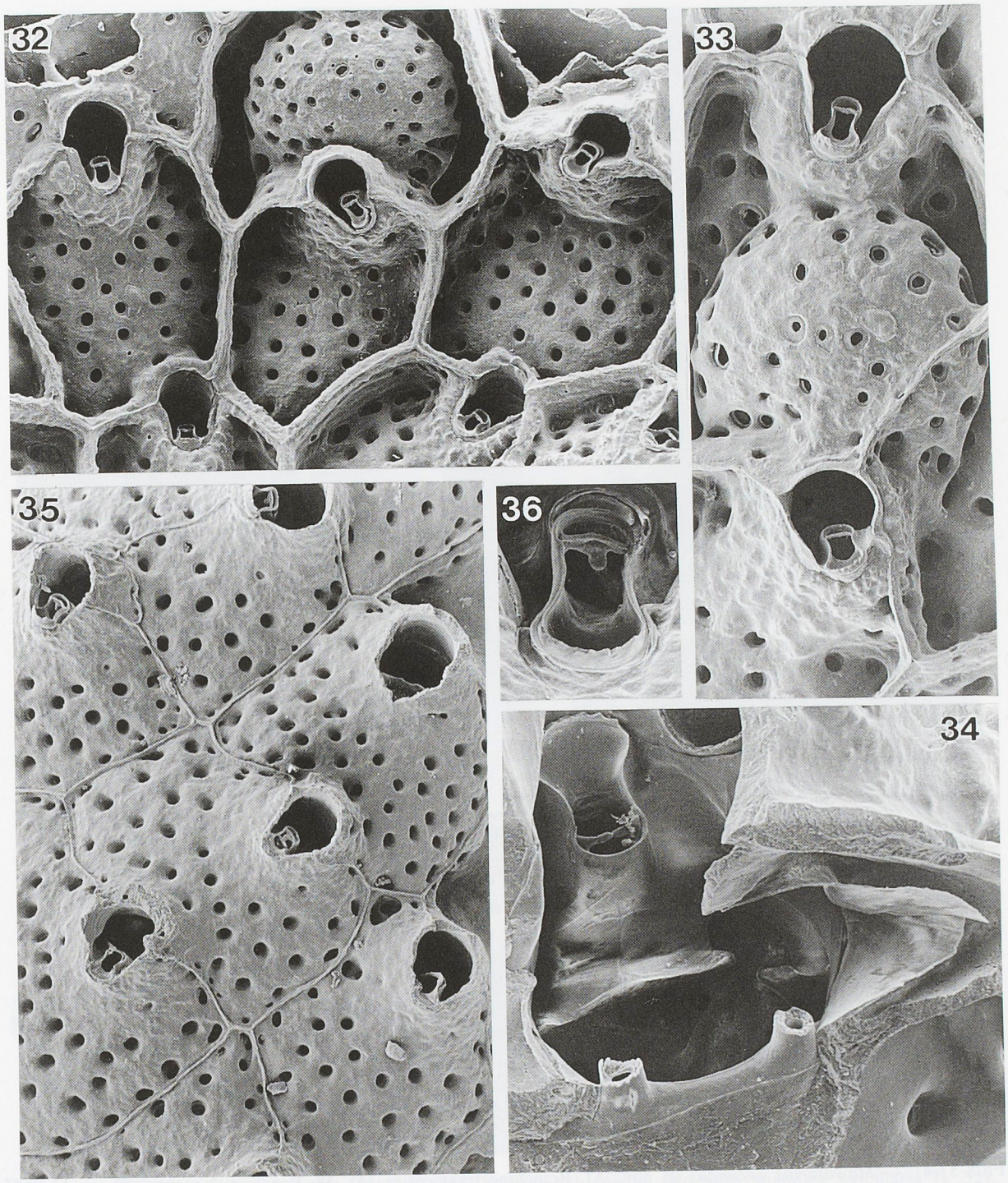
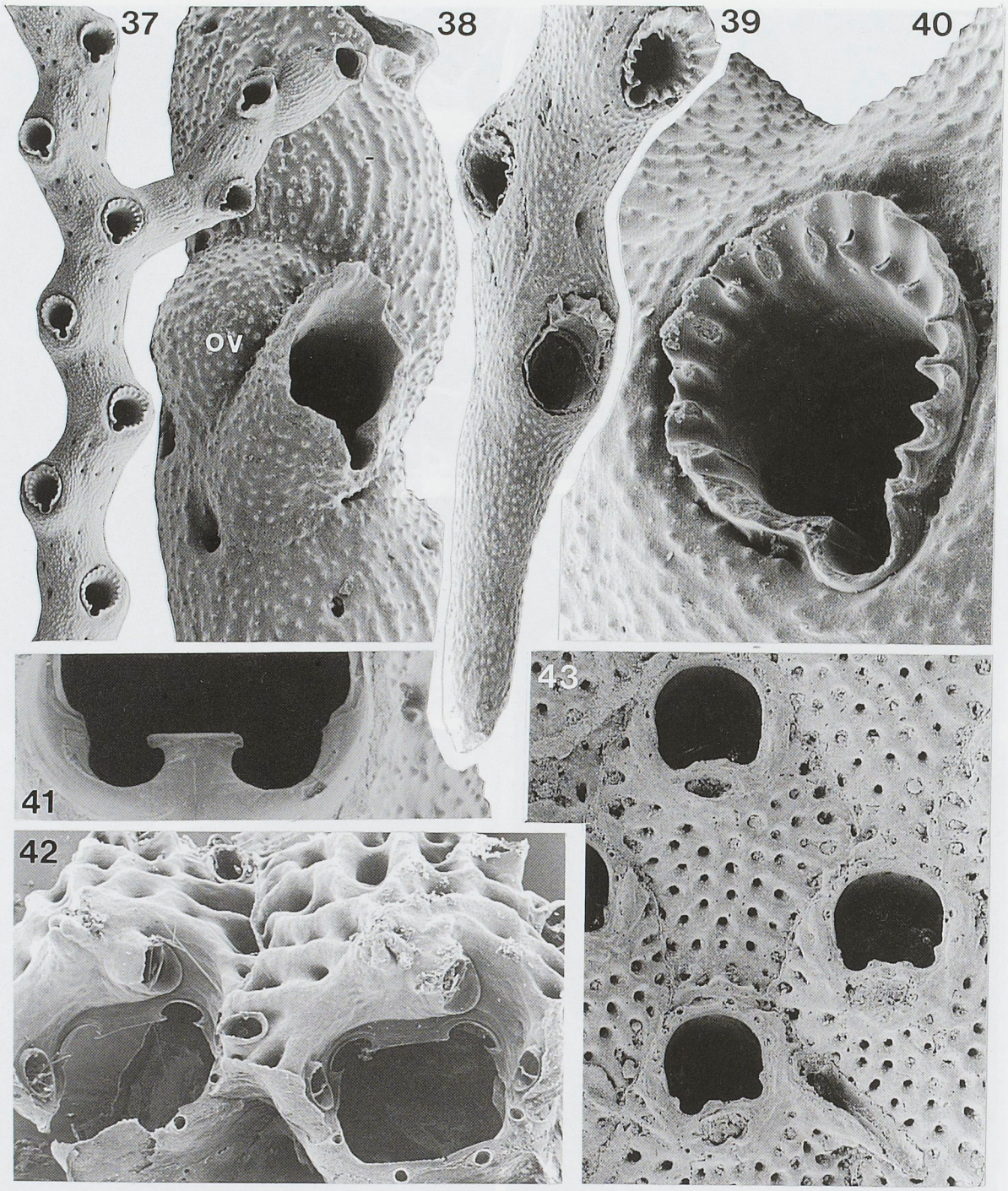


FIG. 27. — *Parasmittina serrula* Soule & Soule: Autozooids and ovicelled zooids (x 107). MUSORSTOM 3 Stn DR 117.
FIGS 28-29. — *Parasmittina erecta* sp. nov. **28**, Branching fragment (x 19). **29**, Group of zooids proximal to the lower bifurcation in fig. 28 (x 76). BIOCAL Stn DW 66.
FIGS 30-31. — *Parasmittina* sp.: **30**, Oral view of autozooids (x 149). **31**, Orifice (x 370). MUSORSTOM 3 Stn DR 117.



FIGS 32-34. — *Smittina asymmetrica* sp. nov.: **32**, Ovicelled zooid and autozooids (x 54). **33**, Close-up of another ovicell (x 97). **34**, Orifice of ovicelled zooid showing a pair of spine bases (normally concealed), part of broken ovicell (at right), lyrula, and suboral avicularium (x 221). BIOCAL Stn DW 66.

FIGS 35-36. — *Smittina abyssicola* (Harmer): **35**, Several autozooids (x 72). **36**, Close-up of suboral avicularium with ligulate cross-bar (x 304). BIOCAL Stn CP 84.



FIGS 37-41. — *Mawatarius secundus* sp. nov.: **37**, Branching fragment (x 26). **38**, Peristomial region of an ovicelled (ov) zooid (x 109). **39**, Ancestrula region of colony (x 61). **40**, Peristomial orifice (x 221). **41**, Lyrula of primary orifice (x 243). BIOCAL Stn DW 66.

FIG. 42. — *Mucropetraliella philippinensis* (Canu & Bassler): Primary orifices of two autozooids (x 54). BIOCAL Stn KG 22.

FIG. 43. — *Mucropetraliella serrata* (Livingstone): Partly eroded autozooids (x 47). MUSORSTOM 4 Stn DW 151.

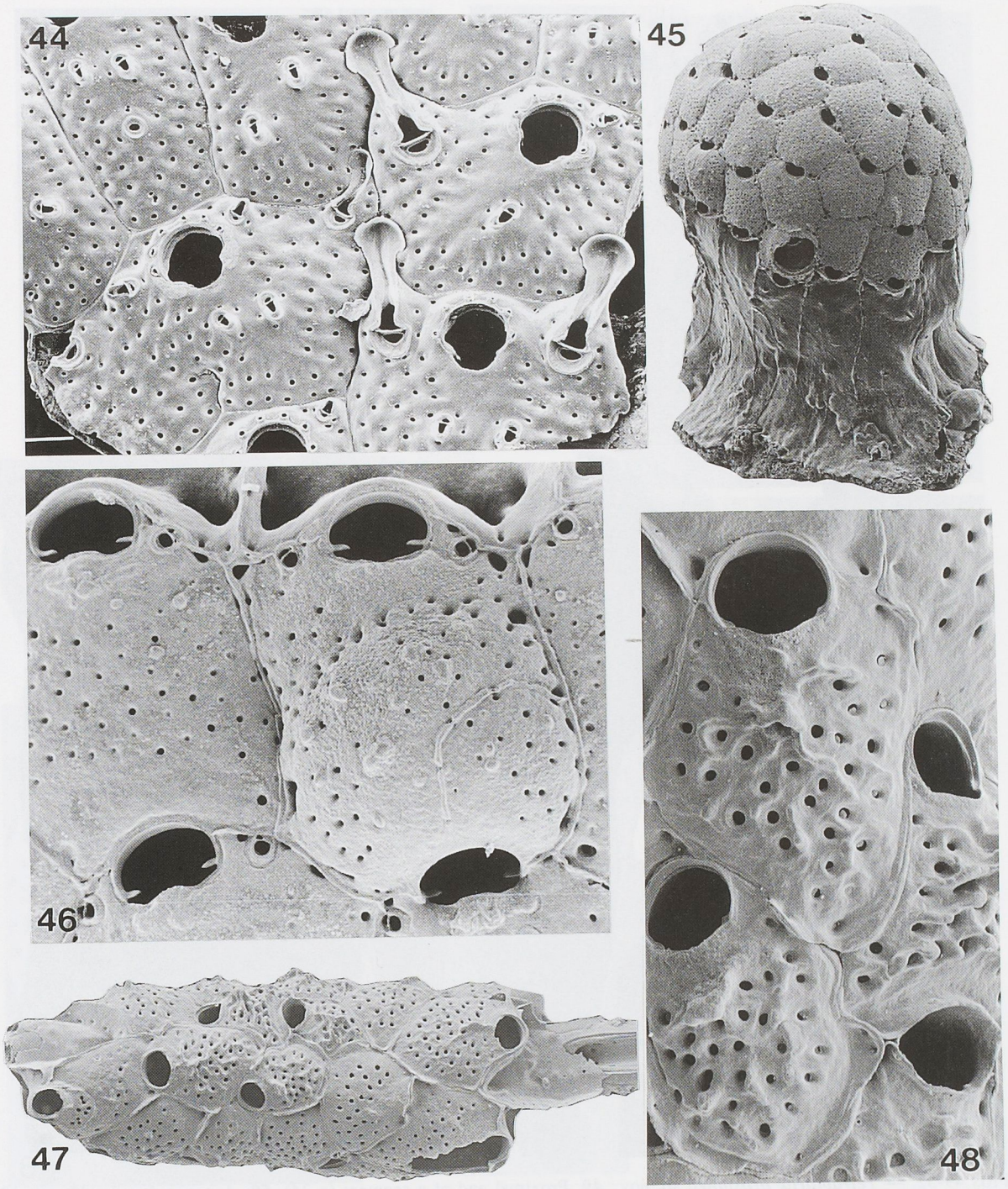
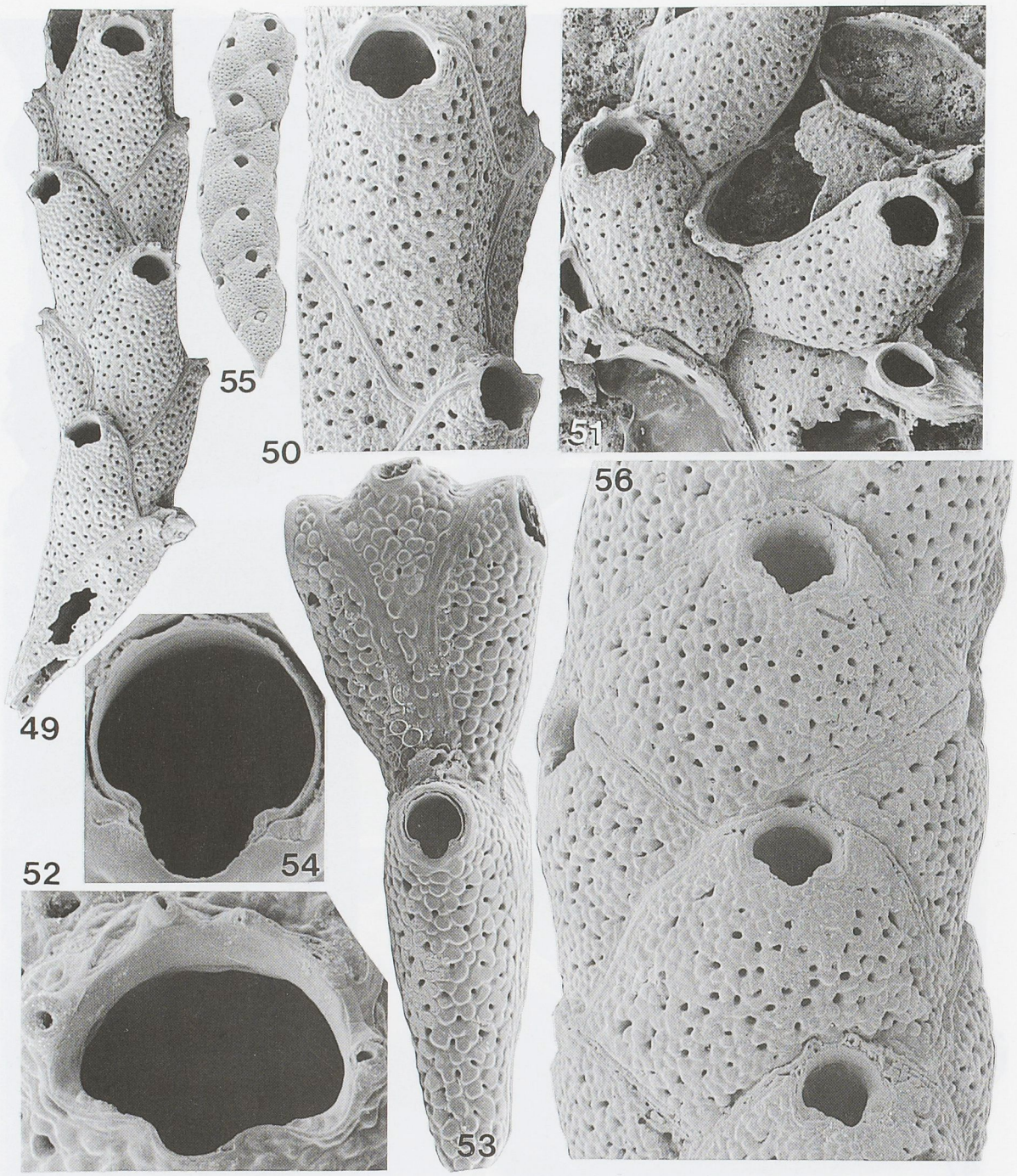


FIG. 44. — *Hippomenella avicularis* (Livingstone): Several autozooids, two with spatulate avicularia (x 52). MUSORSTOM 4 Stn DW 231.

FIGS 45-46. — *Emballotheca rara* sp. nov.: **45**, Whole colony (x 13). **46**, Autozooids and ovicell (x 74). BIOCAL Stn DW 46.

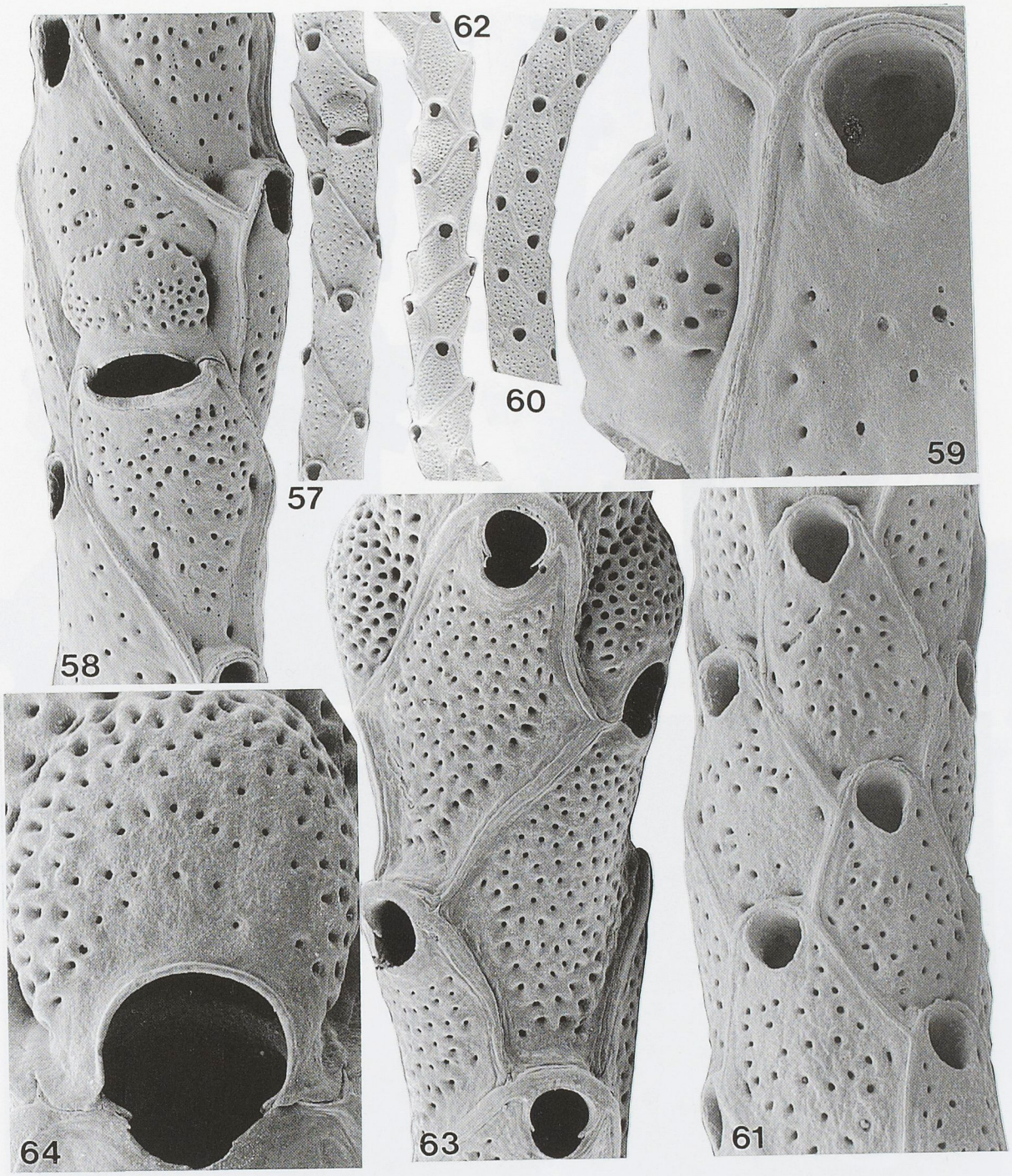
FIGS 47-48. — *Calyptotheca* sp.: **47**, Tiny colony on a branch of the cheilostomate bryozoan *Nellia tenella* (Lamarck) (x 47). **48**, Same, close-up of some autozooids (x 156). MUSORSTOM 4 Stn DW 187.



FIGS 49-52. — *Tetraplaria orospinea* sp. nov.: **49**, Proximal end of a segment (x 34). **50**, Autozooid and orifices with spine bases (x 52). **51**, Encrusting zooids at colony base (x 54). **52**, Autozooidal orifice with spine bases (x 215). BIOGEOCAL Stn CP 232.

FIGS 53-54. — *Tetraplaria ventricosa* (Haswell): **53**, Segment of opposite and decussate zooids (x 75). **54**, Orifice (x 311). MUSORSTOM 3 Stn DR 117.

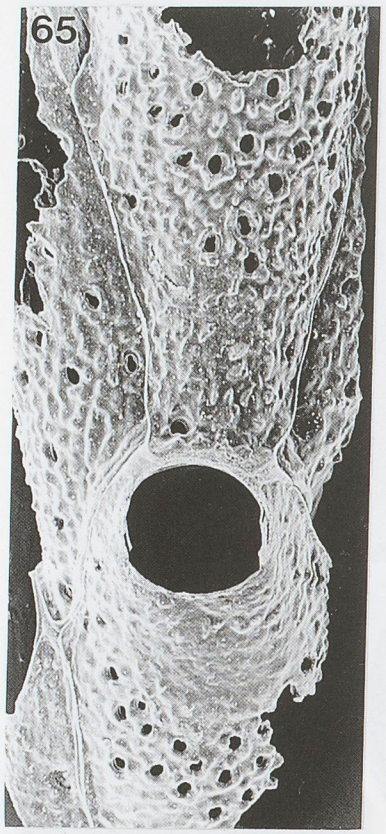
FIGS 55-56. — *Tetraplaria* sp.: **55**, Segment (x 13). **56**, Arrangement of zooids in segment (x 78). BIOCAL Stn DW 38.



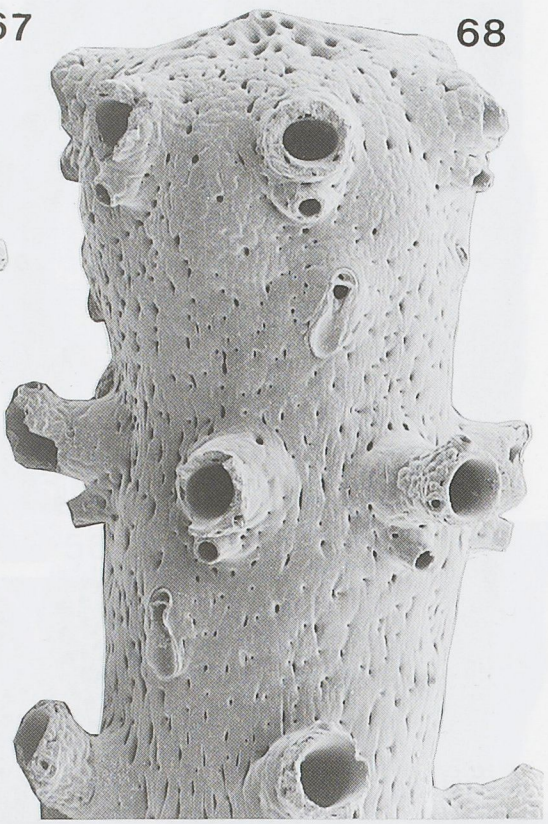
FIGS 57-59. — *Phorioppnia cookae* sp. nov.: **57**, Part of erect stem (x 13). **58**, Ovicelled zooid and skewed distal autozooid (x 44). **59**, Autozooidal orifice and profile of ovicell (x 105). BIOGEOCAL Stn DW 253.

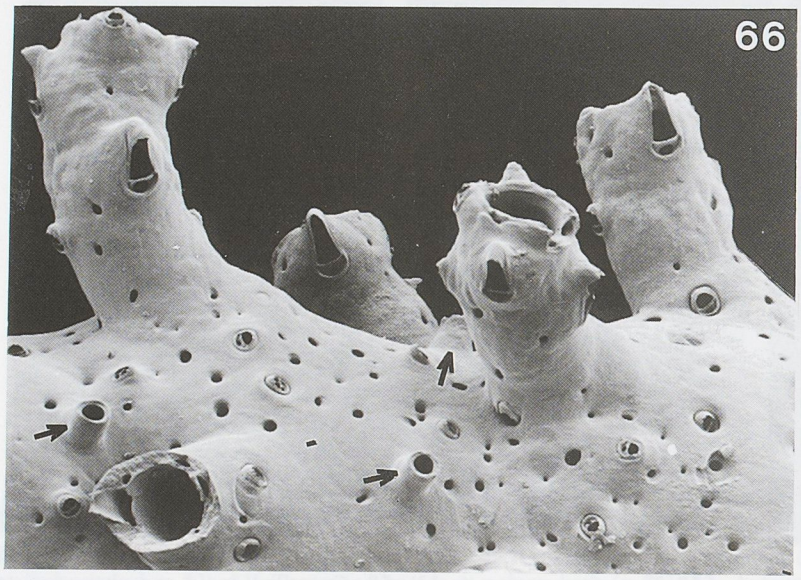
FIGS 60-61. — *Phorioppnia nova* sp. nov.: **60**, Part of erect stem (x 13). **61**, Close-up of zooids (x 56). BIOCAL Stn DW 38.

FIGS 62-64. — *Oppiphorina epaxia* (Gordon): **62**, Part of erect stem (x 13). **63**, Autozooids and profiles of two ovicells (x 62). **64**, Ovicelled orifice (x 145). BIOCAL Stn DW 66.









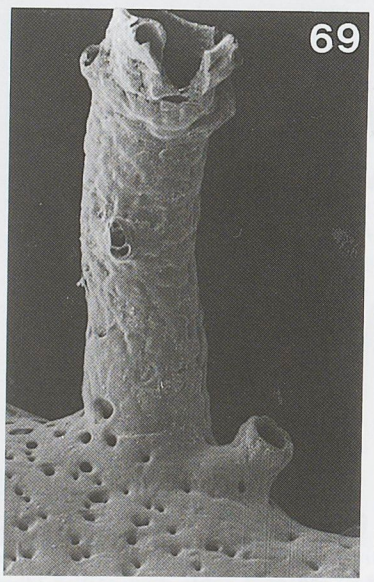


FIG. 65. — Genus and species indet.: Part of erect stem (x 101). BIOGEOCAL Stn KG 275.

FIG. 66. — *Haswelliporina multiaviculata* (Gordon): Profile of zooidal peristomes; spiramen tubes arrowed (x 78). BIOCAL Stn CP 75.

FIGS 67-68. — *Haswelliporina vaubani* (d'Hondt): **67**, Part of erect stem (x 18). **68**, Stem apex (x 56). MUSORSTOM 4 Stn DW 185.

FIG. 69. — *Haswelliporina quinaria* sp. nov.: Profile of peristome and spiramen tube (x 94). MUSORSTOM 6 Stn CP 419.

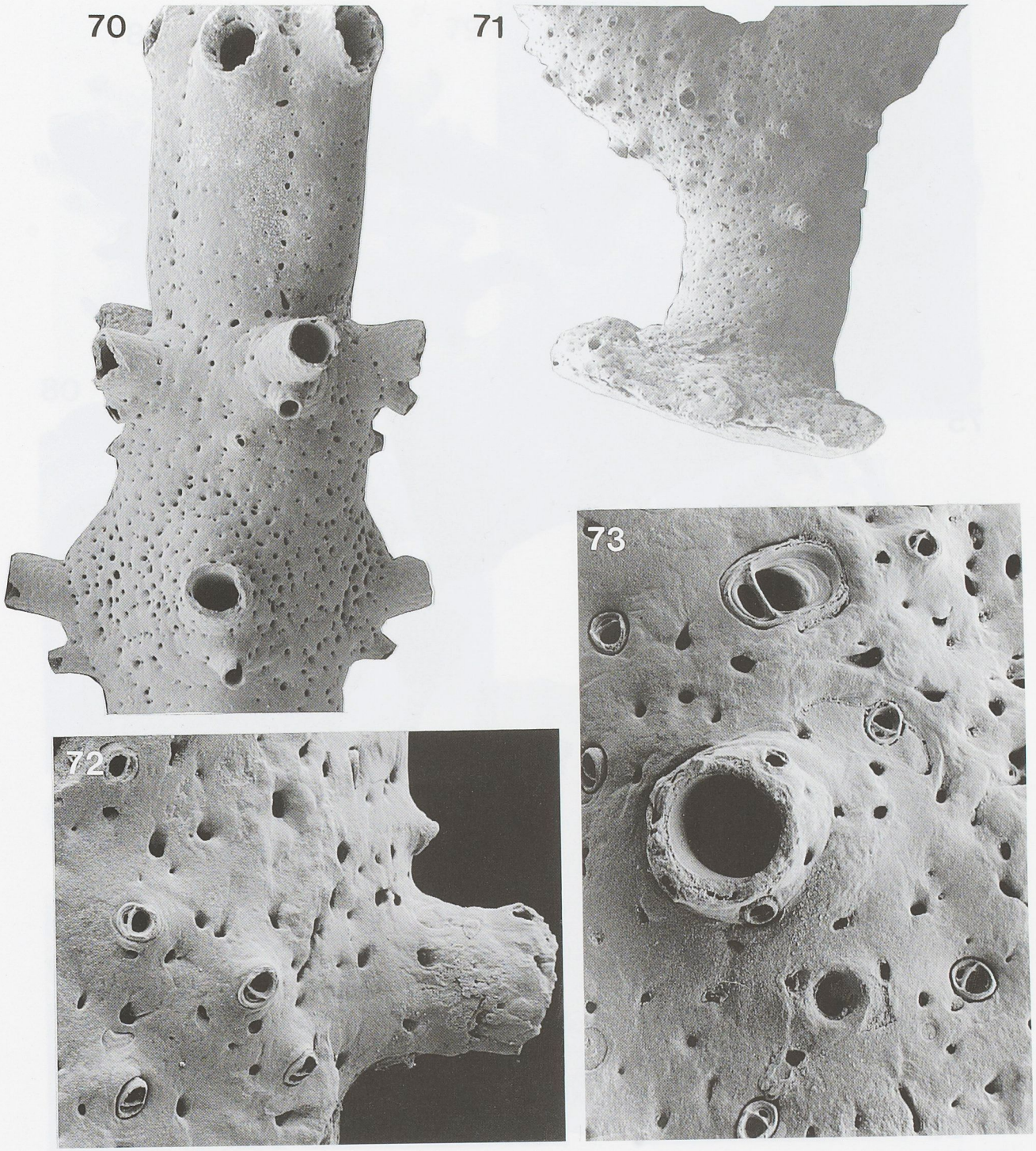


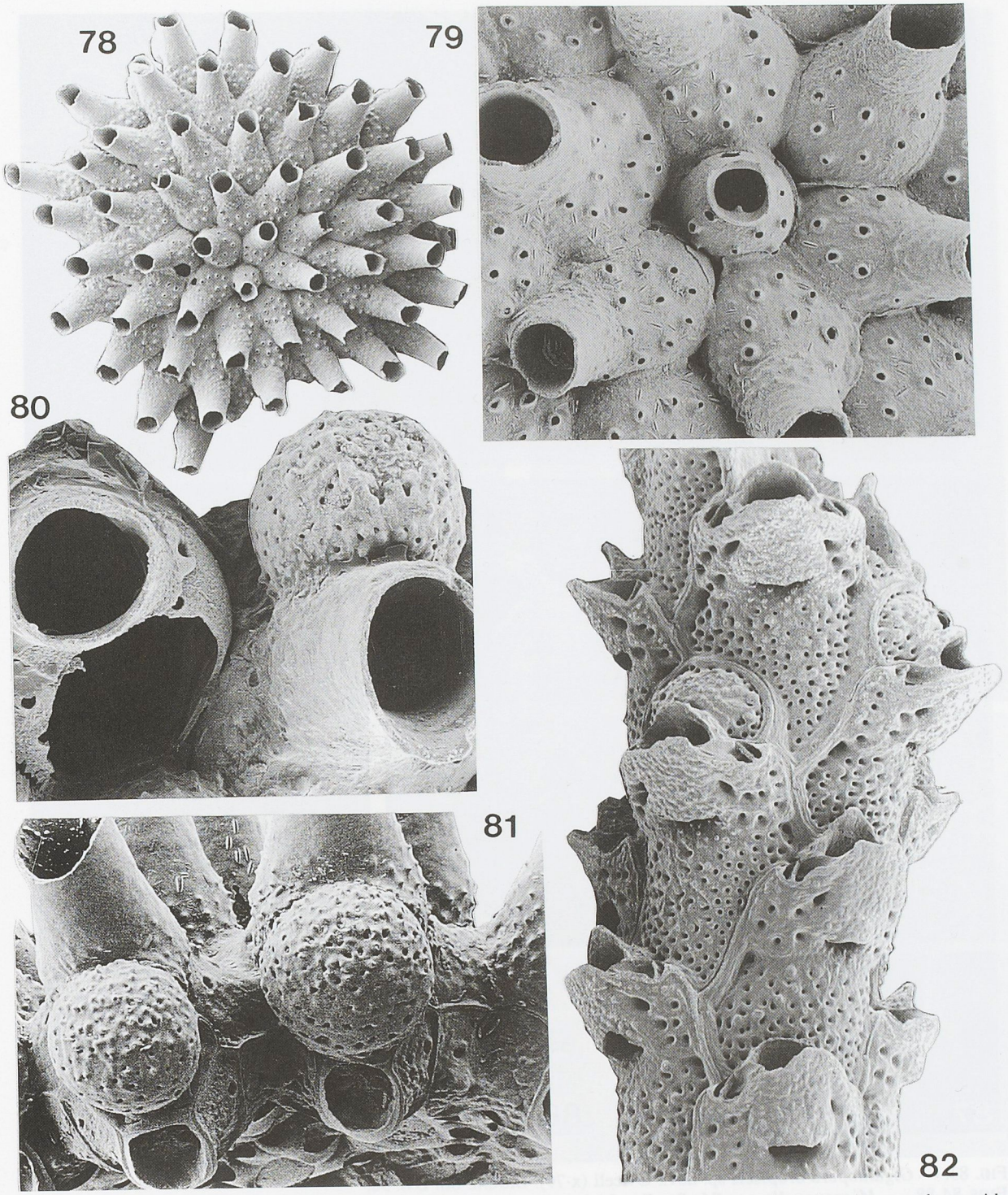
FIG. 70. — *Haswelliporina quinaria* sp. nov.: Distal part of stem, the lowest whorl of zooids ovicelled (x 55). MUSORSTOM 6 Stn CP 419.

FIGS 71-73. — *Haswelliporina ?venusta* (Harmer): **71**, Part of erect stem (x 13). **72**, Lateral view of peristome (x 106). **73**, Frontal view of peristome, spiramen, and two sizes of avicularia (x 106). ESTASE 2 Stn DR 07.



FIGS 74-75. — *Mosaicoporina uniserialis* sp. nov.: **74**, Portion of colony (x 27). **75**, Individual zooid (x 86). BIOCAL Stn DW 66.

FIGS 76-77. — *Semihaswellia umbrella* sp. nov.: **76**, Disposition of zooids (x 29). **77**, Ovicell (ov) (x 56). BIOCAL Stn DW 08.



FIGS 78-81. — *Actisecos regularis* Canu & Bassler: **78**, Whole colony (x 16). **79**, Ancestrula and periancestrular zooids (x 58). **80**, Primary orifice and ovicell (x 131). **81**, Laterobasal view of ovicells and distal pore-chambers (x 81). MUSORSTOM 3 Stn DR 117.

FIG. 82. — *Gigantopora oropiscis* sp. nov.: Part of erect stem, including ovicelled zooids (x 34). BIOCAL Stn DW 38.

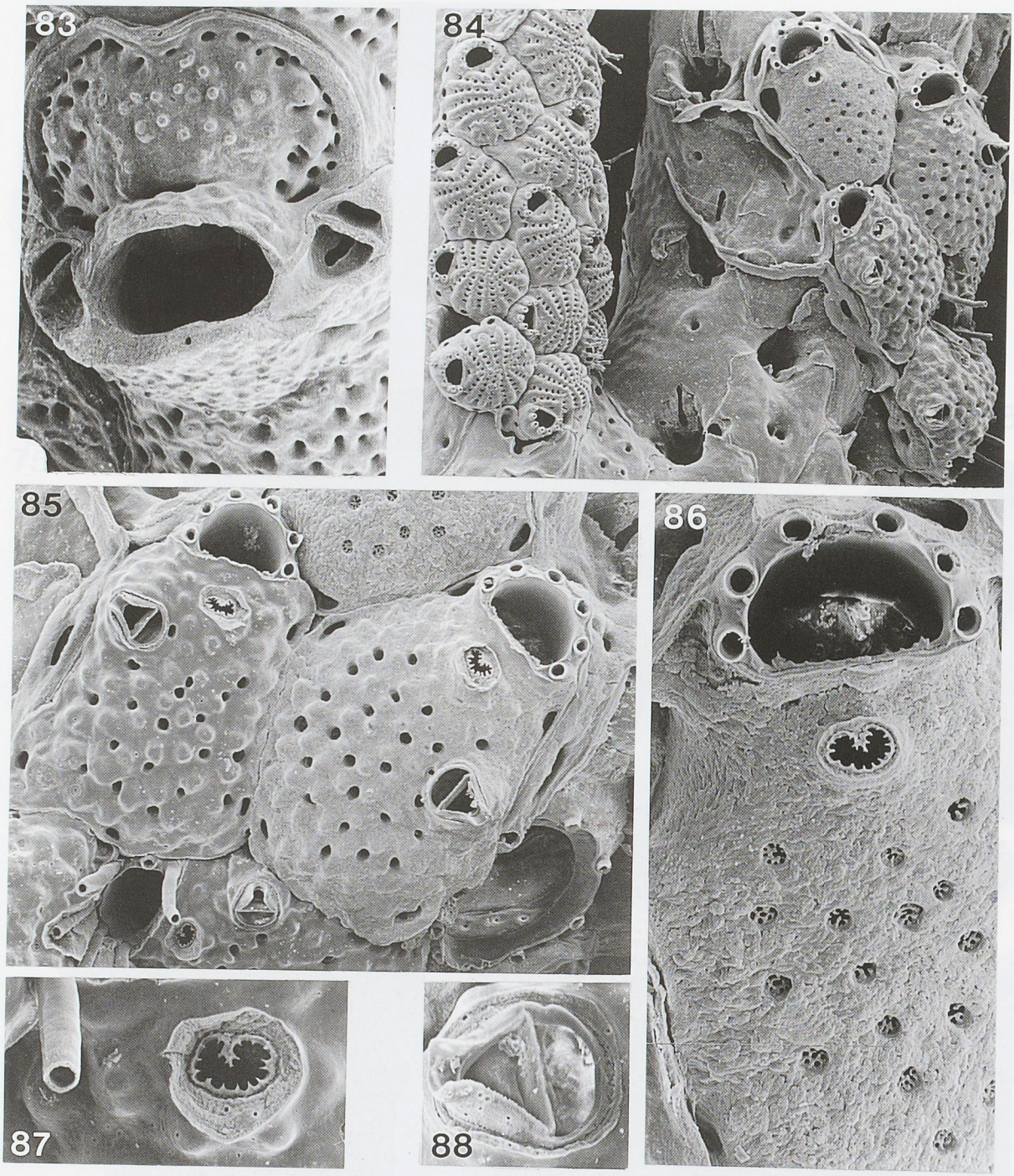
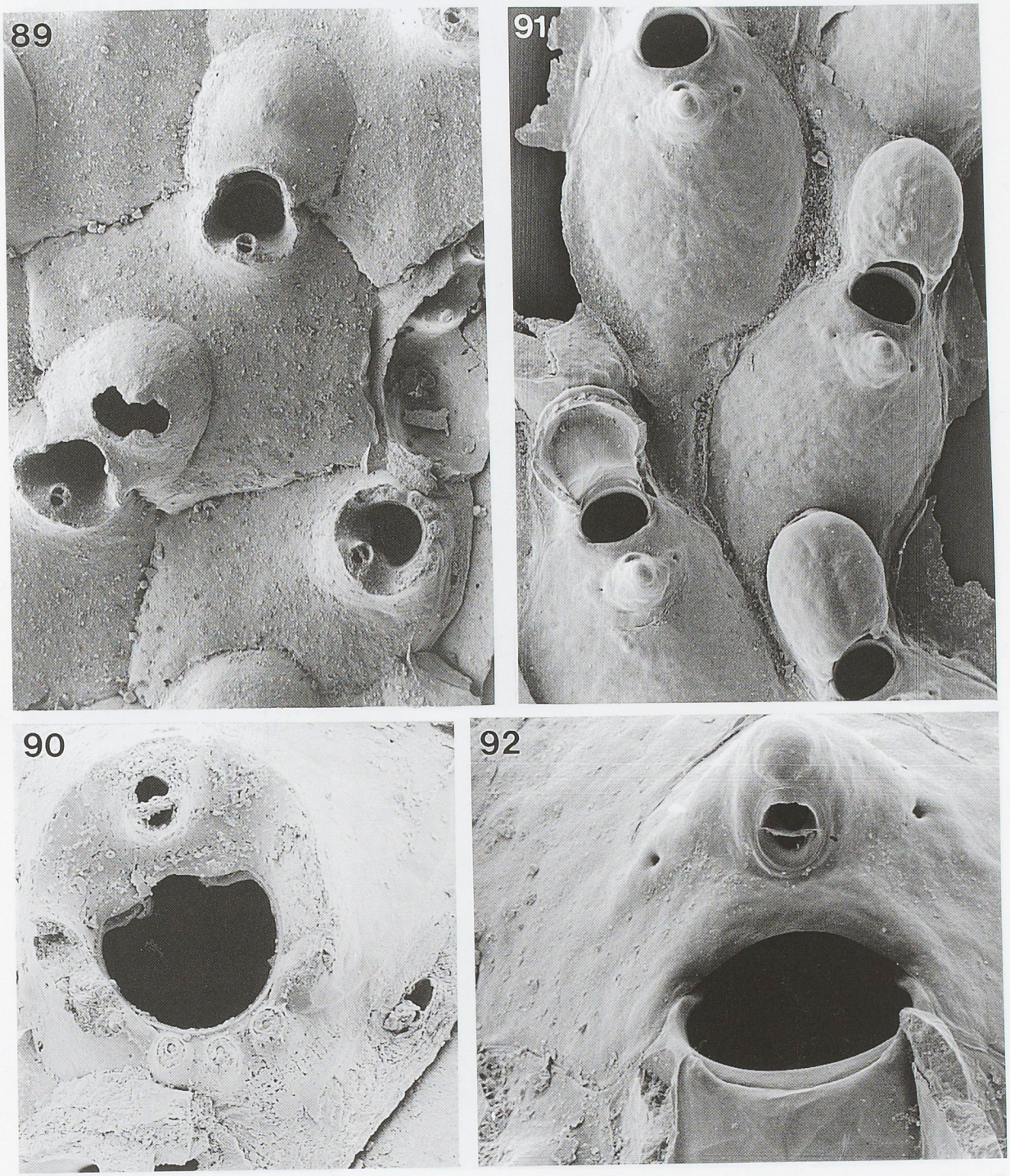


FIG. 83. — *Gigantopora oropiscis* sp. nov.: Ovicell (x 79). BIOCAL Stn DW 38.
FIGS 84-88. — *Microporella* sp.: **84**, Small colonies of *Microporella* sp. (right) and *Puellina harmeri* Ristedt (left) epizoic on *Reteporella orstomia* sp. nov. (q.v.) (x 67). **85**, Ancestrula (lower right) and autozooids (x 141). **86**, Frontal shield of developing autozooid showing reticulation of pseudopores (x 289). **87**, Ascopore (x 434). **88**, Avicularium (x 434). MUSORSTOM 6 Stn DW 431.



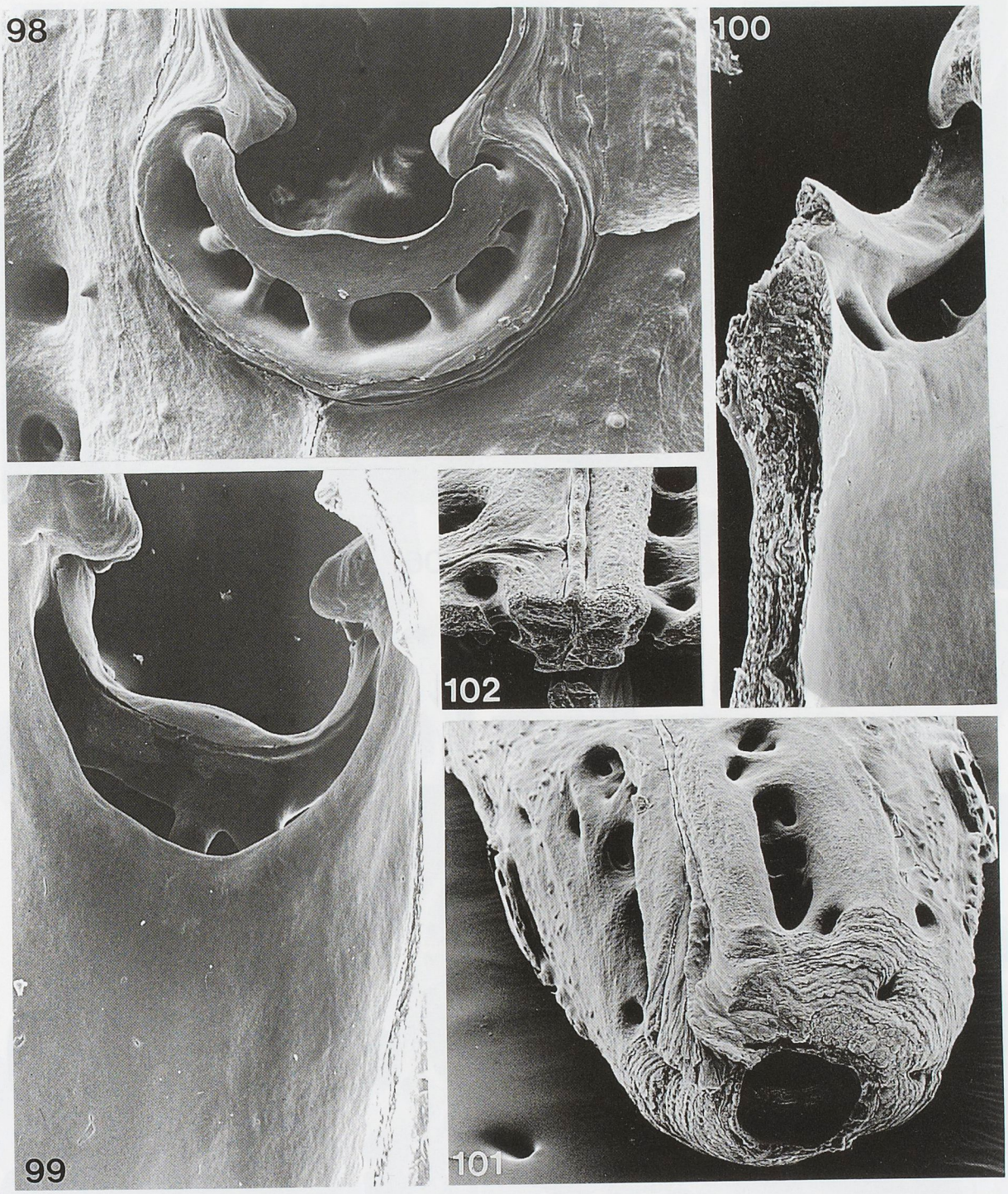
FIGS 89-90. — *Buffonellodes crosnieri* sp. nov.: **89**, Zooids, two ovicelled (x 91). **90**, Primary orifice and oral spine bases (x 270). BIOCAL Stn DW 33.

FIGS 91-92. — *Ipsibuffonella repens* sp. nov.: **91**, Biserially encrusting zooids, with ovicells (x 53). **92**, Primary orifice with broad arcuate poster (x 117). BIOCAL Stn DW 33.

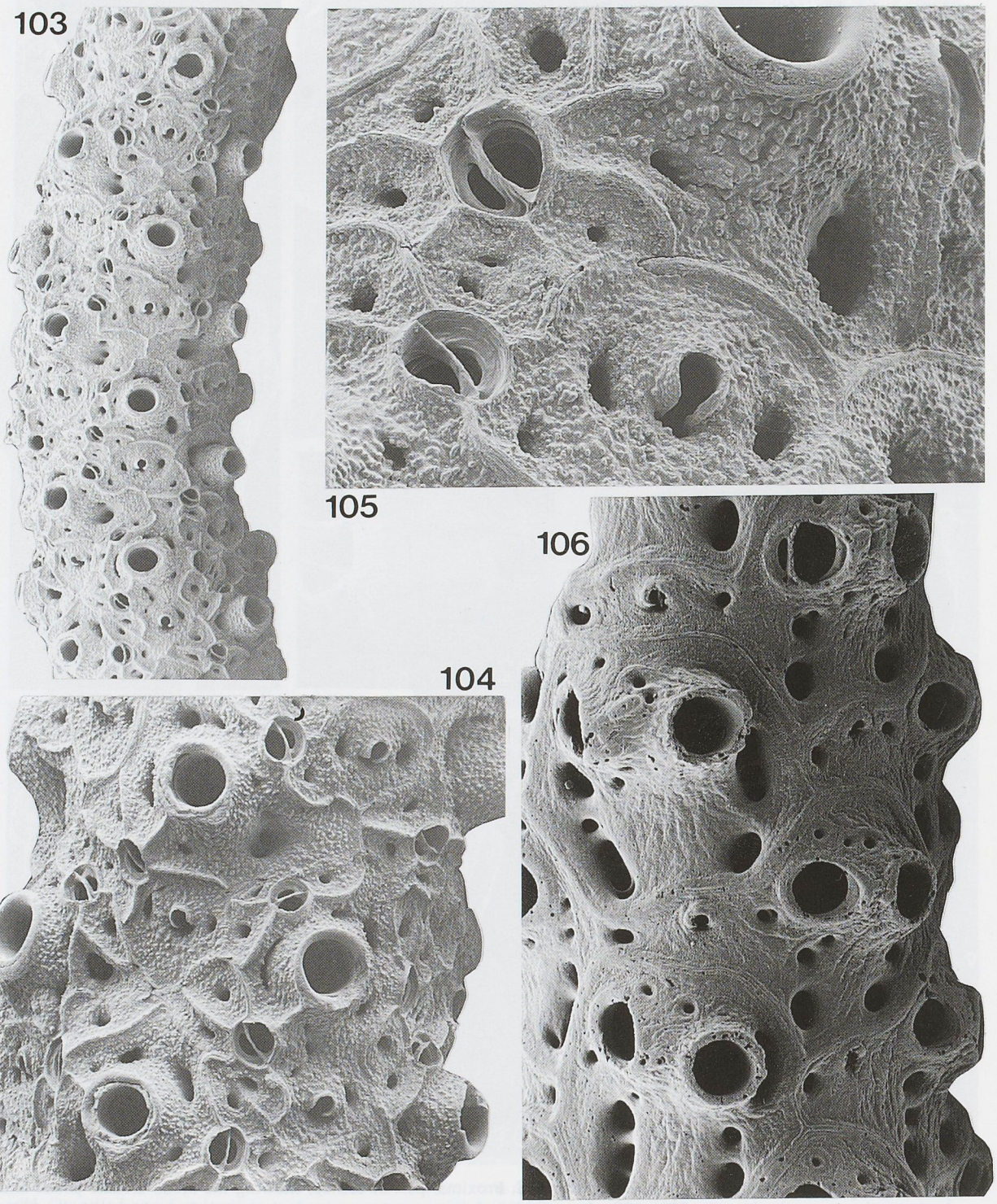


FIGS 93-94. — *Macrocamera erecta* sp. nov.: **93**, Distal end of erect stem with ovicell (left) seen in profile (x 58). **94**, Ovicelled zooid and orifice with adjacent autozooids (x 83). CHALCAL 2 Stn DW 78.

FIGS 95-97. — *Pseudoplatyglena mirabilis* sp. nov.: **95**, Part of erect stem, frontal side (x 36). **96**, Abfrontal side of stem with median ridge, adjacent areolar pores, and orifices (x 152). **97**, Operculum and surrounding epithecal membrane (x 251). MUSORSTOM 4 Stn DW 187.

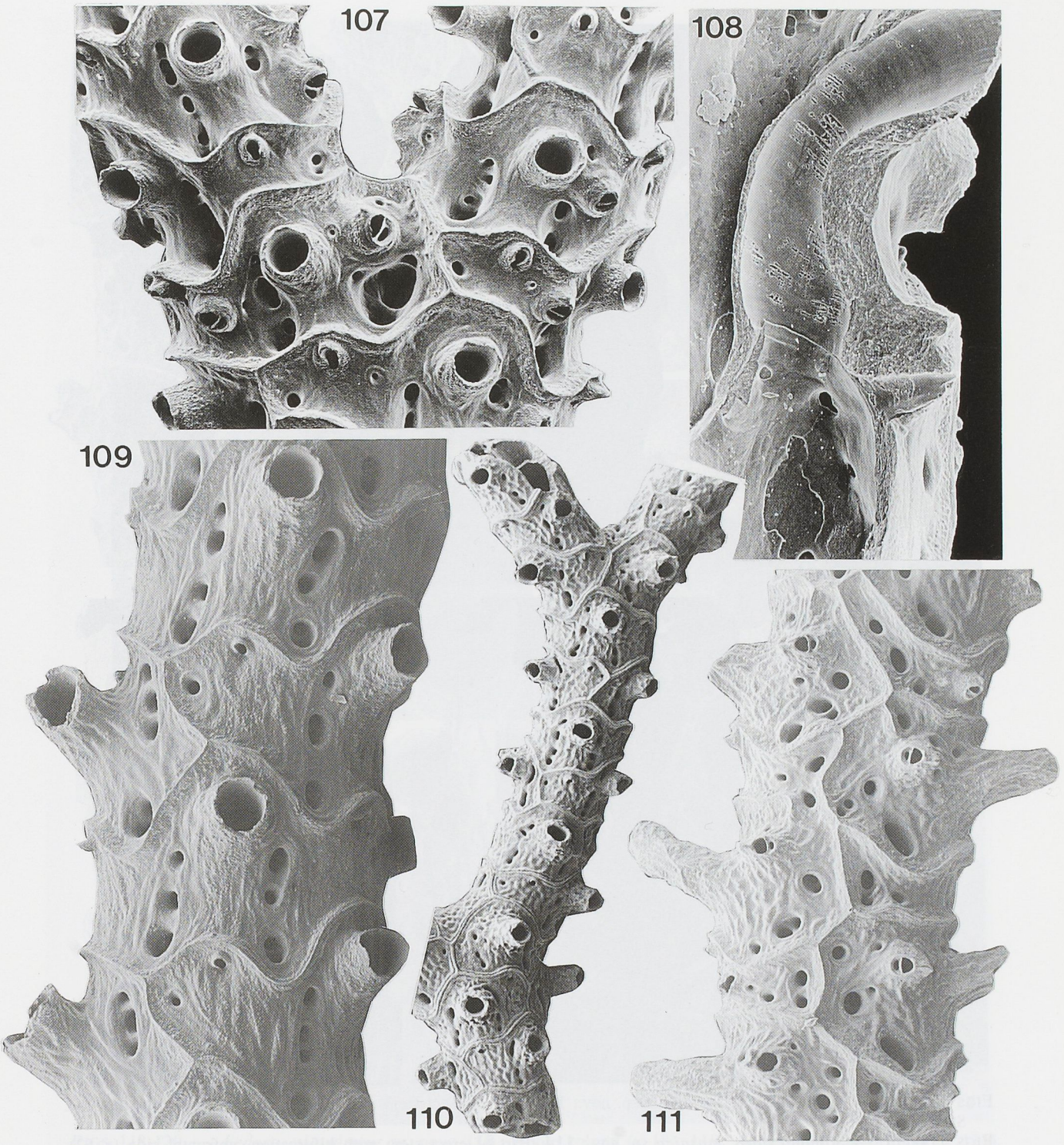


FIGS 98-102. — *Pseudoplatyglena mirabilis* sp. nov.: **98**, Proximal part of orifice, showing the broad arcuate poster and buttressed crescentic bar (x 328). **99**, Inner side of buttressed crescentic bar and frontal shield (x 432). **100**, Longitudinal section through the buttressed bar and adjacent frontal shield (x 430). **101**, Proximal end of segment from abfrontal side (x 109). **102**, Cross section through the median abfrontal keel and areolar tubes (x 200). MUSORSTOM 4 Stn DW 187.



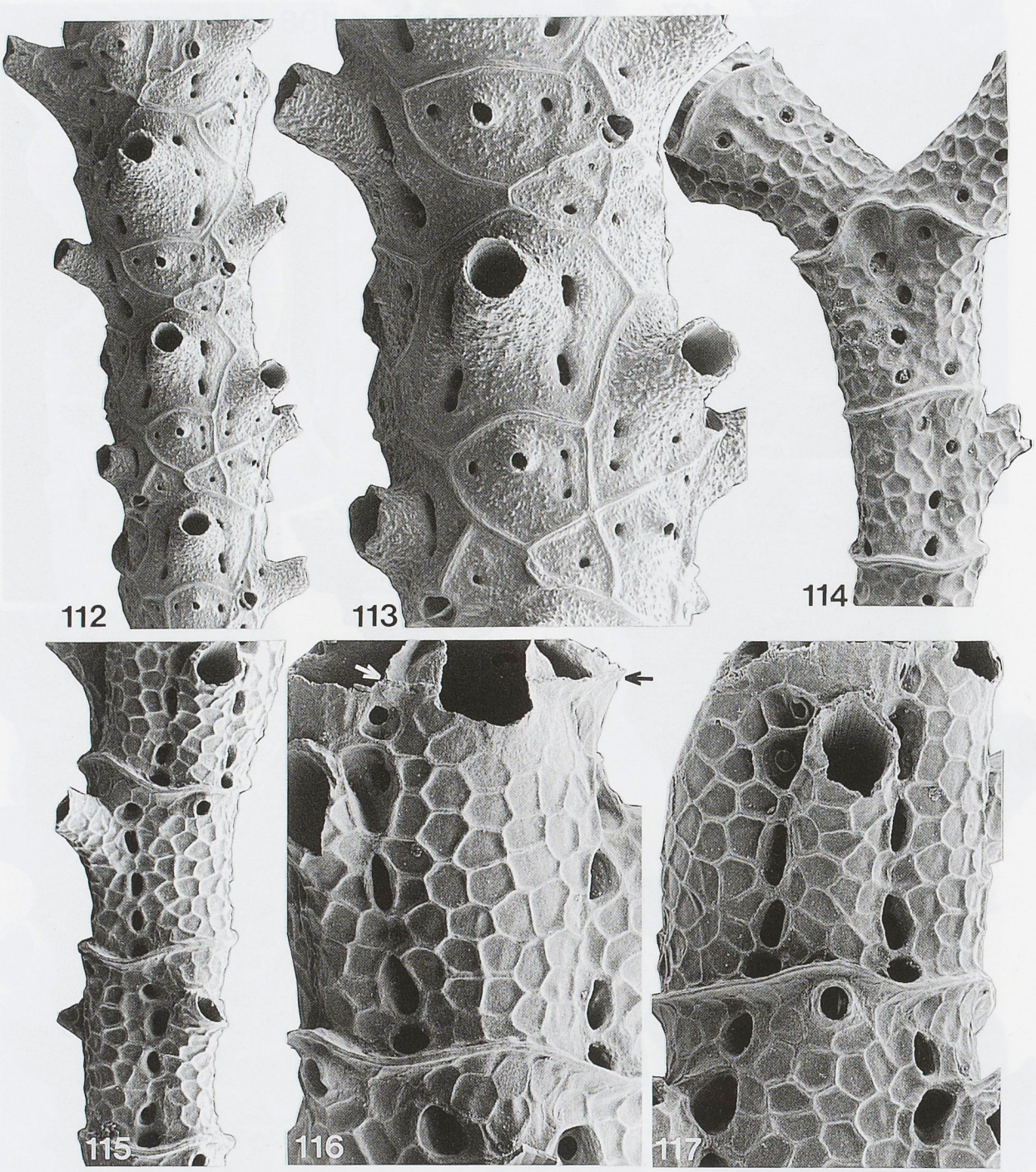
FIGS 103-105. — *Siphonicytara armata* sp. nov.: **103**, Part of erect stem (x 26). **104**, Surface features of stem (x 52). **105**, Ascopore and avicularia (x 135). BIOCAL Stn DW 33.

FIG. 106. — *Siphonicytara excentrica* sp. nov.: Surface features of stem; notice complete cross-bar on most distal avicularium, lacking in the other avicularia (x 52). BIOCAL Stn DW 38.



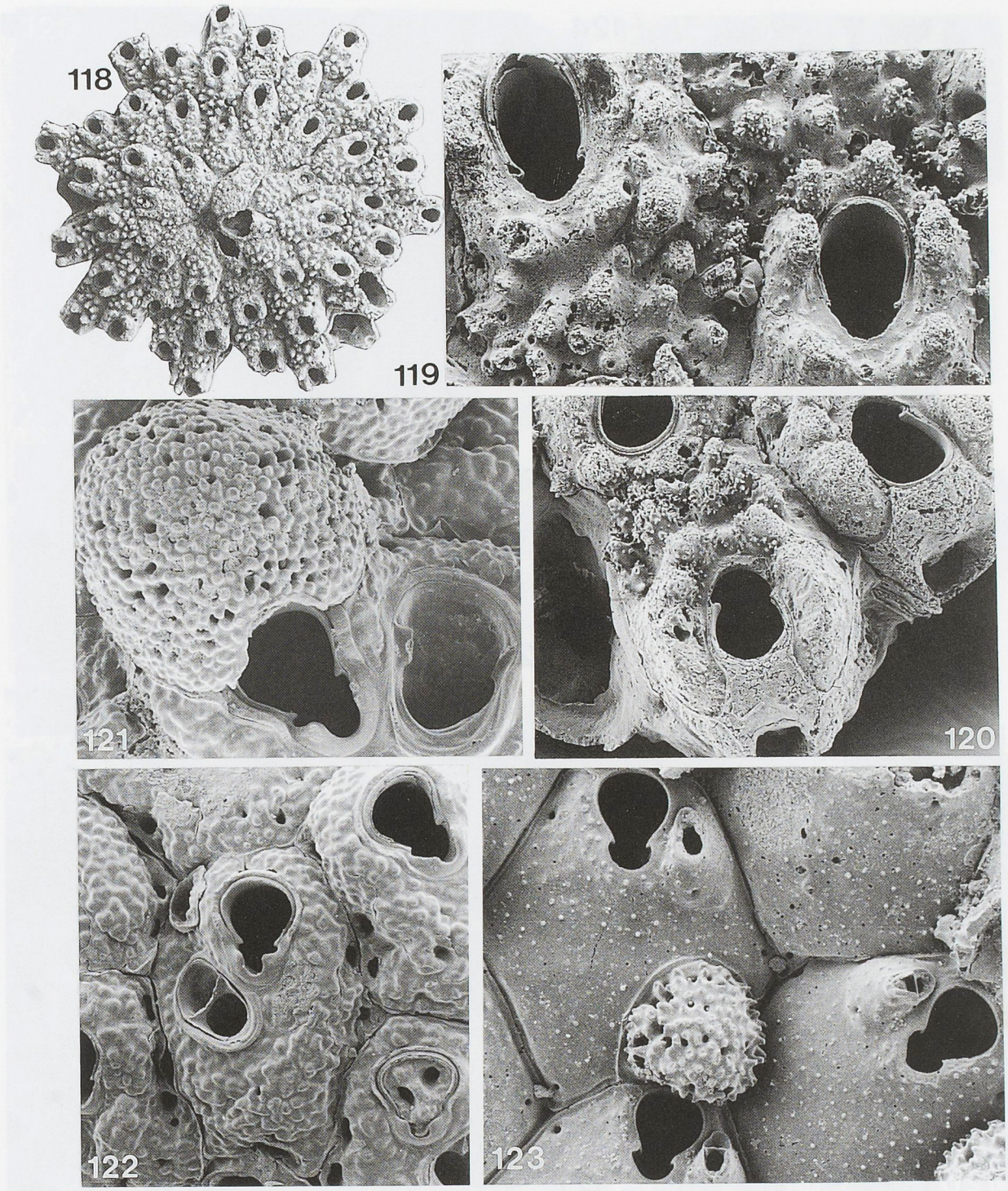
FIGS 107-108. — *Siphonicytara glabra* sp. nov.: **107**, Part of erect stem at bifurcation (x 49). **108**, Longitudinal section through peristome and ascopore (x 130). BIOCAL Stn DW 70.

FIGS 109-111. — *Siphonicytara vittata* sp. nov.: **109**, Part of stem, frontal side (x 52). **110**, Part of stem, abfrontal side (x 36). **111**, Part of erect stem with two bifurcations (x 26). BIOCAL Stn DW 08.



FIGS 112-113. — *Siphonicytara granulosa* sp. nov.: **112**, Part of erect stem (x 27). **113**, Same, (x 54). BIOGEOCAL Stn CP 232.

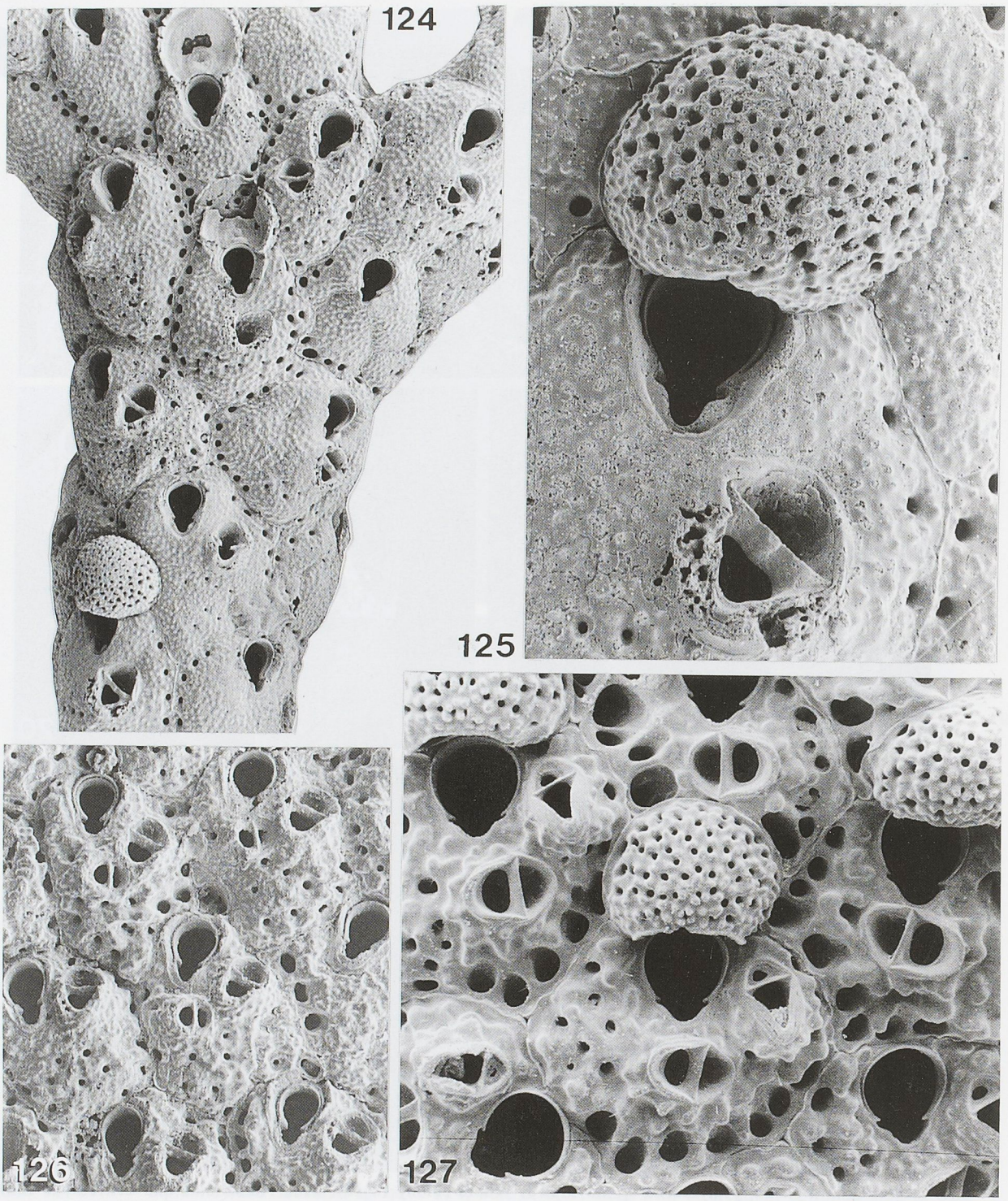
FIGS 114-117. — *Siphonicytara mosaica* sp. nov.: **114**, Part of erect stem with bifurcation, abfrontal side (x 52). **115**, Part of erect stem, frontal side (x 52). **116**, Apex of stem showing differentiation of zooid proximal to developing transverse ridge (arrows) (x 109). **117**, Apex of stem showing newly formed peristome, which lies on the proximal frontal calcification of the differentiating distal zooid; areolae and sunken septular pores present on either side of the peristome (x 93). BIOGEOCAL Stn CP 265.



FIGS 118-120. — *Fedora platydiscus* sp. nov.: **118**, Whole colony (x 18). **119**, Autozooids and orifices (x 131). **120**, Zooids at colony margin showing distal pore-chambers (x 93). MUSORSTOM 3 Stn DR 117.

FIGS 121-122. — *Characodoma areolata* (Canu & Bassler): **121**, Ovicell (x 120). **122**, Autozooids (x 87). MUSORSTOM 3 Stn DR 117.

FIG. 123. — *Characodoma glabra* sp. nov.: Autozooids and ovicell (x 118). MUSORSTOM 3 Stn DR 117.



FIGS 124-126. — *Characodoma biavicularia* (Canu & Bassler): **124**, Part of erect colony (x 41). **125**, Ovicell (x 144). MUSORSTOM 3 Stn DR 117. **126**, From USNM type specimen 8067 (part) (x 69). *"Albatross"* Stn 5179.
FIG. 127. — *Characodoma parva* sp. nov.: Ovicelled and infertile zooids (x 131). MUSORSTOM 3 Stn DR 117.

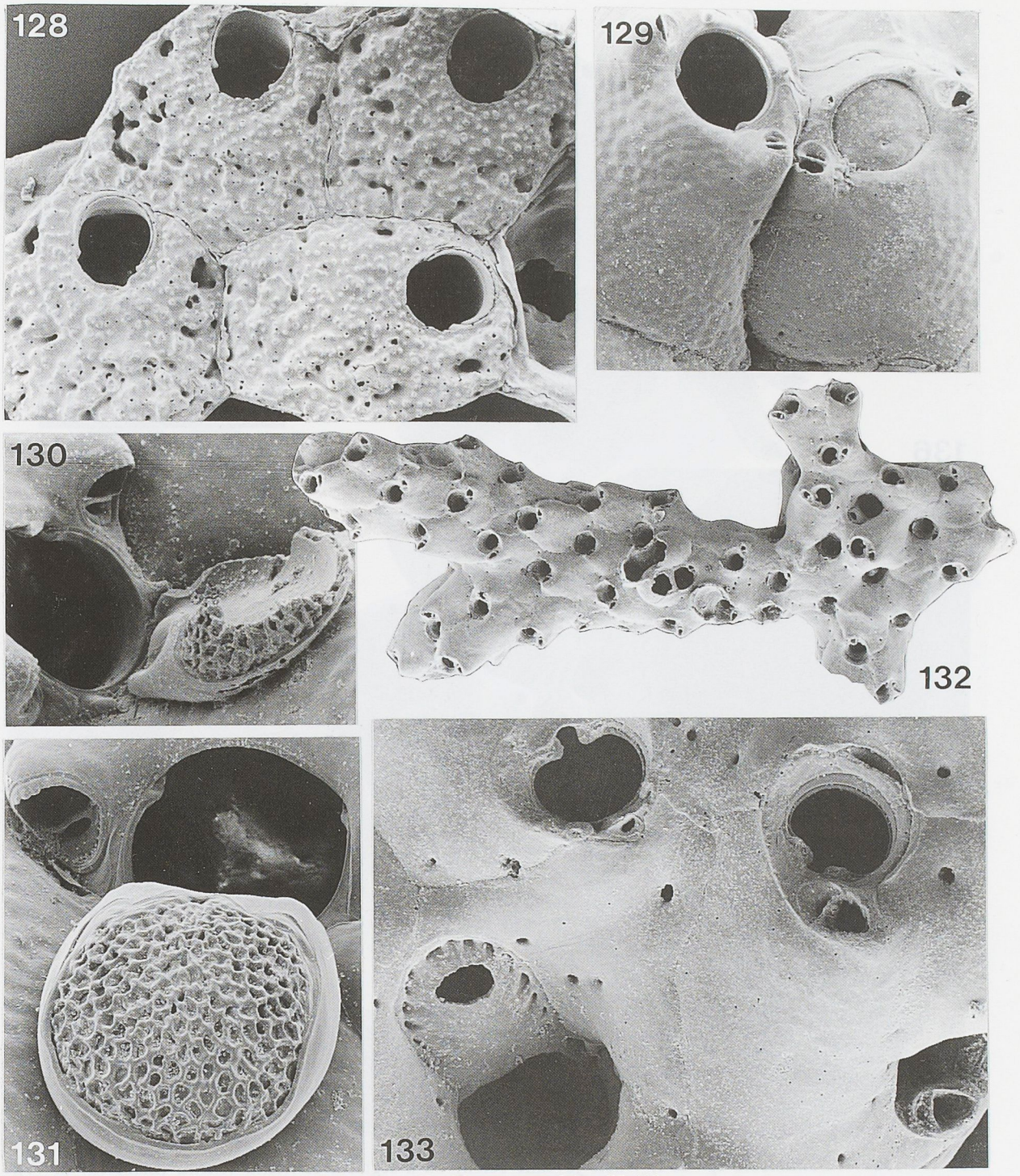
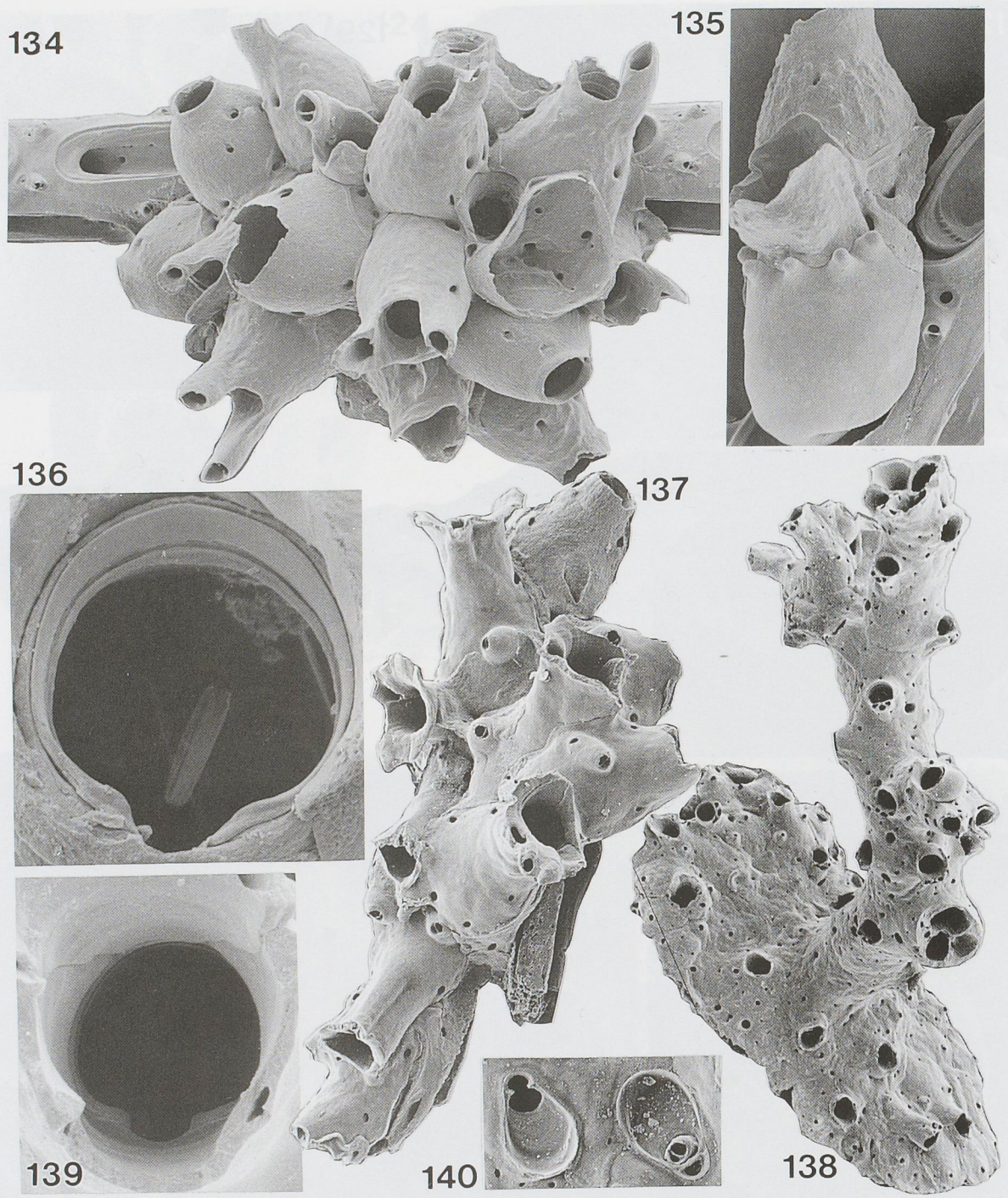


FIG. 128. — *Characodoma* sp.: Infertile zooids (x 69). MUSORSTOM 3 Stn CP 103.

FIGS 129-131. — *Yrbozoon ringens* Gordon: **129**, Two autozooids, one with an operculum in place (x 60). **130**, Profile of fractured ovicell (x 111). **131**, Ovicell, showing reticulated endooecium (x 134). BIOCAL Stn DW 66.

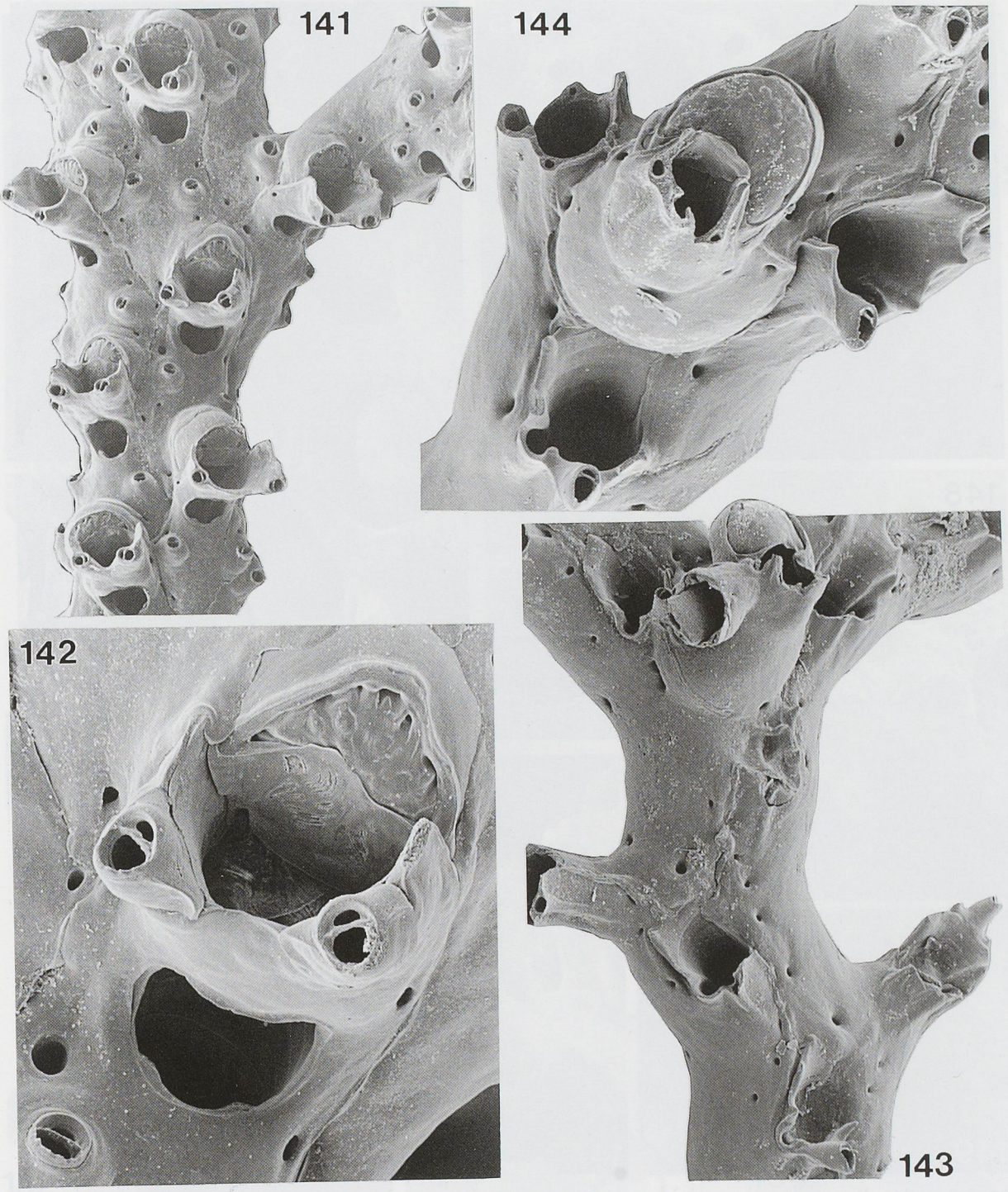
FIGS 132-133. — *Buffonellaria erecta* sp. nov.: **132**, Entire branching colony (x 18). **133**, Orifices, avicularia, and exposed ovicellular endooecium (x 124). BIOCAL Stn DW 66.



FIGS 134-136. — *Osthimosia* sp.: **134**, Whole juvenile colony on a segment of *Nellia tenella* (Lamarck) (x 77). **135**, Ancestrula and first daughter zooid, on *N. tenella* (x 134). **136**, Primary orifice (x 506). MUSORSTOM 4 Stn DW 187.

FIG. 137. — *Lagenipora* sp.: Very young colony (x 79). BIOCAL Stn DW 46.

FIGS 138-140. — *Galeopsis mimicus* Gordon: **138**, Young colony with encrusting base (x 26). **139**, Primary orifice (x 252). BIOCAL Stn CP 75. **140**, Spatulate avicularia (x 89). CHALCAL 2 Stn DW 76.



FIGS 141-142. — *Galeopsis lageniporoides* sp. nov.: **141**, Part of linear encrusting lobe (x 49). **142**, Ovicelled orifice (x 195). MUSORSTOM 6 Stn DW 489.

FIGS 143-144. — *Richbunea gracilis* sp. nov.: **143**, Part of erect branch (x 54). **144**, Ovicell and adjacent peristomes (x 92). BIOCAL Stn CP 67.

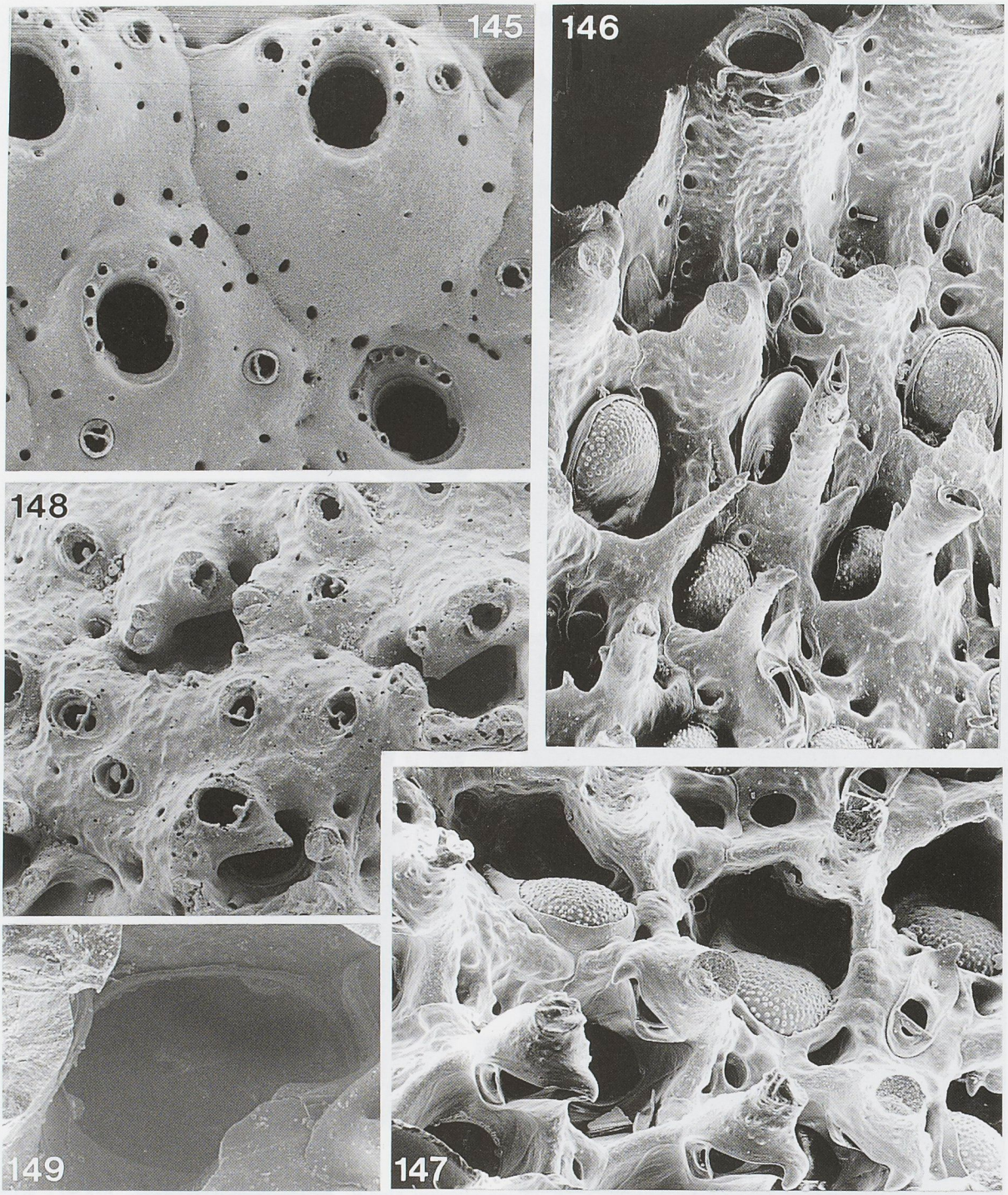


FIG. 145. — *Lifuella calyciformis* (Philipps): Autozooids (x 118). MUSORSTOM 3 Stn DR 117.

FIGS 146-147. — *Rhynchozoon tubulosum* (Hincks): **146**, Ovicelled zooids near growth margin (x 103). **147**, Orifices, tilted to show avicularia on peristomial side of mucrones (x 129). MUSORSTOM 4 Stn DW 231.

FIGS 148-149. — *Rhynchozoon ligulatum* sp. nov.: **148**, Oral view of zooids near growth margin (x 65). **149**, Primary orifice (x 235). BIOCAL Stn DW 38.

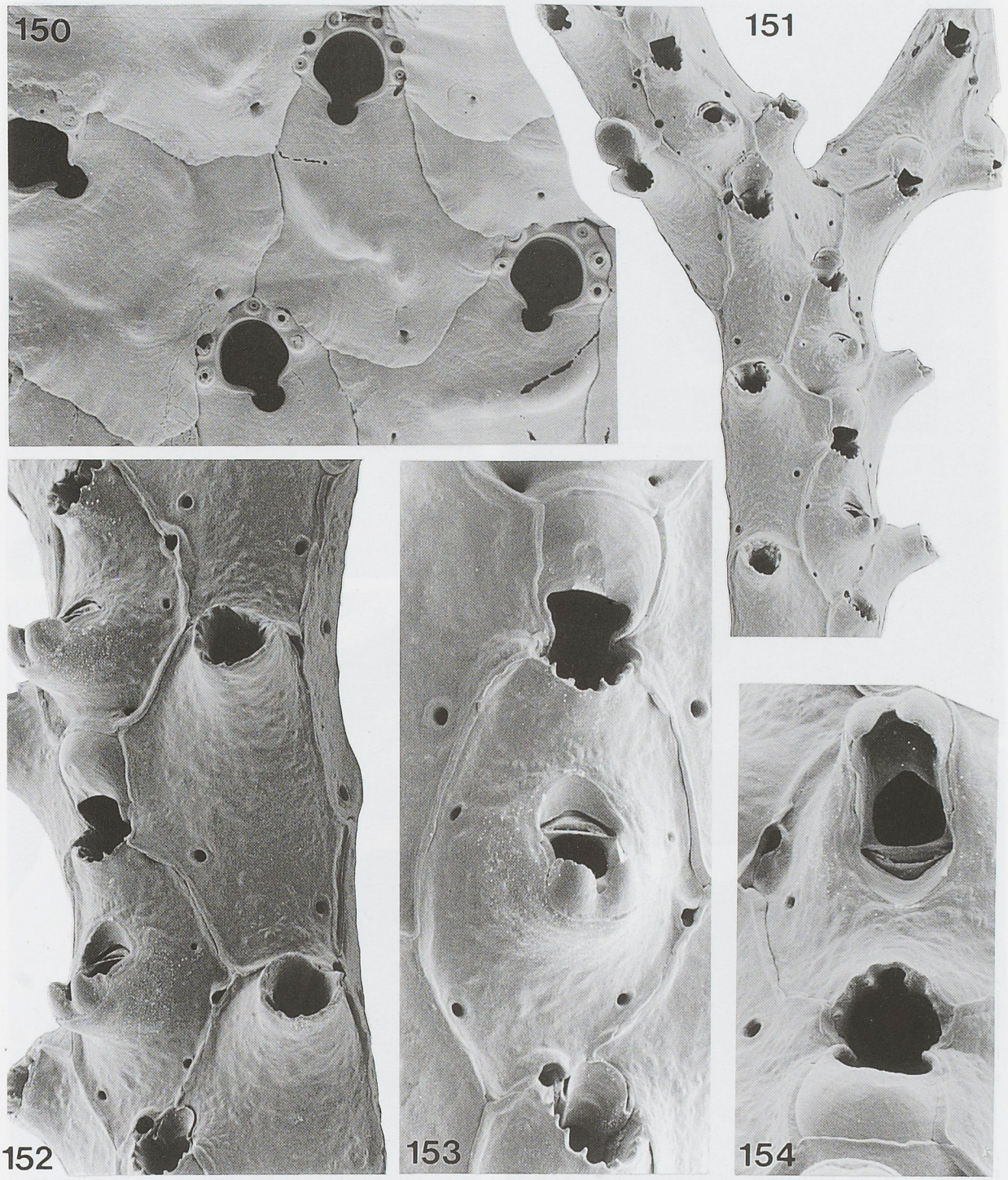
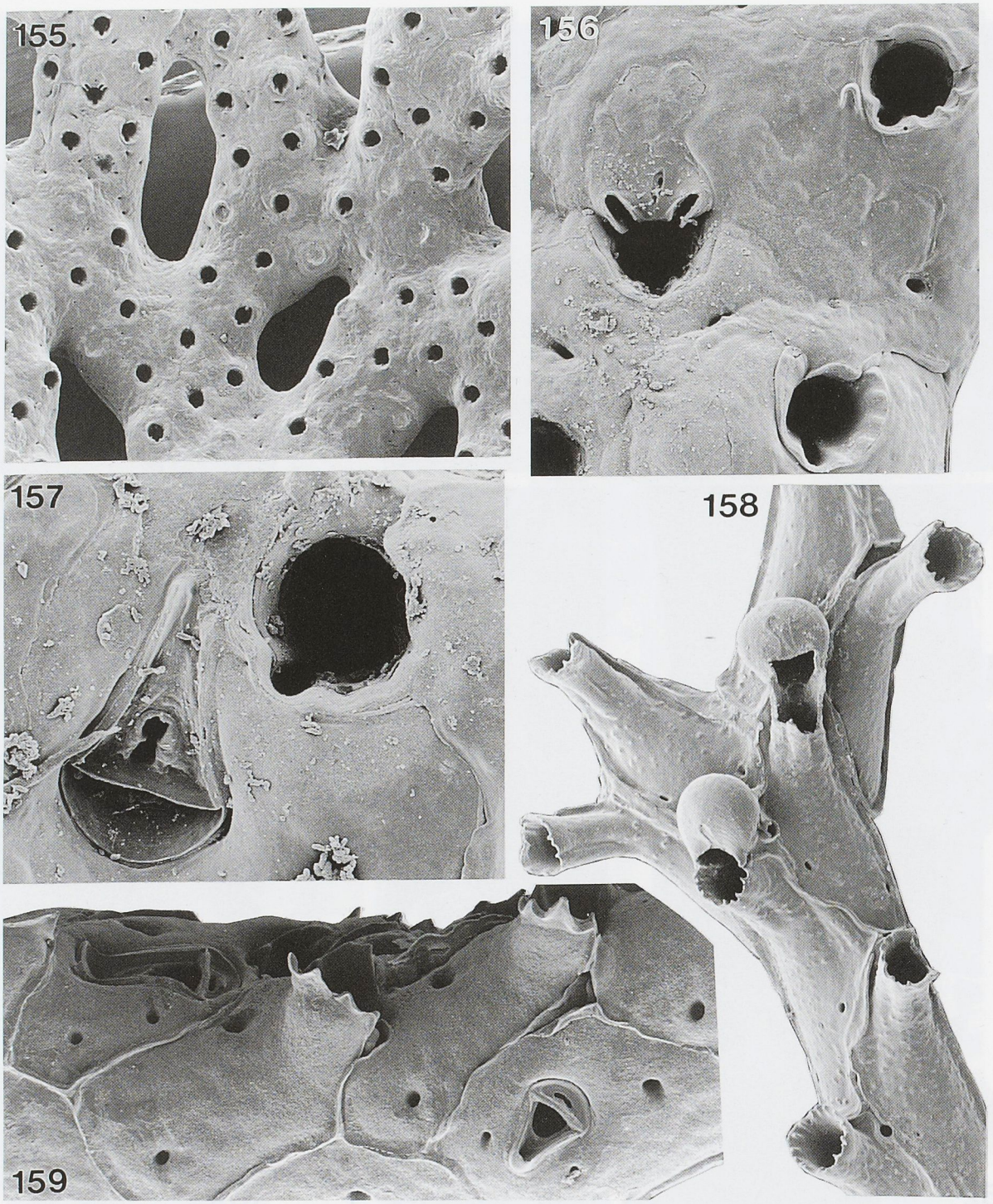


FIG. 150. — *Schedocleidochasma* sp.: Autozooids (x 163). BIOCAL Stn DW 38.

FIGS 151-154. — *Iodictyum bicuspidatum* sp. nov.: **151**, Part of erect branch (x 34). **152**, Autozooids (one ovicelled), with profiles of large avicularia (x 68). **153**, Ovicelled zooid with large avicularium (x 109). **154**, Same, oral view (x 125). MUSORSTOM 6 Stn CP 419.



FIGS 155-157. — *Iodictyum blandum* sp. nov.: **155**, Part of fenestrate colony; an ovicell at upper left (x 23). **156**, Ovicell and adjacent peristomial orifices (x 105). **157**, Large lateral-oral avicularium (x 211). BIOCAL Stn DW 44.

FIGS 158-159. — *Iodictyum illinguum* sp. nov.: **158**, Part of erect branch (x 54). **159**, Lateral view of avicularia (x 111). MUSORSTOM 6 Stn DW 421.



FIG. 160. — *Iodictyum illinguum* sp. nov.: Ovicelled peristome (x 215). MUSORSTOM 6 Stn DW 421.
FIGS 161-163. — *Iodictyum trochus* sp. nov.: **161**, Distal end of erect branch (x 145). **162**, Broken peristome, showing sinus groove (top right) (x 129). **163**, Rare peristomial avicularium (x 211). MUSORSTOM 6 Stn CP 419.

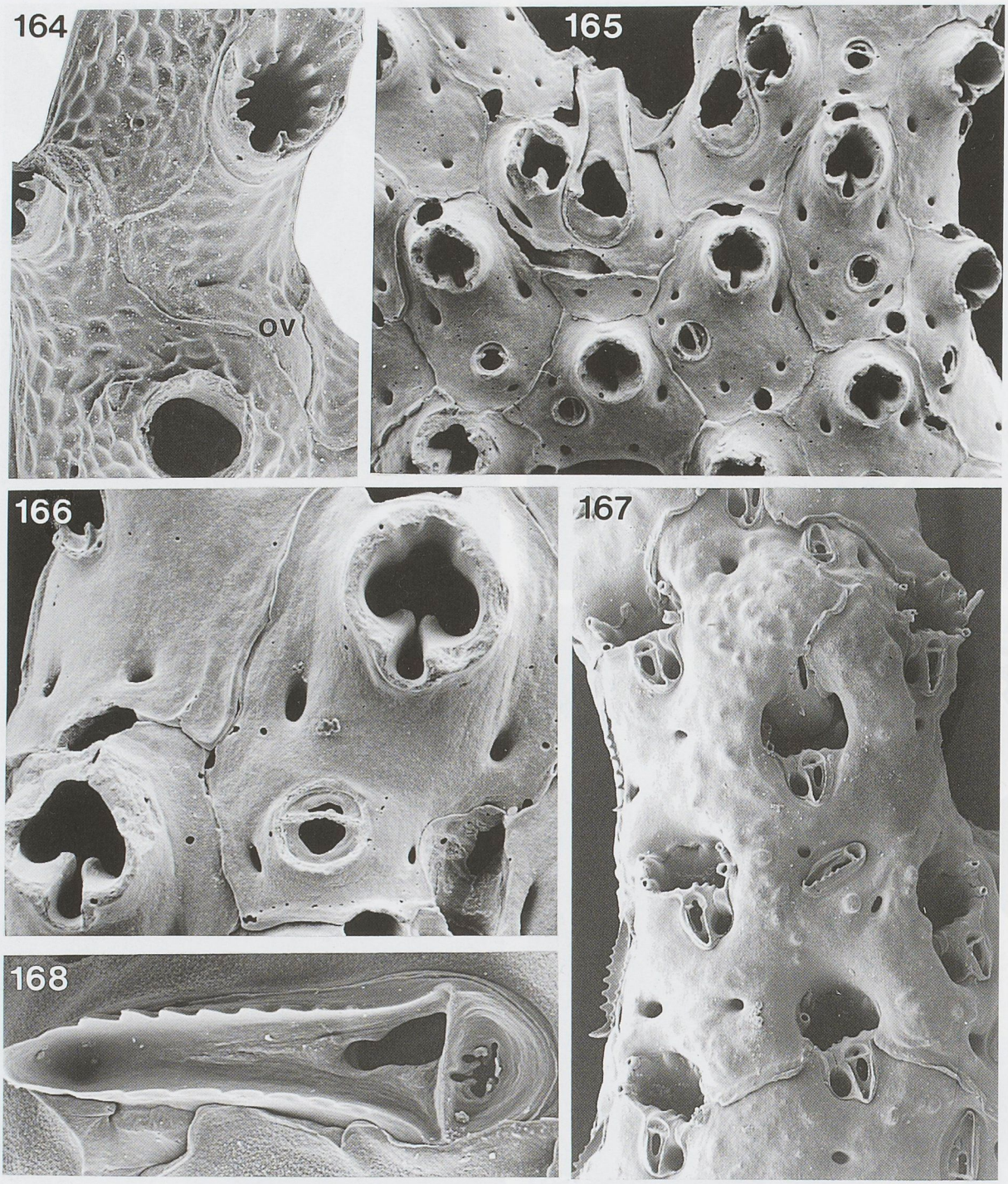
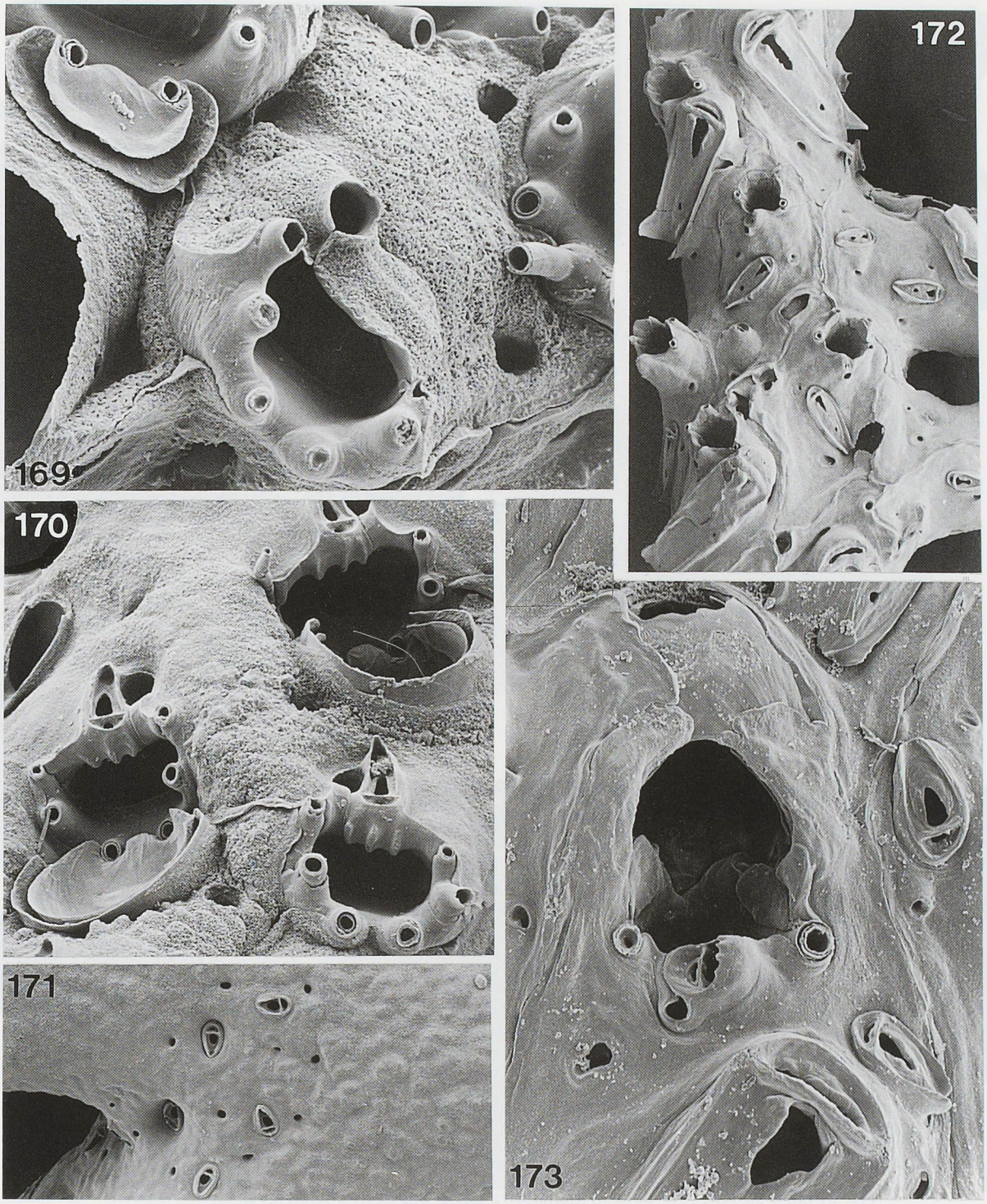


FIG. 164. — *Iodictyum ?trochus*: Partially concealed ovicell (ov) (x 103). BIOCAL Stn DW 46.

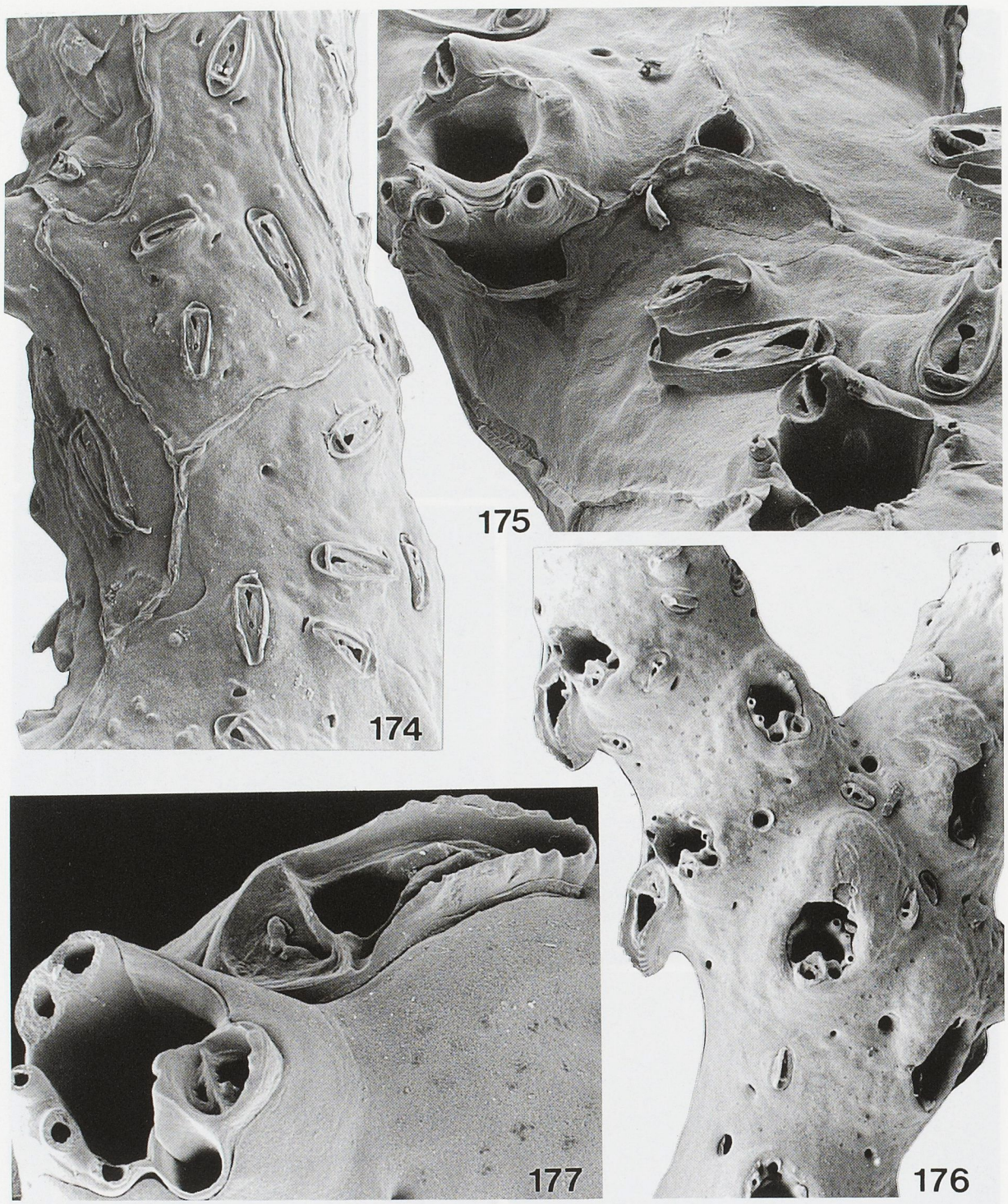
FIGS 165-166. — *Iodictyum* sp.: **165**, Part of fenestrate colony showing two subfenestral avicularia (x 78). **166**, Peristomial orifices and frontal avicularium (x 195). MUSORSTOM 4 Stn DW 151.

FIGS 167-168. — *Reteporella concinnoides* sp. nov.: **167**, Part of trabecula with ovicell (x 141). **168**, Intrafenestral avicularium (x 125). MUSORSTOM 4 Stn DW 231.



FIGS 169-171. — *Reteporella concinnoides* sp. nov.: **169-170**, Stages in skeletal morphogenesis of peristomes and ovicells (x 334, x 239). **171**, Small abfrontal avicularia (x 88). MUSORSTOM 4 Stn DW 231.

FIGS 172-173. — *Reteporella defensa* sp. nov.: **172**, Part of fenestrate colony showing large avicularia (x 59). BIOCAL Stn DW 38. **173**, Ovicell and peristomial avicularium (x 156). CHALCAL 2 Stn DW 76.



FIGS 174-175. — *Reteporella defensa* sp. nov.: **174**, Abfrontal side of trabecula (x 92). BIOCAL Stn CP 108. **175**, Oral view of peristomes and frontal avicularia (x 195). BIOCAL Stn DW 38.

FIGS 176-177. — *Reteporella ferox* sp. nov.: **176**, Part of erect branch (x 68). **177**, Lateral view of peristome and avicularium (x 268). MUSORSTOM 6 Stn CP 419.

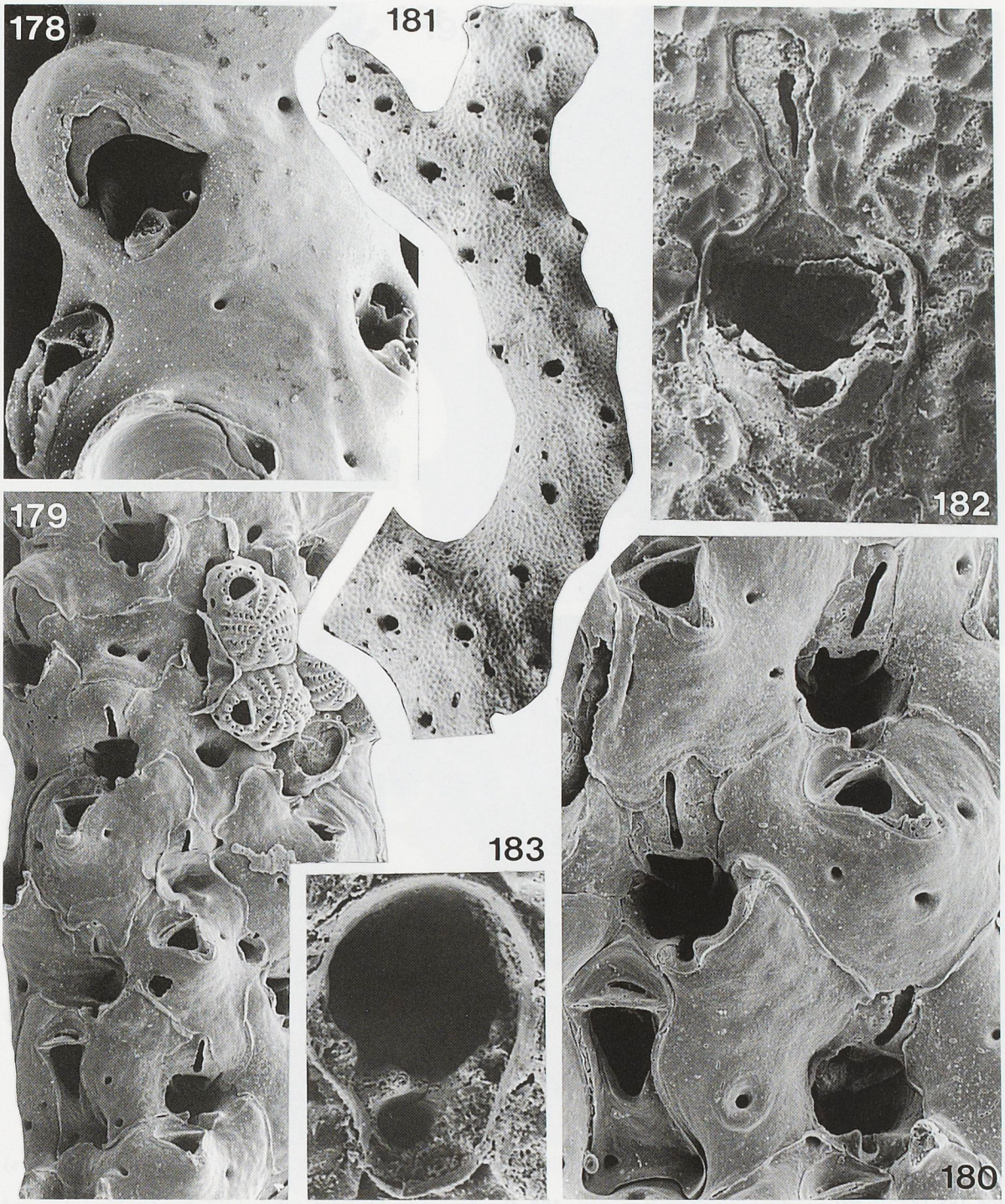


FIG. 178. — *Reteporella ferox* sp. nov.: Ovicell and lateral avicularium (x 248). MUSORSTOM 6 Stn CP 419.

FIGS 179-180. — *Reteporella orstomia* sp. nov.: **179**, Trabecula of fenestrate colony (x 77). **180**, Ovicells and frontal avicularia (x 144). MUSORSTOM 6 Stn DW 431.

FIGS 181-183. — *Reteporella* sp.: **181**, Part of erect branch (x 27). **182**, Ovicell with median slit visible (x 227). **183**, Peristomial orifice and spiramen (x 304). BIOGEOCAL Stn DW 253.

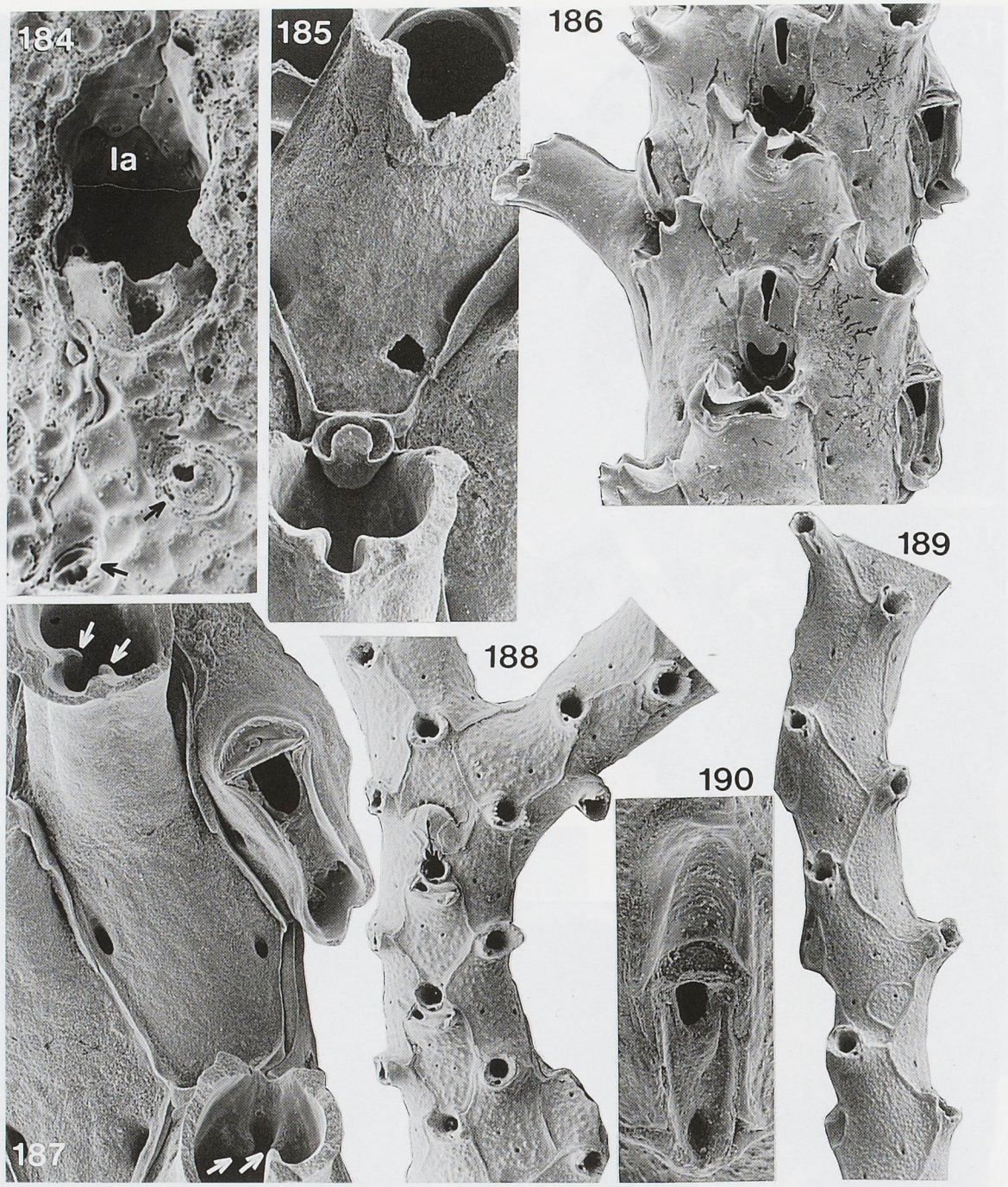


FIG. 184. — *Reteporella* sp.: Ovicelled orifice [ovicellular labellum (la) barely visible] and suboral avicularia (arrows) (x 227). BIOGEOCAL Stn DW 253.

FIGS 185-187. — *Reteporellina cruciformis* sp. nov.: **185**, Developing zooids at growth margin showing beaded rim of primary orifice (above) and ovicell anlage (below) (x 227). **186**, Part of erect branch (x 83). **187**, Zooidal peristomes with cusps (arrows) and lateral avicularium (x 173). MUSORSTOM 3 Stn DR 117.

FIGS 188-190. — *Reteporellina spiramina* sp. nov.: **188**, Part of erect branch; one ovicell present (x 33). MUSORSTOM 3 Stn CP 139. **189**, Part of erect branch with lateral avicularia (x 28). **190**, Lateral avicularium (x 144). BIOCAL Stn DW 44.

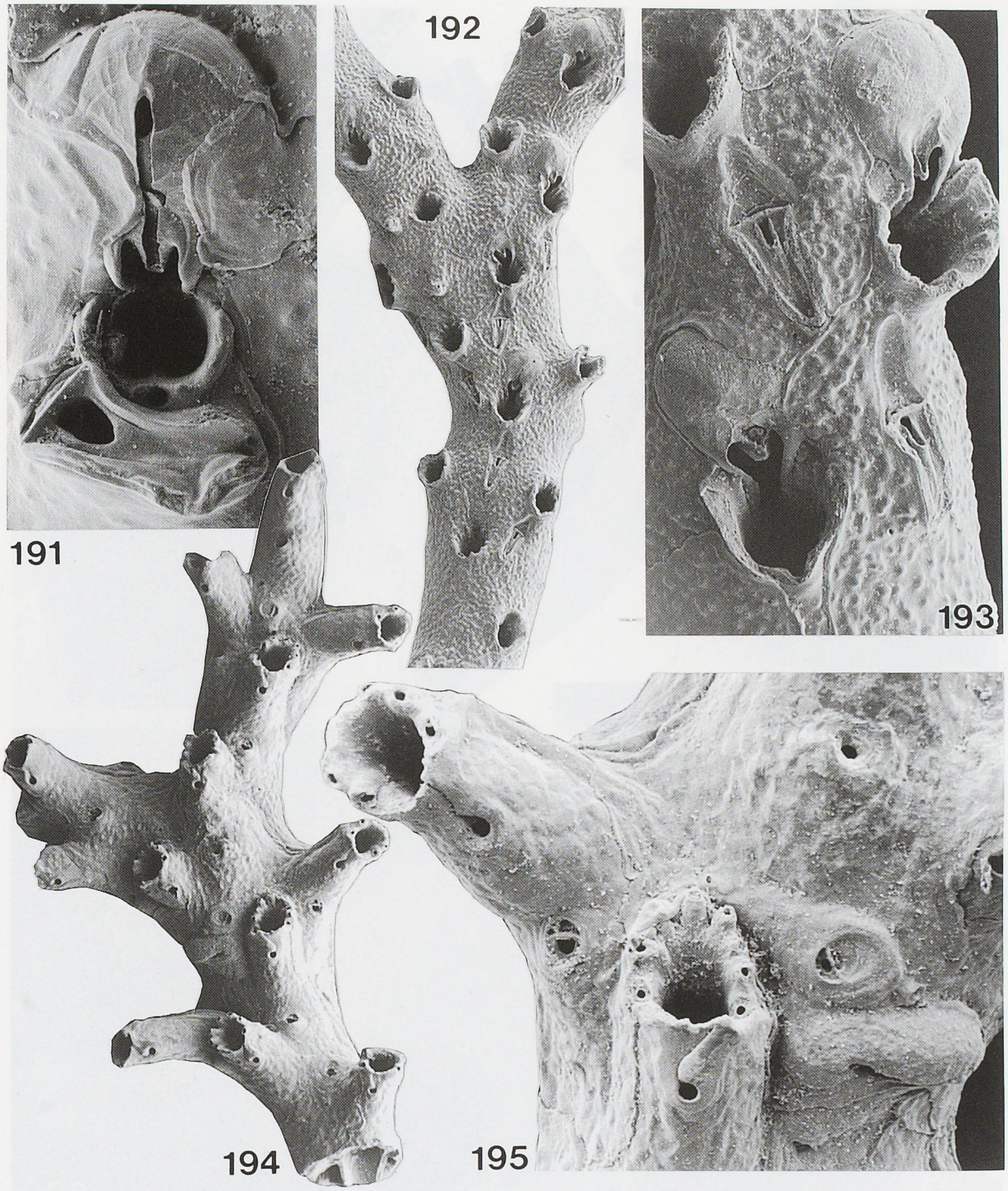


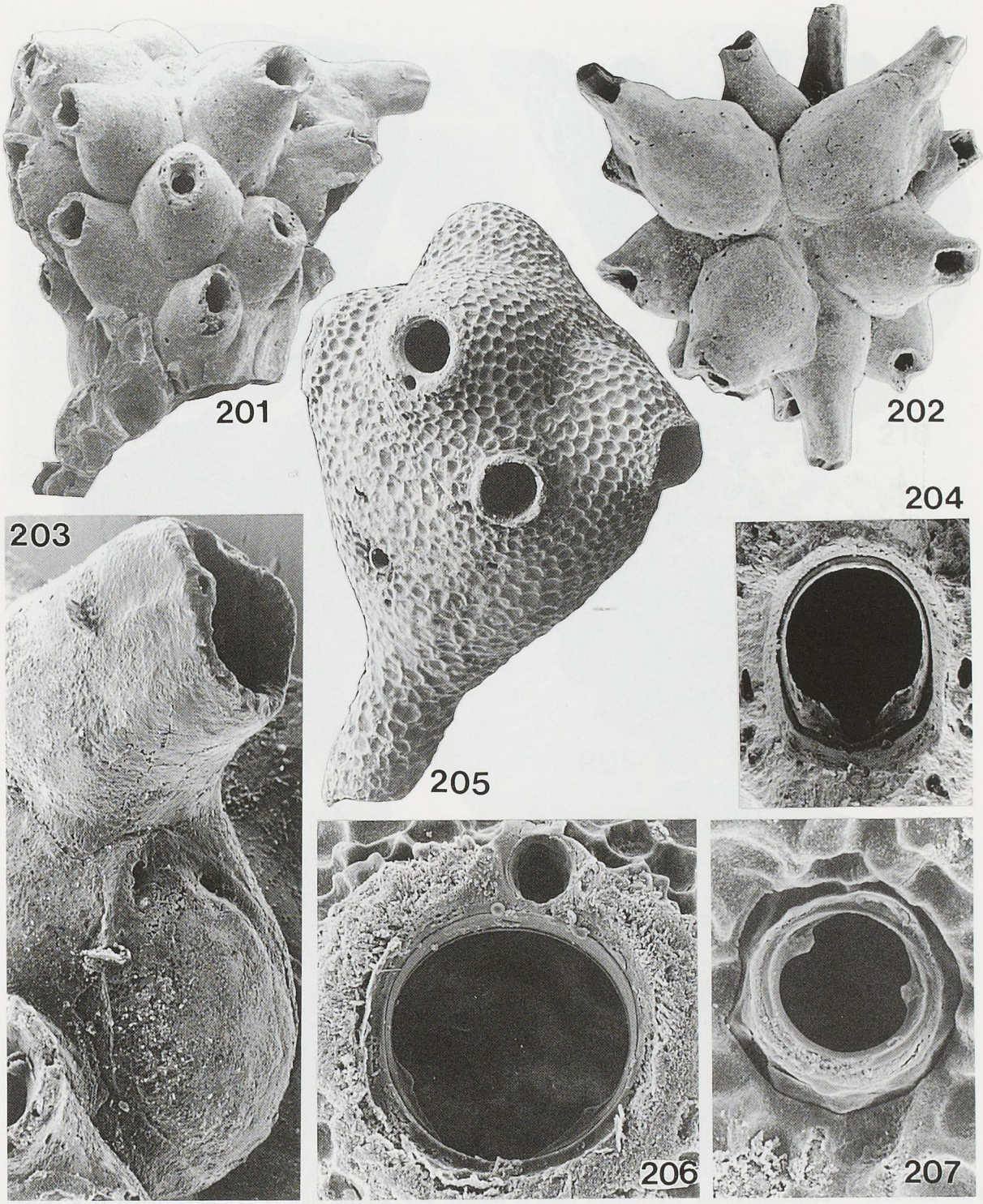
FIG. 191. — *Reteporellina spiramina* sp. nov.: Ovicell and suboral avicularium (x152). MUSORSTOM 3 Stn CP 139.

FIGS 192-193. — *Reteporellina granulosa* sp. nov.: **192**, Part of erect branch (holotype) (x 28). **193**, Ovicells and large avicularia (x 103). BIOCAL Stn DW 38.

FIGS 194-195. — *Reteporellina projecta* sp. nov.: **194**, Part of erect branch (holotype) (x 32). **195**, Peristomes and avicularia (x 98). BIOGEOCAL Stn CP 290.

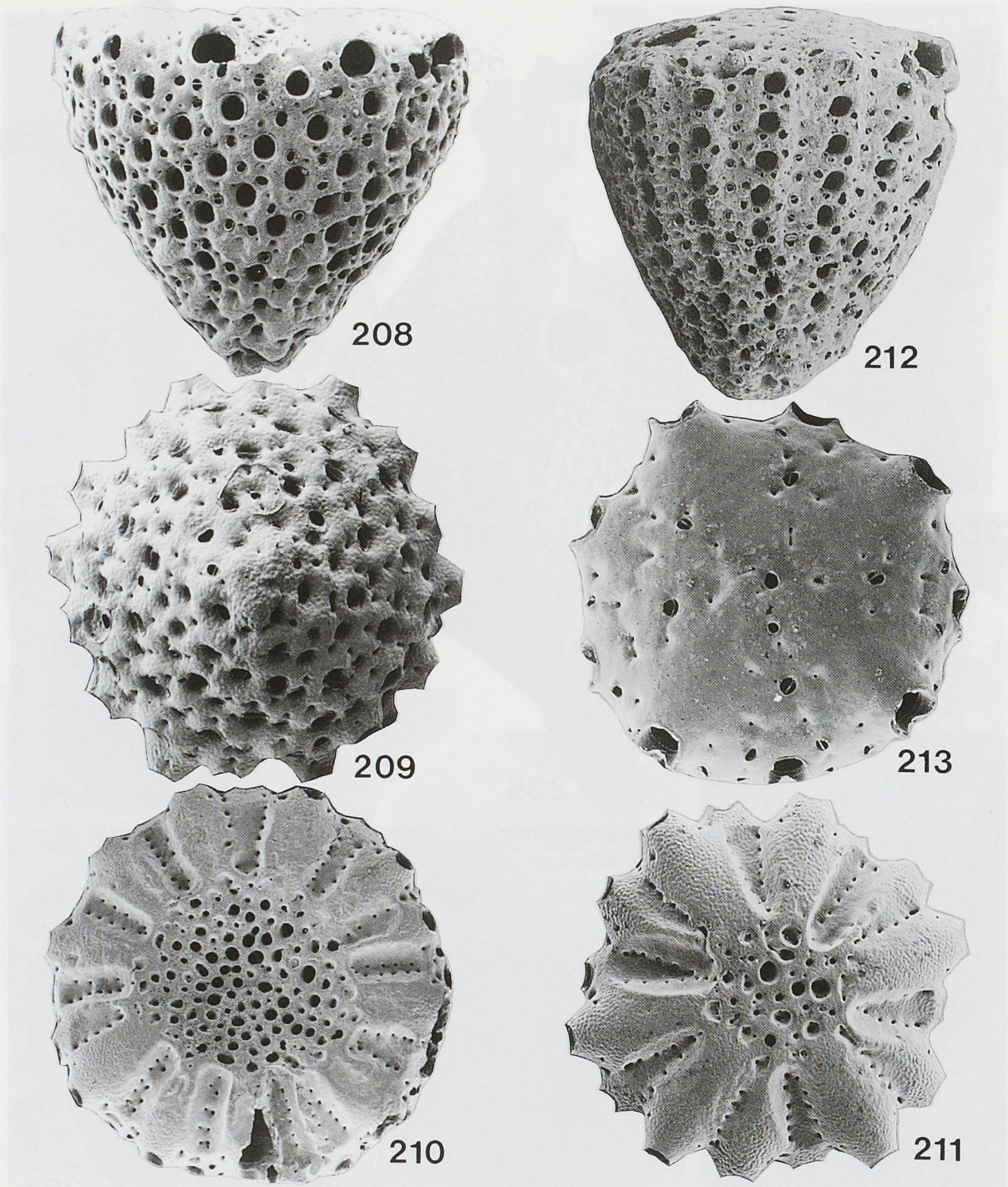


FIGS 196-200. — *Triphyllozoon gracile* sp. nov.: **196**, Part of erect branch (x 18). **197**, Ovicells (x 103). **198**, Ovicells (profile) and lateral avicularia (x 119). **199**, Abfrontal side of branch bifurcation (x 62). **200**, Ovicell anlage and developing peristomes (x 206). MUSORSTOM 3 Stn DR 117.



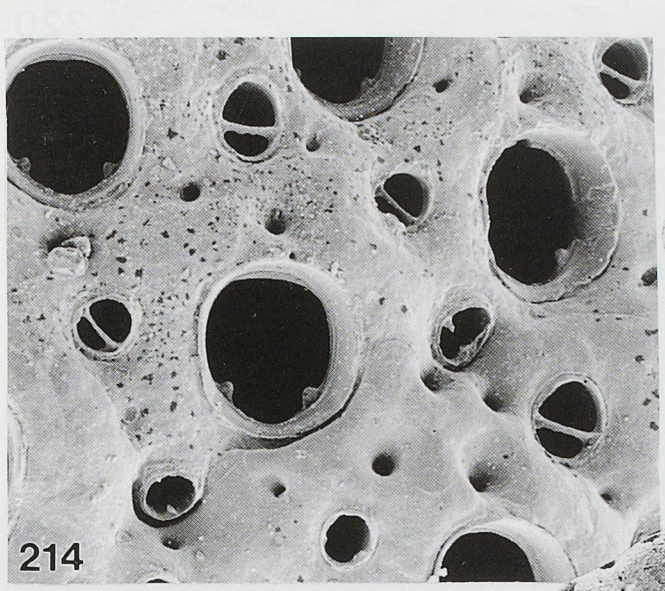
FIGS 201-204. — *Harpago dissidens* sp. nov.: **201**, Holotype colony, base broken (x 35). **202**, Same, antapical view (x 35). **203**, Broken peristome with ovicell (x 155). **204**, Primary orifice (x 217). BIOCAL Stn DW 66.

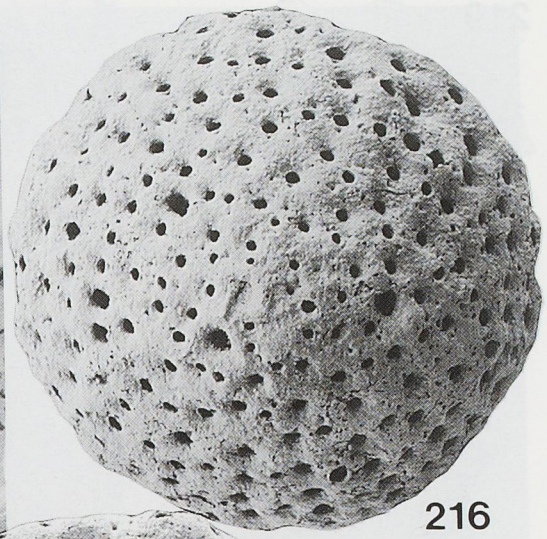
FIGS 205-207. — *Ptoboroa gelasina* sp. nov.: **205**, Holotype colony (x 66). **206**, Primary orifice with distal ovicellular pore (x 317). **207**, Avicularium (x 457). BIOCAL Stn KG 101.

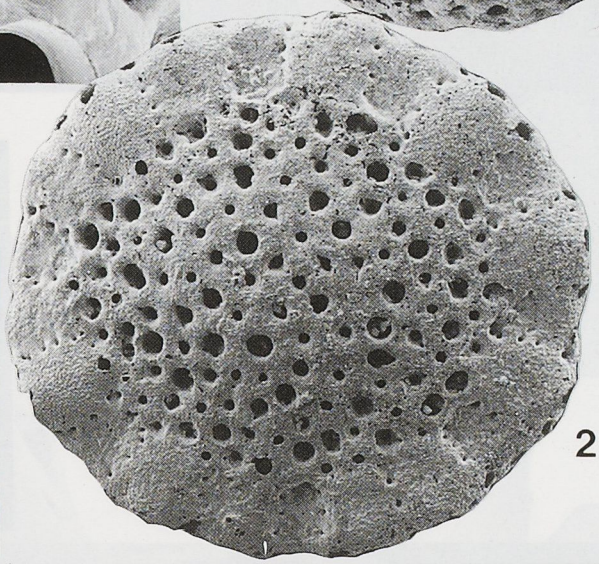


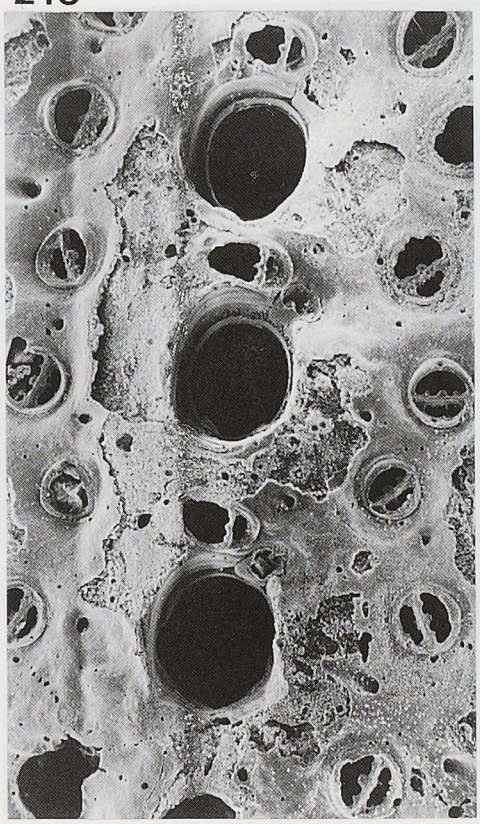
FIGS 208-211. — *Conescharellina breviconica* Canu & Bassler: **208**, Lateral view (x 19). **209**, Apical view (x 29). **210**, Basal view of older colony (x 19). MUSORSTOM 3 Stn CP 87. **211**, Basal view of small colony (x 29). MUSORSTOM 3 Stn CP 106.

FIGS 212-213. — *Conescharellina catella* Canu & Bassler: **212**, Lateral view (x 25). MUSORSTOM 3 Stn DR 117. **213**, Basal view (x 25). MUSORSTOM 3 Stn CP 102.









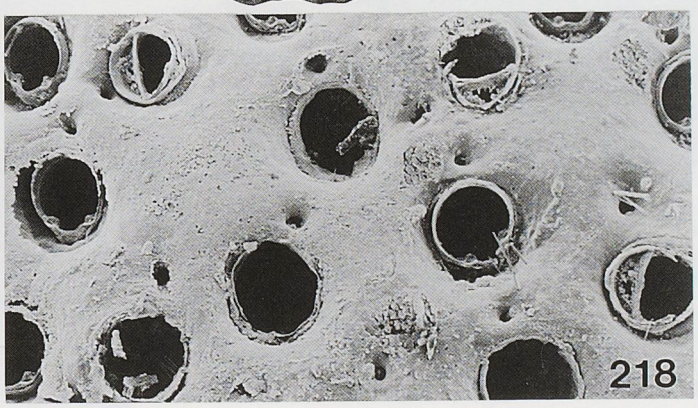
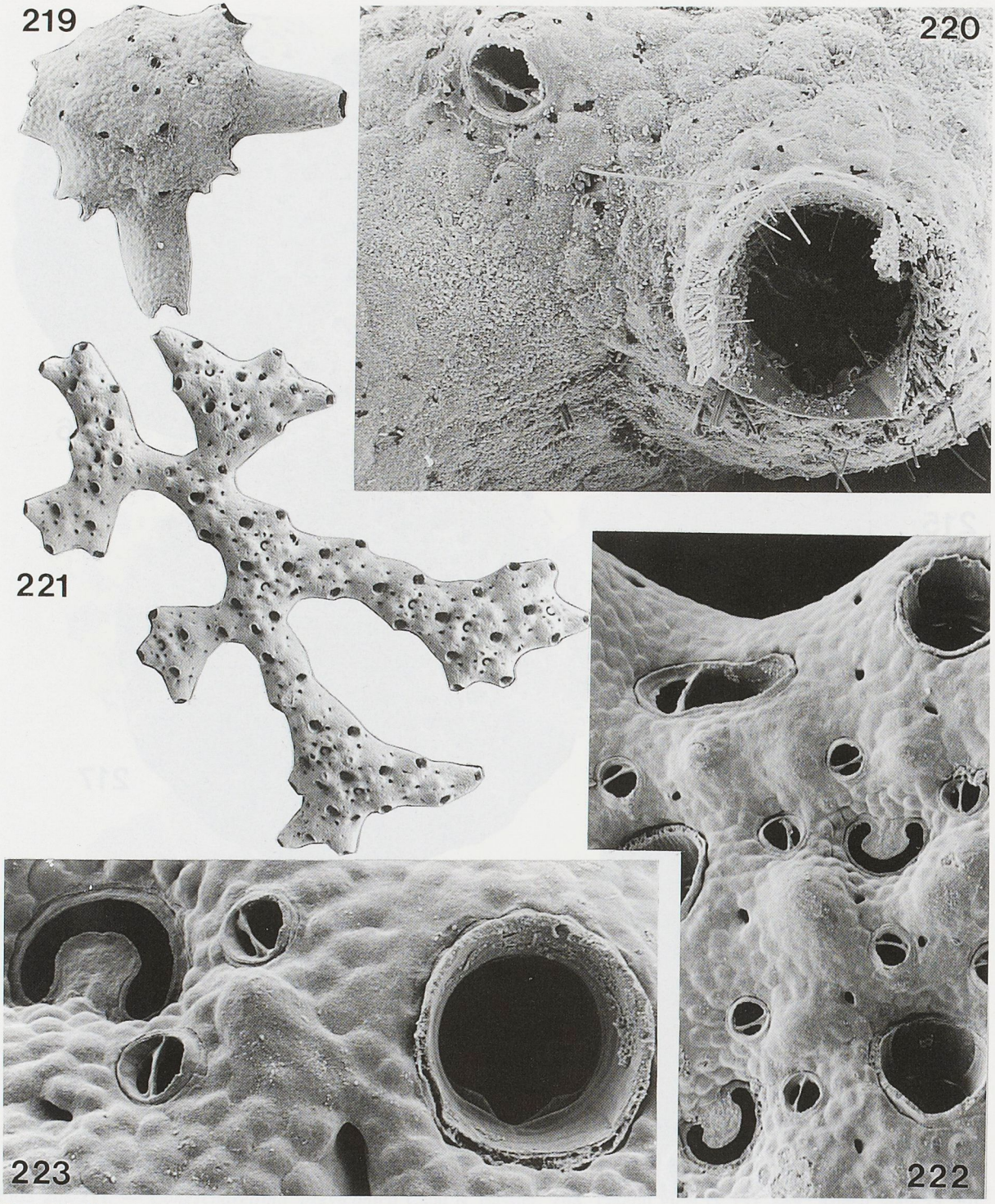
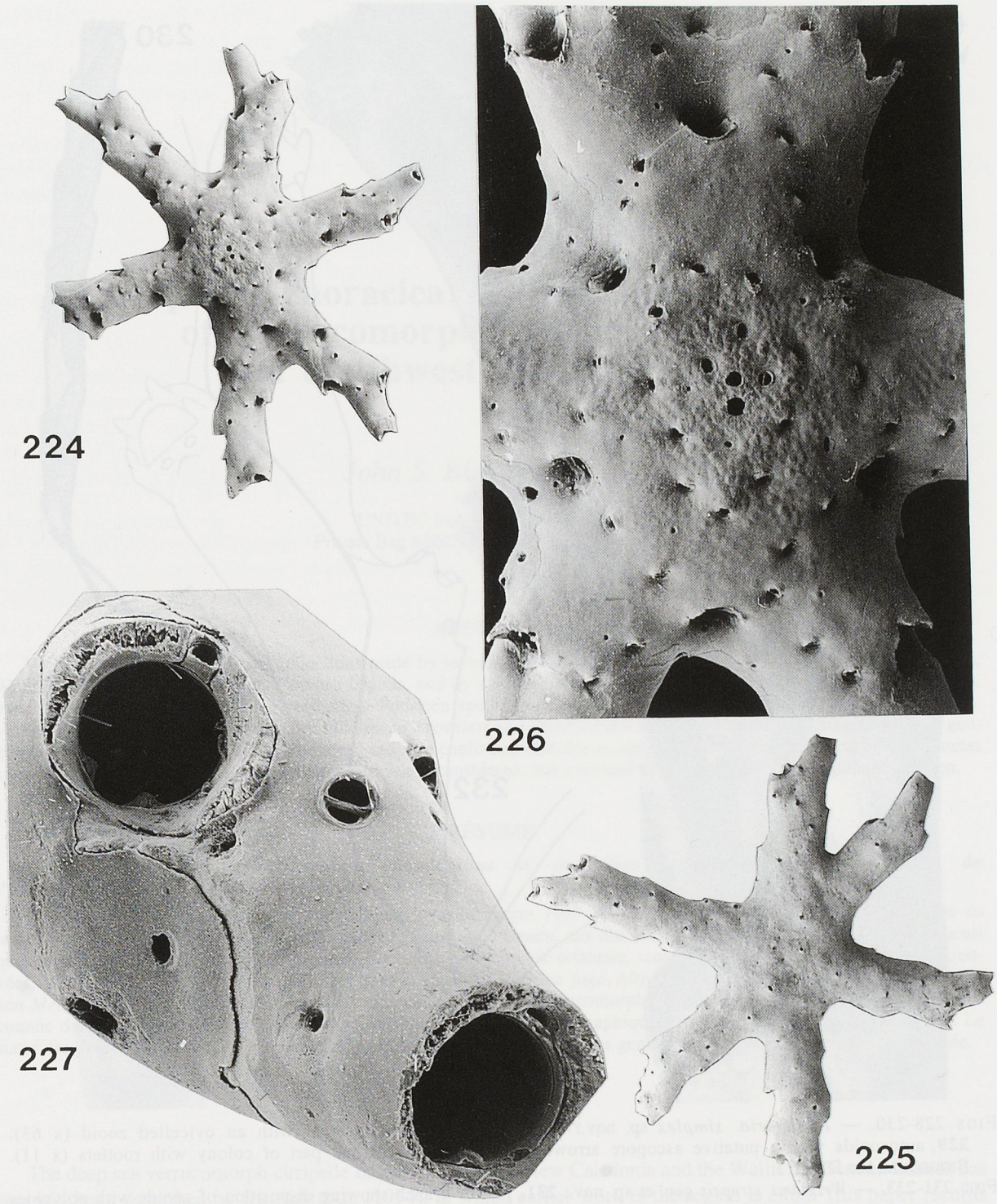


FIG. 214. — *Conescharellina breviconica* Canu & Bassler: Orifices and avicularia (x 105). MUSORSTOM 3 Stn CP 87.
FIG. 215. — *Conescharellina catella* Canu & Bassler: Orifices and avicularia (x 125) MUSORSTOM 3 Stn CP 100.
FIGS 216-218. — *Conescharellina atalanta* sp. nov.: **216**, Apical view of colony (x 26). **217**, Basal view (x 21). MUSORSTOM 4 Stn DW 150. **218**, Orifices and avicularia (x 104). MUSORSTOM 4 Stn DW 149.

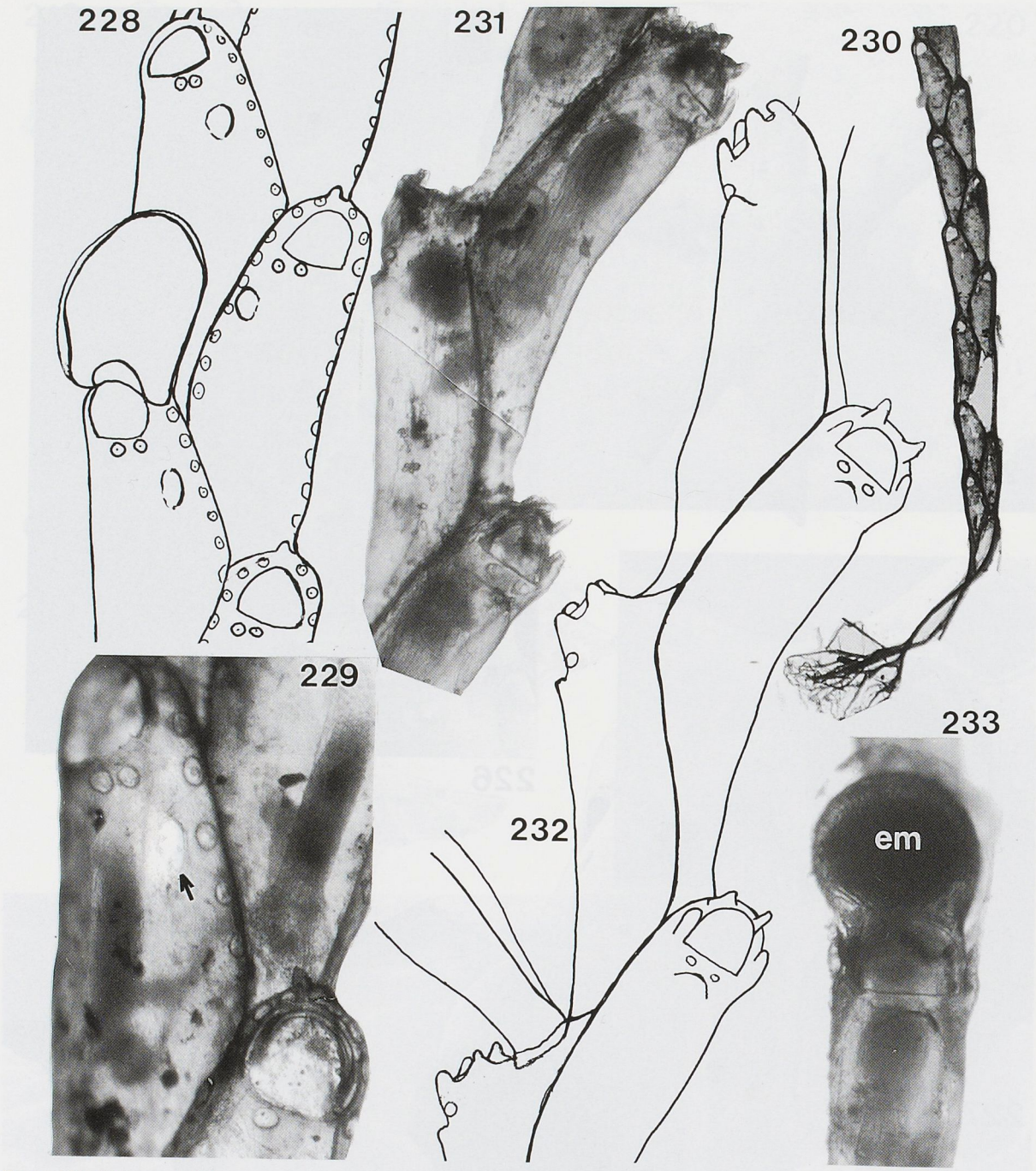


FIGS 219-220. — *Trochosodon* sp.: **219**, Small colony (x 33). **220**, Primary orifice and avicularium (x 215). BIOGEOCAL Stn KG 275.

FIGS 221-223. — *Cruceschareilina japonica* Silén: **221**, Whole colony (x 12). **222**, Large and small avicularia and 'lunoecia' (x 101). **223**, 'Lunoecium', avicularia, and primary orifice (x 212). MUSORSTOM 3 Stn CP 106.



FIGS 224-227. — *Crucescharellina aster* sp. nov.: **224**, Whole colony, orificial side (x 13). **225**, Whole colony, aborificial side (x 13). **226**, Centre of colony, orificial side (x 47). **227**, Primary orifice and avicularium (x 149). BIOGEOCAL Stn CP 232.



FIGS 228-230. — *Ichthyaria simplex* sp. nov.: **228,** portion of biserial stem with an ovicelled zooid (x 63). **229,** autozooids with a putative ascopore arrowed (x 96). **230,** proximal part of colony with rootlets (x 11). BIOGEOCAL Stn DW 313.

FIGS 231-233. — *Wrigiana strepsis* gen. et sp. nov.: **231,** part of branch showing disposition of zooids with polypides in transparency (x 95). **232,** part of stem with origin of lateral branch at lower left (x 95). **233,** zooid with ovicell and contained embryo (em) (x 88). MUSORSTOM 4 Stn DW 185.

2

Cirripedia Thoracica: New ranges and species of Verrucomorpha from the Indian and Southwest Pacific Oceans

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ABSTRACT

Verrucomorpha from deep sea collections made by several French cruises to New Caledonia, Loyalty Ridge, Vanuatu, Wallis Island and Futuna Islands, Comoro Islands, and by the French-Indonesian cruise KARUBAR in Indonesian waters, over the period 1985-1994, are investigated. Fourteen species of verrucid are described, including four new species, *Verruca jago*, *Altiverruca jonesae*, *Brochiverruca crosnieri* and *Metaverruca maclaughlinae*; the bathymetric and geographic ranges of verrucid taxa are extended, and it is confirmed that this is one of the most diverse verrucomorph faunas known. The status of both *Verruca* and *Metaverruca* is considered, and a revised key to genera of the Verrucidae is given.

RÉSUMÉ

Cirripedia Thoracica: Nouvelles répartitions et nouvelles espèces de Verrucomorpha de l'océan Indien et du Sud-Ouest Pacifique.

Les Verrucomorphes, principalement bathyaux, récoltés entre 1985-1994, lors de diverses campagnes françaises au large de la Nouvelle-Calédonie et de la Ride des Loyauté, au Vanuatu, aux îles Wallis et Futuna, à la Grande-Comore, ainsi que lors de la campagne franco-indonésienne KARUBAR en Indonésie orientale, sont étudiés. Quatorze espèces ont été trouvées, parmi lesquelles quatre sont nouvelles pour la science : *Verruca jago*, *Altiverruca jonesae*, *Brochiverruca crosnieri* and *Metaverruca maclaughlinae*. Il se confirme que la faune des Verrucomorphes étudiée ici est l'une des plus diversifiée connue dans une même région. Les distributions bathymétriques et géographiques de plusieurs espèces sont étendues. Le statut des genres *Verruca* et *Metaverruca* est examiné, et une nouvelle clé des genres de la famille Verrucidae est proposée.

INTRODUCTION

The deep sea verrucomorph cirripede fauna of Indonesia, New Caledonia and the Wallis and Futuna Islands has recently been described by BUCKERIDGE (1994), in which earlier work in the region is cited. This paper records

BUCKERIDGE, John S., 1997. — Cirripedia Thoracica: New ranges and species of Verrucomorpha from the Indian and Southwest Pacific Oceans. *In*: A. CROSNIER (ed.), Résultats des Campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176** : 125-149. Paris ISBN 2-85653-511-9.

previously unsorted material collected from New Caledonian waters by BIOCAL (1985), MUSORSTOM 6 (1989), BATHUS 1 (1993), BATHUS 2 (1993), BATHUS 3 (1993), BATHUS 4 (1994) and HALIPRO 1 (1994); from Vanuatu by MUSORSTOM 8 (1994); from the Wallis and Futuna Islands region by MUSORSTOM 7 (1992); from the Loyalty Ridge by MUSORSTOM 6 (1989); from Grande-Comore (in the Indian Ocean) by JAGO-COELACANTHE (1989) and from Indonesian waters by KARUBAR (1991) expeditions.

In addition, the study has been expanded to include verrucid material collected by the Western Australian Museum, Perth, Australia, from off northwestern Australia by R.V. *"Soela"* (1982, 1984). The decision to include western Indian Ocean material was based upon the need to compare the current collection, and that of BUCKERIDGE (1994), with *Verruca macani* Stubbings, 1936, a species which appeared similar to *Metaverruca* described in BUCKERIDGE (1994), but which had previously been only partially described. A first description of the soft parts of this species is provided here. The geographic region thus expanded, permitted a most intriguing new taxon from the Comore Islands to be included. With the exception of unusual varieties, only new species, or parts of taxa not previously illustrated, are figured in this paper.

The Verrucidae are a family of asymmetrical sessile barnacles characterised by six calcareous plates. The shell is made up of a carina and rostrum, plus a tergum and scutum, the latter two having moved from the operculum to become "fixed" as part of the shell wall. The remaining plates, a tergum and scutum (hereafter termed movable plates) make up the operculum. It appears to be totally random as to whether the "left" or "right" opercular plates move to complete the shell wall (DARWIN, 1854; BUCKERIDGE, 1994). However NEWMAN (1989) has demonstrated that in *Neoverruca* at least, the asymmetry is determined in the earliest juveniles by the side closest to the substratum.

TYPES: Holotypes of all new species are held by the Muséum national d'Histoire naturelle (prefix "MNHN-Ci") in Paris, France. Paratypes are also held by the Muséum national d'Histoire naturelle, and when numbers of specimens available permit, by the National Museum of Natural History, Washington DC, United States of America (prefix "USNM") and UNITEC Institute of Technology, Auckland, New Zealand (prefix "CAX").

In the lists of material examined the abbreviations for the gear used are: CP = beam trawl and DW = Warén dredge. The specimens from Grande-Comore were collected by the German submersible *JAGO*. The Western Australian Museum material was collected by Engel trawl. Grid references for the Western Australian material have been corrected to a single value, represented by degrees and minutes only.

LIST OF SPECIES

Genus ***VERRUCA*** Schumacher, 1817

Verruca albatrossiana Pilsbry, 1912
Verruca jago sp. nov.

Genus ***ALTIVERRUCA*** Pilsbry, 1916

Altiverruca cristallina (Gruvel, 1907)
Altiverruca jonesae sp. nov.
Altiverruca nitida (Hoek, 1883)

Genus ***BROCHIVERRUCA*** Zevina, 1993

Brochiverruca crosnieri sp. nov.

Genus ***METAVERRUCA*** Pilsbry, 1916

Metaverruca defayeae Buckeridge, 1994
Metaverruca macani (Stubbings, 1936)
Metaverruca pacifica Buckeridge, 1994
Metaverruca plicata Buckeridge, 1994
Metaverruca recta (Aurivillius, 1898)
Metaverruca maclaughlinae sp. nov.

Genus ***ROSTRATOVERRUCA*** Broch, 1922

Rostratoverruca intexta (Pilsbry, 1912)
Rostratoverruca kruegeri (Broch, 1922)

SYSTEMATIC ACCOUNT

Superorder THORACICA Darwin, 1854
Suborder VERRUCOMORPHA Pilsbry, 1916

DIAGNOSIS. — Sessile thoracican cirripedes with asymmetrical shell wall comprising fixed scutum, fixed tergum, rostrum and carina, closed by movable scutum and movable tergum (Verrucidae), sometimes including rostrolatus and carinolatus on movable side (Proverrucidae), or basal whorls of imbricating plates (Neoverrucidae); basis membranous or calcareous.

Family VERRUCIDAE Darwin, 1854
(amend. NEWMAN & HESSLER, 1989)

DIAGNOSIS. — Verrucomorphans with primary wall (carina, rostrum, fixed scutum, fixed tergum), in contact with substratum; latera absent.

DISCUSSION. — There are currently seven genera recognised within the Verrucidae. Initially, PILSBRY (1916), recognised four "sections", which were subsequently elevated to subgenera (e.g. NEWMAN, ZULLO & WITHERS, 1969; FOSTER, 1978). BROCH, (1922) added *Rostratoverruca*, and ZEVINA (1987, 1993) added *Spongoverruca* and *Brochiverruca* respectively.

The presence of a myophore on the fixed scutum has been previously regarded by many workers as of considerable value in distinguishing between genera, e.g. PILSBRY (1916), ZEVINA (1987), BUCKERIDGE (1994), FOSTER & BUCKERIDGE (1995). Indeed, PILSBRY (1916) used this character to define his "Section A" *Metaverruca*, i.e.,

"The basal borders of the wall plates are inflexed, forming a wide basal ledge; the fixed scutum bears a depending tongue-shaped adductor ridge or myophore; the apex of the rostrum is marginal; top flattened; sculpture weak".

However, as Paulo YOUNG has pointed out (pers. comm.), PILSBRY failed to stress that his *Lepas stroemia* Müller, 1776, the type for "Section B" *Verruca*, also possesses a myophore. If this is taken into account, then PILSBRY's diagnosis for *Verruca s.s.* is less than satisfactory, i.e.,

"Top flattened, the plane of the movable plates not far from parallel with that of the base; radio-alar area between fixed scutum and fixed tergum small or linear".

Of the points stressed in the above two diagnoses, it must be noted that:

1. If the apex of the rostrum is not marginal, the species cannot be *Verruca,* rather it is either *Rostratoverruca* or *Brochiverruca.*

2. The basal ledge is a difficult character to use to distinguish *Verruca* and *Metaverruca*, as a number of *Verruca s.s.* (see in PILSBRY, 1916), have slightly thickened basal edges to the shell wall, e.g. *Verruca alba* Pilsbry, *Verruca calotheca* Pilsbry, *Verruca entobapta* Pilsbry.

3. The radio-alar area between fixed scutum and fixed tergum does not appear to be particularly linear in some *Verruca s.s.*, e.g. *V. entobapta.*

It should also be noted that the angle of the operculum to the base may vary a little, particularly where the nature of the substrate appears to have a strong influence. However, I firmly believe that *Verruca* and *Metaverruca* are distinct. Key features that distinguish *Metaverruca* are the presence of **all** of the following characters:

— thickened basal ledge on the compartments (this is often so well developed that it is very difficult to disarticulate the shell evenly along compartmental sutures).
— a distinctive D-shaped orifice, with opercular hinge straight.
— shell shape "box-like".
— operculum nearly parallel to base.
— a well developed myophore on the fixed scutum.

Although each of these characters may be found in *Verruca,* they are only found **together** in *Metaverruca*. Clearly juveniles of *Metaverruca* will not necessarily possess all features, but it would be most cumbersome in a diagnosis of a genus to include all stages of ontogeny. A revised key is provided below, which permits differentiation between the genera.

In the past, numerous workers have spent considerable time in primary descriptions, detailing the number of interlocking ridges between the carina and rostrum. Whilst there is some validity in considering these aspects, they should only be taken as a guide, for in species like *Metaverruca recta*, (for which there is now a very large amount of comparative material), one can distinguish a series (not necessarily solely ontogenetic) that shows a range from one or two very flat ridges to more than five (see BUCKERIDGE 1994, fig. 13). The spacing of growth lines may also be misleading (see under *Metaverruca recta*). However, one feature that does appear consistent, except in the most juvenile of specimens, is the number of interlocking ribs (or ridges) on the movable opercula. These very quickly reach an optimal number and are not known to add further ribs, even in very large specimens.

Morphology of the soft parts can be of considerable help in distinguishing species, particularly of *Metaverruca*. However, most taxa described here may be identified on shell morphology alone. The nomenclature used in this paper follows that of BUCKERIDGE, 1994, fig. 1. The use of a "+" in the cirral counts indicates that the cirrus is incomplete, and "c.a." refers to caudal appendages.

STRATIGRAPHIC RANGE. — ?Middle, Upper Cretaceous to Recent, Europe, South America, Australasia.

DISTRIBUTION. — Cosmopolitan in present seas.

Key to genera of the Verrucidae

1. Rostral apex marginal **2**
— Rostral apex removed from margin **3**

2. Operculum nearly vertical to base **4**
— Operculum nearly parallel to base **5**

3. Carinal apex marginal..... *Rostratoverruca*
— Carinal apex removed from margin ..... *Brochiverruca*

4. Myophore present on fixed scutum ..... *Cameraverruca*
— Myophore absent on fixed scutum **6**

5. Shell box-like, with thickened, inflected basal margin and D-shaped aperture . *Metaverruca*
— Shell low conic, with non-linear hinge-line ..... *Verruca*

6. Not embedded in sponge ..... *Altiverruca*
— Embedded in sponge ..... *Spongoverruca*

Genus ***VERRUCA*** Schumacher, 1817

Verruca "Section B"- PILSBRY, 1916: 23.
Verruca (Verruca) - NEWMAN ZULLO & WITHERS, 1969: R281. — FOSTER, 1978: 68.
Verruca - ZEVINA 1987: 1812. — NEWMAN & HESSLER, 1989: 268.

DIAGNOSIS. — Verrucids with shell form depressed; apices of rostrum and carina marginal; operculum parallel to base.

TYPE SPECIES. — *Lepas stroemia* Müller, 1776. North Atlantic, northern Europe, Mediterranean, ?Red Sea, intertidal - 500 m.

SPECIES. — Twenty eight taxa are presently assigned to this genus, († indicates extinct taxa): *Verruca alaskana* Pilsbry, 1943; *V. alba* Pilsbry, 1907; *V. alba caribbea* Pilsbry, 1916; *V. alba barbadensis* Pilsbry, 1916;

V. albatrossiana Pilsbry, 1912; *V. calotheca* Pilsbry, 1907; *V. calotheca flavidula* Pilsbry, 1916; *V. calotheca heteropoma* Pilsbry, 1916; *V. calotheca niasiensis* Nilsson-Cantell, 1929; *V. cookei* Pilsbry, 1927; *V. floridana* Pilsbry, 1916; *V. grimaldi* Gruvel, 1920; *V. laevigata* (Sowerby, 1827); †*V. nuciformis* Buckeridge, 1983; †*V. prisca* Bosquet, 1853; †*V. pusilla* Bosquet, 1857; †*V. rocana* Steinmann, 1921; *V. sinuosa* Foster & Buckeridge, 1995; *V. spengleri* Darwin, 1854; *V. stroemia* (Müller, 1776); †*V. tasmanica* Buckeridge, 1983; †*V. tasmanica chatheca* Buckeridge, 1983; *V. trisulcata* Gruvel, 1920; *V. xanthia* Pilsbry, 1916; *V. xanthia insculpta* Pilsbry, 1916; *V. entobapta* Pilsbry, 1916; *V. scrippsae* Zullo, 1964; plus the new species described here: *V. jago* sp. nov.

Remarks: †*Verruca withersi* Newman & Schram, 1980 (included in the listing for *Verruca sensu stricto* in BUCKERIDGE,1994) has been re-evaluated and interpreted as "non-verrucid" in BUCKERIDGE, 1996. The generic status of a further group of verrucids, comprising *V. aequalis* Aurivillius, 1898; *V. cornuta* Aurivillius, 1898; *V. costata* Aurivillius, 1898, is uncertain.

DISCUSSION. — The genus *Verruca* is a grouping of convenience. In this sense, the taxa within it are rather discordant. It is clear that future revision will require the genus to be split, with perhaps only *V. cookei*, *V. jago* sp. nov., *V. laevigata*, *V. spengleri*, *V. stroemia*, and some fossil taxa remaining in *Verruca sensu stricto*, the remaining being placed in at least one new genus (see BUCKERIDGE, 1994).

STRATIGRAPHIC RANGE. — Cretaceous (Australia, New Zealand, Columbia, western Europe), Palaeogene (New Zealand, Argentina, Chatham Islands) to Recent.

DISTRIBUTION. — Pacific, North Atlantic, Mediterranean, Caribbean, ?Red Sea, Indian Ocean, intertidal - 620 m.

Verruca albatrossiana Pilsbry, 1912

Verruca albatrossiana Pilsbry, 1912: 292.
Verruca (Eu-Verruca) albatrossiana - BROCH, 1922: 290, figs 39-40.
Verruca grex Hoek, 1913: 142, pl. 11, figs 7-13, pl. 13, figs 11-13.
Verruca albatrossiana - BUCKERIDGE, 1994: 91, figs 1a-f.

MATERIAL EXAMINED. — **Indonesia**. KARUBAR: stn CP 17, 05°15'S, 133°01'E, 439-459 m, 24.10.1991: 1 specimen on a cidaroid spine.

NW Australia. *"Soela"*: WAM 909-86, 13°33'S, 122°14'E, 494-496 m, 13.2.1984: 11 specimens, on cidaroid spines.

DIAGNOSIS. — *Verruca* with rostrum and carina low, strongly developed longitudinally to give shell oblique appearance; fixed scutum considerably larger than fixed tergum, opercular plates displaced carinally.

DISCUSSION. — This material conforms to that described in BUCKERIDGE (1994). This is the first record of the species from northwestern Australia.

DISTRIBUTION. — Indo-Pacific, 345-620 m.

Verruca jago sp. nov.

Fig. 1 a-m, 8 e-i.

MATERIAL EXAMINED. — **Grande-Comore**. JAGO-COELACANTHE: stn at 11°51'S, 43°20'E, 203 m, 1.12.1989: 4 specimens. — Stn at 11°50'S, 43°21'E, 196 m, 8.12.1989: 4 specimens.

TYPES. — *Holotype*: MNHN-Ci 2425, r-c diameter: 2.9 mm; height: 0.4 mm (from 11°51'S, 43°20'E).

Paratypes: MNHN-Ci 2426, r-c diameter: 2.27 mm; height: 0.25 mm (1 specimen, from 11°51'S, 43°20'E); MNHN-Ci 2431 (3 specimens, from 11°50'S, 43°21'E); CAX 108 (1 specimen, from 11°50'S, 43°21'E); USNM 282635 (2 specimens, from 11°51'S, 43°20'E).

DIAGNOSIS. —Small, flattened *Verruca*; shell with regularly disposed, large punctae; movable tergum quadrangular, 3 ribs; fixed scutum with large myophore; movable scutum triangular, with 3 ribs, occludent portion lacking ribbing, internally with elevated depression for adductor muscle attachment; rami of cirrus I spatulate.

DESCRIPTION. — *Verruca* with shell white, translucent, low conic, weakly to moderately plicate, patterned with fine circular tubes (punctae), which extend from exterior (infilled with chitinous material), to open to interior as very small pores; punctae generally separated by at least own diameter and arranged as rows along leading edge of sub-parallel, concentric growth lines; shell wall comprised of up to 7 calcareous lamellae (particularly clear in basal view of rostrum of Ci 2431); operculum sub-parallel to base; rostrum and carina articulating with up to 2 ribs; basis membranous. Fixed scutum with large, well formed myophore for adductor muscle attachment; fixed tergum low, internally with small horizontal ledge, although not as well developed as myophore in fixed scutum; movable tergum quadrangular, with well defined apico-basal rib, plus 2 secondary ribs, interlocking with movable scutum; articular margin slightly concave; movable scutum triangular, with 2 ribs interlocking with tergum and further adjacent curved, apico-basal rib terminating at rostro-carinal suture, occludent portion lacking ribbing, internally with elevated depression for adductor muscle attachment.

Mandible tridentate, lower angle pectinate, with 2 moderately large basal spines; first maxilla with 2 large and 2 medium upper spines, moderate to weakly formed notch, lower angle with 2 large and 3 medium spines; labrum gently arched, with single large tooth on either side and at least 4 smaller, bidentate teeth centrally; palps with 3-4 terminal spines, not meeting across labrum.

Cirri possess the following number of segments (r-c being the rostro-carinal diameter):

r-c (mm)	I	II	III	IV	V	VI	c.a.
2.27	7, 6	5, 9	12, 14	12, 14	13, 14	13, 13	5

Cirrus I with both rami heavily hirsute, moderately spatulate, cirri I and II with anterior rami shorter than posterior rami, although in cirrus I with more segments.

Length of caudal appendages about twice that of basal segment of pedicel of cirrus VI; penis very large, occupying significant part of mantle cavity, with numerous terminal setae and scattered tufts of long setae; eggs present in holotype, larvae in mantle cavity of Ci 2431a.

DISCUSSION. — The interesting features of this species are the punctae, or pores, the horizontal ledge on the tergum, the spatulate rami on the first cirri and the very large penis. Although the latter is likely a reflection of the current sexual activity of the specimens studied, it was proportionally larger than any other I have viewed in the Verrucidae. The presence of a ledge on the inner surface of the fixed tergum, although not unique (*Verruca stroemia* has one), is rare. In addition, some specimens of *Verruca jago* sp. nov. are remarkably flat. Paratype Ci 2426, from which the soft parts were drawn, had a shell height of only 0.25 mm.

The most distinctive character about this species is the small punctae that are regularly disposed over the entire shell. The shell is translucent in many specimens, and with a stereomicroscope, it is possible to focus through the punctae, and to perceive them as pores. The punctae narrow as they approach the inner side of the wall, and open to the interior. Although under light microscopy, most punctae appear to be closed to the exterior, examination under the scanning electron microscope (following the desiccation and electrolytic coating process) shows that soft tissue extends to the exterior (fig. 8g-i). In regions of higher corrasion, such as around the apices of plates, the punctae form slightly raised granules. In light of this, it is suggested that the tissue (probably chitinous) has some mitigating effect on erosion rates.

The inner surface of the plates of some other species within *Verruca* are characterised by chitin filled pores (e.g. *Verruca laevigata, Verruca stroemia*). However the pores in *V. jago* sp. nov. are at least twice the diameter of those observed in any others, and differ further by being clearly visible on the exterior surface, a feature generally restricted to of worn, or juvenile specimens of other species.

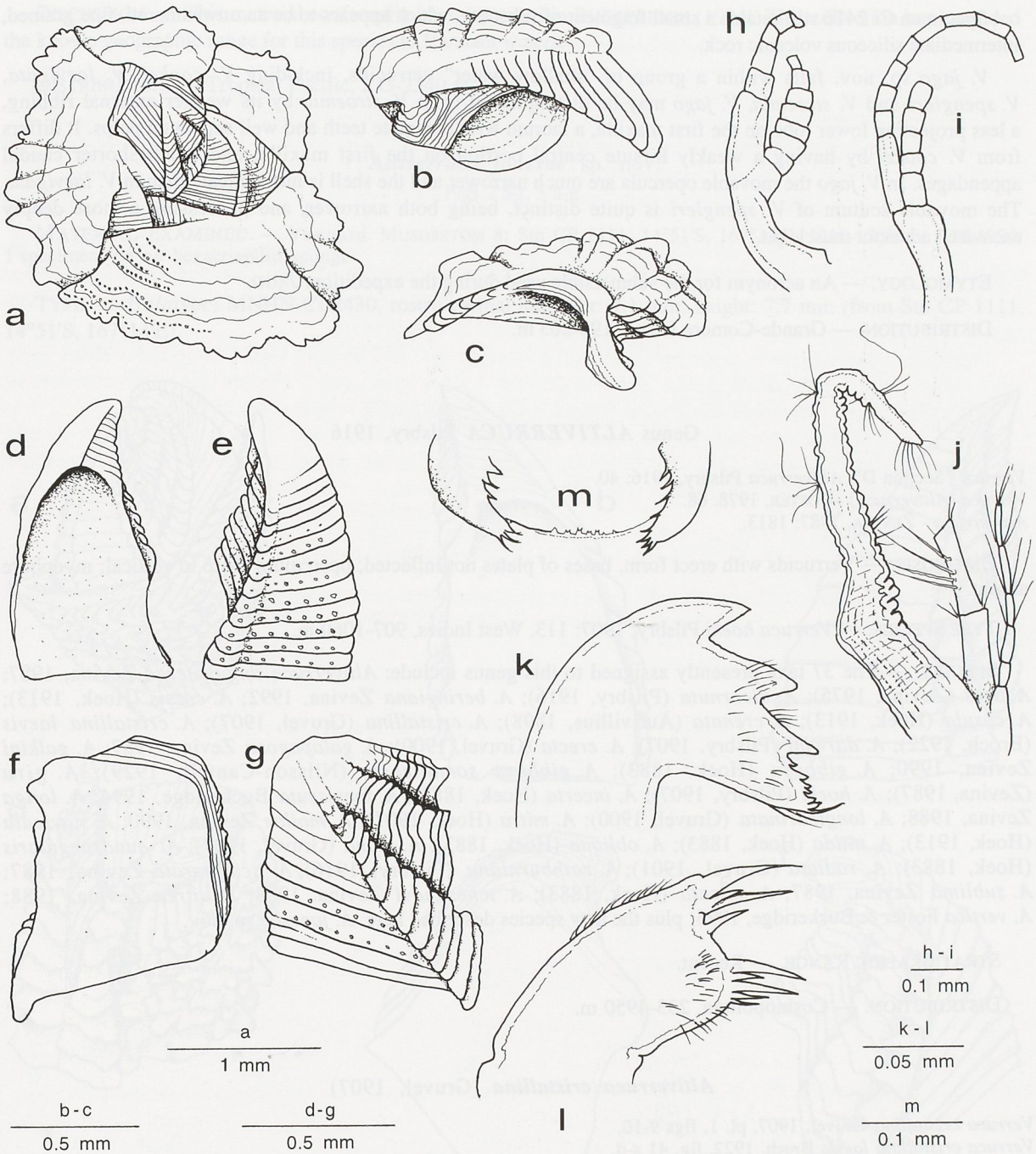


FIG. 1. — *Verruca jago* sp. nov.: **a**, holotype, complete shell (dorsal view), MNHN-Ci 2425; **b**, fixed scutum (right, dorsal view), showing lunulitiform myophore for adductor muscle attachment; **c**, fixed tergum (right, dorsal view), showing internal ledge for muscle attachment; **d**, movable scutum (left, interior); **e**, movable scutum (left, exterior); **f**, movable tergum (left, interior); **g**, movable tergum (left exterior); **h**, cirrus I; **i**, cirrus II; **j**, basal portion of cirrus VI, with penis and caudal appendage attached; **k**, mandible; **l**, first maxilla; **m**, labrum with palps. All material from 11°51'S, 43°20'E.

Specimen Ci 2426 still retains a small fragment of substrate, which appears to be an unweathered, fine grained, intermediate siliceous volcanic rock.

V. jago sp. nov. falls within a group of "shallow water" verrucids, including *V. cookei*, *V. laevigata*, *V. spengleri* and *V. stroemia*. *V. jago* may be distinguished from *V. stroemia* by its weaker external ribbing, a less projecting lower lobe on the first maxilla, a labrum with bidentate teeth and well separated palps. It differs from *V. cookei* by having a weakly hirsute central portion on the first maxilla, and much shorter caudal appendages. In *V. jago* the movable opercula are much narrower and the shell is more plicate than in *V. laevigata*. The movable scutum of *V. spengleri* is quite distinct, being both narrower, and possessing a more deeply excavated adductor muscle pit.

ETYMOLOGY. — An acronym for the submersible used during the expedition: *JAGO*.

DISTRIBUTION. — Grande-Comore Island, 196-203 m.

Genus ***ALTIVERRUCA*** Pilsbry, 1916

Verruca "Section D": *Altiverruca* Pilsbry, 1916: 40.
Verruca (Altiverruca) - FOSTER, 1978: 68.
Altiverruca - ZEVINA, 1987: 1813.

DIAGNOSIS. — Verrucids with erect form, bases of plates not inflected; operculum close to vertical; myophore absent.

TYPE SPECIES. — *Verruca hoeki* Pilsbry, 1907: 113. West Indies, 907-1060 m.

SPECIES. — The 37 taxa presently assigned to this genus include: *Altiverruca angustiterga* Zevina, 1987; *A. aves* (Zevina, 1975); *A. bicornuta* (Pilsbry, 1916); *A. beringiana* Zevina, 1992; *A. cassis* (Hoek, 1913); *A. casula* (Hoek, 1913); *A. crenata* (Aurivillius, 1898); *A. cristallina* (Gruvel, 1907); *A. cristallina laevis* (Broch, 1922); *A. darwini* (Pilsbry, 1907); *A. erecta* (Gruvel, 1900); *A. galapagosa* Zevina, 1987; *A. galkini* Zevina, 1990; *A. gibbosa* (Hoek, 1883); *A. gibbosa somaliensis* (Nilsson-Cantell, 1929); *A. gira* (Zevina, 1987); *A. hoeki* (Pilsbry, 1907); *A. incerta* (Hoek, 1883); *A. laeviscuta* Buckeridge, 1994; *A. longa* Zevina, 1988; *A. longicarinata* (Gruvel, 1900); *A. mitra* (Hoek, 1907); *A. mollae* Zevina, 1990; *A. navicula* (Hoek, 1913); *A. nitida* (Hoek, 1883); *A. obliqua* (Hoek, 1883); *A. plana* (Gruvel, 1907); *A. quadrangularis* (Hoek, 1883); *A. radiata* (Gruvel, 1901); *A. rathburniana* (Pilsbry, 1916); *A. sculpturata* Zevina, 1987; *A. sublima* Zevina, 1987; *A. sulcata* (Hoek, 1883); *A. tchesunovi* Zevina, 1988; *A. vitrea* Zevina, 1988; *A. vertica* Foster & Buckeridge, 1995; plus the new species described here: *A. jonesae* sp. nov.

STRATIGRAPHIC RANGE. — Recent.

DISTRIBUTION. — Cosmopolitan, 233-4950 m.

Altiverruca cristallina (Gruvel, 1907)

Verruca cristallina Gruvel, 1907, pl. 1, figs 9-10.
Verruca cristallina laevis Broch, 1922, fig. 41 a-d.
Verruca (Altiverruca) cristallina - ROSELL, 1989: 24, pl. 6. figs d-i. — ROSELL, 1991: 34.
Altiverruca cristallina - BUCKERIDGE, 1994: 93, figs 2a-h.

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn CP 1109, 14°52'S, 167°18'E, 1550-1620 m, 8.10.1994: 21 specimens, on rocks. — Stn CP 1110, 14°49'S, 167°15'E, 1360 m, 8.10.1994: 3 specimens, on rock.

DIAGNOSIS. — *Altiverruca* with carina and rostrum interlocking with up to 6 ribs; movable tergum with 4 to 5 articulating ribs, at least two articulating with scutum; caudal appendages short.

DISCUSSION. — This material conforms to that described in BUCKERIDGE (1994). This collection has extended the known geographic range for this species to Vanuatu waters.

DISTRIBUTION. — Tropical Pacific, 233-2340 m.

Altiverruca jonesae sp. nov.

Figs 2 a-f, 3 a-g.

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: Stn CP 1111, 14°51'S, 167°14'E, 1210-1250 m, 8.10.1994: 1 specimen, on an hexactinellid sponge.

TYPE. — *Holotype*: MNHN-Ci 2430, rostro-carinal diameter: 7.1 mm; height: 7.7 mm (from Stn CP 1111, 14°51'S, 167°14'E).

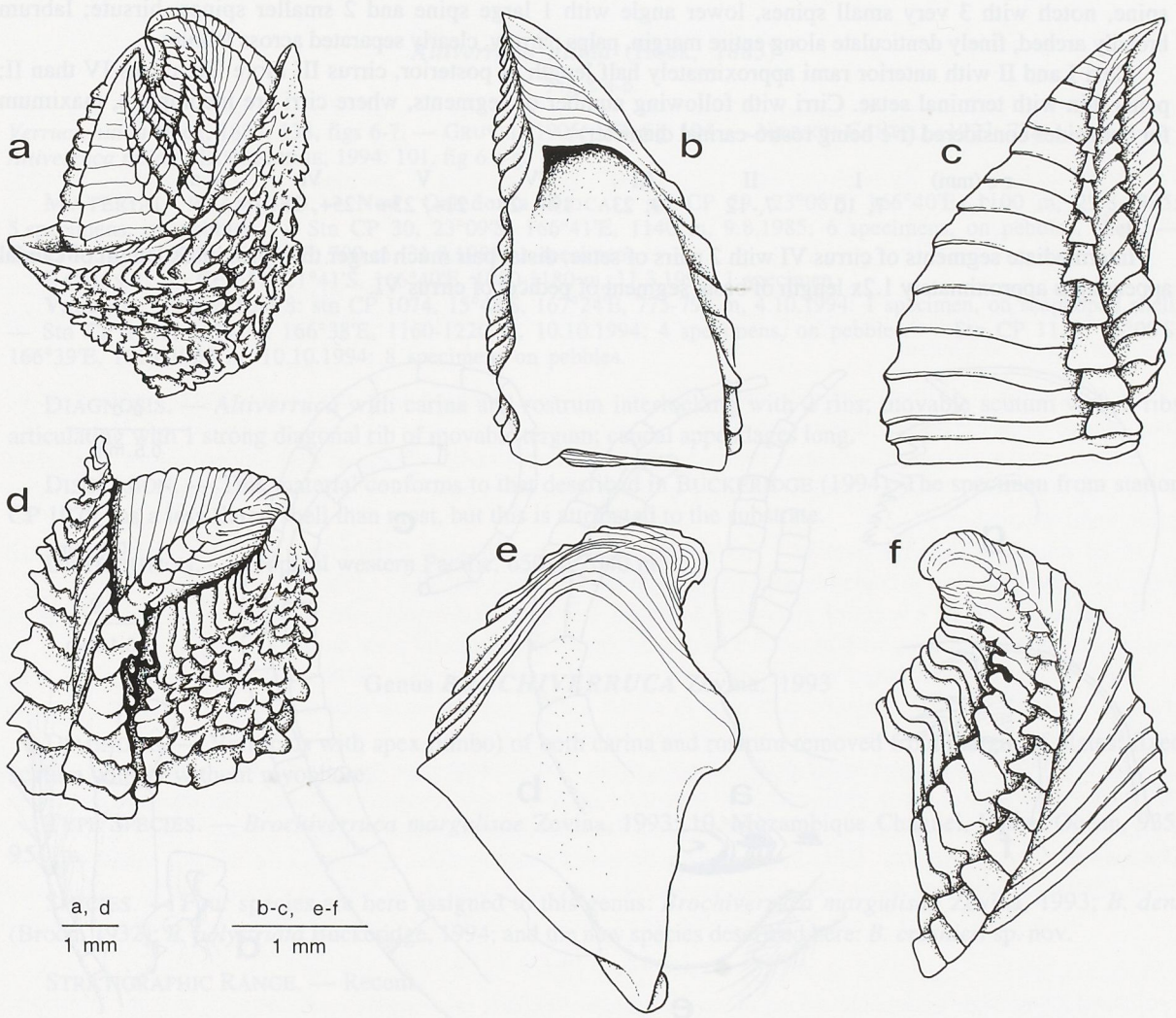


FIG. 2. — *Altiverruca jonesae* sp. nov.: **a**, holotype, complete shell (dorsal view), MNHN-Ci 2430; **b**, movable scutum (right, interior); **c**, movable scutum (right, exterior); **d**, complete shell (fixed opercula view); **e**, movable tergum (right, interior); **f**, movable tergum (right exterior). All material from Stn CP 1111.

DIAGNOSIS. — Moderate sized *Altiverruca* with surface ornamented by short rounded spines; movable tergum and scutum possessing 3 diagonal ribs; movable tergum with concave occludent margin and incurved apex.

DESCRIPTION. — Shell white, with short, flattened and rounded spines aligned along regularly spaced growth lines; rostrum and carina interlock with 4 to 5 ribs; apex of rostrum and carina produced.

Fixed scutum and fixed tergum with apices extending beyond opercular plates; fixed scutum folded over on upper margin to form surface confluent with plane of operculum; fixed tergum strongly flexed towards fixed scutum, with strong, sharply rounded primary diagonal rib, and weak minor secondary rib running along lower part of scutal margin.

Movable scutum triangular, apico-basal ridge prominent, with 2 secondary ribs, tergal margin concave; interior with elevated, well developed depression for adductor muscle attachment. Movable tergum with concave occludent margin and incurved apex; upper angle between occludent margin and scutal margin protuberant; 1 primary apico-basal ridge and 2 secondary ribs present on scutal side, carinal side without ribs.

Mandible tridentate, lower angle pectinate with 6 small spines; first maxilla with 1 large and 1 small upper spine, notch with 3 very small spines, lower angle with 1 large spine and 2 smaller spines, hirsute; labrum broadly arched, finely denticulate along entire margin, palps narrow, clearly separated across labrum.

Cirri I and II with anterior rami approximately half length of posterior, cirrus III more like cirrus IV than II; penis thin with terminal setae. Cirri with following number of segments, where cirri are incomplete, maximum for both sides considered (r-c being rostro-carinal diameter) :

r-c (mm)	I	II	III	IV	V	VI	c.a.
7.1	7, 10	7, 12	19, 23	19+, 25	21+, 23+	25+, 28+	8

Intermediate segments of cirrus VI with 2 pairs of setae, distal pair much larger than proximal; length of caudal appendages approximately 1.2x length of basal segment of pedicel of cirrus VI.

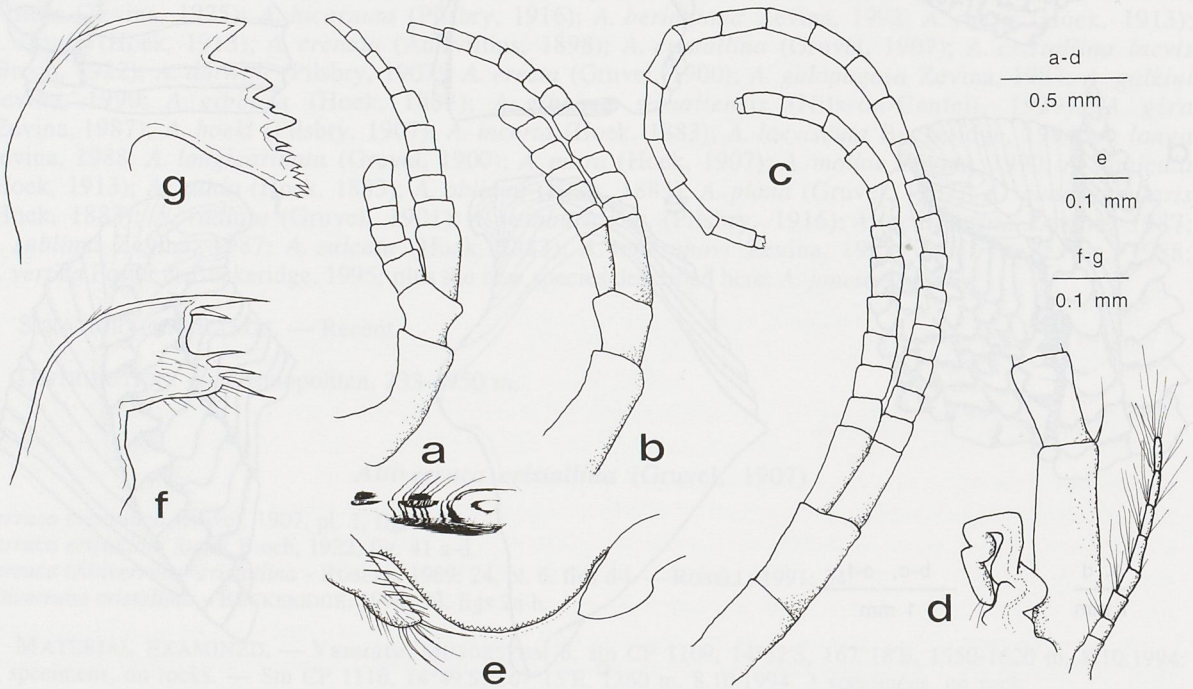


FIG. 3. — *Altiverruca jonesae* sp. nov.: **a**, holotype, cirrus I, MNHN-Ci 2430; **b**, cirrus II; **c**, cirrus III; **d**, basal portion of cirrus VI, with penis and caudal appendage attached; **e**, labrum with palps, setae shown on left palp only; **f**, first maxilla; **g**, mandible. All material from Stn CP 1111.

DISCUSSION. — This is a most elegant species. Unfortunately only one specimen has been collected; however the spinose nature of the shell ornamentation, the deep adductor muscle depression on the movable scutum and the strongly incurved apex and shape of the movable tergum are sufficient to warrant specific differentiation. Shell ornamentation is considered significant with this species, as this is clearly neither a function of substrate nor overcrowding. *Verruca jonesae* resembles, but may be distinguished from, both *Altiverruca gibbosa* (Hoek, 1883), and *Altiverruca sulcata* (Hoek, 1883), by the ornate ornamentation, a more defined second rib on the movable scutum, the incurved apex of the movable tergum and a much shorter anterior ramus on cirrus I.

It may be distinguished from a similar north Pacific species, *Altiverruca sculpturata* Zevina 1987, by a narrower movable scutum, a more protruded fixed tergal apex, and more spinose shell ornamentation.

ETYMOLOGY. — Named for Diana JONES, Curator of Crustacea, Western Australian Museum, in recognition of her extensive work with the cirripedes of the region.

DISTRIBUTION. — Vanuatu, 1210-1250 m.

Altiverruca nitida (Hoek, 1883)

Fig 8 a-b.

Verruca nitida Hoek, 1883: 138, figs 6-7. — GRUVEL, 1905: 177, fig. 194. — NILSSON-CANTELL, 1927: 778.
Altiverruca nitida - BUCKERIDGE, 1994: 101, fig 6 a-g.

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn CP 29, 23°08'S, 166°40'E, 1100 m, 29.8.1985: 5 specimens, on pebbles. — Stn CP 30, 23°09'S, 166°41'E, 1140 m, 9.8.1985: 6 specimens, on pebbles, shell. — Stn DW 51, 23°05'S, 167°44'E, 700 m, 31.8.1985: 1 specimen.

BATHUS 1: stn CP 651, 21°41'S, 166°40'E, 1080-1180 m, 11.3.1993: 1 specimen.

Vanuatu. MUSORSTOM 8: stn CP 1074, 15°48'S, 167°24'E, 775-798 m, 4.10.1994: 1 specimen, on scaphopod shell. — Stn CP 1125, 15°57'S, 166°38'E, 1160-1220 m, 10.10.1994: 4 specimens, on pebbles. — Stn CP 1129, 16°00'S, 166°39'E, 1014-1050 m, 10.10.1994: 8 specimens on pebbles.

DIAGNOSIS. — *Altiverruca* with carina and rostrum interlocking with 2 ribs; movable scutum with 2 ribs articulating with 1 strong diagonal rib of movable tergum; caudal appendages long.

DISCUSSION. — This material conforms to that described in BUCKERIDGE (1994). The specimen from station CP 1074 has a less flared shell than most, but this is attributed to the substrate.

DISTRIBUTION. — Tropical western Pacific, 650 to 2040 m.

Genus ***BROCHIVERRUCA*** Zevina, 1993

DIAGNOSIS. — Verrucids with apex (umbo) of both carina and rostrum removed from margin of plates; fixed scutum with or without myophore.

TYPE SPECIES. — *Brochiverruca margulisae* Zevina, 1993: 10. Mozambique Channel, Indian Ocean, 935-950 m.

SPECIES. — Four species are here assigned to this genus: *Brochiverruca margulisae* Zevina, 1993; *B. dens* (Broch, 1932); *B. polystriata* Buckeridge, 1994; and the new species described here: *B. crosnieri* sp. nov.

STRATIGRAPHIC RANGE. — Recent.

DISTRIBUTION. — Western Pacific and Western Indian Ocean, 270-950 m.

DISCUSSION. — The distinctive nature of *Brochiverruca* was first recognised by BROCH (1932). He suggested that the patelliform carina might be sufficient cause to set *V. dens* apart from *Rostratoverruca.* However, he left

this "to future investigators to settle, whether *Verruca dens* must be considered type of a separate subgenus or not". In light of this reference, and the abundance of *V. dens*, it is to be regretted that ZEVINA chose not to use *Verruca (Rostratoverruca?) dens* as her type.

Brochiverruca crosnieri sp. nov. extends the bathymetric range of the genus into shallower water. Prior to this record, the genus was unknown from depths of less than 348 m. *Brochiverruca* is unlike other verrucids in that the species appear to have strong substrate (= host) preferences. Of the *Brochiverruca* species that I have studied, all are consistently attached to the following cnidarians:

Brochiverruca dens (Broch)	scleractinian	*Madrepora*
Brochiverruca polystriata Buckeridge	scleractinian	*Ellanospammia* and *Madrepora*
Brochiverruca crosnieri sp. nov.	antipatharian	antipatharian sp. indet.

Unfortunately, ZEVINA states only that the type, *B. margulisae* Zevina, represented by 4 specimens, is attached to "coral".

Brochiverruca crosnieri sp. nov.

Fig 4 a-h

MATERIAL EXAMINED. — **Loyalty Ridge**. MUSORSTOM 6: stn CP 401, 20°42'S, 167°00'E, 270 m, 14.2.1989: 1 specimen, on antipatharian.

TYPE. — *Holotype*: MNHN-Ci 2424, r-c diameter: 2.2 mm; height: 2.4 mm (from Stn CP 401, 20°42'S, 167°00'E).

DIAGNOSIS. — Shell white, porcelanous, very finely sculptured with delicate longitudinal striae crossed by fine growth lines; rostrum and carina each with apex separated from upper margin by slightly more than 1/3rd distance from basal margin; interior of movable tergum with articular node on scutal margin; fixed scutum with ledge for adductor muscle attachment.

DESCRIPTION. — Shell white, porcelanous, molariform; exterior very finely sculptured, with delicate longitudinal striae crossed by fine growth lines.

Rostrum and carina each with apex protruded and incurved distally, separated from upper margin by slightly more than one third distance from basal margin; margin between both plates characterised by 5 flat and non-prominent, articulating ribs.

Fixed scutum with ledge internally for adductor muscle attachment; fixed tergal edge confluent with fixed tergum and with no clear articulating ribs, fixed tergal apex most elevated part of shell.

Movable tergum of low relief, quadrangular, with 1 narrow, flat medial rib; with extended upper angle of articular margin articulating with movable scutum; internally with articular node on scutal margin.

Movable scutum quadrangular, less than half width of movable tergum, with weak apico-basal ridge; apex incurved towards movable tergum; interior with raised central portion excavated centrally for adductor muscle attachment; tergal margin of raised area with rounded embayment (fig. 4b).

Mandible tridentate, lower angle pectinate with about 7 small spines; first maxilla with 2 larger spines above notch and 3 spines on lower part, centrally hirsute, 3 tufts of setae on upper surface. Labrum gently arcuate, margin finely denticulate. Penis about twice length of caudal appendages, terminally hirsute. Cirri I and II with flattened anterior rami, cirrus III more like cirrus IV than II; intermediate segments of cirrus VI with 3 pairs of setae. Cirri with following number of segments, (r-c being rostro-carinal diameter) :

r-c (mm)	I	II	III	IV	V	VI	c.a.
2.2	6, 8	5, 10	14, 16	9+, 17	16, 16+	17, 23	5

Caudal appendages about half as long as basal segment of pedicel of cirrus VI.

DISCUSSION. — This species is related to *Brochiverruca dens* (Broch) and *Brochiverruca polystriata* Buckeridge. It may be distinguished from *B. dens* by its significantly smoother shell, with longitudinal ornamentation

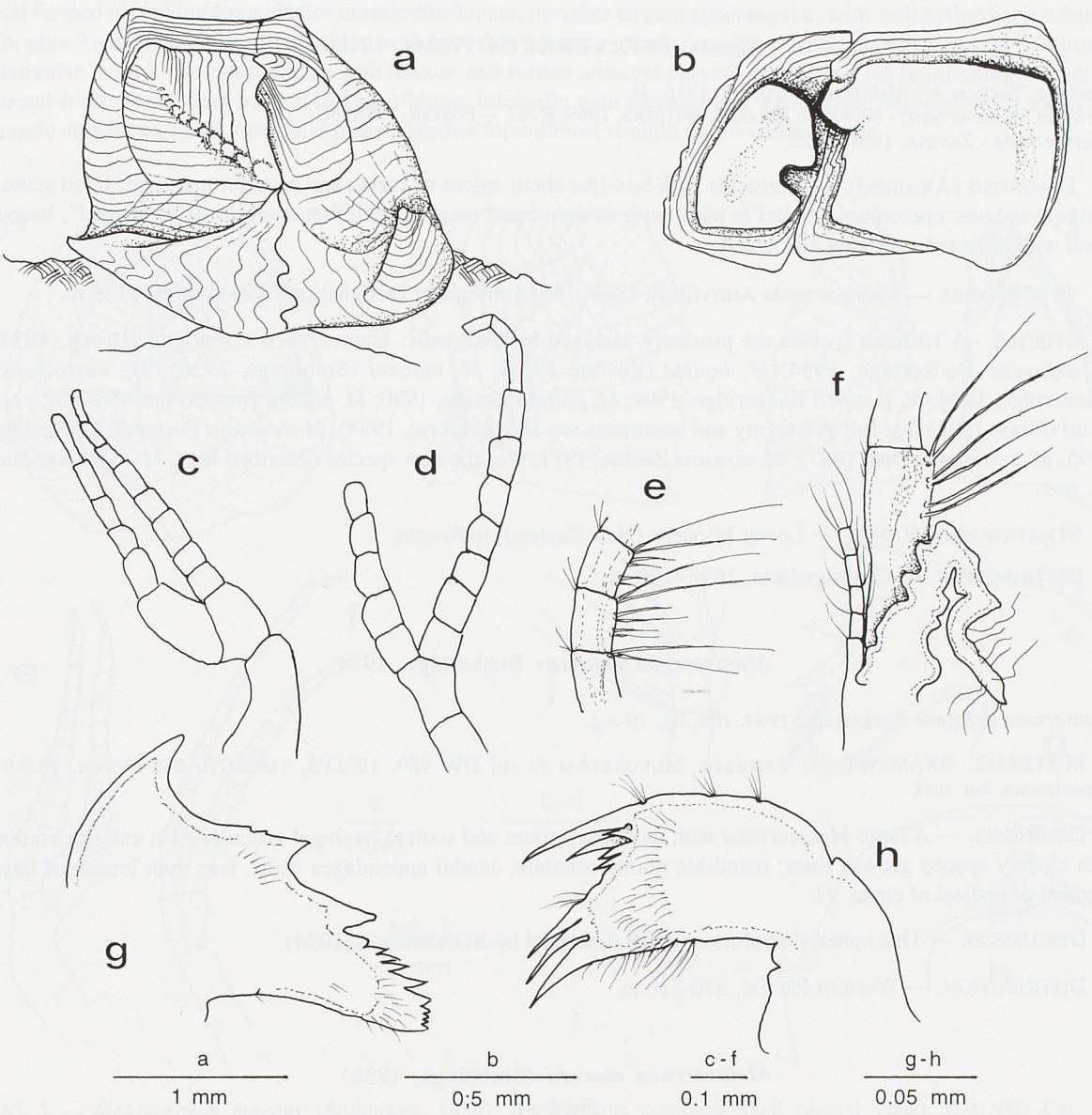


FIG. 4. — *Brochiverruca crosnieri* sp. nov.: **a**, holotype, complete shell (dorsal view), MNHN-Ci 2424; **b**, movable scutum and movable tergum (interior); **c**, cirrus I; **d**, cirrus II; **e**, intermediate segment of cirrus VI; **f**, basal portion of cirrus VI, with penis and caudal appendage attached; **g**, mandible; **h**, first maxilla. All material from Stn CP 401.

restricted to rare striae; and a broader movable scutum and finely denticulate labrum. It differs from *B. polystriata* in its shell ornamentation, and the possession of only one rib on the movable tergum.

ETYMOLOGY. — Named for Alain CROSNIER, ORSTOM (Institut Français de Recherche Scientifique pour le Développement en Coopération), Paris, who was instrumental in much of the collecting and sorting, and who provided sustained support and friendship during my sojourn in Paris.

DISTRIBUTION. — Loyalty Ridge, 270 m.

Genus *METAVERRUCA* Pilsbry, 1916

Verruca "Section A": *Metaverruca* Pilsbry, 1916: 21.
Verruca (Metaverruca) - NEWNAN, ZULLO & WITHERS, 1969: R283. — FOSTER, 1978: 68.
Metaverruca - ZEVINA, 1987: 1812.

DIAGNOSIS (Amended). — Verrucids with box-like shell; apices of carina and rostrum marginal; fixed scutum with myophore; operculum parallel to base, with straight basal margin, such that aperture is "D-shaped"; base of shell wall inflected internally, thickened.

TYPE SPECIES. — *Verruca recta* Aurivillius, 1898: 195 (Subsequent Designation). The Azores, 1135 m.

SPECIES. — Thirteen species are presently assigned to this genus: *Metaverruca corrugata* (Broch, 1922); *M. defayeae* Buckeridge, 1994; *M. lepista* (Zevina, 1987); *M. macani* (Stubbings, 1936); *M. norfolkensis* Buckeridge, 1994; *M. pacifica* Buckeridge, 1994; *M. pallida* Zevina, 1990; *M. plicata* Buckeridge, 1994; *M. recta* (Aurivillius, 1898) (for full synonymy and comments see BUCKERIDGE, 1994); *M. reunioni* Foster & Buckeridge, 1995; *M. seriola* (Zevina, 1987); *M. tarasovi* Zevina, 1971; plus the new species described here, *M. maclaughlinae* sp. nov.

STRATIGRAPHIC RANGE. — Lower Miocene (New Zealand) to Recent.

DISTRIBUTION. — Cosmopolitan, 167- 4100 m.

Metaverruca defayeae Buckeridge, 1994

Metaverruca defayeae Buckeridge, 1994: 109, fig. 19 a-g.

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn DW 989, 19°13'S, 169°20'E, 650-669 m, 23.9.94: 2 specimens, on rock.

DIAGNOSIS. — A large *Metaverruca* with movable tergum and scutum having 4 articular ribs; exterior smooth with closely spaced growth lines; mandible quinquedentate, caudal appendages short, less than length of basal segment of pedicel of cirrus VI.

DISCUSSION. — This material conforms to that described by BUCKERIDGE (1994).

DISTRIBUTION. — Western Pacific, 370-710 m.

Metaverruca macani (Stubbings, 1936)

Fig 5 a-i.

Verruca macani Stubbings, 1936: 39, figs 17 a-b.

MATERIAL EXAMINED. — **Zanzibar**. JOHN MURRAY EXPEDITION 1933-1934: stn 122, 05°22'S, 39°23'E, 762 m, 1935: 1 specimen, slightly damaged.

TYPE. — *Holotype*: Natural History Museum (London) Cat. No. NHM 1938.1.20.154, (unique specimen).

DIAGNOSIS (Amended). — *Metaverruca* with movable tergum quadrangular, movable scutum and tergum each with 4 articular ridges; caudal appendages short.

DESCRIPTION (Amended and updated to include internal anatomy). — Medium sized *Metaverruca* with shell white, low conic, sides steep; operculum sub-parallel to base; exterior generally smooth, with relatively closely spaced concentric growth lines; rostrum and carina articulating with 3 ribs; basis membranous. Fixed scutum with

well formed myophore for adductor muscle attachment; movable tergum quadrangular, with well defined apico-basal rib, plus 3 secondary ribs, interlocking with movable scutum; articular margin slightly concave; movable scutum triangular, with 3 ribs interlocking with tergum and further adjacent curved, apico-basal rib terminating at rostro-carinal suture; occludent portion lacking ribbing; internally with elevated and well formed depression for adductor muscle attachment; both opercular plates together form almost straight rostro-carinal hinge.

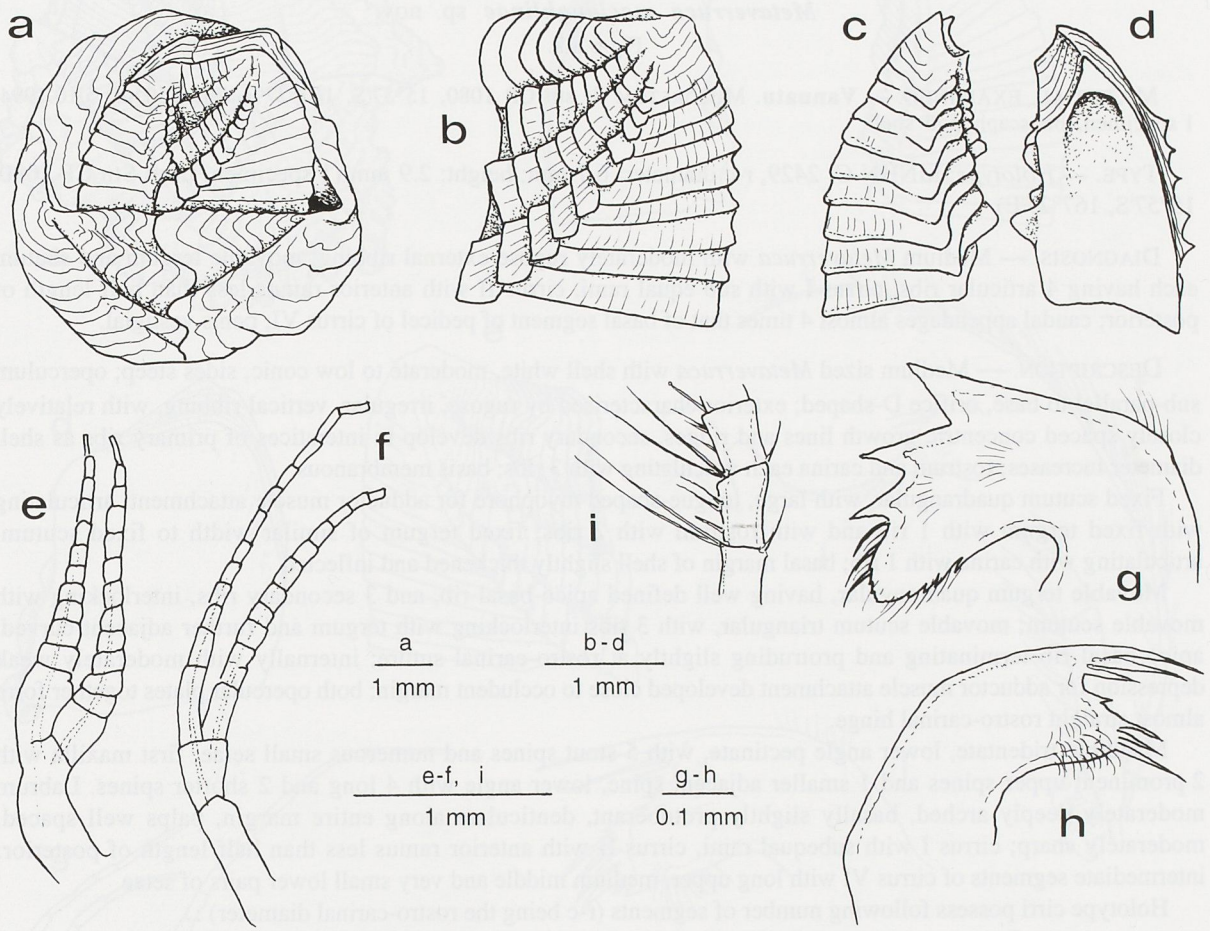


FIG. 5. — *Metaverruca macani* (Stubbings, 1936): **a**, holotype, complete shell (dorsal view), BM(NH) Cat. No. 1938.1.20.154; **b**, movable tergum (right, exterior); **c**, movable scutum (right, exterior); **d**, movable scutum (right, interior); **e**, cirrus I; **f**, cirrus II; **g**, mandible; **h**, first maxilla; **i**, intermediate segment of cirrus VI. All material from Stn 122.

Mandible tridentate, lower angle pectinate; first maxilla with 2 large upper spines, moderate notch with 1 small spine, lower angle hirsute, with 4 large spines.

Cirri possess the following number of segments (r-c being the rostro-carinal diameter) :

r-c (mm)	I	II	III	IV	V	VI	c.a.
6.4	13,12	12,12	18,18	24,26	24,28	35,36	7
	13,15	13,14					

Counts for cirri I and II for both sides of animal.

Caudal appendages very short, length less than that of basal segment of pedicel of cirrus VI; penis short.

DISCUSSION. — *Metaverruca macani* has not been recorded since the original collection made by the John Murray Expedition. This species shows some similarity to *Metaverruca pacifica* Buckeridge. Comments on the differences between the two species are provided here-in, under the discussion of that species.

DISTRIBUTION. — Off Zanzibar, 726 m.

Metaverruca maclaughlinae sp. nov.

Fig 6 a-k.

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn CP 1080, 15°57'S, 167°27'E, 799-850 m, 5.10.1994: 1 specimen, on scaphopod shell.

TYPE. — *Holotype*: MNHN-Ci 2429, r-c diameter: 6.7 mm; height: 2.9 mm (1 specimen, from Stn CP 1080, 15°57'S, 167°27'E).

DIAGNOSIS. — Medium *Metaverruca* with moderately rugose external ribbing; movable tergum and scutum each having 4 articular ribs; cirrus I with sub equal rami, cirrus II with anterior ramus less than half length of posterior; caudal appendages almost 4 times that of basal segment of pedicel of cirrus VI; penis vestigial.

DESCRIPTION. — Medium sized *Metaverruca* with shell white, moderate to low conic, sides steep; operculum sub-parallel to base, orifice D-shaped; exterior characterised by rugose, irregular, vertical ribbing, with relatively closely spaced concentric growth lines and ridges, secondary ribs develop in interstices of primary ribs as shell diameter increases; rostrum and carina each articulating with 3 ribs; basis membranous.

Fixed scutum quadrangular, with large, tongue-shaped myophore for adductor muscle attachment; articulating with fixed tergum with 1 rib and with rostrum with 2 ribs; fixed tergum of similar width to fixed scutum, articulating with carina with 1 rib; basal margin of shell slightly thickened and inflected.

Movable tergum quadrangular, having well defined apico-basal rib, and 3 secondary ribs, interlocking with movable scutum; movable scutum triangular, with 3 ribs interlocking with tergum and further adjacent curved, apico-basal rib terminating and protruding slightly at rostro-carinal suture; internally with moderately weak depression for adductor muscle attachment developed close to occludent margin; both opercular plates together form almost straight rostro-carinal hinge.

Mandible tridentate, lower angle pectinate, with 5 stout spines and numerous small setae; first maxilla with 2 prominent upper spines and 1 smaller adjacent spine, lower angle with 4 long and 2 shorter spines. Labrum moderately deeply arched, basally slightly protuberant, denticulate along entire margin, palps well spaced, moderately sharp; cirrus I with subequal rami, cirrus II with anterior ramus less than half length of posterior; intermediate segments of cirrus VI with long upper, medium middle and very small lower pairs of setae.

Holotype cirri possess following number of segments (r-c being the rostro-carinal diameter) :

r-c (mm)	I	II	III	IV	V	VI	c.a.
6.7	15,17	9,18	18,21	26,29	28,30	30,29	23

Caudal appendages very long, almost 4 times that of basal segment of pedicel of cirrus VI; penis vestigial.

DISCUSSION. — When first observed, *Metaverruca maclaughlinae* appeared similar to *Metaverruca defayae*; with the primary external difference, a rugose surface, being attributed to the type of substrate. The growth of this verrucid was indeed tortuous, as the diameter of the specimen exceeded that of the scaphopod shell on which it grew, such that the resulting exposed base required to be sealed with sand grains. However, *M. maclaughlinae* has quite distinctive internal anatomy, the caudal appendages are proportionately longer than in any other known *Metaverruca*, and the cirri are also unusual, with cirrus I being longer than cirrus II.

Metaverruca maclaughlinae may be distinguished from *Metaverruca pacifica* Buckeridge by its movable tergum, which possesses a longer occludent margin, the movable scutum, which lacks longitudinal striae or ribs on the occludent side, the shorter anterior ramus of cirrus II and the presence of spines in the notch of the first maxilla. It

differs from *M. defayae* primarily by its more rugose external ornamentation and the very much longer caudal appendages.

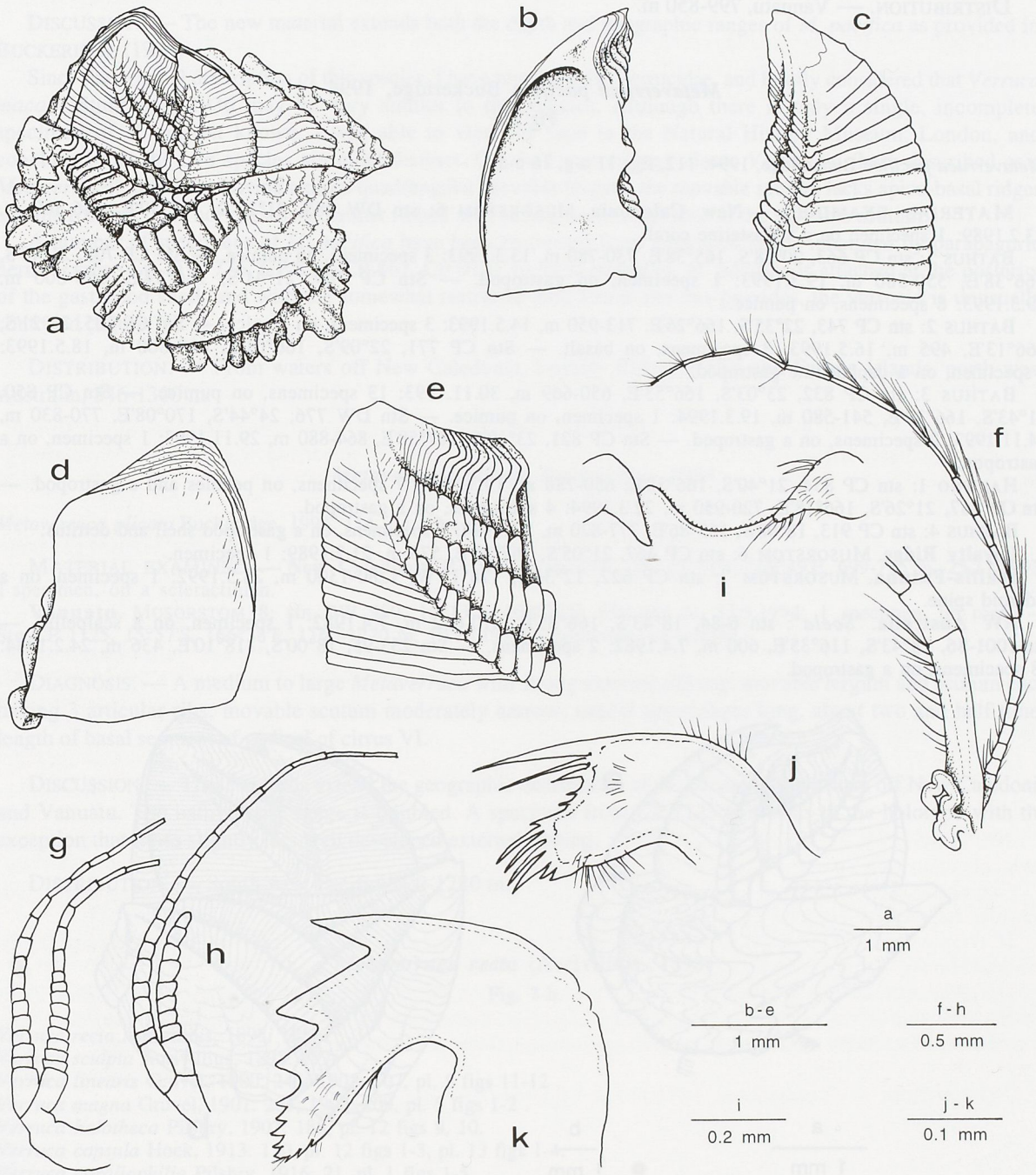


FIG. 6. — *Metaverruca maclaughlinae* sp. nov.: **a**, holotype, complete shell (dorsal view), MNHN-Ci 2429; **b**, movable scutum (left, interior); **c**, movable scutum (left, exterior); **d**, movable tergum (left, interior); **e**, movable tergum (left exterior); **f**, basal portion of cirrus VI, with penis and caudal appendage attached; **g**, cirrus I; **h**, cirrus II; **i**, labrum with palps, setae shown on right palp only; **j**, first maxilla; **k**, mandible. All material from Stn CP 1080.

ETYMOLOGY. — Named for Dr Patsy MCLAUGHLIN, Sedro Woolley, Washington, United States of America, in recognition of her previous work on cirripedes, and her support and knowledge during my Paris sojourn.

DISTRIBUTION. — Vanuatu, 799-850 m.

Metaverruca pacifica Buckeridge, 1994

Fig 7 a.

Metaverruca pacifica Buckeridge, 1994: 112, figs 11 a-g, 16 c-d.

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 6: stn DW 485, 21°23'S, 167°59'E, 346-360 m, 23.2.1989: 1 specimen on a stylasterine coral.

BATHUS 1: stn CP 663, 20°58'S, 165°38'E, 730-780 m, 13.3.1993: 3 specimens, on pumice. — Stn CP 708, 21°43'S, 166°38'E, 550-580 m, 19.3.1993: 1 specimen, on gastropod. — Stn CP 709, 21°41'S, 166°37'E, 650-800 m, 19.3.1993: 8 specimens, on pumice.

BATHUS 2: stn CP 743, 22°35'S, 166°26'E, 713-950 m, 14.5.1993: 3 specimens, on pumice. — Stn CP 755, 22°21'S, 166°13'E, 495 m, 16.5.1993: 3 specimens, on basalt. — Stn CP 771, 22°09'S, 166°01'E, 610-800 m, 18.5.1993: 1 specimen, on a daphnelline gastropod.

BATHUS 3: stn CP 832, 23°03'S, 166°53'E, 650-669 m, 30.11.1993: 13 specimens, on pumice. — Stn CP 850, 21°43'S, 166°39'E, 541-580 m, 19.3.1994: 1 specimen, on pumice. — Stn DW 776, 24°44'S, 170°08'E, 770-830 m, 24.11.1993: 2 specimens, on a gastropod. — Stn CP 821, 23°19'S, 167°58'E, 864-880 m, 29.11.1993: 1 specimen, on a gastropod.

HALIPRO 1: stn CP 854, 21°40'S, 166°38'E, 650-780 m, 19.3.1994: 7 specimens, on pebbles and a gastropod. — Stn CP 867, 21°26'S, 166°18'E, 720-950 m, 22.3.1994: 4 specimens, on a gastropod.

BATHUS 4: stn CP 913, 18°08'S, 163°86'E, 777-820 m, 5.8.1994: 5 specimens, on a gastropod shell and detritus.

Loyalty Ridge. MUSORSTOM 6: stn CP 467, 21°05'S, 167°32'E, 575 m, 21.2.1989: 1 specimen.

Wallis-Futuna. MUSORSTOM 7: stn CP 622, 12°34'S, 178°11'W, 1280-1300 m, 28.5.1992: 1 specimen, on a cidaroid spine.

NW Australia. *"Soela"*: stn 6-84, 18°43'S, 166°35'E, 610-612 m, 7.4.1982: 1 specimen, on a scalpellid. — Stn 1001-86, 18°43'S, 116°35'E, 600 m, 7.4.1982: 2 specimens. — Stn 253-95, 18°00'S, 118°10'E, 436 m, 24.2.1984: 28 specimens, on a gastropod.

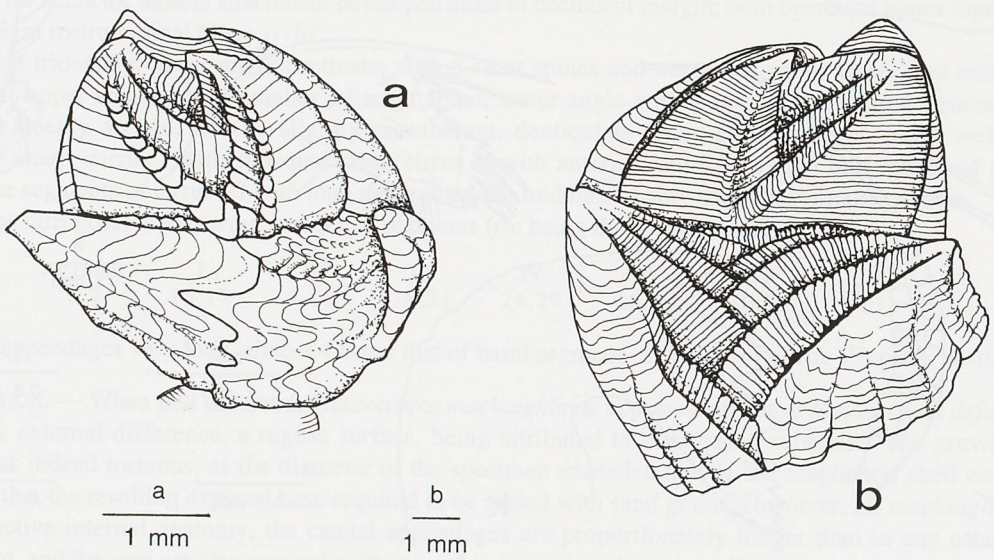


FIG. 7 a. — *Metaverruca pacifica* Buckeridge, 1994. Complete shell (dorsal view), variety, with distortion resulting from basal restriction following attachment to the apex of a gastropod. Material from Stn CP 821.

FIG. 7 b. — *Metaverruca recta* (Aurivillius, 1898). Complete shell (dorsal view), MNHN-Ci 2423, variety with moderately rugose exterior and close, well defined growth lines. Material from Stn CP 1125.

DIAGNOSIS. — *Metaverruca* with movable tergum and scutum having 4 articular ribs; exterior generally smooth with widely spaced growth lines; caudal appendages more than twice length of basal segment of pedicel of cirrus VI.

DISCUSSION. — The new material extends both the depth and geographic ranges of *M. pacifica* as provided in BUCKERIDGE (1994).

Since the original description of this species, I have reviewed the Verrucidae, and briefly considered that *Verruca macani* Stubbings, 1936 may be very similar to this species. Although there is only a single, incomplete specimen of *V. macani* known, I was able to view the type in the Natural History Museum, London, and concluded that the two species are quite distinct. On shell morphology alone, *V. macani* (here described as a *Metaverruca*), differs in having a more quadrangular movable tergum, the movable scutum lacks apico-basal ridges and the rostrum does not possess a distinct ribbed zone arcing back to the base of the movable scutum.

A number of specimens of *M. pacifica* have been recovered from gastropod shells inhabited by parapagurid hermit crabs (e.g. DW 776, CP 821, CP 867, CP 913). In most instances, *M. pacifica* is attached at the posterior of the gastropod shell, and with the somewhat restricted attachment site this provides, the verrucid is unusually contorted (figure 7a).

DISTRIBUTION. — From waters off New Caledonia, Loyalty Ridge, Wallis and Futuna Islands, north west Australia, 346-1300 m.

Metaverruca plicata Buckeridge, 1994

Metaverruca plicata Buckeridge, 1994: 114, fig. 12 a-i.

MATERIAL EXAMINED. — **New Caledonia**. BATHUS 3: stn DW 786, 23°54'S, 169°49'E, 699-715 m, 25.11.1993: 1 specimen, on a scleractinian.

Vanuatu. MUSORSTOM 8: stn DW 989, 19°13'S, 169°20'E, 650-669 m, 23.9.1994: 1 specimen, on rock. — Stn CP 1125, 15°57'S, 166°38'E, 1160-1220 m, 10.10.1994: 1 specimen, on pebble.

DIAGNOSIS. — A medium to large *Metaverruca* with strong external ribbing; movable tergum and scutum each having 3 articular ribs; movable scutum moderately narrow; caudal appendages long, about two and half times length of basal segment of pedicel of cirrus VI.

DISCUSSION. — These records extend the geographic distribution of *M. plicata* to the waters off New Caledonia and Vanuatu. The bathymetric range is doubled. A specimen from CP 1125 conforms to the holotype with the exception that it has slightly less well developed external ribbing.

DISTRIBUTION. — South west Pacific, 520-1220 m.

Metaverruca recta (Aurivillius, 1898)

Fig. 7 b.

Verruca recta Aurivillius, 1898: 195.
Verruca sculpta Aurivillius, 1898: 197.
Verruca linearis Gruvel, 1900: 243; 1902: 107, pl. 5 figs 11-12 .
Verruca magna Gruvel, 1901: 261; 1902: 109, pl. 5 figs 1-2 .
Verruca halotheca Pilsbry, 1907: 188, pl. 12 figs 9, 10.
Verruca capsula Hoek, 1913: 130, pl. 12 figs 1-3, pl. 13 figs 1-4.
Verruca coraliophilia Pilsbry, 1916: 21, pl. 1 figs 1-5.
Verruca cookei - ROSELL, 1989: 299, pl. 11 figs r,s,u,v; 1991: 33. Non *Verruca cookei* Pilsbry, 1927.
Metaverruca recta - BUCKERIDGE, 1994: 116, fig 13 a-f.

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 5: stn DW 302, 22°10'S, 159°23'E, 346-360 m, 12.10. 1986: 1 specimen, on a turritellid.

BATHUS 1: stn CP 651, 21°41'S, 166°40'E, 1080-1180 m, 11.3.1993: 1 specimen, on pumice. — Stn CP 660, 21°10'S, 165°53'E, 786-800 m, 13.3.1993: 3 specimens, on pumice.

BATHUS 2: stn DW 734, 23°00'S, 166°51'E, 766-775 m, 13.5.1993: 1 specimen, on pumice.

BATHUS 3: stn DW 778, 24°43'S, 170°07'E, 750-760 m, 24.11.1993: 1 specimen. — Stn CP 842, 23°05'S, 166°48'E, 830 m, 1.12.1993: 1 specimen, on pumice.

HALIPRO 1: stn CP 858, 21°42'S, 166°41'E, 1000-1120 m, 20.3.1994: 1 specimen, on shell fragment.

Indonesia. KARUBAR: stn DW14, 05°18'S, 132°38'E, 245-246 m, 24.10.1991: 1 specimen, on pebble.

Grande-Comore. JAGO-COELACANTHE: 11°51'S, 43°20'E, 203 m, 1.12.1989: 1 specimen.

Vanuatu. MUSORSTOM 8: stn CP 991, 18°51'S, 168°52'E, 936-910 m, 24.9.1994: 2 specimens, attached to pumice rock. — Stn CP 956, 20°33'S, 169°35'E, 1175-1210 m, 21.9.1994: 5 specimens, on pumice. — Stn DW 969, 20°18'S, 169°53'E, 252-280 m, 21.9.1994: 1 specimen, on a brachiopod. — Stn DW 977, 19°24'S, 169°28'E, 410-505 m, 22.9.1994: 2 specimens, on pebble. — Stn DW 986, 19°20'S, 169°31'E, 602-648 m, 23.9.1994: 3 specimens, on pebbles. — Stn CP 990, 18°51'S, 168°50'E, 980-990 m, 24.9.1994: 10 specimens, on pumice. — Stn CP 991, 18°51'S, 168°52'E, 936-910 m, 24.9.1994: 8 specimens, on rock. — Stn CP 1008, 18°53'S, 168°52'E, 919-1000 m, 25.9.1994: 3 specimens, on pumice. — Stn CP 1025, 17°49'S, 168°39'E, 385-410 m, 28.9.1994: 1 specimen, on coral. — Stn CP 1036, 18°01'S, 168°48'E, 920-950 m, 29.9.1994: 6 specimens, on pumice. — Stn CP 1074, 15°48'S, 167°24'E, 775-798 m, 4.10.1994: 35 specimens, on basalt. — Stn CP 1076, 15°53'S, 167°42'E, 1100-1191 m, 4.10.1994: 11 specimens, on pebbles. — Stn CP 1080, 15°57'S, 167°27'E, 799-850 m, 5.10.1994: 5 specimens, on rock, shell debris. — Stn CP 1095, 15°07'S, 167°11'E, 304-320 m, 6.10.1994: 1 specimen, on rock. — Stn DW 1097, 15°05'S, 167°10'E, 281-288 m, 7.10.1994: 5 specimens, on rock. — Stn CP 1110, 14°49'S, 167°15'E, 1360 m, 8.10.1994: 2 specimens, on rock. — Stn DW 1113, 14°53'S, 167°06'E, 700-736 m, 8.10.1994: 5 specimens, on rock. — Stn CP 1114, 14°52'S, 167°03'E, 647 m, 8.10.1994: 1 specimen, on rock. — Stn CP 1125, 15°57'S, 166°38'E, 1160-1220 m, 10.10.1994: 6 specimens, on pebbles. — Stn CP 1126, 15°58'S, 166°39'E, 1210-1260 m, 11.10.1994: 7 specimens, on pebbles. — Stn CP 1129, 16°00'S, 166°39'E, 1014-1050 m, 10.10.1994: 9 specimens, on pebbles. — Stn CP 1131, 15°38'S, 167°03'E, 140-175 m, 11.10.1994: 5 specimens, on scleractinian. — Stn CP 1137, 15°41'S, 167°02'E, 360-371 m, 11.10.1994: 2 specimens, on gastropod shell.

DIAGNOSIS. — *Metaverruca* with movable tergum and scutum each having 3 articular ribs; exterior generally smooth with widely spaced growth lines; caudal appendages short.

DISCUSSION. — Specimen Ci 2423 (fig. 7b) from Vanuatu appeared at first to be a new taxon. Although the movable opercula are of similar dimension and ribbing to *M. recta*, the growth lines are much more closely spaced, and the exterior of the compartments is rather rugose. However, the mandible and first maxilla are found to fall within the *M. recta* range, the labrum is broadly curved and finely denticulate, and the cirri possess the following number of segments (r-c being the rostro-carinal diameter):

r-c (mm)	I	II	III	IV	V	VI	c.a.
7.9	13,13	10,15	19,21	24,27	25,28	28,29	9

The caudal appendages are slightly shorter than the basal segment of the pedicel of cirrus VI; and intermediate segments of cirrus VI possess 3 pairs of spines each (as in *V recta*).

I am cautious about using the spacing of growth lines as a criterion for specific differentiation, and in this case consider that they merely reflect a growth rate variable from the norm.

M. recta is the most cosmopolitan of verrucids, with material being recorded from all seas. It is also the largest verrucid known, with r-c diameters of over 14.5 mm being recorded (BUCKERIDGE, 1994).

The three articular ribs between movable scutum and tergum, the generally inornate exterior, the fixed scutum myophore, and the short caudal appendages distinguish this from all other verrucids. This material conforms to that described in BUCKERIDGE (1994), and extends depth range, the upper limit changing from 160 to 140 m.

DISTRIBUTION. — Cosmopolitan, 140-2110 m. Miocene (New Zealand, BUCKERIDGE, 1983).

Genus ***ROSTRATOVERRUCA*** Broch, 1922

Verruca "Sectio *Rostrato-verruca*" Broch, 1922: 298.
Verruca (Rostratoverruca) - FOSTER, 1978: 68.
Rostratoverruca - ZEVINA, 1987: 1813.

DIAGNOSIS. — Verrucids with apex of rostrum removed from margin; fixed scutum without myophore; operculum sub-parallel to base.

TYPE SPECIES. — *Verruca nexa* Darwin, 1854: 522. West Indies, 60 m.

SPECIES. — The following 8 species are assigned to this genus: *Rostratoverruca conchula* (Hoek, 1913), Timor Sea; *R. intexta* (Pilsbry, 1912), Indian Ocean - Western Pacific; *R. koehleri* (Gruvel, 1907), Bay of Bengal; *R. kruegeri* (Broch, 1922), Western Pacific; *R. murrayi* (Stubbings, 1936), Zanzibar; *R. nexa* (Darwin, 1854), West Indies; *R. sewelli* (Stubbings, 1936), Zanzibar; *R. malevichi* Zevina, 1988, South Pacific.

STRATIGRAPHIC RANGE. — Recent.

DISTRIBUTION. — West Indies and Indo-West Pacific, 60-3250 m.

Rostratoverruca intexta (Pilsbry, 1912)

Fig 8 c-d.

Verruca intexta Pilsbry, 1912: 292; 1916: 47. — NILSSON-CANTELL, 1927: 774; 1929: 468, fig. 3. — STUBBINGS, 1940: 389.
Verruca conchula Hoek, 1913: 146, figs 14-15.
Verruca (Rostratoverruca) intexta - ROSELL, 1989: 26, pl. 7 f-g; 1991: 33.
Rostratoverruca intexta - BUCKERIDGE, 1994: 119, fig 14 a-f.

MATERIAL EXAMINED. — **New Caledonia**. HALIPRO 1: stn CP 850, 21°43'S, 166°39'E, 541-580 m, 19.3.1994: 4 specimens, on sponge. — Stn CP 850, 21°43'S, 166°39'E, 541-580 m, 19.3.1994: 4 specimens, on sponge.
Loyalty Ridge. MUSORSTOM 6: stn CP 455, 21°00'S, 167°26'E, 260 m, 20.2.1989: 1 specimen, on octocoral.
Indonesia. KARUBAR: stn CP 25, 05°30'S, 132°52'E, 336-346 m, 26.10.1991: 1 specimen, on sponge. — Stn CP 62, 09°01'S, 132°42'E, 246-253 m, 1.11.1991: 3 specimens, on octocoral. — Stn CP 69, 08°42'S, 131°53'E, 356-368 m, 2.11.1991: 4 specimens, on coral.
Vanuatu. MUSORSTOM 8: stn CP 1028, 17°54'S, 168°40'E, 624-668 m, 28.9.1994: 2 specimens, on cidaroid spine.
NW Australia. *"Soela"*: stn 116-84, 15°44'S, 120°39'E, 430-446 m, 7.4.1982: 1 specimen, on a scalpellid. — Stn 1001-86, 18°43'S, 116°35'E, 610-612 m, 7.4.1982: 2 specimens. — Stn 254-95, 18°49'S, 120°40'E, 396-400 m, 10.2.1984: 2 specimens, on hexactinellid sponge. — Stn 909-86, 13°33'S, 122°14'E, 494-496 m, 13.2.1984: 2 specimens, on cidaroid spine. — Stn 967-85, 16°56'S, 119°54'E, 436 m, 22.2.1984: 3 specimens, on hexactinellid sponge spicules. — Stn 968-85, 16°56'S, 119°53'E, 436 m, 22.2.1984: 2 specimens, on hexactinellid. — Stn 253-95, 16°56'S, 119°55'E, 436 m, 22.2.1984: 1 specimen, on hexactinellid. — Stn 966-85, 18°00'S, 118°10'E, 436 m, 24.2.1984: 1 specimen, on gastropod.

DIAGNOSIS. — *Rostratoverruca* with movable tergum and scutum each with 3 articular ribs; operculum sub-parallel to base.

DISCUSSION. — Although this material is consistent with that described in BUCKERIDGE (1994), some specimens provide evidence of the colour of the shell, which in the samples from station CP 455 is a distinct mottled, reddish-brown on white. In BUCKERIDGE (1994), the shell is described as "cream-white". The lack of colour or patterning in many collections may be attributed to the preservatives causing colour fade. One specimen was found growing within the coral *Madrepora oculata*. The verrucid had evidently reached adult size without being overgrown by the coral, indeed, the action of the cirri appear to have either prevented deposition, or eroded the coral skeleton near the verrucid orifice (fig. 8d).

DISTRIBUTION. — Indo-Pacific, 194-1002 m.

Rostratoverruca kruegeri (Broch, 1922)

Verruca Krügeri Broch, 1922: 295, figs 43-44.
Verruca (Rostratoverruca) krügeri - BROCH, 1932: 46.
Rostratoverruca kruegeri - BUCKERIDGE, 1994: 121, fig 15 a-f.

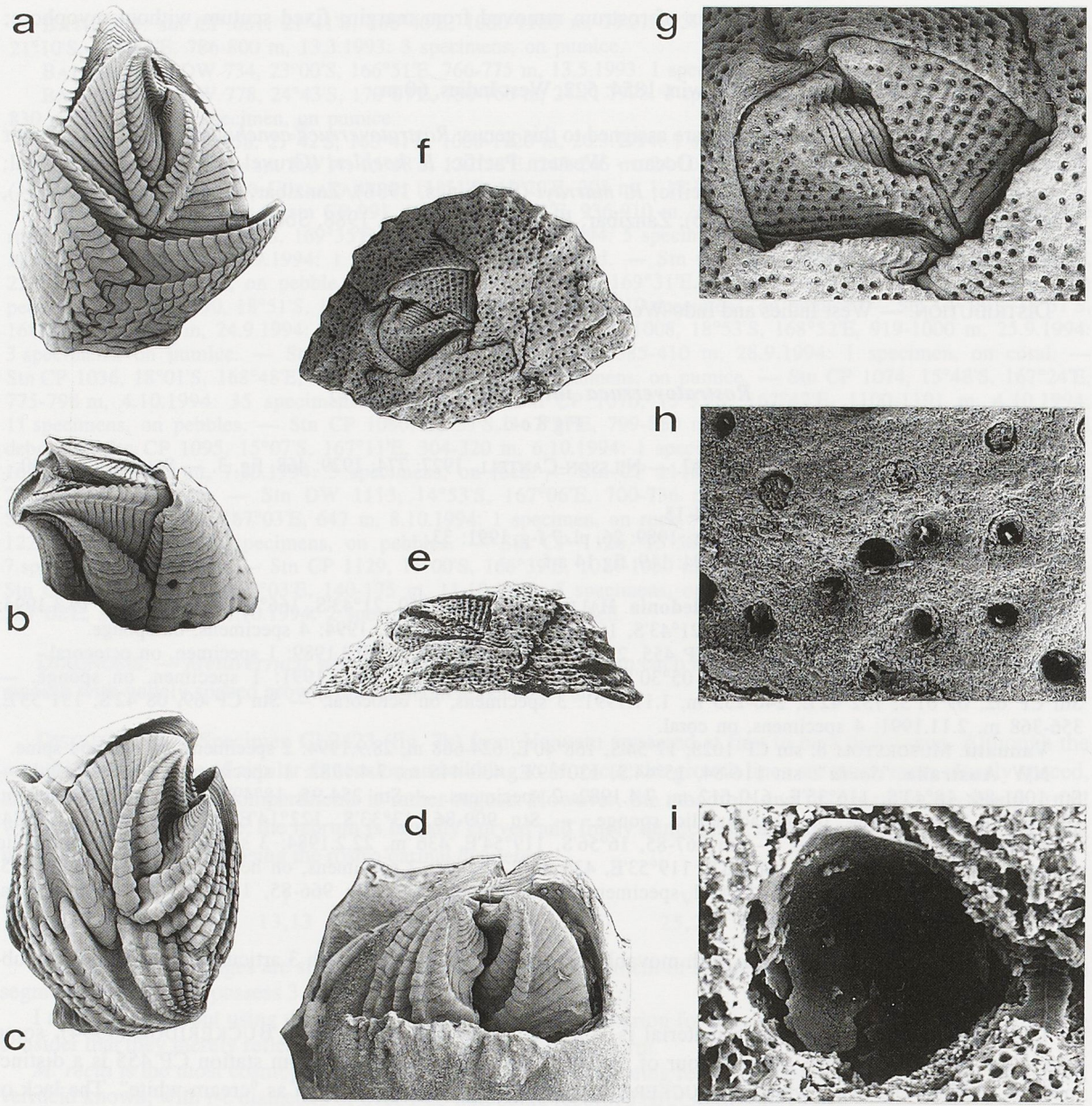


FIG. 8. — Verrucidae: Scanning Electron Microscope Photographs.
a-b, *Altiverruca nitida* (Hoek, 1883): **a**, complete shell (dorsal view, x 15); **b**, complete shell (fixed opercula view, x 15). Material from Stn CP 30.
c-d, *Rostratoverruca intexta* (Pilsbry, 1912): **c**, complete shell (dorsal view, x 19). Material from Stn CP 69; **d**, shell growing within the coral *Madrepora oculata*, note vertical grooves in the coral adjacent to the verrucid orifice, possibly caused by cirral movement (dorsal view, x 15). Material from Stn CP 455.
e-i, *Verruca jago* sp. nov.: **e**, complete shell (carino-rostral view, x 37); **f**, complete shell (dorsal view, x 37); **g**, detail of operculum from f (x 95); **h**, detail of porous surface from g, note desiccated organic material in centre of some pores (x 500); **i**, detail of pore from h (x 4000). Material from 11°51'S, 43°20'E.

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn CP 973, 19°21'S, 169°27'E, 460-480 m, 22.9.1994: 311 specimens, on cidaroid spines. — Stn CP 974, 19°21'S, 169°28'E, 492-520 m, 22.9.1994: 66 specimens, on

cidaroid spines. — Stn CP 975, 19°23'S, 169°28'E, 536-566 m, 22.9.1994: 4 specimens, on cidaroid spines. — Stn CP 1107, 15°05'S, 167°15'E, 397-402 m, 7.10.1994: 105 specimens, on cidaroid spines. — Stn DW 1108, 15°04'S, 167°15'E, 425-455 m, 7.10.1994: 65 specimens, on cidaroid spines.

DIAGNOSIS. — *Rostratoverruca* with fixed scutum and tergum possessing weak longitudinal ribbing; movable tergum and scutum each with 4 articular ribs.

DISCUSSION. — This material is consistent with that described in BUCKERIDGE (1994). In addition, it extends the bathymetric range from 290 to 566 m.

DISTRIBUTION. — Western Pacific, 233-566 m.

DISCUSSION

DISTRIBUTION. — The material studied in both this paper and in BUCKERIDGE (1994) was collected from depths ranging between 223 and 3680 m. This study extends the bathymetric ranges for the Indo-Southwest Pacific region, as provided in BUCKERIDGE (1994). The following provides a broad appreciation of the current known bathymetric distribution of verrucid genera for this region:

Genus	Depth range (m)	Mean (m)	No. of Stns
Altiverruca	412-3680	1140*	65
Metaverruca	203-2110	720	154
Verruca	196-620	377	6
Brochiverruca	270-700	435	7
Cameraverruca	380-450	415	2
Rostratoverruca	222-668	436	35

*only 2 specimens of *Altiverruca* were recovered from depths less than 510 m.

In the following table, data from this paper and BUCKERIDGE (1994) are combined to provide an overview of the geographic distribution of verrucid species in the Indo-Pacific region. Verrucid genera listed in the table (horizontally) are, respectively: *Verruca, Altiverruca*, *Cameraverruca*, *Brochiverruca*, *Metaverruca*, and *Rostratoverruca.*

Material recovered from waters off:

	V. albatrossiana	*V. jago*	*A. cristallina*	*A. galapagosa*	*A. jonesae*	*A. laeviscuta*	*A. navicula*	*A. nitida*	*C. nodiscuta*	*B. crosnieri*	*B. dens*	*B. polystriata*	*M. defayeae*	*M. maclaughlinae*	*M. norfolkensis*	*M. pacifica*	*M. plicata*	*M. recta*	*R. intexta*	*R. kruegeri*
Philippines	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-	x	x	x
New Caledonia	-	-	x	x	-	x	x	x	-	-	-	x	-	-	x	x	x	x	x	-
Vanuatu	-	-	x	-	x	-	-	x	-	-	-	-	x	x	-	x	x	x	x	x
Wallis and Futuna	-	-	-	-	-	-	-	x	-	-	-	-	x	-	-	x	-	x	-	-
Chesterfield	-	-	-	-	-	-	-	x	x	-	-	-	-	-	-	x	-	x	-	-
Loyalty Ridge	-	-	-	-	-	-	-	-	x	x	-	-	x	-	-	x	x	x	x	-
Indonesia	x	-	-	-	-	-	x	-	-	-	x	-	-	-	-	-	-	x	x	x
Northwest Australia	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-	-	x	-
Grande-Comore	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-	-

ENDEMISM. — A number of verrucid taxa are known from only one location, often by a unique specimen. It is reassuring then that some of the rarer taxa, described in BUCKERIDGE (1994), after further collecting, have had their geographic ranges extended, e.g. *Metaverruca defayeae*, *Metaverruca plicata*. The areas with highest biodiversity are also characterised by high verrucid endemism: Vanuatu has two, Loyalty Ridge one, and New Caledonia two endemic species. These three localities are situated in a transition area between tropical and subtropical zones; in addition, the ocean bathymetry is characterised by numerous highs of volcanic origin, in all providing ideal opportunities for speciation. Although the abundance of taxa recovered from waters off New Caledonia and Vanuatu mark this region as one of extraordinary verrucid diversity, I am also confident that this reflects the extensive and comprehensive collecting programme undertaken in the area by MUSORSTOM.

SUBSTRATE. — Verrucids are generally not particular in their choice of substrate, the most common being the abundant benthic debris (generally small pebbles) found at many stations, although broken shell material has also been utilised. Both *Metaverruca recta* and *Metaverruca pacifica* have been found living on gastropod shells inhabited by parapagurid crabs. These two large verrucids, like many cirripedes, are commensals, and are likely to have benefited from the feeding habits of their hosts. Some verrucids appear to be host specific, in particular *Brochiverruca* species, which are always found attached to cnidarians, and *Rostratoverruca kruegeri*, always found attached to cidaroid spines.

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3

Crustacea Isopoda Serolidae: *Acutiserolis cidaris* and *Caecoserolis novaecaledoniae*, two new species from the Coral Sea

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ABSTRACT

Two new species of Serolidae are described from deep waters in the Coral Sea : *Acutiserolis cidaris* sp. nov. from 891-1491 m depth and *Caecoserolis novaecaledoniae* sp. nov. from 500-2750 m depth. *A. cidaris* is compared with *A. bromleyana*, illustrated and briefly diagnosed, from the Southern Ocean. *A. bromleyana* may be a variable species widely distributed in the Southern Ocean and more than one similar species exist in deep seas in lower latitudes. Both genera are rediagnosed.

RÉSUMÉ

Crustacea Isopoda Serolidae: *Acutiserolis cidaris* et *Caecoserolis novaecaledoniae*, deux espèces nouvelles de la mer du Corail.

Deux nouvelles espèces de Serolidae, provenant des eaux profondes de la mer de Corail, sont décrites : *Acutiserolis cidaris* sp. nov., récoltée à des profondeurs comprises entre 891-1491 m et *Caecoserolis novaecaledoniae* sp. nov. trouvée entre 500-2750 m de profondeur. *A. cidaris*, trouvée dans l'océan Austral, est comparée avec *A. bromleyana*, brièvement décrite et illustrée ici. *A. bromleyana* pourrait être une espèce variable, largement distribuée dans l'océan Austral, tandis que plusieurs espèces voisines existent en eau profonde aux basses latitudes. Les deux genres considérés ici sont redéfinis.

POORE, G.C.B. & BRANDT, A., 1997. — Crustacea: Isopoda Serolidae: *Acutiserolis cidaris* and *Caecoserolis novaecaledoniae*, two new species from the Coral Sea . *In* : A. CROSNIER (ed.), Résultats des Campagnes MUSORSTOM. Volume 18. *Mém. Mus. natn. Hist. nat.*, **176** : 151-168. Paris ISBN 2-85653-511-9.

INTRODUCTION

Following extensive earlier reviews (NORDENSTAM, 1933; SHEPPARD, 1933) the history of the taxonomy of the isopod crustacean family Serolidae Dana, 1853 was reviewed by BRANDT (1988, 1991) and WÄGELE (1994) who established new genera and subgenera to bring the total described to 20. BRANDT (1991) and WÄGELE (1994) both proposed phylogenies of the genera based on morphological characters.

French expeditions near New Caledonia and Australian expeditions along the eastern coast of Australia have collected serolids in deep water and this contribution describes two new species from tropical waters. The first species is similar to *Acutiserolis bromleyana* Willemöes-Suhm originally described from Antarctic waters and reported from New Zealand by HURLEY (1961). Adults of our material were much smaller than adults of the Antarctic species and differed morphologically from it and the New Zealand specimens. Investigation leads us to believe that it was one of several similar species and that *A. bromleyana* itself may be variable. The new species is described and its variability briefly discussed.

The second species was placed only with difficulty in any of the genera diagnosed by WÄGELE (1994) and in the phylogenies proposed by him and by BRANDT (1991) but is assigned to *Caecoserolis* Wägele, 1994.

METHODS

The material comes from two sources : deep dredging during cruises near New Caledonia organised by ORSTOM and the Muséum national d'Histoire naturelle, Paris; and dredging in northeastern Australia by James Cook University, Townsville, Australia. It is deposited in the Muséum national d'Histoire naturelle, Paris (MHNH), the Museum of Tropical Queensland, Townsville, Australia (MTQ), and the Museum of Victoria, Melbourne, Australia (NMV).

All illustrations are of left limbs unless otherwise noted, labelled as follows : A1, A2, antennae 1, 2; MD, mandible; MDp, mandibular palp; MX 1, 2, maxillae 1, 2; MP, maxilliped; P1-P7, pereopods 1-7; PL1-PL5, pleopods 1-5; U, uropod; l, left; r, right.

SYSTEMATIC ACCOUNT

Genus *ACUTISEROLIS* Brandt, 1988

Acutiserolis Brandt, 1988 : 21; 1991 : 131, 139.
Serolis (*Acutiserolis*) - WÄGELE, 1994 : 53, 60.

DIAGNOSIS. — Body broad, weakly-sculptured, slate-grey, lateral margin strongly divided from head to pleonites; pleotelson with weak dorsal lateral submarginal ridges. Eyes reniform, large, lateral. Pereonites 5-7 and pleonite 1 fused. Pereonal sternite 1 visible, sternites 2-4 invisible (ventral coxal plates meeting in midline), sternites 5-7 fused. Pleonal sternites 1-3 with 3-cornered medial plate, not sexually dimorphic.

Coxal plates with interacting keys, otherwise not in contact distal to bases of pereopods and acutely projecting and tapering; coxal sutures 2-4 visible dorsally; coxa 6 strongly exceeding pleonal epimera 2 and 3 posteriorly. Pleonites 2 and 3 with epimera narrow and strongly produced posteriorly.

Mandible with incisor process untoothed; left lacinia mobilis three-quarters width of incisor process, right toothed and narrower. Maxilla 2 with middle and outer lobes as long as inner, each with 2 distal setae. Maxilliped with free coxa, epipod and lamella on basis; palp article 2 cordiform.

Pereopod 1 with alternating spiniform and plate-like setae. Pereopod 2 of male with propodus palm having U-shaped marginal row of spiniform setae; unguis small and terminal; pereopod without felt of fine hairs. Pereopod 7 of male with propodus little broader than in female, setose and with felt of fine hairs; dactylus simple.

Pleopod 2 of male with endopod tapering. Pleopod 4 endopod not bilobed. Uropod biramous, peduncle short; inserting half-way along pleotelson.

Oostegites present on pereopods 1-4 of female.

REMARKS. — BRANDT (1988) diagnosed the genus and listed six species of *Acutiserolis*. We present an expanded diagnosis. In 1991 she discussed its relationship to other genera, differentiating it from them with a single autapomorphy, extreme posterior elongation of the coxal plates and pleonal epimera. WÄGELE (1994) added a seventh species while reducing the taxon to a subgenus of *Serolis* Leach. WÄGELE placed *Acutiserolis* on a clade in his dendrogram with *Serolis*, sharing two synapomorphies : a bilobed endopod on pleopod 4 and enlarged posterior coxal plates. While *S. paradoxa* Leach, type species of *Serolis* s.s. has a bilobed endopod (POORE, 1987), none of the species of *Acutiserolis* seen by us does. Nor do species of *Serolis* s.s. have the extremely elongated coxal plates of *Acutiserolis*. For these reasons we do not accept the subgeneric status of *Acutiserolis*.

Species of *Acutiserolis* differ from each other primarily in adult size, sculpture and setation of the male pereopods. Material available to us from New Zealand and from deep water off southern Australia contains at least three undescribed species. BEDDARD (1884b) and HURLEY (1961) referred material from the Tasman Sea and the vicinity of New Zealand to *A. bromleyana* but only BEDDARD noted differences from the syntypes from Antarctic waters. He figured a male from New Zealand which may be the species figured by HURLEY. A second species occurs off the southeastern coast of Australia but is not dealt with in this paper.

Here, we describe the third species which comes from the Coral Sea and the northern part of the Tasman Sea as new. It is certainly not the species mentioned by other authors.

We also comment on *A. bromleyana* and material from Antarctic waters which may belong to this species.

Acutiserolis bromleyana (Willemöes-Suhm, 1874)

Figs 1-2

Serolis bromleyana Willemöes-Suhm, 1874 : XIX; 1876 : 591. — BEDDARD, 1884a : 331; 1884b : 53-57, pl. 4 (except figs 3, 6). — SHEPPARD, 1933 : 280, 329-330.
Acutiserolis bromleyana - BRANDT, 1988 : 17, 21.
Serolis (*Acutiserolis*) *bromleyana* - WÄGELE, 1994 : 53.
not *Serolis bromleyana* - HURLEY, 1957 : 13; 1961 : 228-229, pl. 1.

MATERIAL EXAMINED. — **Southern Ocean (Indian Ocean sector)**. *"Challenger"* : stn 156, 62°26'S, 95°44'E, 3614 m, 26 February 1874, diatom ooze bottom : ♂ 53 mm, and ♀ 45 mm, syntypes (BMNH 1889.4.27.20).

DIAGNOSIS OF MALE. — Greatest width of body (between tips of coxae 4) 105% of body length (rostrum to end of pleotelson). Head with broad diverging anterolateral lobes lateral to bases of antennae, acutely produced anterolaterally; continuous sharp transverse ridge at base of antennae; with pair of low elevations between anterior margins of eyes and medial and pair of posterolateral elevations along posterior margin.

Pereonite 1 with anterior margin (medial to small triangular projection) concave; lateral margin shallowly sinuous; posterolateral corner produced as an acute triangular plate, convex posteriorly; sharp oblique ridge runs from near eye to meet an angled submarginal ridge, sharply defined between oblique ridge and anterior projection and more obscure on posterolateral plate. Pereonites 2-4 articulating, with coxal plates marked off by dorsal sutures; pereonites 5-7 fused, with groove between 5 and 6 dorsally; all pereonites with small spine on mid-dorsal margin. Posterolateral angles of the coxal plates 2-6 longer than and reaching much further posteriorly than those of preceding segments; coxal plate 4 reaching to base of pleotelson, 5 reaching 70% of length of pleotelson, 6 exceeding total body length by 38%). Pereonite 7 without coxal plates. Pleonite 1 not visible dorsally. Pleonites 2 and 3 with narrow elongate diverging epimera, apically notched; (epimera 2 both broken); epimeron 3 only slightly exceeding pleotelson. Pleotelson 34% of total length, 1.2 times as wide as long, tapering to rounded posterolateral corners and concave posterior margin; with long slight medial keel and obscure triangular elevations near angle at base of uropods; a narrow medial pit at base of keel.

Pereopod 2 without fine setae; propodus cylindrical proximally, with heel about halfway along, greatest width half of length, palm with 18 spiniform setae in irregular U-shaped marginal row plus 1 spiniform seta in middle of oblique concave palm; dactylus strongly curved and overlapping heel of palm, unguis absent (or broken).

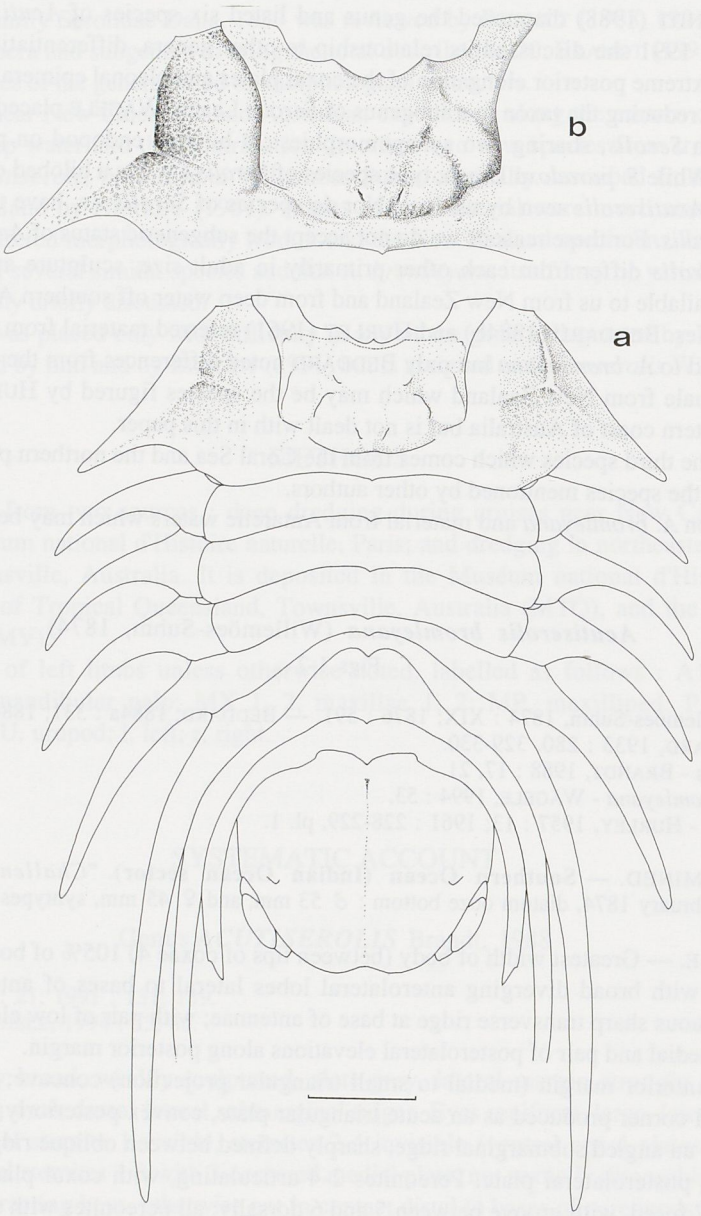


FIG. 1. — *Acutiserolis bromleyana* (Willemöes-Suhm). Male syntype, BMNH 1889.4.27.20 : **a**, habitus (reconstructed from damaged specimen), scale bar = 10 mm; **b**, detail of head and pereonite 1.

REMARKS. — The brief diagnosis deals with the overall shape and sculpture of the body and the male pereopod 2. These are sufficient to differentiate this species from the new species described herein and others. The combination of an anterior spine and a strong angled submarginal ridge on pereonite 1, and a short concave palm on the propodus of the male pereopod 2 serve to diagnose the species.

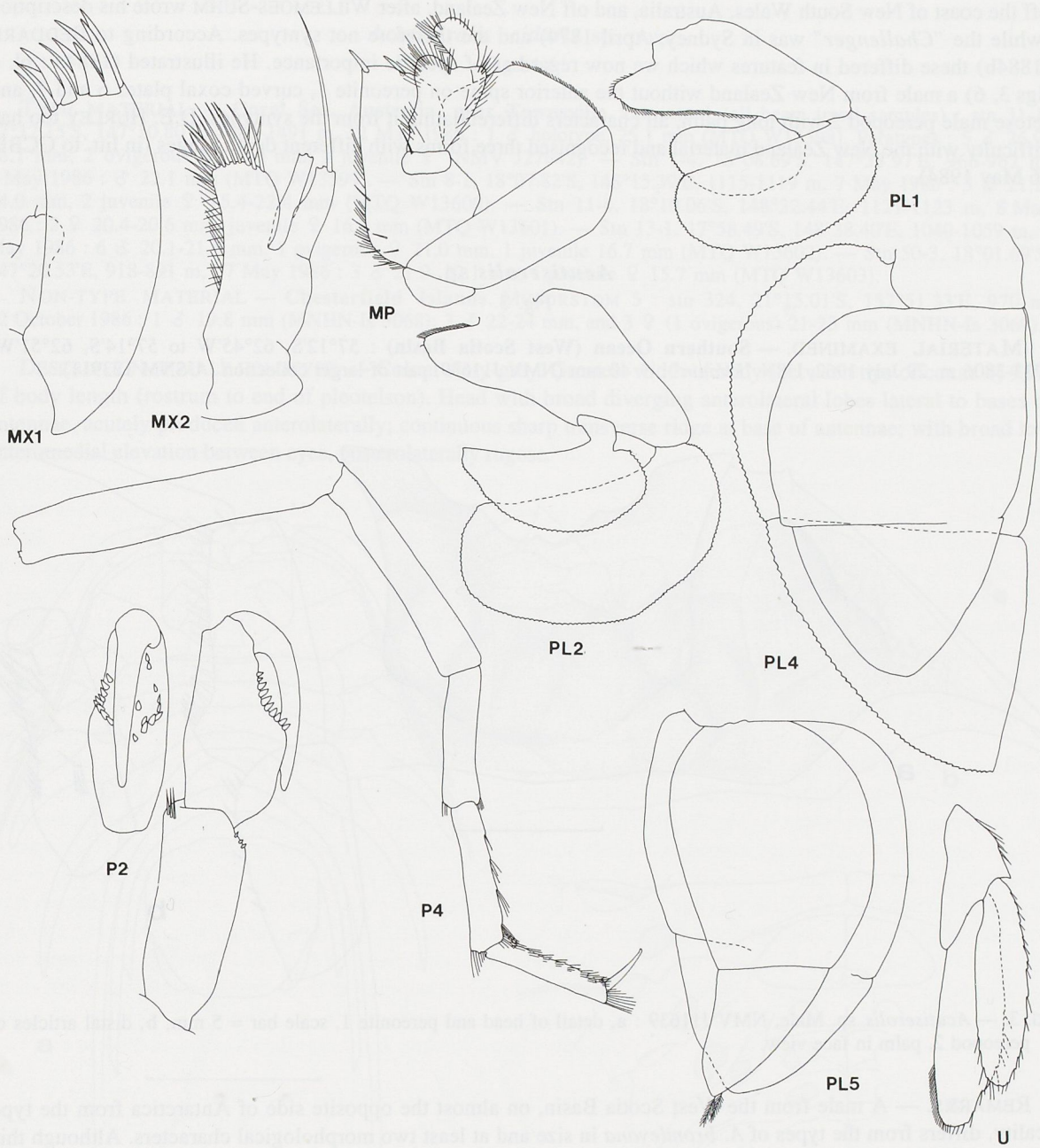


FIG. 2. — *Acutiserolis bromleyana* (Willemöes-Suhm). Female syntype, BMNH 1889.4.27.20 : maxillae 1, 2, maxilliped, pereopod 4, pleopods 1, 4, 5, uropod. — Male syntype, BMNH 1889.4.27.20 : pereopod 2 propodus and dactylus, palm in face view; pleopod 2 (appendix masculina lost).

The syntypes are damaged. Our figures of the other limbs are incomplete but show only very slight differences in proportions and setation from the new species.

Besides the two syntypes from the Southern Ocean, the *Challenger* collected other similar specimens, listed by BEDDARD (1884b), and some of these remain in the Natural History Museum, London. These were dredged from

off the coast of New South Wales, Australia, and off New Zealand, after WILLEMÖES-SUHM wrote his description (while the *"Challenger"* was in Sydney, April 1874) and are therefore not syntypes. According to BEDDARD (1884b) these differed in features which we now regard as of specific importance. He illustrated (1884a : pl. 4 figs 3, 6) a male from New Zealand without the anterior spine on pereonite 1, curved coxal plates 6 and 7, and setose male pereopod 2 with long palm, all characters differentiating it from the syntypes. D.E. HURLEY too had difficulty with the New Zealand material and recognised three forms with different depth ranges (in litt. to GCBP, 16 May 1984).

Acutiserolis sp.

Fig. 3

MATERIAL EXAMINED. — **Southern Ocean (West Scotia Basin)** : 57°12'S, 62°45'W to 57°14'S, 62°51'W, 3733-3806 m, 29 July 1962, USN *"Eltanin"* : ♂ 40 mm (NMV J11639, part of larger collection : USNM 123911).

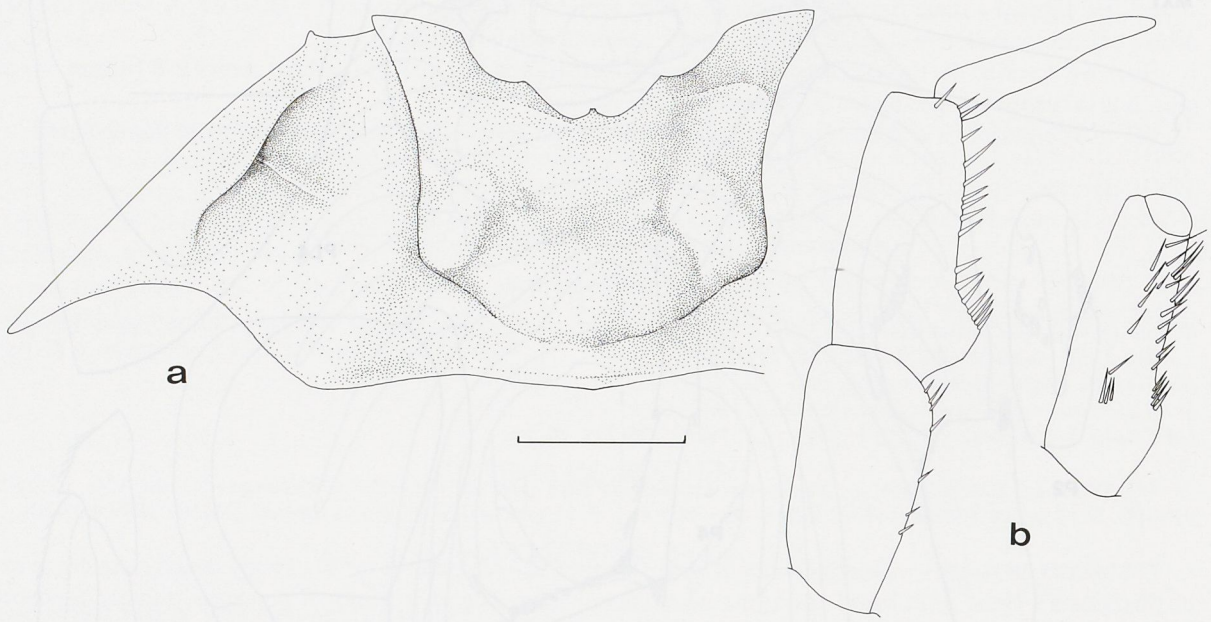


FIG. 3. — *Acutiserolis* sp. Male, NMV J11639 : **a**, detail of head and pereonite 1, scale bar = 5 mm; **b**, distal articles of pereopod 2, palm in face view.

REMARKS. — A male from the West Scotia Basin, on almost the opposite side of Antarctica from the type locality, differs from the types of *A. bromleyana* in size and at least two morphological characters. Although this male is smaller than other species, adult male features are generally seen in individuals over quite a size range. The more pronounced, erect submarginal oblique ridge on pereonite 1 might be interpreted as a local variation. However, the shape of the male pereopod 1 differs substantially from that of the syntypes. Its heel is more proximal, the palm more elongate, and there are many more (30) and finer setae along its margins. MENZIES (1962) described *A. macdonnellae* and *A. maryannae* from the South Atlantic but his material and figures are too poor to reconcile with this specimen. Circumpolar variation or speciation in *Acutiserolis* remains to be investigated before the status of this specimen can be determined. WÄGELE (1986) concluded after studying variability in *Ceratoserolis trilobitoides* (Eights, 1833) that this is a polymorphic circum-Antarctic species. The same may be true for *A. bromleyana*.

Acutiserolis cidaris sp. nov.

Figs 4-6

TYPE MATERIAL. — **Coral Sea, Australia, near Townsville**. CIDARIS 1 (all beam trawl samples) : stn 31-1, 17°12.15'S, 147°10.80'E, 1489-1491 m, 12 May 1986 : 1 ♂ holotype, 25.1 mm (MTQ W13598). Paratypes : 5 ♂ 26.9-28.1 mm; 2 ovigerous ♀ 26.9 mm; 1 juvenile ♀ (NMV J27642). — Stn 1-4, 18°08.69'S, 147°33.97'E, 966-962 m, 6 May 1986 : ♂ 22.1 mm (MTQ W13599). — Stn 8-1, 18°07.82'S, 148°15.39'E, 1115-1119 m, 7 May 1986 : 3 ♂ 21.2-24.0 mm, 2 juvenile ♀ 15.4-22.4 mm (MTQ W13600). — Stn 11-4, 18°10.06'S, 148°32.44'E, 1121-1123 m, 8 May 1986 : 2 ♀ 20.4-20.6 mm, juvenile ♀ 16.9 mm (MTQ W13601). — Stn 13-1, 17°58.49'S, 148°38.40'E, 1040-1059 m, 8 May 1986 : 6 ♂ 20.1-21.8 mm, 1 ovigerous ♀ 21.0 mm, 1 juvenile 16.7 mm (MTQ W13602). — Stn 50-3, 18°01.69'S, 147°20.53'E, 918-891 m, 17 May 1986 : 3 ♂ 21.0- 22.1 mm, 1 juvenile ♀ 15.7 mm (MTQ W13603).

NON-TYPE MATERIAL — **Chesterfield Islands**. MUSORSTOM 5 : stn 324, 21°15.01'S, 157°51.33'E, 970 m, 22 October 1986 : 1 ♂ 19.8 mm (MNHN-Is 3068); 3 ♂ 22-24 mm, and 3 ♀ (1 ovigerous) 21-23 mm (MNHN-Is 3069).

DESCRIPTION OF MALE HOLOTYPE. — Colour slaty-grey. Greatest width of body (between tips of coxae 4) 93% of body length (rostrum to end of pleotelson). Head with broad diverging anterolateral lobes lateral to bases of antennae, acutely produced anterolaterally; continuous sharp transverse ridge at base of antennae; with broad low anteromedial elevation between eyes, posterolaterally rugose.

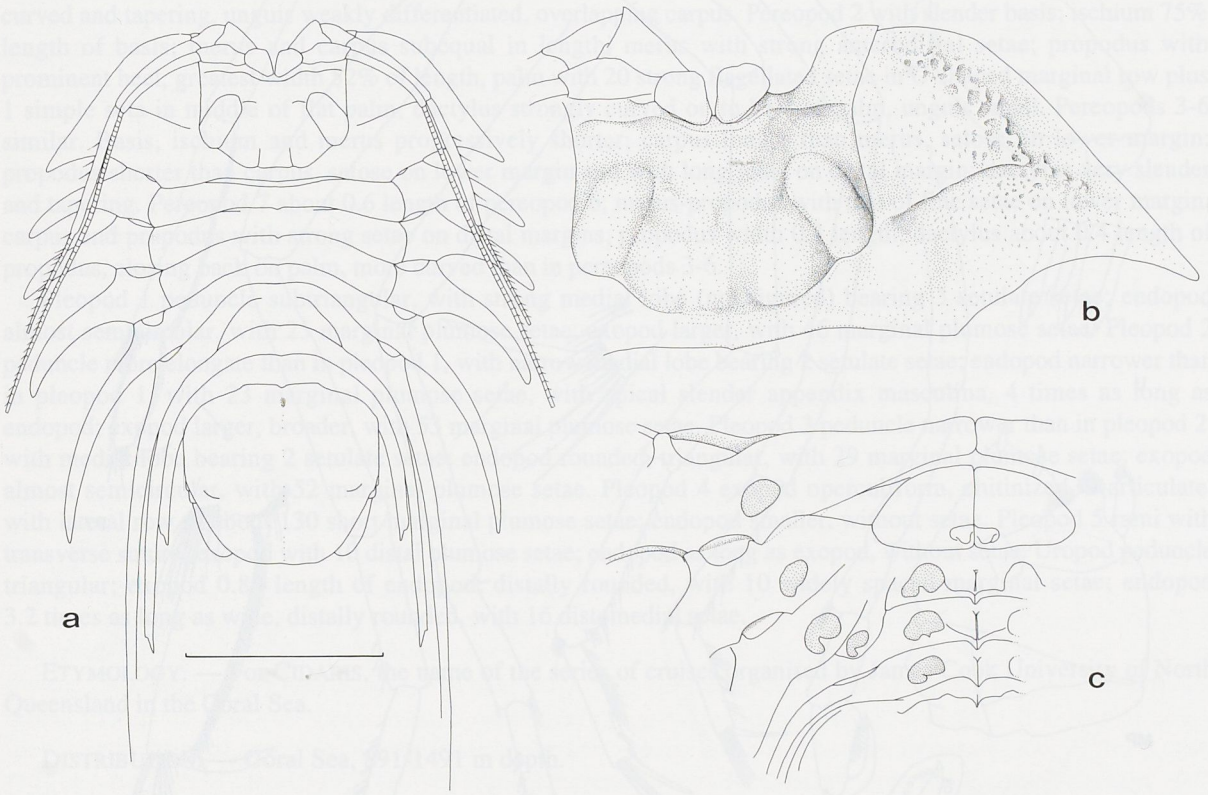


FIG. 4. — *Acutiserolis cidaris* sp. nov. Male holotype, MTQ W13598 : **a**, habitus (reconstructed from damaged specimen), scale bar = 10 mm; **b**, detail of head and pereonite 1; **c**, ventral view of pereonites 4-7 and pleonites 1-3.

Pereonite 1 with anterolateral margin convex and upturned over anterior quarter, straight posteriorly; posterolateral corner produced as an acute triangular plate, concave posteriorly; a sharp oblique ridge runs from near eye to meet a low pocked submarginal ridge, broad anteriorly and narrower on posterolateral plate. Pereonites 2-4

articulating, with coxal plates marked off by dorsal sutures; pereonites 5-7 fused, with groove between 5 and 6 dorsally. Posterolateral angles of the coxal plates 2-6 longer than and reaching much further posteriorly than those of preceding segments; coxal plate 4 reaching to base of pleotelson, 5 reaching 85% of length of pleotelson; 6 broken on all specimens, exceeding total body length by over 60%. Pereonite 7 without coxal plates. Ventral coxal plates 2-4 meeting in midline, smooth; sternites 5-7 fused, with paired small penes posteriorly; coxal plates 5-7 fused, 7 visible only ventrally. Pleonite 1 not visible dorsally. Pleonites 2 and 3 with narrow elongate diverging epimera, apically notched; epimeron 2 90% of length of pleotelson and epimeron 3 exceeding pleotelson by 57% of its length. Pleonite 1 with 3-cornered sternal plate with median ridge between bases of pleopods; pleonites 2 and 3 similar but less well developed. Pleotelson 35% of total length, little wider than long, posterolateral corners rounded and posterior margin convex; with long elevated medial keel and obscure triangular elevations near angle at base of uropods; a narrow medial pit at base of keel.

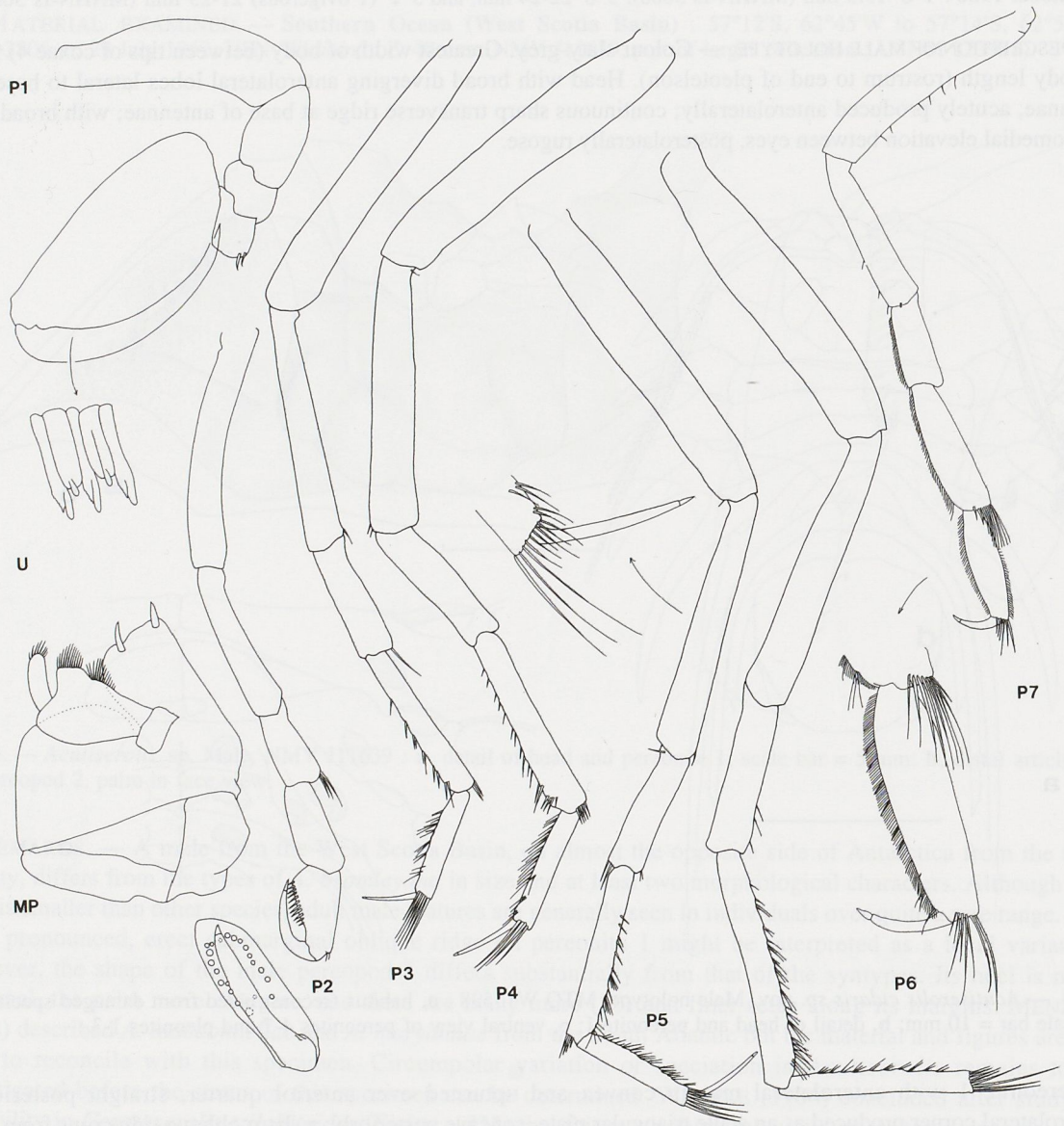


FIG. 5. — *Acutiserolis cidaris* sp. nov. Male holotype, MTQ W13598.

Antenna 1 with peduncular articles 1 and 2 of similar width, article 2 about twice as long as 1, article 3 almost as long as first two together; flagellum of over 50 articles; flagellar article 1 longest, one-quarter length of last peduncle article, articles 1-2 without aesthetascs, remainder with 1 long aesthetasc and 2-3 simple setae. Antenna 2 with short first peduncular article, second longer than third, with few proximal short setules, third with medial and lateral setae, fourth and fifth with tufts of lateral and dorsal setules, fifth 1.3 times as long as fourth; flagellum of at least 19 articles, each with group of 4 distolateral simple setae and 1 on opposite side.

Mandibles : Left lacinia mobilis a broad blade as wide as incisor, spine (spine row rudiment) simple and straight. Right lacinia mobilis with 1 strong tooth and denticles, spine simple and straight. Mandibular palp second article 1.6 times as long as first, with 35 short setae along distal part of lateral margin, third article lanceolate, with row of 50 setae, last 3 longer. Maxilla 1 lateral lobe with 11 strong apical teeth; medial lobe with 1 short apical seta in weak notch. Maxilla 2 inner lobe with 19 slender setae, median and outer lobes each with 2 setae. Maxilliped : coxa and epipod lateral to it separated by suture; basis not separated by suture from lateral almost-semicircular lamella; basis without facial setae proximal to palp; endite with oblique distal margin bearing 2 short spiniform setae; palp with short first article, second article without lateral row of setae, with 2 rows of mesial setae with hiatus between, third article without lateral row of setae but with distal setae.

Pereopod 1 basis to merus without setae; carpus without setae on posterior margin, with 2 spiniform setae on distal corner; propodus greatest width 50% of length, curved palm with row of 45 alternating flattened and spiniform setae, each with apical projection, and with row of short lateral setae submarginally; dactylus evenly curved and tapering, unguis weakly differentiated, overlapping carpus. Pereopod 2 with slender basis; ischium 75% length of basis; merus and carpus subequal in length, merus with strong anterodistal setae; propodus with prominent heel, greatest width 52% of length, palm with 20 strong flagellated setae in U-shaped marginal row plus 1 simple seta in middle of flat palm; dactylus strongly curved on to heel of palm, unguis small. Pereopods 3-6 similar. Basis, ischium and merus progressively shorter; carpus longer than merus, setose on lower margin; propodus shorter than carpus, setose on lower margin and with long setae on distal margin; dactylus very slender and tapering. Pereopod 7 about 0.6 length of pereopod 6; merus-propodus with mat of fine setae on lower margin; carpus and propodus with strong setae on distal margins; propodus width 0.3 length; dactylus about 0.4 length of propodus, closing back on palm, more curved than in pereopods 3-6.

Pleopod 1 peduncle subtriangular, with strong medial lobe (not figured) bearing 3 setulate setae; endopod almost semicircular, with 25 marginal plumose setae; exopod larger, with 46 marginal plumose setae. Pleopod 2 peduncle more elongate than in pleopod 1, with narrow medial lobe bearing 2 setulate setae; endopod narrower than in pleopod 1, with 23 marginal plumose setae, with apical slender appendix masculina, 4 times as long as endopod; exopod larger, broader, with 53 marginal plumose setae. Pleopod 3 peduncle narrower than in pleopod 2, with medial lobe bearing 2 setulate setae; endopod rounded, triangular, with 29 marginal plumose setae; exopod almost semicircular, with 52 marginal plumose setae. Pleopod 4 exopod operculiform, chitinized, 2-articulate, with lateral row of about 130 short marginal plumose setae; endopod smaller, without setae. Pleopod 5 rami with transverse suture; exopod with 10 distal plumose setae; endopod as long as exopod, without setae. Uropod peduncle triangular; exopod 0.85 length of endopod, distally rounded, with 10 widely spaced marginal setae; endopod 3.2 times as long as wide, distally rounded, with 16 distomedial setae.

ETYMOLOGY. — For CIDARIS, the name of the series of cruises organised by James Cook University of North Queensland in the Coral Sea.

DISTRIBUTION. — Coral Sea, 891-1491 m depth.

REMARKS. — *A. cidaris* differs from *A. bromleyana* mainly in the dorsal sculpture of pereonite 1, shape and setation of male pereopods 1 and 7, and size. The low submarginal ridge on pereonite 1 is characteristic of the species. It does not end anteriorly in the marginal spine seen in *A. bromleyana*. The male syntype of *A. bromleyana* is 53 mm long whereas adult males of *A. cidaris* range in size from 19.8 to only 28.1 mm. Ovigerous females are 15.4 to 26.9 mm and have similar body proportions to males. The species also differs from the other species of *Acutiserolis* [listed by BRANDT (1991) and WÄGELE (1994) but only partly illustrated] : *Acutiserolis macdonnellae* (Menzies, 1962) and *A. maryannae* (Menzies, 1962) have a small anterior triangular

projection on pereonite 1 (like *A. bromleyana*); *A. neaera* (Beddard, 1884), *A. gracilis* (Beddard, 1884) and *A. spinosa* (Kussakin, 1967) have strong sculpture on the pleotelson and slightly different relative lengths of the coxal plates and epimera. *Serolis margaretae* Menzies, 1962, included by both BRANDT (1991) and WÄGELE (1994) in *Acutiserolis*, lacks the extreme elongation of coxal plates and epimera so may belong in another genus but, at 8.4 mm long, may not be an adult specimen.

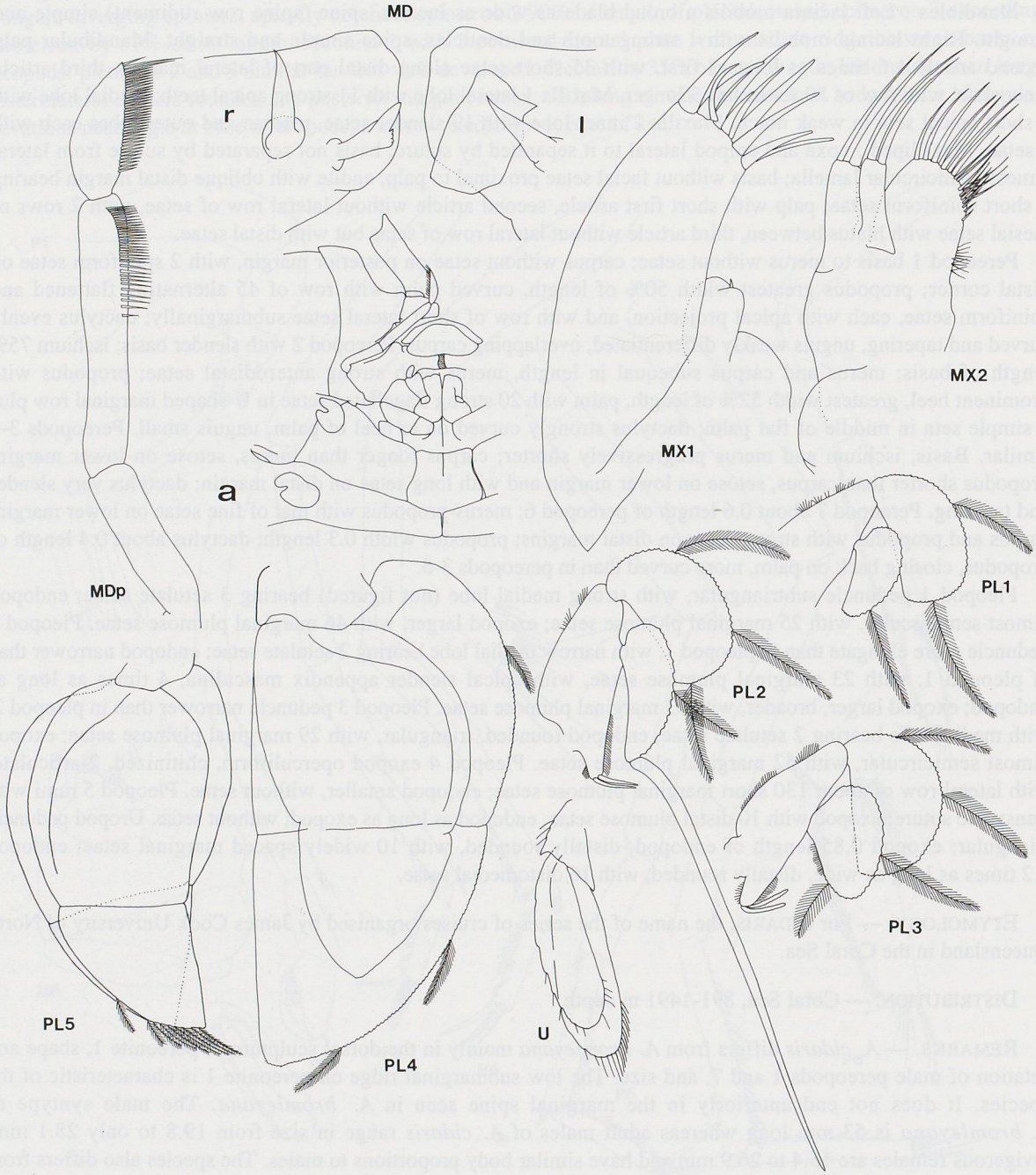


FIG. 6. — *Acutiserolis cidaris* sp. nov. Male holotype, MTQ W13598 (only representative setae shown on pleopods) : **a**, ventral view of head and pereonites 1-2.

Genus *CAECOSEROLIS* Wägele, 1994

Caecoserolis Wägele, 1994 : 10-11, 50, 55-57.

DIAGNOSIS. — Body ovoid, smooth, slate-grey, margin continuous from head to coxa 6; pleotelson with dorsal lateral submarginal ridges. Eyes minute, round, lateral. Pereonites 5-7 and pleonite 1 fused. Pereonal sternite 1 visible, sternites 2-4 invisible (ventral coxal plates meeting in midline), sternites 5-7 fused. Pleonal sternites 1-3 with vertical posterior ridge, not sexually dimorphic.

Coxal plates without interacting keys, closely fitting; coxal sutures 2-4 visible dorsally; coxa 6 as long as or exceeding pleonal epimera 2 and 3 posteriorly. Pleonites 2 and 3 with epimera laterally flattened, narrow in dorsal view.

Mandible with incisor process untoothed; left lacinia mobilis three-quarters width of incisor process, right toothed and narrower. Maxilla 2 with middle and outer lobes shorter than inner, each with 2 distal setae. Maxilliped with free coxa, epipod and lamella on basis; palp article 2 cordiform.

Pereopod 1 with alternating spiniform and plate-like setae plus submarginal lateral row along palm. Pereopod 2 of male with propodus palm having margin of spiniform setae and lateral row of longer setae; unguis small and terminal; pereopod without felt of fine hairs. Pereopod 7 of male with propodus little broader than in female, setose but without felt of fine hairs; dactylus simple.

Pleopod 2 of male with endopod tapering. Pleopod 4 endopod not bilobed. Uropod biramous, peduncle short; inserting half-way along pleotelson.

Oostegites present on pereopods 1-4 of female.

REMARKS. — The new species *Caecoserolis novaecaledoniae* is difficult to place in any genus as recently defined. BRANDT (1991) defined a genus-group, expanded by WÄGELE (1994), of three genera, *Atlantoserolis* Wägele, 1994, *Glabroserolis* Menzies, 1962 and *Caecoserolis* Wägele, 1994, which share synapomorphies of being blind and being widest at pereonite 2. They were also said to have a "stalked" endopod on the male pleopod 2 which bears the appendix masculina. WÄGELE (1994) believed this to be a synapomorphy of his genus-group B (which includes these genera). The new species has a similar shape and smooth dorsal surface to members of these three genera but has small eyes. It does not have the stalked endopod but nor do *Caecoserolis brinki* (Kensley, 1978) or *C. apheles* (Schotte, 1992), species presently assigned to *Caecoserolis*. This genus was reported by WÄGELE (1994) to differ from *Atlantoserolis* and *Glabroserolis* in not having a shortened uropodal exopod but it is very short in *C. apheles*.

The genera have been weakly differentiated in the past, not all species agreeing well with the diagnoses of the genera to which they have been assigned. For many characters such as those used by HARRISON and POORE (1984) and POORE (1987) (coxal keys, mandible, maxilla 2, maxilliped, male pereopod 2 palm setation and unguis, felt of setae on pereopods 2 and 7, pleonal sternites) the condition is known for few serolid genera. We present an expanded diagnosis and, for the time being, we believe the new species is best assigned to *Caecoserolis*.

An alternative might be to place the new species in one of WÄGELE's genus-group C whose synapomorphy is a 3-lobed ridge between the eyes. Similar structures are seen outside this genus-group, for example in *Serolina* Poore, 1987, which may cast doubt on its monophyly. All but one genus of this group posses paired spines and raised triangular fields on the pleotelson viewed as synapomorphies by WÄGELE (1994). If this sculpture is homologous with the dorsolateral ridges seen in the new species and it is a member of genus-group C, the species may be a member of *Serolella* Pfeffer, 1891 but its members have large reniform eyes and diverging coxal plates.

Caecoserolis novaecaledoniae sp. nov.

Figs 7-10

TYPE MATERIAL. — **New Caledonia**. BIOCAL : stn CP 62, 24°19'S, 167°49'E, 1395-1410 m, 2 September 1985 : holotype ♂ 16.9 mm (MNHN-Is 4081). Paratypes : 1 ovigerous ♀ 18.5 mm, 1 juvenile ♀ 13.7 mm, damaged post-manca,

10.0 mm (MNHN-Is 4082). — Stn CP 58, 23°56'S, 166°41'E, 2660-2750 m, 1 September 1985 : manca, 7.8 mm (MNHN-Is 4080). — Stn CP 69, 23°52'S, 167°58'E, 1220-1225 m, 3 September 1985 : 1 ♂ 16.7 mm, 1 ovigerous ♀ 18.5 mm (NMV J27644).

NON-TYPE MATERIAL. — **Chesterfield Islands**. CORAIL 2 : stn DE 13, 21°02.77'S, 160°55.00'E, 700-705 m, 21 July 1988 : 1 juvenile ♀ 12.2 mm (MNHN-Is 4083);

MUSORSTOM 5 : stn 386, 20°56.21'S, 160°51.12'E, 770-755 m, 22 October 1986 : male, 13.0 mm (MNHN-Is 3067).

Norfolk Island : 29°46.6'S, 167°58.9'E to 29°42.0'S, 168°02.0'E, 500 m, Sigsbee trawl, J.E. WATSON on *R.V. "Dimitry Mendeleev"*, 1 January 1976 : 1 ♂ 11.4 mm (NMV J6796). — 30°31.0'S, 161°54.2'E to 30°19.4'S, 161°40.6'E, 1210 m, 29 December 1976 : 1 ♂ 11.7 mm (NMV J7763).

DESCRIPTION OF MALE HOLOTYPE. — Greatest width of body (between tips of coxae 2) 78% of body length (rostrum to end of pleotelson). Head with broad diverging anterolateral lobes lateral to bases of antennae, bluntly produced anterolaterally; continuous obscure transverse ridge at base of antennae; eye minute, circular, submarginal near widest part of head.

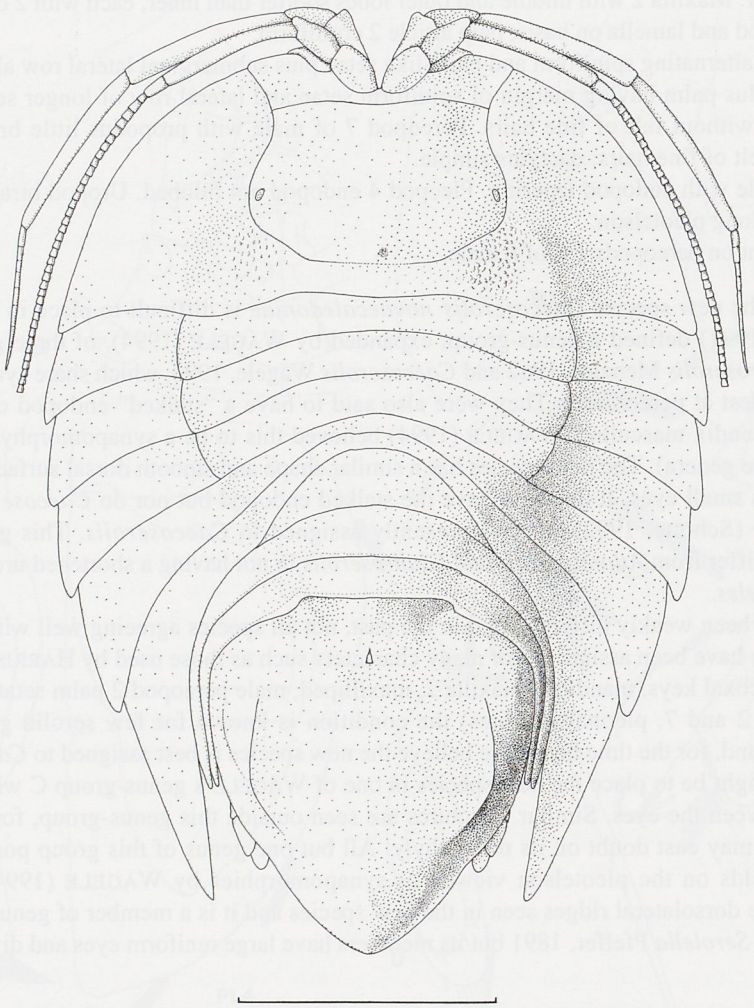


FIG. 7. — *Caecoserolis novaecaledoniae*. Male holotype, MNHN-Is 4081 : habitus, scale bar = 5 mm.

Pereonite 1 with anterolateral margin continuously convex; posterolateral corner tightly overlapping coxa 2; smooth except for slight mediolateral roughening. Pereonites 2-4 articulating, with coxal plates marked off by

dorsal sutures; pereonites 5-7 fused mid-dorsally. Posterolateral angles of the coxal plates 2-6 barely protruding posterolaterally, longer than and reaching further posteriorly than those of preceding segments; coxal plate 4 reaching to base of pleotelson, 5 reaching 30% of length of pleotelson, 6 reaching 80% of length of pleotelson. Pereonite 7 without coxal plates. Ventral coxal plates 2-4 meeting, swollen and sculptured in mid-line; sternites 5-7 fused and visible, with minute fused paired penes; ventral coxal plates 6-7 incompletely separated.

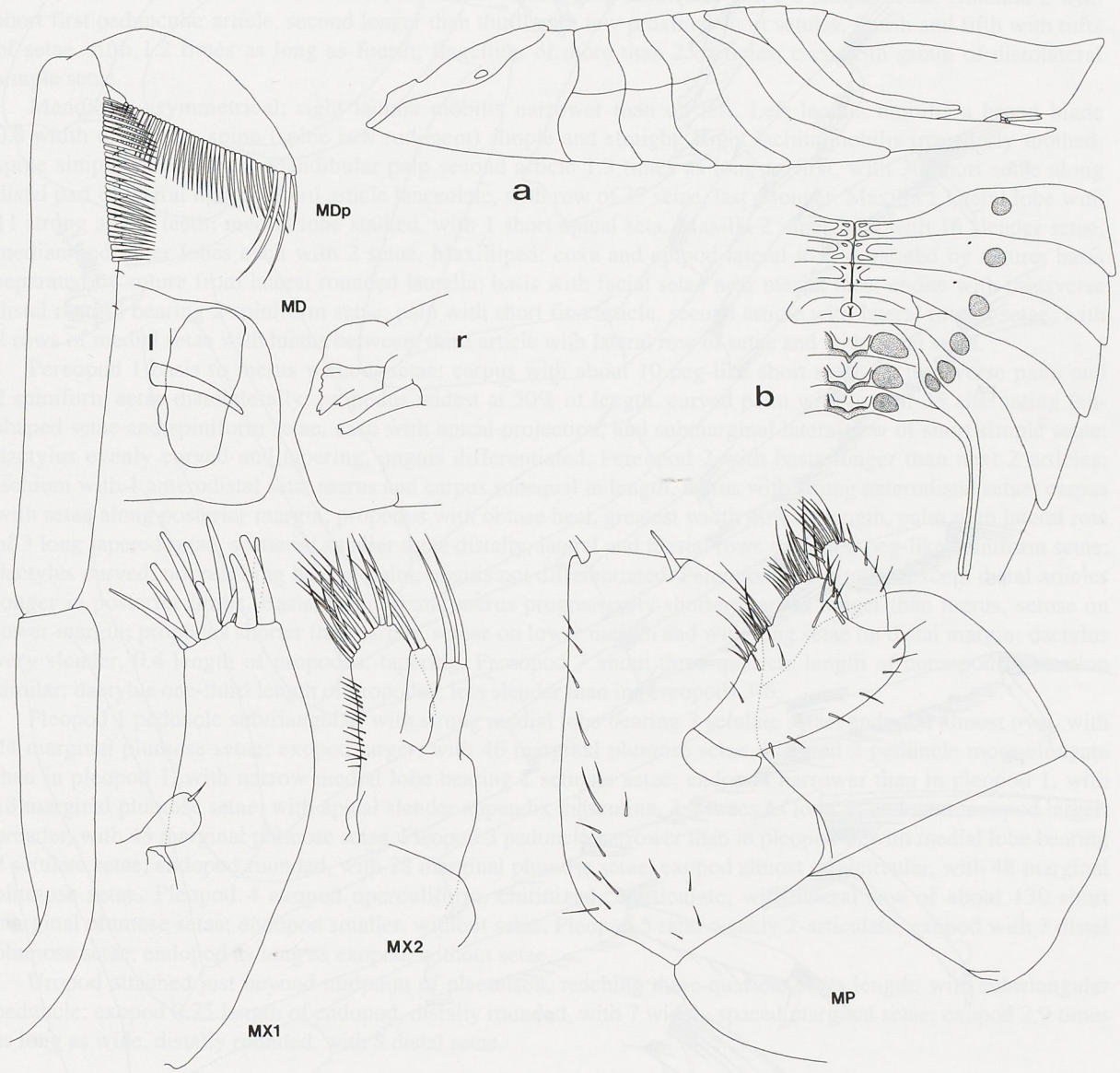


FIG. 8. — *Caecoserolis novaecaledoniae*. Male holotype, MNHN-Is 4081 : **a**, habitus in lateral view. **b**, ventral view of pereonites 2-7, pleonites 1-3.

Pleonite 1 not visible dorsally. Pleonites 2 and 3 with narrow epimera, both 50% of length of pleotelson. Pleonites 1-3 similar, with sternal plate broad, prominent, sculptured, angled sharply posterolaterally and at midpoint.

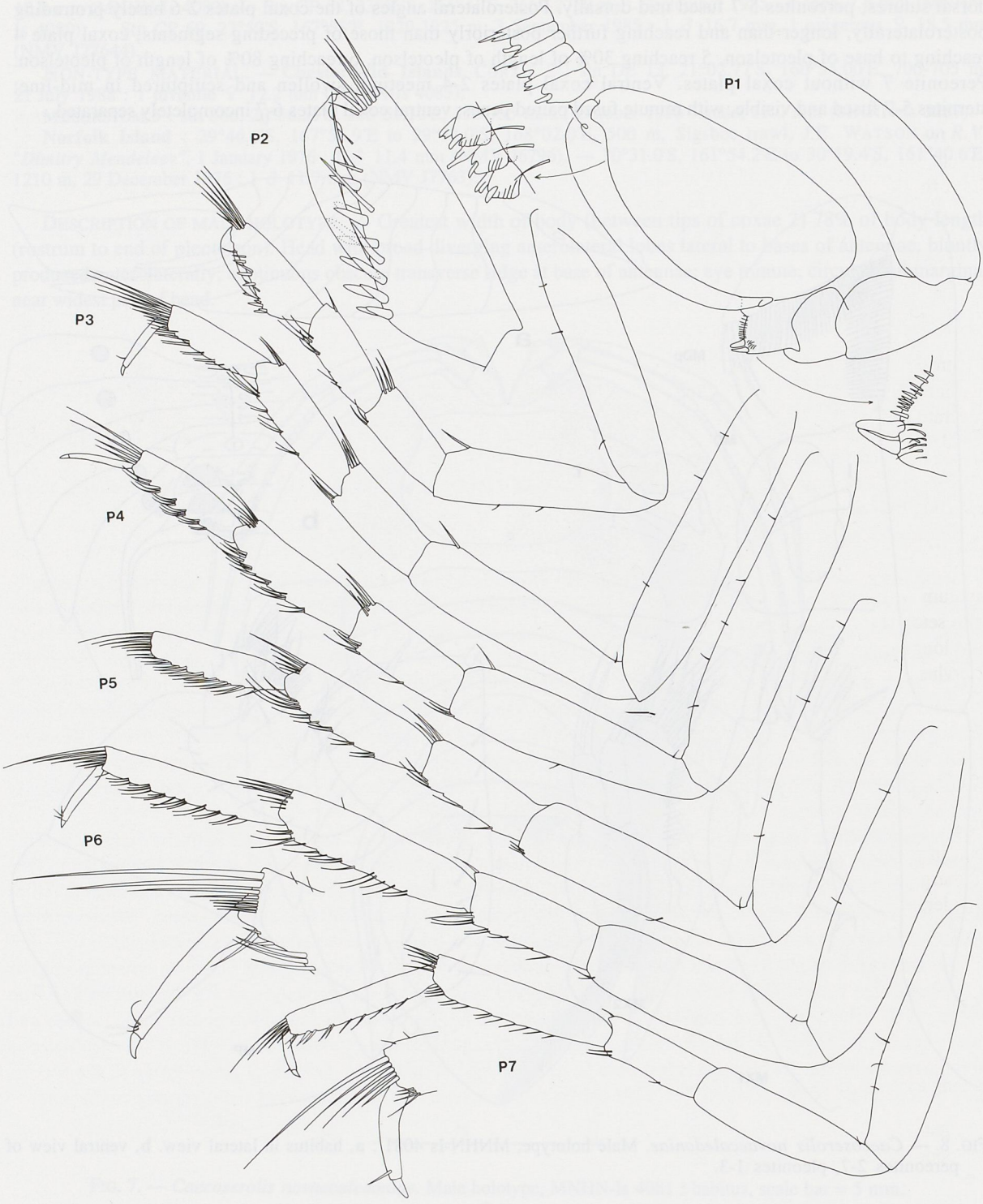


FIG. 9. — *Caecoserolis novaecaledoniae*. Male holotype, MNHN-Is 4081 (p5 dactylus missing).

Pleotelson 42% of total length, 92% as wide as long, lateral margins curved, posterior margin rounded and upturned; with obscure mid-dorsal ridge over proximal half, sharp dorsolateral ridge sharp and evenly curved over three-quarters of length, widest at about midpoint of pleotelson; sides almost vertical over proximal half and bulging over shallow concavity.

Antenna 1 with peduncular article 2 slightly narrower and shorter than article 1, article 3 little longer than first two together; flagellum of about 60 articles; flagellar article 1 longest, one-sixth length of last peduncle article, articles 1-4 without aesthetascs, remainder with 1 long aesthetasc and 2-3 simple setae. Antenna 2 with short first peduncular article, second longer than third, with few proximal short setules, fourth and fifth with tufts of setae, fifth 1.2 times as long as fourth; flagellum of more than 25 articles, each with group of distolateral simple setae.

Mandibles asymmetrical, right lacinia mobilis narrower than on left. Left lacinia mobilis a broad blade 0.8 width of incisor, spine (spine row rudiment) simple and straight. Right lacinia mobilis irregularly toothed, spine simple and straight. Mandibular palp second article 1.3 times as long as first, with 30 short setae along distal part of lateral margin, third article lanceolate, with row of 37 setae, last 4 longer. Maxilla 1 lateral lobe with 11 strong apical teeth; medial lobe stalked, with 1 short apical seta. Maxilla 2 inner lobe with 16 slender setae, median and outer lobes each with 2 setae. Maxilliped: coxa and epipod lateral to it separated by suture; basis separated by suture from lateral rounded lamella; basis with facial setae near mesial face; endite with transverse distal margin bearing 2 spiniform setae; palp with short first article, second article with lateral row of setae, with 2 rows of medial setae with hiatus between, third article with lateral row of setae and with distal setae.

Pereopod 1 basis to merus without setae; carpus with about 10 peg-like short setae on transverse palm and 2 spiniform setae distolaterally; propodus widest at 50% of length, curved palm with row of 35 alternating fan-shaped setae and spiniform setae, each with apical projection, and submarginal lateral row of short simple setae; dactylus evenly curved and tapering, unguis differentiated. Pereopod 2 with basis longer than next 2 articles; ischium with 1 anterodistal seta; merus and carpus subequal in length, merus with strong anterodistal setae; carpus with setae along posterior margin; propodus with obtuse heel, greatest width 40% of length, palm with lateral row of 3 long tapered setae, scattered smaller setae distally, lateral and mesial rows each of 6 peg-like spiniform setae; dactylus curved, not reaching heel of palm, unguis not differentiated. Pereopods 3-6 similar, except distal articles longer in posterior limbs. Basis, ischium and merus progressively shorter; carpus longer than merus, setose on lower margin; propodus shorter than carpus, setose on lower margin and with long setae on distal margin; dactylus very slender, 0.4 length of propodus, tapering. Pereopod 7 about three-quarters length of pereopod 6; setation similar; dactylus one-third length of propodus, less slender than in pereopods 3-6.

Pleopod 1 peduncle subtriangular, with strong medial lobe bearing 3 setulate setae; endopod almost oval, with 24 marginal plumose setae; exopod larger, with 46 marginal plumose setae. Pleopod 2 peduncle more elongate than in pleopod 1, with narrow medial lobe bearing 2 setulate setae; endopod narrower than in pleopod 1, with 18 marginal plumose setae, with apical slender appendix masculina, 3.6 times as long as endopod; exopod larger, broader, with 48 marginal plumose setae. Pleopod 3 peduncle narrower than in pleopod 2, with medial lobe bearing 2 setulate setae; endopod rounded, with 28 marginal plumose setae; exopod almost semicircular, with 48 marginal plumose setae. Pleopod 4 exopod operculiform, chitinized, 2-articulate, with lateral row of about 130 short marginal plumose setae; endopod smaller, without setae. Pleopod 5 rami weakly 2-articulate; exopod with 3 distal plumose setae; endopod as long as exopod, without setae.

Uropod attached just beyond midpoint of pleotelson, reaching three-quarters of its length; with subtriangular peduncle; exopod 0.75 length of endopod, distally rounded, with 7 widely spaced marginal setae; exopod 2.9 times as long as wide, distally rounded, with 8 distal setae.

FEMALE. — Differs from male : oostegites present on pereopods 1-4; pereopod 2 similar to pereopods 3-6; pereopod 7 dactylus very slender as in pereopods 3-6.

ETYMOLOGY. — For New Caledonia.

DISTRIBUTION. — Coral Sea, northern Tasman Sea; 500-2750 m depth.

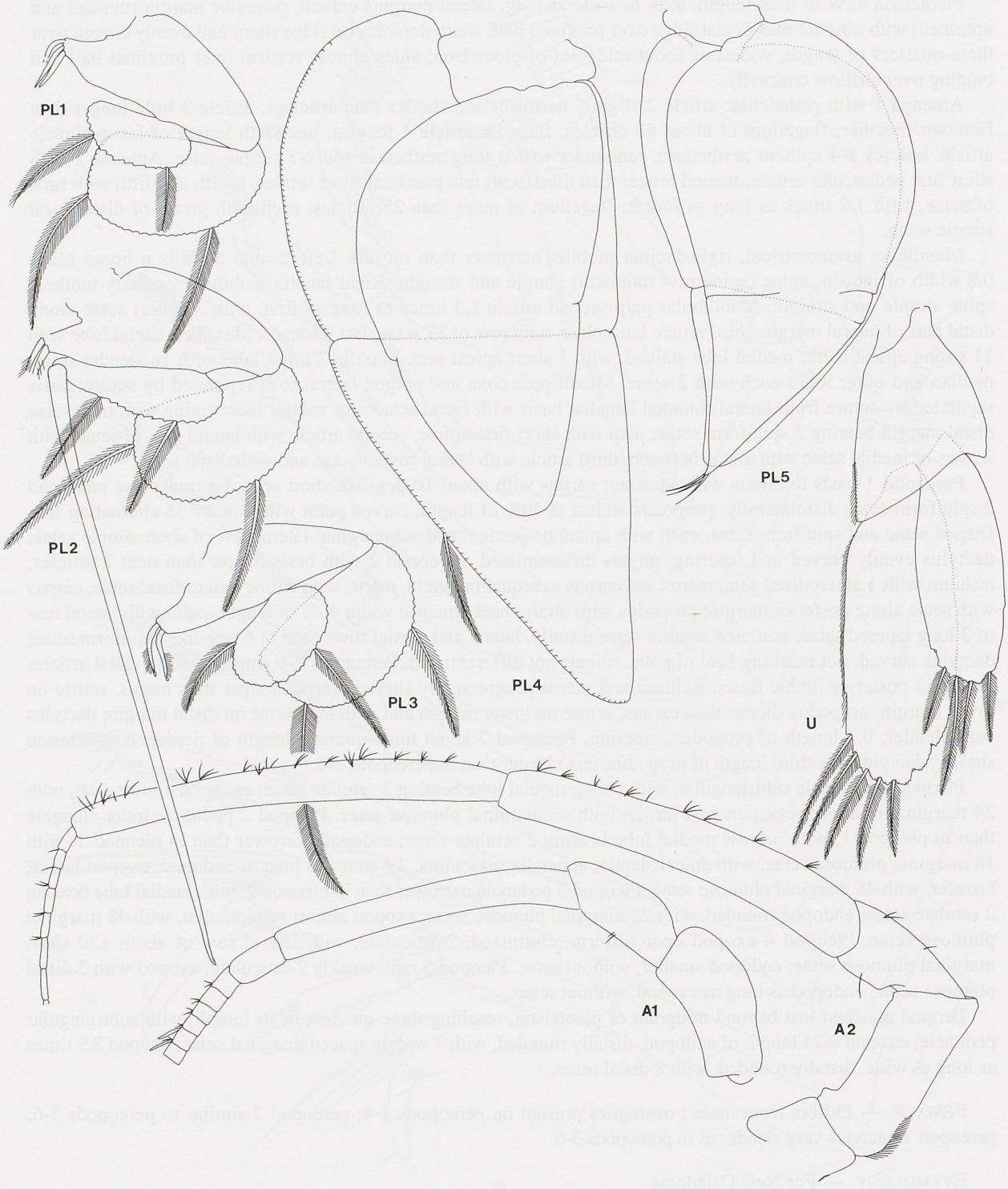


FIG. 10. — *Caecoserolis novaecaledoniae*. Male holotype, MNHN-Is 4081 (only representative setae shown on pleopods).

REMARKS. — The shape and sculpture of the pleotelson of the two males far south from the type locality, in the vicinity of Norfolk Island (30°S), differ slightly from that of the type material. The pleotelson is more angled laterally at the ends of the pleonal epimera than in the holotype. The dorsolateral ridge is more sharply angled, proximal to the ends of the pleonal epimera, whereas in the holotype this ridge is curved and widest further posteriorly. These differences point to possible widespread polymorphism in Serolidae (WÄGELE, 1986). Variability of this species over a wider geographic range remains to be investigated.

ACKNOWLEDGEMENTS

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4

Crustacea Decapoda : *Pseudopandalus curvirostris*, genre et espèce nouveaux (Pandalidae) de Nouvelle-Calédonie

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RÉSUMÉ

Un genre et une espèce nouveaux appartenant à la famille des Pandalidae, *Pseudopandalus curvirostris*, sont décrits et figurés. Proche du genre *Pandalus*, cette espèce a été récoltée en Nouvelle-Calédonie, à plusieurs reprises, entre 420 et 570 m de profondeur.

ABSTRACT

Crustacea Decapoda : *Pseudopandalus curvirostris*, new genus and species (Pandalidae) off New Caledonia.

A new genus and species, *Pseudopandalus curvirostris,* belonging in the family Pandalidae are described and figured. Close to the genus *Pandalus,* this species has been collected, several times, off New Caledonia, at depths between 420 and 570 m.

INTRODUCTION

Lors de diverses campagnes autour de la Nouvelle-Calédonie, il a été récolté, à dix reprises, des spécimens d'une crevette d'assez grande taille, qui s'est révélée appartenir à un genre et à une espèce nouveaux que nous décrivons dans les pages qui suivent.

Le matériel est déposé au Muséum national d'Histoire naturelle (MNHN), à Paris, à l'exception d'un mâle et d'une femelle paratypes, envoyés au National Museum of Natural History (USNM), à Washington.

CROSNIER, A., 1997. — Crustacea Decapoda : *Pseudopandalus curvirostris*, genre et espèce nouveaux (Pandalidae) de Nouvelle-Calédonie. *In* : A. CROSNIER (ed.), Résultat des Campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176** : 169-176. Paris ISBN 2-85653-511-9.

La longueur de la carapace (LC) est mesurée du fond de l'orbite à la partie dorsale du bord postérieur de la carapace; c'est elle qui est mentionnée dans la liste du matériel examiné. La longueur totale correspond à la distance séparant la pointe du rostre de l'extrémité du telson.

Genre *PSEUDOPANDALUS* nov.

DESCRIPTION . — Rostre fort et long, dépassant très largement le scaphocérite, non articulé avec la carapace, avec des dents toutes mobiles sur son bord dorsal (à l'exception de la dent subdistale) et des dents toutes fixes sur son bord ventral. Dents postrostrales toutes mobiles. Carapace sans carènes longitudinales, avec une épine antennaire, une épine ptérygostomienne et une dent supra-orbitaire. Abdomen avec les pleurons des trois premiers segments arrondis et ceux des quatrième et cinquième se terminant en pointe aiguë.

Antennules d'une longueur inférieure à celle du corps. Yeux très développés, pigmentés, avec une cornée beaucoup plus large que le pédoncule oculaire et un ocelle dorsal très bien marqué. Stylocérite très allongé et acéré. Lobe postérieur du scaphognathite court et arrondi, sans très longues soies. Deuxièmes maxillipèdes avec un article terminal beaucoup plus large que long. Troisièmes maxillipèdes avec un exopodite et une légère expansion de l'antépénultième article vers son milieu. Épipodites et arthrobranchies présents sur les quatre premières paires de péréiopodes. Premiers péréiopodes avec une pince minuscule et une légère expansion ventrale de l'ischion dans sa moitié distale. Seconds péréiopodes de tailles inégales (le droit étant nettement plus court et plus fort que la gauche) avec un carpe multiarticulé et une pince bien développée. Troisièmes, quatrièmes et cinquièmes péréiopodes forts. Ischion des troisièmes et quatrièmes péréiopodes portant un forte épine latérale externe mobile, en plus de l'épine de la face inférieure.

ESPÈCE TYPE. — *Pseudopandalus curvirostris* sp. nov., par monotypie.

ÉTYMOLOGIE. — Du grec *pseudos*, mensonge, accolé au nom de genre *Pandalus* afin de rappeler combien le nouveau genre se situe près du précédent.

POSITION. — Parmi les genres de la famille des Pandalidae (voir CHRISTOFFERSEN, 1989; HOLTHUIS, 1993, en particulier), le genre que nous décrivons est proche du groupe d'espèces *Australopandalus*, *Pandalina*, *Dichelopandalus*, *Pandalus* et *Pandalopsis*. Parmi ces espèces, c'est de *Pandalus* Leach, 1814, qu'il semble le plus proche. Comme lui, il présente un rostre très long, ayant toutes ses dents dorsales mobiles (à l'exception de la subdistale), une expansion de l'antépenultième article des troisièmes maxillipèdes et de l'ischion des premiers péréiopodes faiblement développée, des antennules dont la longueur n'excède pas celle du corps, une carapace avec une épine antennaire et une épine ptérygostomienne, des mandibules avec un processus incisif et un palpe de trois articles, des péréiopodes assez forts, dont les deuxièmes sont de taille inégale avec un carpe pluriarticulé, la présence d'arthrobranchies et d'épipodites sur les quatre premières paires de péreiopodes.

Il en diffère par :

— le lobe postérieur du scaphognathite court et arrondi (au lieu d'être allongé et en pointe), sans très longues soies;

— la présence d'un exopodite (de petite taille) sur les troisièmes maxillipèdes;

— le stylocérite très long et acéré (au lieu d'être court et tronqué).

Pseudopandalus partage, par ailleurs, de nombreux caractères avec le genre *Plesionika* : carpe des deuxièmes péréiopodes avec de nombreux articles, pas de carène longitudinale sur la carapace, roste long et fixe, yeux bien développés, avec une cornée plus large que le pédoncule oculaire, troisièmes maxilipèdes avec un exopodite, épipodes sur les quatre premières paires de péréiopodes; stylocerite terminé en pointe, lobe postérieur du scaphognathite arrondi. Dans ce genre, il s'apparente au sous-genre *Nothocaris* (voir BURUKOVSKY, 1981; CHACE, 1985) par ses deuxièmes péréiopodes inégaux.

Mais il en diffère par :

— le rostre qui ne porte sur son bord supérieur que des dents mobiles (à l'exception de la subdistale);

— le stylocérite très long (beaucoup plus que chez *Plesionika*);
— le troisième segment abdominal avec une dent dorsale recourbée, caractéristique;
— le faible développement de l'exopodite des troisièmes maxillipèdes.

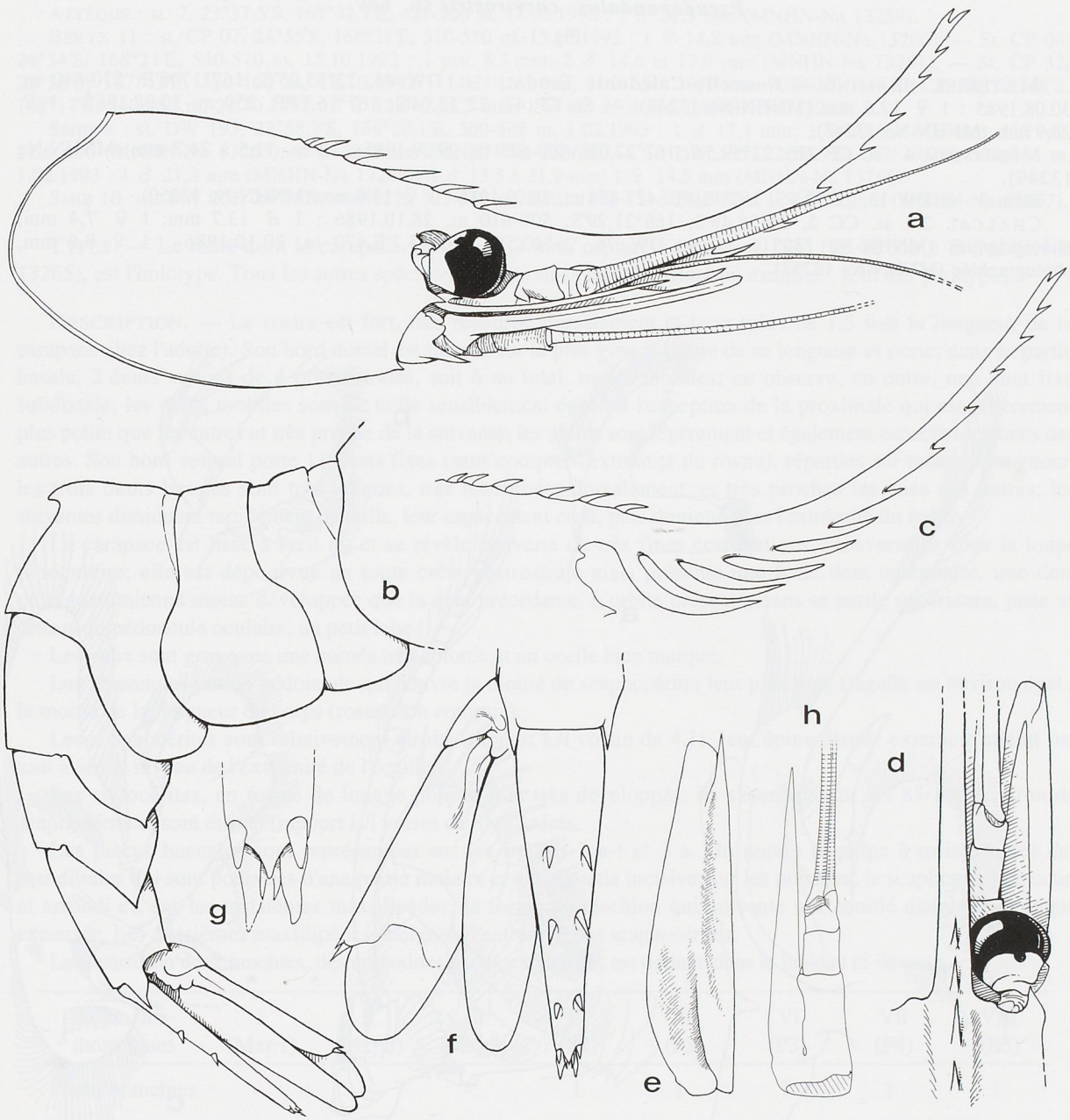


FIG. 1. — *Pseudopandalus curvirostris* gen. nov. sp. nov., **a-d**, ♂ 21,3 mm, holotype, Nouvelle-Calédonie, SMIB 8, st. DW 195 : **a**, partie antérieure du corps, vue latérale : **b**, abdomen, vue latérale; **c**, rostre; **d**, base du rostre, œil, pédoncule antennulaire et scaphocérite, vue de dessus. — **e-g**, ♀ 23,0 mm, paratype, Nouvelle-Calédonie, SMIB 8, st. DW 193 : **e**, scaphocérite droit, vue de dessus; **f**, telson et uropodes gauches, vue de dessus; **g**, extrémité du telson, vue de dessus; **h**, stylocérite gauche vu de dessus.

Les figures a et b sont au même grossissement.

On remarquera, enfin, que la présence d'un lobe orbitaire semble être un caractère bien particulier à *Pseudopandalus* parmi les Pandalidae.

Pseudopandalus curvirostris sp. nov.

Fig. 1-3

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. DW 46, 22°53,05'S, 167°1708'E, 570-610 m, 30.08.1985 : 1 ♀ 17,6 mm (MNHN-Na 13247). — St. CP 47, 22°53,04'S, 167°16,77'E, 550 m, 30.08.1985 : 1 ♀ 23,9 mm (MNHN-Na 13248).

MUSORSTOM 4 : st. CP 216, 22°59,5'S, 167°22,0'E, 490-515 m, 29.09.1985 : 12 ex. 11,5 à 24,7 mm (MNHN-Na 13249).

SMIB 2 : st. DW 13, 22°52,4'S, 167°13,4'E, 427-454 m, 18.09.1986 : 1 ♀ 13,6 mm (MNHN-Na 13250).

CHALCAL 2 : st. CC 2, 24°55,48'S, 168°21,29'S, 500-610 m, 28.10.1986 : 1 ♂ 13,7 mm; 1 ♀ 7,4 mm, photographiés (MNHN-Na 13251). — St. DW 76, 23°40,5'S, 167°45,2'E,470 m, 30.10;1986 : 1 ♀ 8,6 mm, photographiée (MNHN-Na 13252).

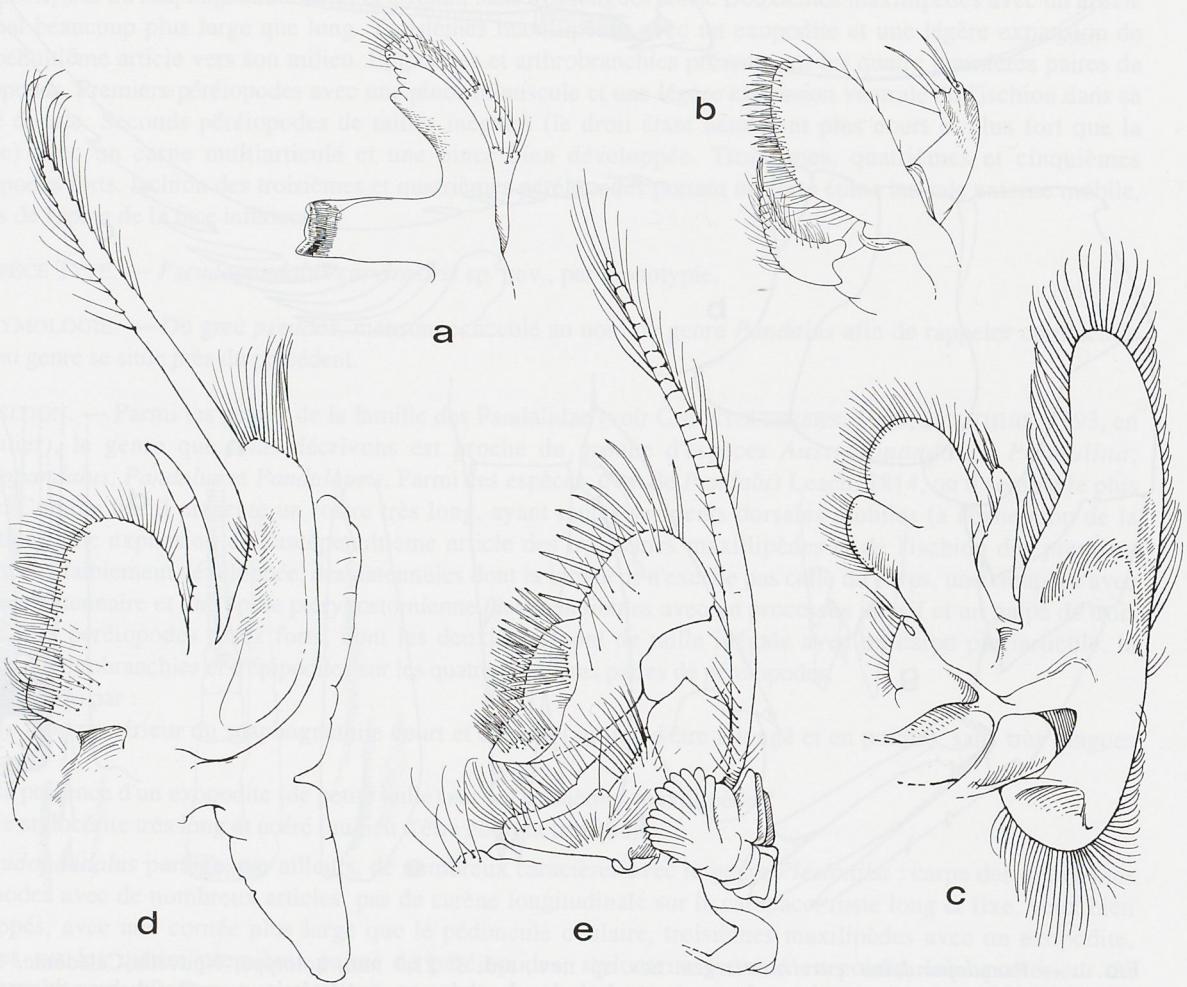


FIG. 2. — *Pseudopandalus curvirostris* gen. nov. sp. nov., ♀ 13,0 mm, paratype, Nouvelle-Calédonie, SMIB 8, st. DW 193. Pièces buccales gauches, face externe : **a**, mandibule; **b**, première maxille; **c**, deuxième maxille; **d**, premier maxillipède; **e**, deuxième maxillipède.

Toutes les figures sont au même grossissement.

SMIB 3 : st. CP 4, 24°54,0'S, 168°22,5'E, 530 m, 20.05.1987 : 1 ♂ 20,1 mm (MNHN-Na 13253), 1 ♀ 20,4 mm, photographiée (MNHN-Na 13254). — St. DW 24, 22°58,7'S, 167°21,1'E, 535 m, 24.05.1987 : 1 ♂ 19,5 mm; 3 ♀ 8,7 à 14,6 mm (MNHN-Na 13255).

SMIB 4 : st. DW 62, 23°00,4'S, 167°21,8'E, 540 m, 10.03.1989 : 2 ♂ 17,0 à 21,4 mm; 1 ♀ 14,5 mm (MNHN-Na 13257); 1 ♂ 20,3 mm, photographié (MNHN-Na 13258).

AZTÈQUE : st. 7, 23°37,5'S, 167°42,1'E, 425-500 m, 14.02.1990 : 1 ♂ 21,3 mm (MNHN-Na 13259).

BERYX 11 : st. CP 07, 24°55'S, 168°21'E, 510-550 m, 15.10.1992 : 1 ♀ 14,8 mm (MNHN-Na 13260). — St. CP 08, 24°54'S, 168°21'E, 540-570 m, 15.10.1992 : 1 juv. 8,3 mm; 2 ♂ 14,6 et 17,9 mm (MNHN-Na 13261). — St. CP 32, 23°38'S, 167°43'E, 420-460 m, 18.10.1992 : 1 ♂ 16,3 mm, 1 ♀ ov. 20,7 mm (USNM). — St. CP 53, 23°48'S, 168°17'E, 540-950 m, 21.10.1992 : 2 ♀ 12,6 et 22,3 mm; 1 ♀ ov. 25,0 mm (MNHN-Na 13262).

SMIB 8 : st. DW 193, 22°58,7'S, 168°20,1'E, 500-508 m, 1.02.1993 : 1 ♂ 17,1 mm; 3 ♀ 13,6 à 14,8 mm; 1 ♀ ov. 22,6 mm (MNHN-Na 13263); 1 ♀ 23,0 mm (MNHN-Na 13264). — St. DW 195, 22°58,9'S, 167°20,2'E, 508-514 m, 1.02.1993 : 1 ♂ 21,3 mm (MNHN-Na 13265); 4 ♂ 13,3 à 21,9 mm; 1 ♀ 14,5 mm (MNHN-Na 13266).

SMIB 10 : st. DW 202, 24°55'S, 168°22'E, 525-513 m, 10.01.1995 : 1 ♂ 10,5 mm; 1 ♀ 15,9 mm (MNHN-Na 13267).

TYPES. — Le mâle dont la carapace mesure 21,3 mm, capturé à la station DW 195 de SMIB 8 (MNHN-B 13265), est l'holotype. Tous les autres spécimens mentionnés dans le "Matériel examiné" sont des paratypes.

DESCRIPTION. — Le rostre est fort, très recourbé dorsalement et long (plus de 1,5 fois la longueur de la carapace chez l'adulte). Son bord dorsal est inerme sur la plus grande partie de sa longueur et porte, dans sa partie basale, 2 dents suivies de 4 postrostrales, soit 6 au total, toutes mobiles; on observe, en outre, une dent fixe subdistale; les dents mobiles sont de taille sensiblement égale, à l'exception de la proximale qui est légèrement plus petite que les autres et très proche de la suivante; les autres sont légèrement et également espacées les unes des autres. Son bord ventral porte 11 dents fixes (sans compter l'extrémité du rostre), réparties sur toute sa longueur; les trois dents basales sont très longues, très recourbées dorsalement, et très proches les unes des autres; les suivantes diminuent rapidement de taille, leur espacement croît, puis diminue vers l'extrémité du rostre.

La carapace est lisse à l'œil nu et se révèle couverte de très fines corrugations transversales sous la loupe binoculaire; elle est dépourvue de toute crête postrostrale mais présente une forte dent antennaire, une dent ptérygostomienne moins développée que la dent précédente. L'orbite présente, dans sa partie supérieure, juste au dessus du pédoncule oculaire, un petit lobe.

Les yeux sont gros avec une cornée très colorée et un ocelle bien marqué.

Les antennules ont un pédoncule qui couvre la moitié du scaphocérite; leur plus long flagelle est environ égal à la moitié de la longueur du corps (rostre non compris).

Les scaphocérites sont relativement étroits (rapport L/l voisin de 4,1); leur épine distale externe n'atteint pas tout à fait le niveau de l'extrémité de l'écaille.

Les stylocérites, en forme de longue pointe, sont très développés; ils s'étendent sur les 85/100 environ du scaphocérite et sont étroits (rapport L/l voisin de 8) et acérés.

Les pièces buccales sont représentées sur les figures 2 a-f et 3 a. On notera le palpe à trois articles des mandibules qui sont pourvues d'une partie molaire et d'une partie incisive; sur les maxilles, le scaphognathite court et arrondi et, sur les troisièmes maxillipèdes, la forme de l'ischion qui présente une moitié distale légèrement expansée. Les troisièmes maxillipèdes atteignent l'extrémité des scaphocérites.

La répartition des branchies, des épipodites et des exopodites est donnée dans le tableau ci-dessous :

Segments thoraciques	I (Mxp1)	II (Mxp2)	III (Mxp3)	IV (P1)	V (P2)	VI (P3)	VII (P4)	VIII (P5)
Pleurobranchies	-	-	-	1	1	1	1	1
Arthrobranchies	-	-	2	1	1	1	1	-
Podobranchies	-	1	-	-	-	-	-	-
Épipodites	1	1	1	1	1	1	1	-
Exopodites	1	1	1	-	-	-	-	-

L'exopodite des troisièmes maxillipèdes est bien visible mais de petite taille.

Les premiers péréiopodes atteignent l'extrémité du stylocérite. L'ischion porte, sur la moitié distale de sa face ventrale, une dizaine de spinules mobiles.

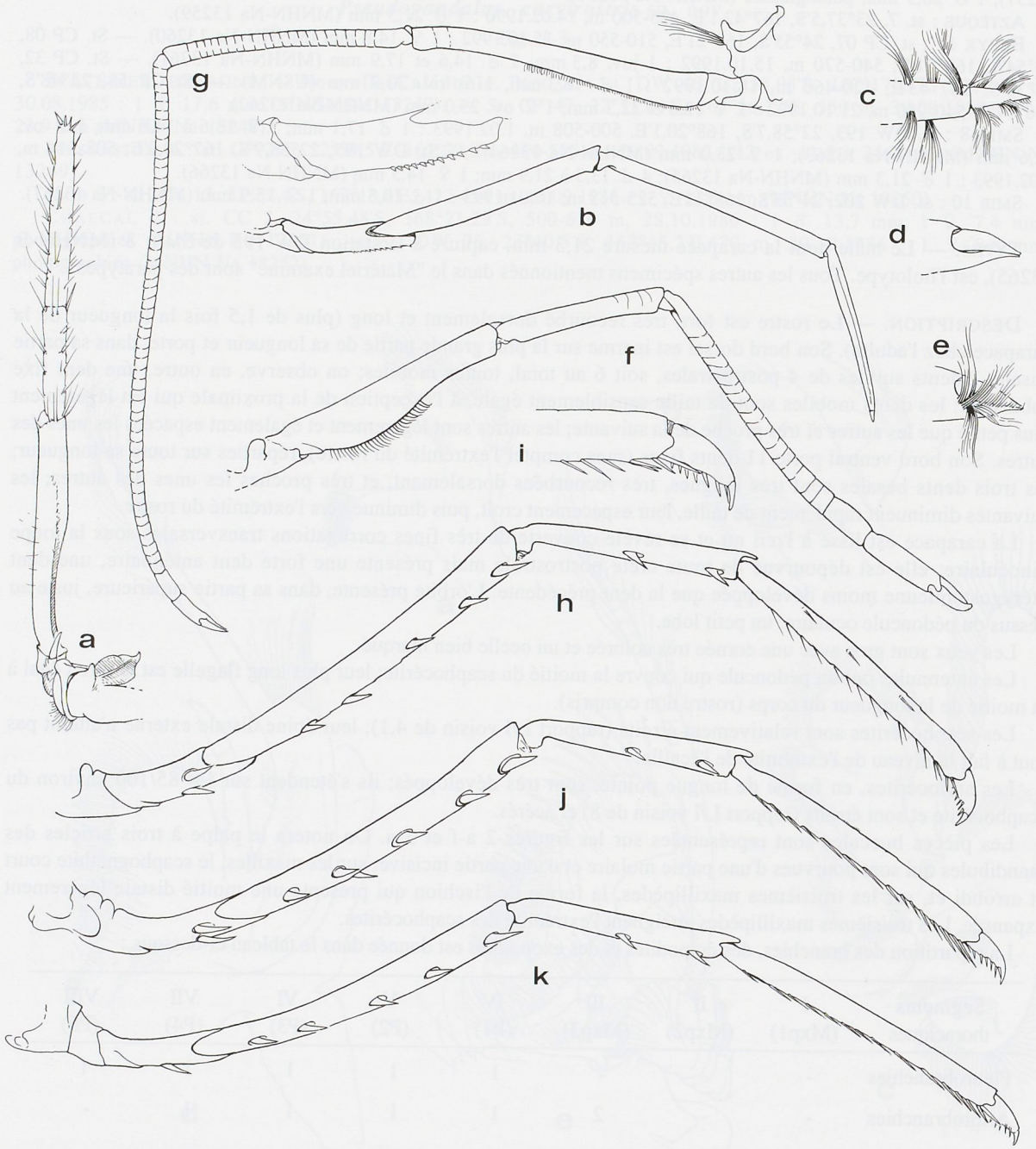


FIG. 3. — *Pseudopandalus curvirostris* gen. nov. sp. nov., **a**, ♀ 13,0 mm, paratype, Nouvelle-Calédonie, SMIB 8, st. DW 193 : Mxp3 gauche. — **b-k**, ♀ 23,0 mm, paratype, *ibidem* : **b**, P1 droit, avec au dessus le mérus grossi; **c-e**, extrémité du propode et dactyle de P1 sous divers aspects; **f**, P2 droit; **g**, P2 gauche; **h**, P3 droit; **i**, partie distale du propode et dactyle de P3 droit; **j**, P4 droit; **k**, P5 droit.

Les figures b, f-g, h, j-k sont au même grossissement.

Le deuxième péréiopode gauche dépasse le scaphocérite d'une longueur égale à la moitié de celle de ce dernier. Son carpe est divisé en nombreux articles; suivant les spécimens nous en avons compté de 55 à 61; sur le mérus, également divisé, nous avons compté de 25 à 28 article environ, répartis sur toute sa longueur; sur l'ischion, on distingue également 3 ou 4 traces de division dans sa partie distale. La pince est bien développée.
Le deuxième péréiopode droit est nettement plus court que le gauche; il atteint presque l'extrémité du scaphocérite. Son carpe est divisé en de moins nombreux articles que le deuxième péréiopode gauche : nous en avons compté de 19 à 22 suivant les spécimens; le mérus n'est divisé que dans sa partie distale; les divisions ne sont pas toujours nettes et l'on distingue 5 ou 6 articles; aucune trace de division ne s'observe sur l'ischion. La pince est bien développée comme dans le deuxième péréiopode gauche.

Les troisièmes, quatrièmes et cinquièmes péréiopodes sont forts et d'une longueur modérée (les troisièmes dépassent le scaphocérite par leur dacyle et le dixième environ de leur propode, les quatrièmes atteignent l'extrémité du scaphocérite, les cinquièmes les neuf dixièmes du scaphocérite). De grosses épines mobiles s'observent sur l'ischion, le mérus et le carpe; elles sont au nombre, respectivement, de 2, 4 ou 5 et 2 sur les troisièmes péréiopodes, de 2, 6 et 2 sur les quatrièmes et de 1, 5 ou 6 et 2 sur les cinquièmes. Les dactyles sont fort, recourbés, et garnis, sur leur bord postérieur, de 6 épines mobiles dont la taille croît de la base à l'extrémite du dactyle.

L'abdomen a les pleurons de ses trois premiers segments arrondis, tandis que ceux des quatrième et cinquième segments présentent un denticule acéré à la jonction des bords ventral et postérieur. La face dorsale du troisième segment porte, vers son centre, une très forte excroissance en forme d'épine recourbée vers l'arrière. Le sixième segment a ses faces latérales qui se prolongent par un lobe terminé en pointe; ses bords ventraux portent une petite épine distale; le rapport de sa longueur (mesurée du condyle d'articulation avec le cinquième à la base du telson) à sa hauteur est très voisin de deux. Le telson qui dépasse très légèrement, par ses épines terminales, la rame interne des uropodes, est environ 1,3 fois plus long que le sixième segment abdominal; il porte, à son extrémité, une paire de petites épines, encadrée par une paire de très fortes épines et est orné, dorsolatéralement, de quatre paires d'épines dont la dernière est subdistale.

Coloration - L'allure générale est celle d'un animal rouge avec de larges bandes transversales blanches.

La carapace présente une large bande transversale blanche au niveau des deux dernières dents postrostrales; une autre bande couvre la partie tout à fait postérieure de la carapace; entre ces deux bandes, se trouve une tache, de forme irrégulière, souvent incurvée vers l'arrière, qui part du bord dorsal et s'étend sur le tiers supérieur environ de la carapace; la partie antérieure de la carapace, enfin, entre les épines antennaire et ptérygostomienne, est également blanche.

Le rostre est rouge dans sa partie antérieure puis, en arrière, présente une zone blanche qui se recolore plus ou moins dans sa partie basale. Les dents rostrales dorsales et les dents postrostrales sont rouges, à l'exception de la dernière, ou des deux dernières dents postrostrales qui sont blanches.

L'abdomen se caractérise par une large bande très blanche, très marquée, qui part de la forte épine recourbée, dorsale, du troisième segment abdominal qu'elle englobe, et qui s'étend, en diagonale, sur la partie postérieure du pleuron du second segment abdominal. Les segments 1, 4 et 5 ont, d'une manière générale, leur partie antérieure décolorée et leur partie postérieure rouge. Le sixième segment a sa partie dorsale colorée et le reste plus ou moins blanchâtre. Le telson et les uropodes sont rouges avec une bande blanche transversale sub-basale.

Les péréiopodes présentent des alternances de longues zones blanches et rouges. Les pléopodes sont rouges ou blancs suivant les spécimens.

ÉTYMOLOGIE. — Du Latin *curvus*, courbé, et *rostrum*, rostre, afin de rappeler la forme très incurvée du rostre.

TAILLE. — Les plus grands spécimens observés sont une femelle ovigère dont la longueur totale est de 122 mm (LC = 25,0 mm) et un mâle mâle mesurant 123 mm (LC = 24,7 mm). La plus petite femelle ovigère observée mesure 101 mm (LC = 20,7 mm).

Les œufs sont très nombreux et petits (diamètre voisin de 0,2 mm).

DISTRIBUTION. — Nouvelle-Calédonie, entre 420-570 m. Une récolte a été faite lors d'un chalutage effectué entre 540 et 950 m de profondeur, mais, compte tenu des autres récoltes, il est vraisemblable que la capture a été faite lors du début du chalutage.

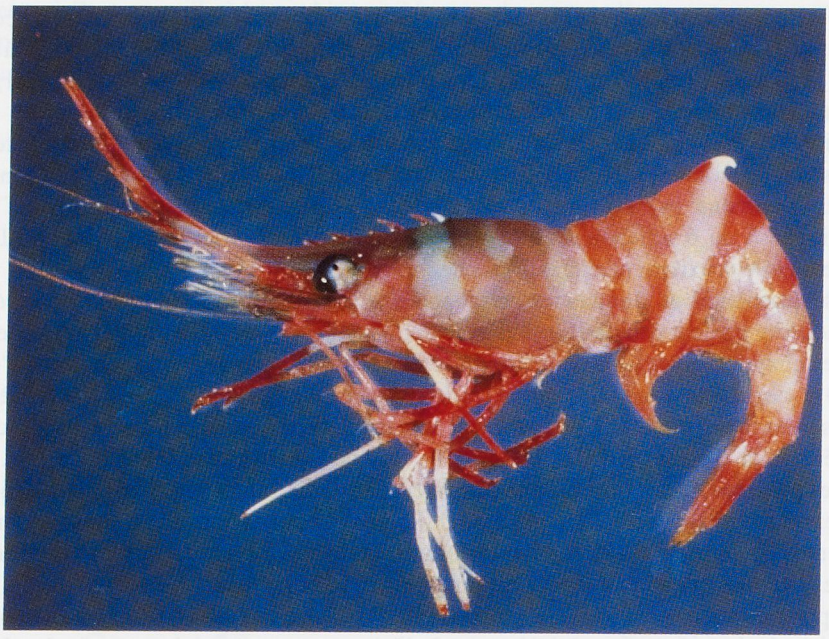


FIG. 4. — *Pseudopandalus curvirostris* gen. nov., sp. nov., ♀ paratype 20,4 mm, SMIB 3, st. CP 4, 24°54,0'S, 168°22,5'E, 530 m (MNHN-Na 13254). Photo P. TIRARD.

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Par ailleurs, nous avons une gratitude toute particulière envers le Dr Tomoyuki KOMAI (Natural History Museum and Institute, Chiba, Japon), dont les commentaires nous ont été précieux.

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Crustacea Decapoda: *Chelonika macrochela*, a new genus and new species of pandalid shrimp (Caridea) from New Caledonian waters

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ABSTRACT

A new genus and species of Pandalidae, *Chelonika macrochela*, is described and figured. The species was collected in New Caledonian waters, at a depth between 144 and 155 m.

RÉSUMÉ

Crustacea Decapoda : *Chelonika macrochela*, genre et espèce nouveaux appartenant à la famille des Pandalidae (Caridea) et provenant des eaux néo-calédoniennes.

Un genre et une espèce nouveaux d'une crevette appartenant à la famille des Pandalidae, *Chelonika macrochela*, sont décrits. L'espèce a été récoltée en Nouvelle-Calédonie, à une profondeur comprise entre 144 et 155 m.

INTRODUCTION

Among the caridean shrimp collected by the MUSORSTOM cruises in New Caledonian waters, one specimen of a pandalid shrimp with a large chela on the second pereiopod was found. Such large chelae on the second pereiopods are not known within the family Pandalidae. For this reason, a new genus is erected.

Genus ***CHELONIKA*** nov.

DEFINITION. — Rostrum long, slender, immovably connected to the carapace, with immovable dorsal and ventral teeth. Carapace without longitudinal carinae, with antennal spine and pterygostomian tooth. Abdomen with

FRANSEN, C. H. J. M., 1997. — Crustacea Decapoda: *Chelonika macrochela*, a new genus and new species of pandalid shrimp (Caridea) from New Caledonian waters. *In* : A. CROSNIER (ed.), Résultats des Campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176** : 177-185. Paris ISBN 22-85653-511-9.

pleura of first four somites rounded, pleura of fifth somite acutely pointed. Eyes well developed, pigmented, cornea broader than eyestalk; dorsal ocellus present. Posterior lobe of scaphognathite rounded. Second maxilliped with terminal segment wider than long. Third maxilliped with exopod. Epipods and arthrobranchs present on first four pairs of pereiopods. First pair of pereiopods without chelae; dactylus formed by a small, distal spine. Second pereiopod with multiarticulate carpus; chela large. Ambulatory pereiopods long and slender; dactyli with spines on flexor margin.

TYPE SPECIES. — *Chelonika macrochela* sp. nov., by monotypy.

ETYMOLOGY. — Combination of the greek word *chela,* meaning pincer, and the last part of the pandalid genus *Plesionika.* Gender : feminine.

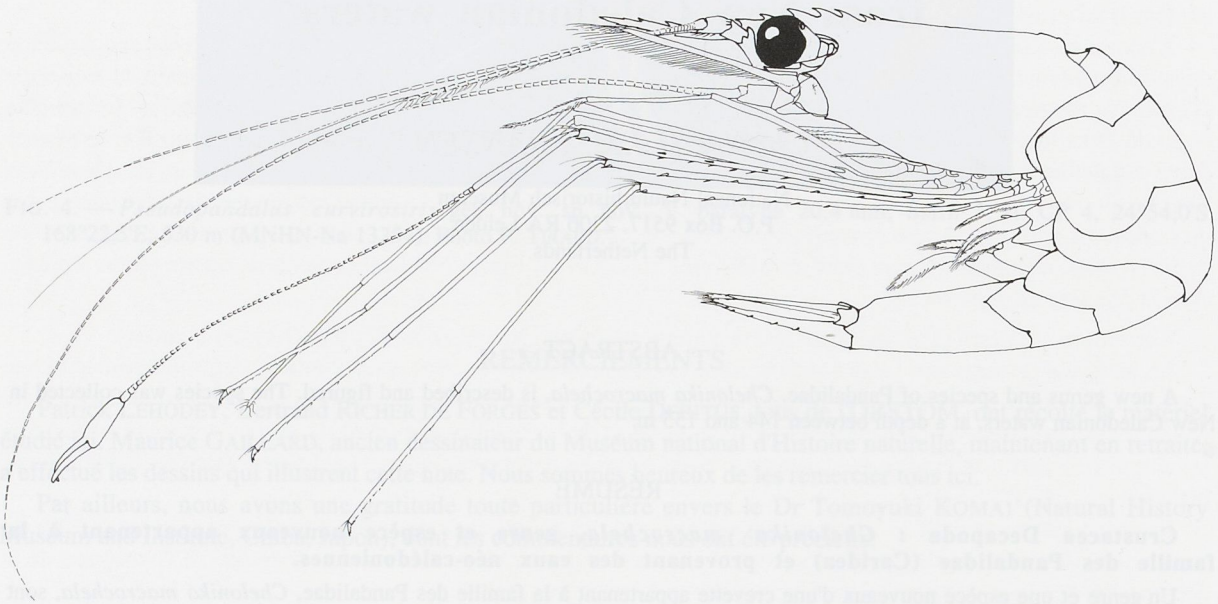


FIG. 1. — *Chelonika macrochela* sp. nov., holotype, ♀ cl. 7.3 mm, New Caledonia (MNHN-B 12966).

SYSTEMATIC POSITION. — The present specimen falls within the diagnosis of the family Pandalidae Haworth, 1825, given by CHACE (1985 : 9). At present, 19 genera are recognized (following CHACE's (1985) synonymy of *Parapandalus* with *Plesionika*) : *Anachlorocurtis* Hayashi, 1975; *Austropandalus* Holthuis, 1952; *Bitias* Fransen, 1990; *Chlorocurtis* Kemp, 1925; *Chlorotocella* Balss, 1914; *Chlorotocus* A. Milne Edwards, 1882; *Dichelopandalus* Caullery, 1896; *Dorodotes* Bate, 1888; *Heterocarpus* A. Milne Edwards, 1881; *Miropandalus* Bruce, 1983; *Notopandalus* Yaldwyn, 1960; *Pandalina* Calman, 1899; *Pandalopsis* Bate, 1888; *Pandalus* Leach, 1814; *Pantomus* A. Milne Edwards, 1883; *Peripandalus* de Man, 1917; *Plesionika* Bate, 1888; *Procletes* Bate, 1888; and *Stylopandalus* Coutière, 1905. In HOLTHUIS' account of the recent caridean genera (HOLTHUIS, 1993 : 261-263), the present specimen keys out with the genus *Plesionika* Bate, 1888. CHRISTOFFERSON (1989) performed a manual cladistic analysis on 21 genera of the presumably monophyletic taxon Pandaloidea, which consists of both the families Pandalidae and Thalassocarididae Bate, 1888. CHRISTOFFERSON suspects the genus *Plesionika*, which comprises about 84 species, to be paraphyletic or polyphyletic. It could well be that *Chelonika* will turn out to be an ingroup of the *'Plesionika'* assemblage. More definite conclusions on the systematic position of *Chelonika* awaits a phylogenetic analysis of the *'Plesionika'* assemblage.

Almost certainly an apomorphic character in *Chelonika* is the presence of the extremely large chela in the second pereiopod. This character does not occur in any of the 19 genera of the family Pandalidae. The non-chelate form of first pereiopod does not occur in *Plesionika*. In *Plesionika* the dactylus is more developed, emerging subdistally to form a 'chela' with the distal tip of the propodus. Nor is the short squarish stylocerite known in *Plesionika*, most species of which have the stylocerite about as long as the basal segment of the antennular peduncle and the distal part acute.

Chelonika macrochela sp. nov.

Fig. 1-7

MATERIAL EXAMINED. — **New Caledonia**. BATHUS 2 : st. DW 753, 22°21.5'S 166°14,6'E; 144-155 m, 15.05. 1993, B. RICHER DE FORGES coll. : 1 ♀ cl. 7.3 mm (MNHN-B 12966).

TYPES. — The unique female is the holotype.

DESCRIPTION. — Rostrum slightly overreaching antennal scale, sabre-like, immovably connected to carapace; dorsal lamina slightly elevated proximally; 10 dorsal fixed teeth present; proximal 7 teeth evenly spaced, 3 proximal teeth postorbital; distal third of lamina with 3 small teeth. Ventral lamina with 5 small teeth in distal 2/5. Antennal spine robust. Pterygostomian tooth distinct.

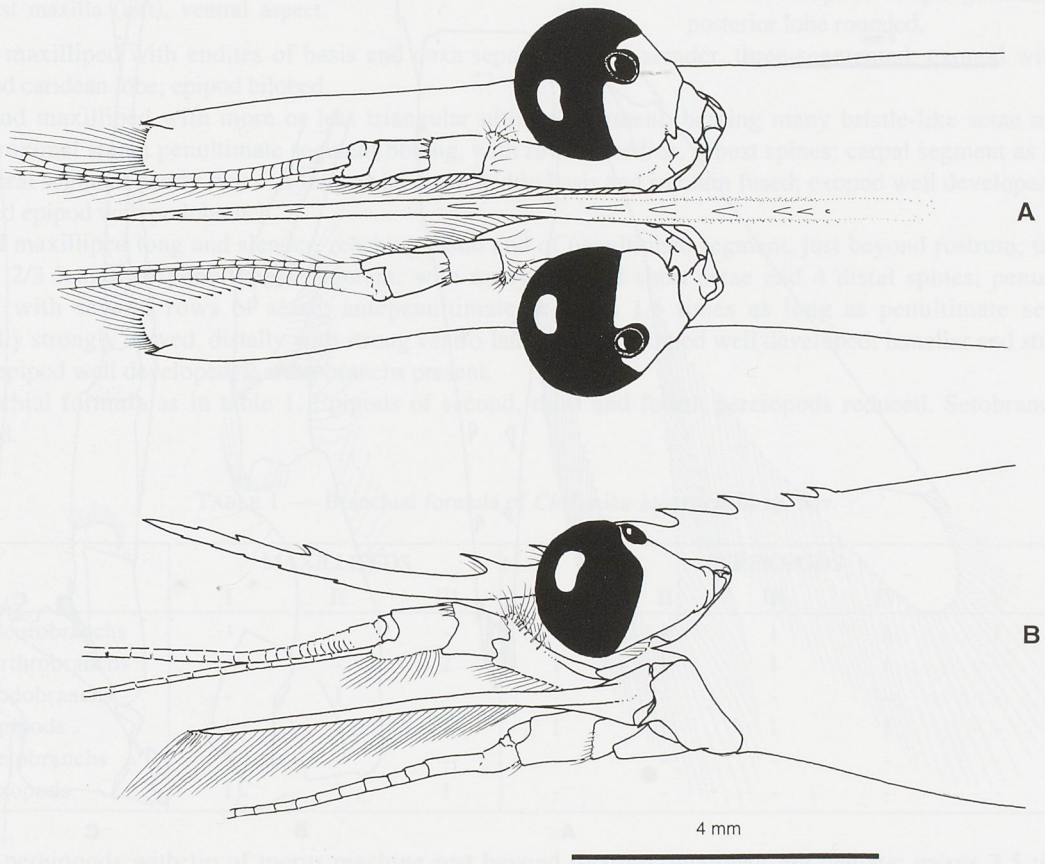


FIG. 2. — *Chelonika macrochela* sp. nov., holotype, ♀ cl. 7.3 mm, New Caledonia (MNHN-B 12966) : **A**, anterior region, dorsal aspect; **B**, anterior region, lateral aspect.

Abdomen with third somite rounded posteriorly, unarmed, without median carina. Pleura of anterior four somites rounded, fifth with sharp posteroventral tooth and slightly convex ventral margin. Sixth abdominal somite about 2.5 times as long as fifth. Telson about 0.8 times as long as sixth abdominal somite; with four pairs of dorsolateral spines; posterior margin of telson with three pairs of spines, lateral pair as long as dorsolateral spines, intermediate pair longest, median pair about half length of intermediate pair. Uropods as long as telson. Exopod with movable distolateral spine.

Tegumental scales not found.

Eye pyriform. Ocellus well developed.

Basal segment of antennular peduncle without ventromesial tooth. Stylocerite squarish, almost half as long as basal segment; distolateral angle acute; lateral margin slightly convex. Penultimate and ultimate segment slightly longer than wide; penultimate segment with 4-5 dorso-distal spines. Flagella long, slender and uniramous; basal third of outer flagellum with aesthetascs.

Scaphocerite twice as long as antennal peduncle, 5 times as long as median width; distolateral tooth reaching distal margin of lamina; lateral margin sinuous. Basal segment with strong distoventral tooth. Penultimate and ultimate segments each about twice as long as wide.

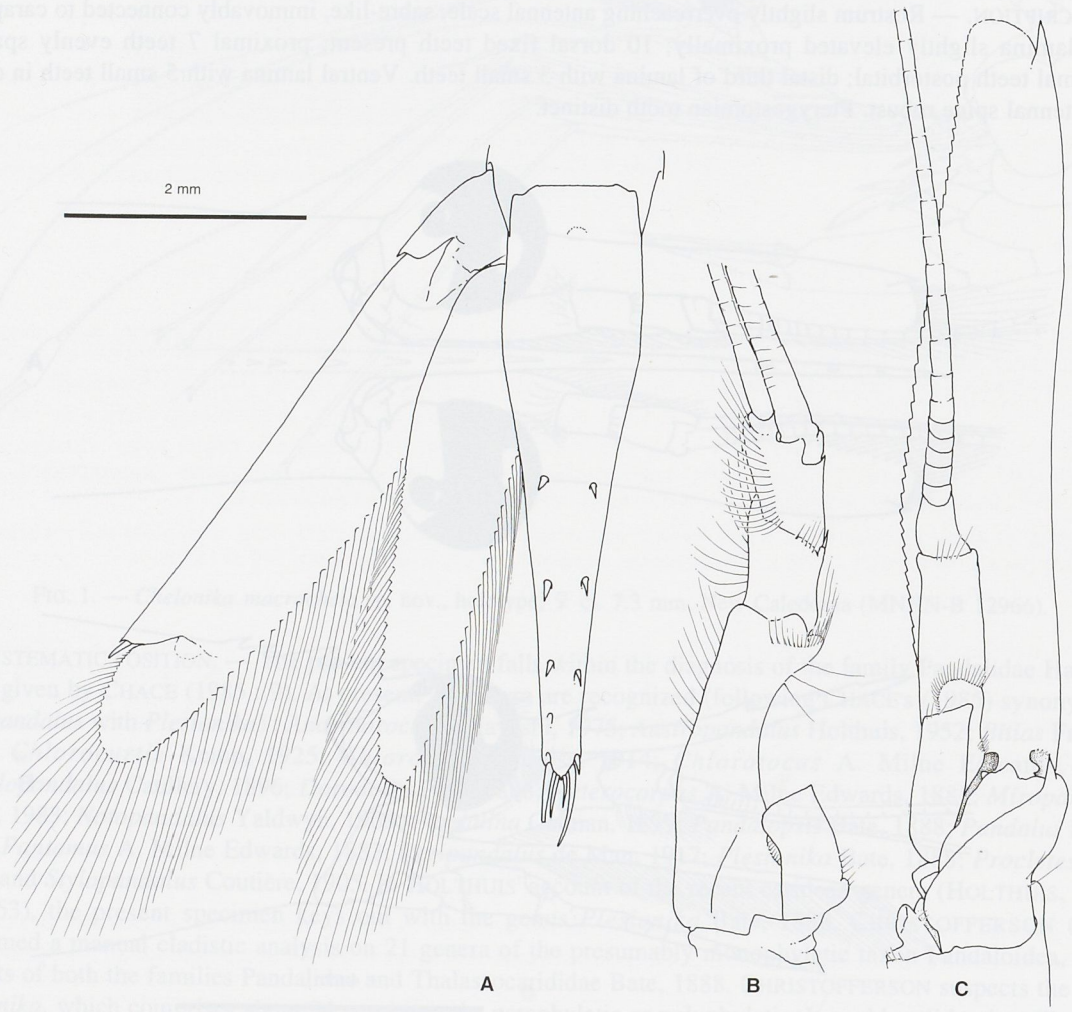


FIG. 3. — *Chelonika macrochela* new species, holotype, ♀ cl. 7.3 mm, New Caledonia (MNHN-B 12966) : **A**, caudal fan; **B**, antennular peduncle (left), ventral aspect; **C**, antennal peduncle (left), ventral aspect.

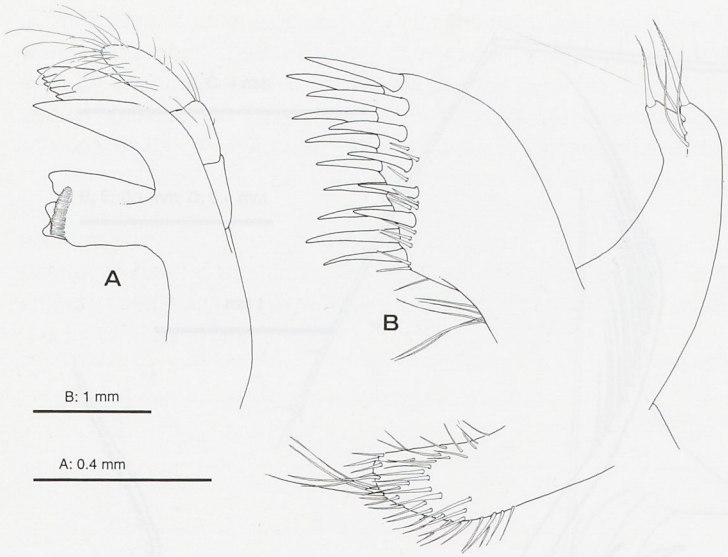


FIG. 4. — *Chelonika macrochela* sp. nov., holotype, ♀ cl. 7.3 mm, New Caledonia (MNHN-B 12966) : **A**, mandible (left), ventral aspect; **B**, first maxilla (left), ventral aspect.

Incisor process of left mandible with 6 teeth, right mandible with 5 teeth; ventralmost tooth much larger than others; molar process ends in 4 blunt teeth and an area with series of short setae. Mandibular palp three-segmented; basal segment slender; penultimate segment short, widening distally; ultimate segment almost twice as long as penultimate segment, with many long, slender setae.

First maxilla with lower and upper endites well developed; upper endite broad, with two rows of strong spines; lower endite distally rounded, with many simple setae; palp bilobed, with each lobe ending in one large seta.

Second maxilla with lower endite somewhat reduced; upper endite bilobed, of which upper lobe best developed; palp well developed; scaphognathite with posterior lobe rounded.

First maxilliped with endites of basis and coxa separated; palp slender, three-segmented; exopod with well developed caridean lobe; epipod bilobed.

Second maxilliped with more or less triangular ultimate segment, bearing many bristle-like setae and one robust proximal spine; penultimate segment oblong, with row of median, robust spines; carpal segment as long as wide; meral segment nearly twice as long as its distal width; basis and ischium fused; exopod well developed; well-developed epipod with podobranch.

Third maxilliped long and slender, reaching distal end of penultimate segment, just beyond rostrum; ultimate segment 2/3 length of penultimate segment, with many rows of short setae and 4 distal spines; penultimate segment with several rows of setae; antepenultimate segment 1.6 times as long as penultimate segment, proximally strongly curved, distally with strong ventro-lateral spine; exopod well developed; lamellar and strap-like parts of epipod well developed; 2 arthrobranchs present.

Branchial formula as in table 1. Epipods of second, third and fourth pereiopods reduced. Setobranchs not developed.

TABLE 1. — Branchial formula of *Chelonika macrochela* sp. nov.

	MAXILLIPEDS			PEREIOPODS				
	I	II	III	I	II	III	IV	V
Pleurobranchs	-	-	-	1	1	1	1	1
Arthrobranchs	-	-	2	1	1	1	1	-
Podobranchs	-	1	-	-	-	-	-	-
Epipods	1	1	1	1	1	1	1	-
Setobranchs	-	-	-	-	-	-	-	-
Exopods	1	1	1	-	-	-	-	-

First pereiopods with tip of merus reaching just beyond rostrum, unarmed, not chelate; merus 3.5 times as long as ischium; carpus slightly shorter than merus; propodus 0.7 times as long as carpus, with setiferous cleaning organ on proximal part; dactylus very small, spiniform, surrounded by several groups of long setae.

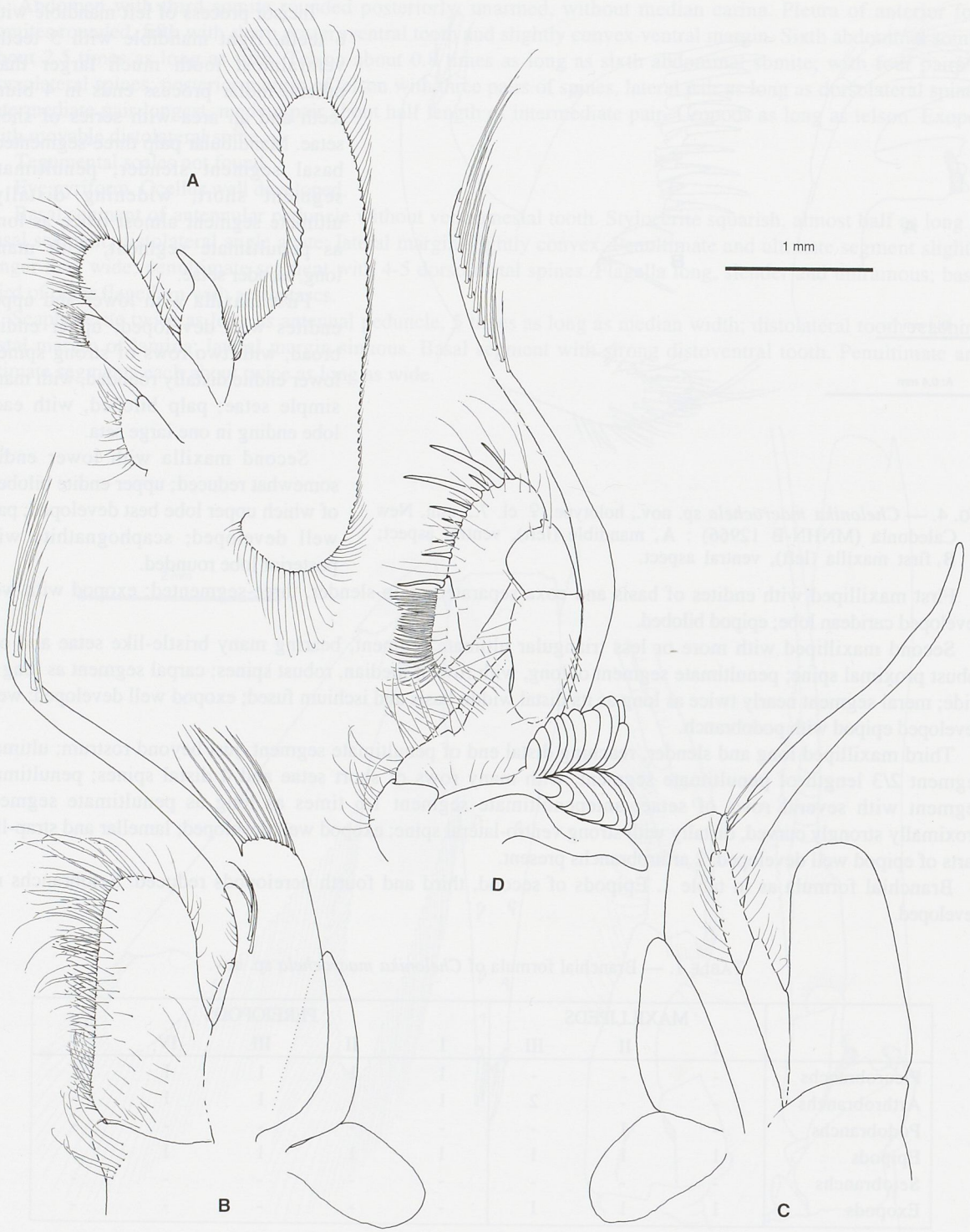


FIG. 5. — *Chelonika macrochela* sp. nov., holotype, ♀ cl. 7.3 mm, New Caledonia (MNHN-B 12966) : **A**, second maxilla (left), ventral aspect; **B**, first maxilliped (left), ventral aspect; **C**, first maxilliped (left), dorsal aspect (setae omitted except for palp); **D**, second maxilliped (left), ventral aspect.

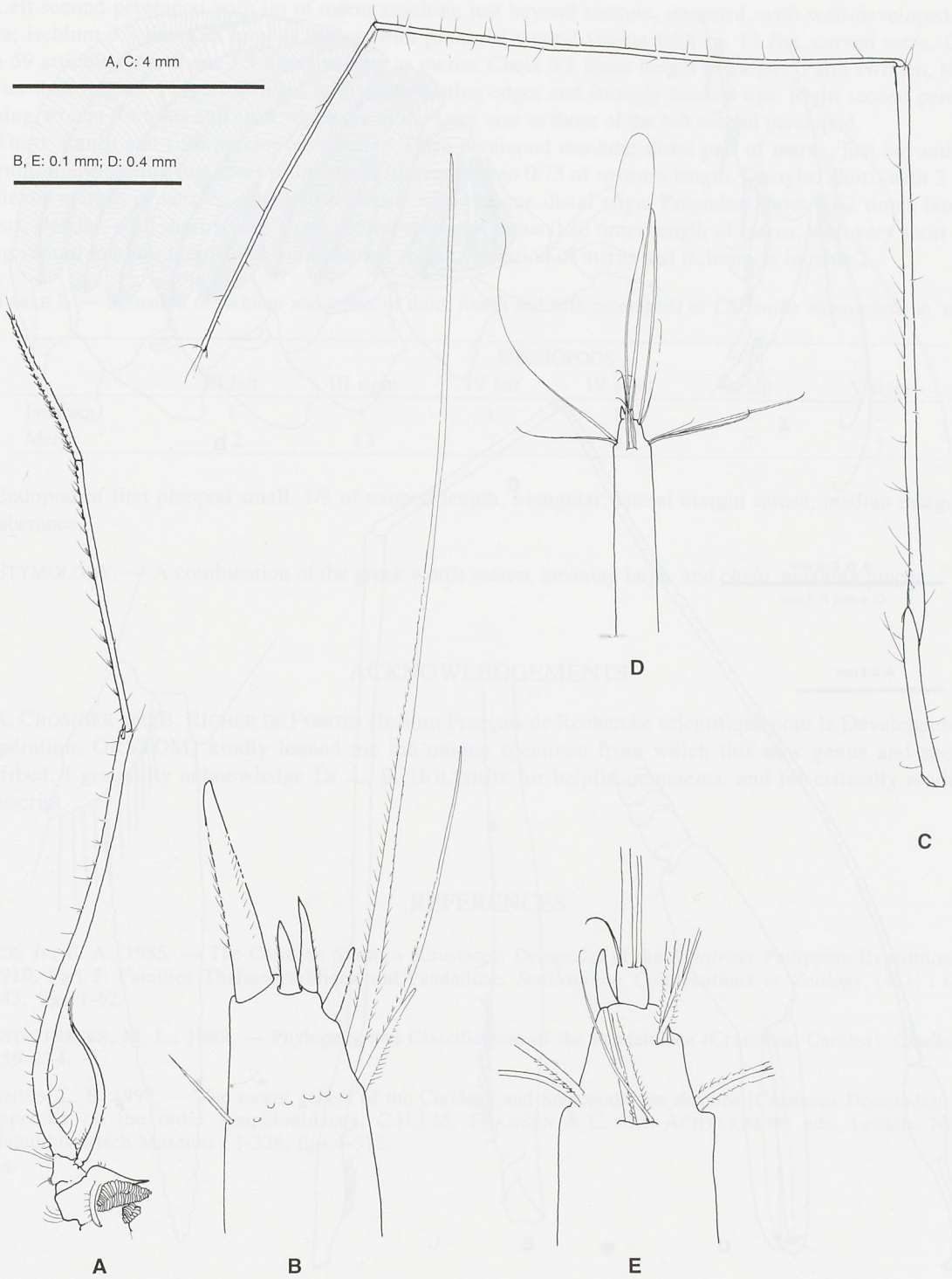


FIG. 6. — *Chelonika macrochela* sp. nov., holotype, ♀ cl. 7.3 mm, New Caledonia (MNHN-B 12966) : **A**, third maxilliped (left), ventral aspect; **B**, same, detail of tip; **C**, first pereiopod (left); **D-E**, same, detail of tip.

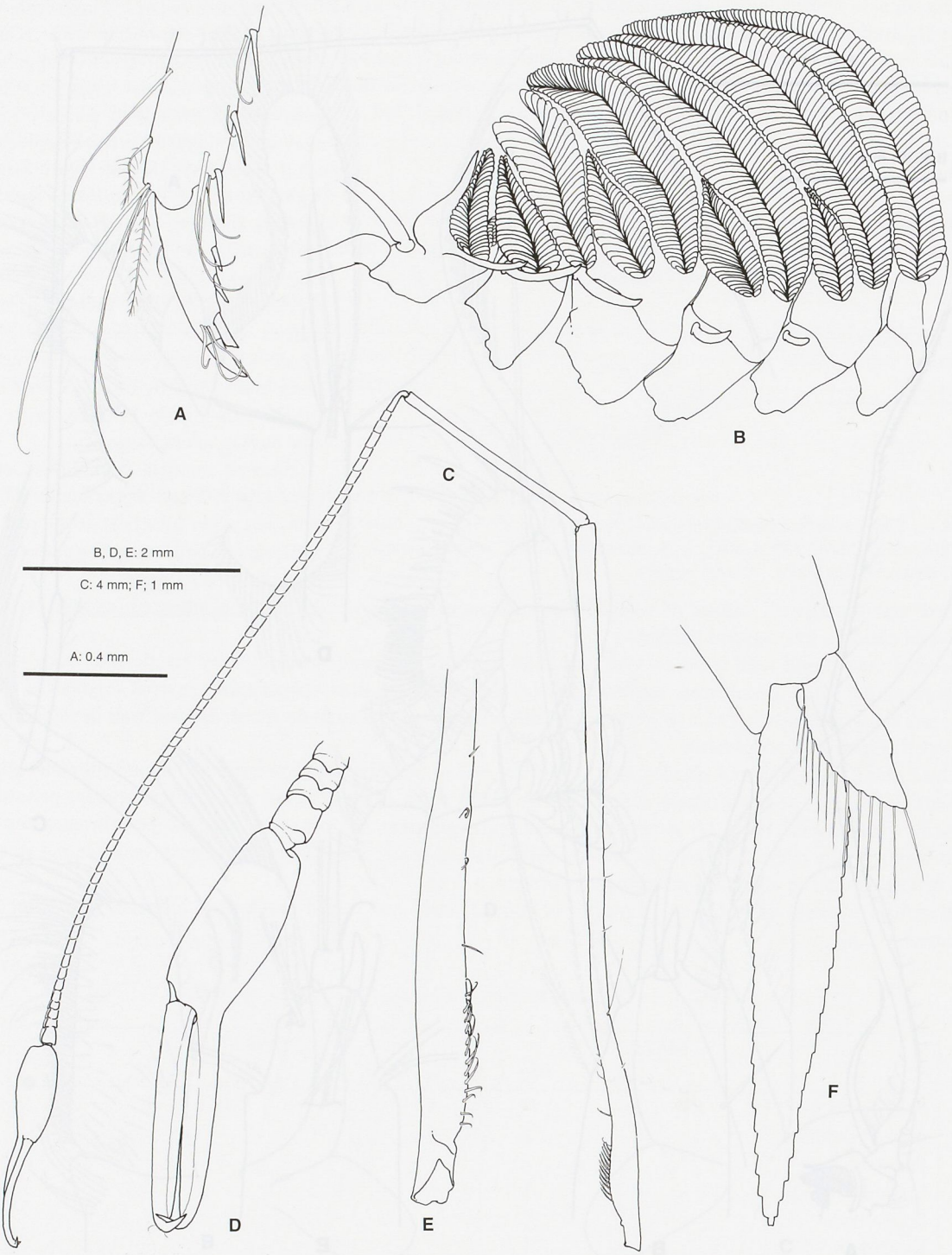


FIG. 7. — *Chelonika macrochela* sp. nov., holotype, ♀ cl. 7.3 mm, New Caledonia (MNHN-B 12966) : **A**, third pereiopod (left), dactylus; **B**, branchiae (left); **C**, second pereiopod (left); **D**, same, chela; **E**, same, basal part of basis-ischium, median aspect; **F**, first pleopod (left).

Left second pereiopod with tip of merus reaching just beyond rostrum, unarmed, with well-developed, large chela; ischium 3.3 times as long as merus, with proximal ventral lamina with ca. 13 flat, curved setae. Carpus with 59 articulations, about 3.3 times as long as merus. Chela 0.3 times length of carpus. Palm swollen, slightly shorter than fingers. Fingers slender, with entire cutting edges and strongly hooked tips. Right second pereiopod missing, except for basis and coxa which are of the same size as those of the left second pereiopod.

Third, fourth and fifth pereiopods similar. Third pereiopod reaching distal part of merus, just beyond tip of rostrum, fourth falling just short of tip, and fifth reaching to 0.75 of rostrum length. Dactylus short, with 3 spines on flexor margin of carpus; distalmost robust, with oblique distal edge. Propodus about 0.62 times length of carpus, slender, with short spines along ventral margin. Carpus 0.80 times length of merus, with very short spines along ventral margin; merus with ventrolateral spines; spination of merus and ischium as in table 2.

TABLE 2. — Spination of ischium and merus of third, fourth and fifth pereiopods of *Chelonika macrochela* sp. nov.

	PEREIOPODS					
	III left	III right	IV left	IV right	V left	V right
Ischium	1	1	1	1	-	-
Merus	12	13	7	9	7	5

Endopod of first pleopod small, 1/3 of exopod length, triangular; lateral margin setose, median margin with protuberance.

ETYMOLOGY. — A combination of the greek words *macro,* meaning large, and *chela,* meaning pincer.

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6

Crustacea Decapoda: Deep-sea shrimps of the genus *Plesionika* Bate, 1888 (Pandalidae) from French Polynesia, with descriptions of five new species

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ABSTRACT

Recent extensive deep-sea trappings in French Polynesian waters produced 21 species of shrimps belonging to the caridean genus *Plesionika* Bate, 1888. Seven of these have been described in detail before (CHAN & CROSNIER, 1991). The present report mainly deals with the remaining 14 species and has many interesting findings. *P. ocellus* (Bate, 1888) is actually a senior synonym of *P. chacei* Hayashi, 1986 and the name *P. sindoi* (Rathbun, 1906) has to be revived. *P. macropoda* Chace, 1939 and *P. williamsi* Forest, 1964 are distinct species and both occur, sometimes even sympatrically, in the Atlantic and Indo-Pacific. Abundant material belonging to the poorly known species *P. nesisi* (Burukovsky, 1986) is found in French Polynesia, and this species is closely related to *P. laevis* (A. Milne Edwards, 1883) and *P. fenneri* Crosnier, 1986. Furthermore, *P. alexandri* (A. Milne Edwards, 1883) and *P. unicarinatus* (Borradaile, 1915) also belong to the *"P. laevis"* group which is intermediate between the typical *Plesionika* and *Heterocarpus*. The exact differences between *P. reflexa* Chace, 1985 and *P. ensis* (A. Milne Edwards, 1881) are not clear, and it appears that the posterior spine on the abdomen somite III can be recurved or straight in the specimens from the Indo-Pacific but is always straight in the Atlantic material. Five new species were found in French Polynesia: *P. erythrocyclus* sp. nov., which is near to *P. rostricrescentis* (Bate, 1888) and also distributed in Taiwan; *P. payeni* sp. nov., which is somewhat affiliated to *P. ocellus*; *P. picta* sp. nov., which is distinct in lacking antennal spine and without epipod on the pereiopod IV; *P. poupini* sp. nov., which is very similar to *P. carsini* Crosnier, 1986; and *P. protati* sp. nov., which is closely related to *P. sindoi*. The other species reported from French Polynesia are *P. edwardsii* (Brandt, 1851), *P. martia* (A. Milne Edwards, 1883), *P. semilaevis* Bate, 1888 and *P. spinidorsalis* (Rathbun, 1906). Moreover, two probable postlarvae of *P. fenneri* Crosnier, 1986 were found and additional information is provided for this species.

CHAN, T.-Y. & CROSNIER, A., 1997. — Crustacea Decapoda: Deep-sea shrimps of the genus *Plesionika* Bate, 1888 (Pandalidae) from French Polynesia, with descriptions of five new species. *In* : A. CROSNIER (ed.), Résultats des Campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176**: 187-234. Paris ISBN 2-85653-511-9.

RÉSUMÉ

Crustacea Decapoda : Crevettes d'eau profonde du genre *Plesionika* Bate, 1888 (Pandalidae) de la Polynésie française. Description de cinq espèces nouvelles.

De nombreuses pêches au casier en eau profonde, faites en Polynésie française durant ces dernières années, ont permis de capturer 21 espèces de crevettes carides appartenant au genre *Plesionika* Bate, 1888. Sept d'entre elles ont déjà été décrites ou étudiées (CHAN & CROSNIER, 1991). Le présent travail considère les quatorze restantes et a permis plusieurs mises au point. C'est ainsi qu'il a été trouvé que *P. ocellus* (Bate, 1888) et *P. chacei* Hayashi, 1986, sont synonymes et que *P. sindoi* (Rathbun, 1906) doit être ressuscité. *P. macropoda* Chace, 1939, et *P. williamsi* Forest, 1964, sont bien distinctes et se trouvent toutes deux, parfois en sympatrie, dans l'Atlantique et dans l'Indo-Pacifique. De nombreux spécimens de *P. nesisi* (Burukovsky, 1986) ont été récoltés en Polynésie française et cette espèce se révèle très proche de *P. laevis* (A. Milne Edwards, 1883) et *P. fenneri* Crosnier, 1986, de même que *P. alexandri* (A. Milne edwards, 1883) et *P. unicarinatus* (Borradaile, 1915), ces espèces formant un groupe qui présente des caractères intermédiaires entre la plupart des *Plesionika* et les *Heterocarpus*. Les différences exactes entre *P. reflexa* Chace, 1985, et *P. ensis* (A. Milne Edwards, 1881) n'ont pu être éclaircies de manière satisfaisante; il apparaît que l'épine postérieure du troisième segment abdominal peut être recourbée ou droite dans l'Indo-Pacifique, mais est toujours droite dans l'Atlantique. Cinq nouvelles espèces sont décrites de la Polynésie française : *P. erythrocyclus* sp. nov. qui est proche de *P. rostricrescentis* (Bate, 1888) et qui se trouve également à Taiwan, *P. payeni* sp. nov. qui présente des affinités avec *P. ocellus*, *P. picta* sp. nov. qui se caractérise par l'absence d'une épine antennaire et d'un épipode sur les quatrièmes péréiopodes, *P. poupini* sp. nov. qui est très semblable à *P. carsini* Crosnier, 1986, et *P. protati* sp. nov. qui est très proche de *P. sindoi*. Les autres espèces trouvées en Polynésie française sont *P. edwardsii* (Brandt, 1851), *P. martia* (A. Milne Edwards, 1883), *P. semilaevis* Bate, 1888, et *P. spinidorsalis* (Rathbun, 1906). Enfin, deux postlarves, appartenant vraisemblablement à *P. fenneri* Crosnier, 1986, ont été trouvées et des informations additionnelles sont fournies pour cette espèce.

INTRODUCTION

Species of the genus *Plesionika* Bate, 1888 are common caridean shrimps found in deep waters. Abundant material of this genus was also obtained during the recent extensive deep sea trapping in French Polynesian waters conducted by the Service Mixte de Surveillance Radiologique et Biologique [SMSRB] under the leadership of J. POUPIN (POUPIN, 1988, 1996; POUPIN *et al.*, 1990; POUPIN & RICHER DE FORGES, 1991).

Until now, only 2 main taxonomic works on the French Polynesian *Plesionika* have been published (CROSNIER, 1986a, CHAN & CROSNIER, 1991). They considered 7 species reported in details. The other species of the genus found in this area were not easy to identify and a lot of problems were encountered by several authors (CROSNIER, 1986a, POUPIN, 1988, 1996; POUPIN *et al.*, 1990; POUPIN & RICHER DE FORGES, 1991). The present study attempts to clarify these problems and reports all the *Plesionika* species known to date from French Polynesia. Altogether 21 species are recorded and five are described here as new to Science.

List of the *Plesionika* species found in French Polynesia

Most of the species of *Plesionika* can be fairly readily divided into groups showing strong affinities. The following species groups are used here in order to make comparisons and discussions of the various species clearer. They are listed in the order that, for various reasons, they are studied in the following pages.

"*P. carsini* Crosnier, 1986" group
- *P. carsini* Crosnier, 1986
- *P. poupini* sp. nov.

"*P. edwardsii* (Brandt, 1851)" group
- *P. edwardsii* (Brandt, 1851)

"*P. ensis* (A. Milne Edwards, 1881)" group
- *P. reflexa* Chace, 1985

"*P. laevis* (A. Milne Edwards, 1883)" group
- *P. fenneri* Crosnier, 1986
- *P. nesisi* (Burukovsky, 1986)

"*P. macropoda* Chace, 1939" group
- *P. macropoda* Chace, 1939
- *P. williamsi* Forest, 1964

"*P. martia* (A. Milne Edwards, 1883)" group
- *P. martia* (A. Milne Edwards, 1883)
- *P. semilaevis* Bate, 1888

"*P. narval* (Fabricius, 1787)" group
P. narval (Fabricius, 1787)
P. spinipes Bate, 1888
P. flavicauda Chan & Crosnier, 1991
P. rubrior Chan & Crosnier, 1991
P. curvata Chan & Crosnier, 1991

"*P. rostricrescentis* (Bate, 1888)" group
P. erythrocyclus sp. nov.

"*P. sindoi* (Rathbun, 1906)" group
P. sindoi (Rathbun, 1906)
P. protati sp. nov.

Affinities not clear
P. payeni sp. nov.
P. picta sp. nov.
P. spinidorsalis (Rathbun, 1906)

As shown in previous studies on this genus (e.g. CHAN & YU, 1991; CHAN & CROSNIER, 1991), knowledge of the coloration and morphological variations from many localities, including the types and topotypic material, is often essential in resolving intricate taxonomic problems. Since *P. narval* (Fabricius, 1787), *P. spinipes* Bate, 1888, *P. fenneri* Crosnier, 1986, *P. carsini* Crosnier, 1986, *P. flavicauda* Chan & Crosnier, 1991, *P. rubrior* Chan & Crosnier, 1991 and *P. curvata* Chan & Crosnier, 1991, have previously been described in detail, they are not studied further in the present work, except *P. fenneri* for which two postlarvae are found and look rather different from the adults.

MATERIAL AND METHODS

Unless otherwise stated, specimens from French Polynesia were mainly collected by trapping aboard the R. V. *"Marara"*, of the SMSRB (detailed station data of *"Marara"* can be found in POUPIN, 1996) and deposited at the Muséum national d'Histoire naturelle, Paris (MNHN). Specimens from the National Taiwan Ocean University, Keelung (NTOU), the National Museum of Natural History, Washington, D.C. (USNM), The Natural History Museum, London (NHM) and the Zoological Museum of the Moscow State University (MSU) were also examined.

In the lists of material examined, the names of the vessels are in both italics and quotation marks. The names of the cruises are printed in capital letters.

The measurements provided are of carapace length (cl), which is measured dorsally from the orbital margin to the posterior margin of the carapace. The colour photographs provided for the species were taken by J. POUPIN of the SMSRB, except the figure 35 taken by the first author.

The synonymy provided for each species is mainly restricted to previous French Polynesian records and important works (e.g. original description and major taxonomic revisions related to the species).

SYSTEMATIC ACCOUNT

Plesionika poupini sp. nov.

Figs 1-2, 22

Plesionika carsini Crosnier, 1986a: 369 (in part). — POUPIN & RICHER DE FORGES, 1991: 211 (in part) [non Crosnier, 1986].
Plesionika aff. *carsini* - POUPIN *et al.*, 1990, pl. 3h [non Crosnier, 1986].
Plesionika sp. nov. 3 - POUPIN, 1996, pl. 4g.

MATERIAL EXAMINED. — *Specimens photographed.* **French Polynesia**. SMSRB (J. POUPIN coll.): ***Tuamotu Islands***. ***Fangataufa***. Stn 438, 22°12.3'S, 138°46.6'W, 410 m, 14.11.1994: 4 ♂ 20.3-23.8 mm, 1 ovig. ♀ 22.8 mm (MNHN-Na 13074). — ***Maria***. Stn 37, 22°00.0'S, 136°12.0'W, 470 m, 24.11.1987, 2 ♂ 23.5 and 25.8 mm, 2 ♀ 16.2 and 23.9 mm (MNHN-Na 12519, transferred to USNM). — Stn 72, 22°00.0'S, 136°17.0'W, 430 m, 10.06.1988, 1 ♂ 24.5 mm, 1 ♀ 18.3 mm (MNHN-Na 13080). — Stn 241, 22°00.9'S, 136°12.5'W, 380 m, 30.05.1990: 2 ♀ 21.1 and 22.6 mm (MNHN-Na 13079). — ***Rimatara***. Stn 151, 22°38.2'S, 152°49.7'W, 260 m, 11.03.1989:

1 ♂ 22.3 mm (MNHN-Na 13078). — ***Rurutu***. Stn 149, 22°27.2'S, 151°23.3'W, 520 m, 10.03.1989: 2 ♂ 15.6 and 21.6 mm (MNHN-Na 13077).

Tubuai Islands. ***Raevavae***. Stn 99, 23°55.0'S, 147°40.0'W, 450 m, 23.08.1988: 1 ovig. ♀ 26.6 mm (MNHN-Na 13122).

Specimens not photographed. **French Polynesia**. SMSRB (J.-L. CARSIN and J. POUPIN coll.): ***Tuamotu Islands***. ***Mururoa***. 350-600 m, 1984: 1 ovig. ♀ 22.2 mm (MNHN-Na 7718). — Stn 53, 21°53.7'S, 138°57.3'W, 510 m, 11.12.1987: 1 ♂ 21.1 mm, 1 ♀ 21.1 mm (MNHN-Na 12520). — Stn 164, 21°47.3'S, 138°55.6'W, 360 m, 21.06.1989: 2 ♂ 14.2 & 21.2 mm (MNHN-Na 13072). — ***Makemo***. Stn 68, 16°36.0'S, 143°33.0'W, 510 m, 4.06.1988: 1 ♂ 24.0 mm (MNHN-Na 13073). — Stn 317, 21°53.8'S, 139°1.6'W, 500 m, 19.10.1990: 1 ♂ 20.7 mm (MNHN-Na 13075).

Tubuai Islands. ***Raevavae***. Stn 100, 23°55.0'S, 147°40.0'W, 530 m, 24.08.1988: 1 ♂ 19.6 mm, 1 ♀ 18.4 mm (MNHN-Na 13076).

Below we give the list of the specimens belonging in *P. carsini* examined for comparison with *P. poupini*.

Specimens photographed. **French Polynesia**. SMSRB (J. POUPIN coll.): ***Gambier***. Stn 311, 23°04.0'S, 135°01.6'W, 470 m, 11.10.1990: 1 ovig. ♀ 28.2 mm (MNHN).

Tuamotu Islands. ***Fangataufa***. Stn 438, 22°12.3'S, 138°46.6'W, 410 m, 14.11.1994: 5 ovig. ♀ 22.3-27.3 mm, 3 ♀ 17.3-26 mm (MNHN). — ***Maria***. Stn 72, 22°00.0'S, 136°17.0'W, 430 m, 10.06.1988: 1 ♂ 25.7 mm (MNHN). — ***Mururoa***. Stn 39, 21°49.3'S, 138°46.5'W, 470 m, 2.12.1987: 5 ♂ 18.8-24.1 mm, 1 ♀ 17.8 mm (MNHN-Na 12518, transferred to USNM). — ***Tureia***. Stn 36, 20°45.0'S, 138°31.0'W, 490 m, 24.11.1987: 2 ♂ 15.6 and 20.8 mm, 1 ovig. ♀ 22.4 mm, 1 ♀ 13.4 mm (MNHN-Na 12523).

Taiwan. ***Northeastern coast***, ***Tai-Chi***, I-Lan County, commercial trawler, about 300 m, 9.05.1989: 1 ♂ 18.8 mm (NTOU). — 11.07.1989: 1 ♂ 21.5 mm (NTOU, transferred to MNHN); 1 ♂ 21.1 mm, 1 ovig. ♀ 23.1 mm (NTOU). — 1.09.1989: 2 ♂ 20.0 and 21.2 mm (NTOU). — 5.03.1993: 1 ovig. ♀ 25.4 mm (NTOU). — ***Su-Aou***, I-Lan County, commercial trawler, about 300 m, 17.06.1993: 1 ♀ 15.7 mm (NTOU).

Specimens not photographed. **French Polynesia**. SMSRB (J.-L. CARSIN and J. POUPIN coll.): ***Tuamotu Islands***. ***Makemo***. Stn 68, 16°36.0'S, 143°33.0'W, 510 m, 4.06.1988: 1 ♂ 24.4 mm (MNHN). — ***Mururoa***. 450 m, 1984: 1 ovig. ♀ 24.7 mm, holotype (MNHN-Na 7714); 1 ovig. ♀ 23.5 mm, 1 ♀ 20.2 mm, paratypes (MNHN-Na 7717); 1 ovig. ♀ 23.4 mm paratype (MNHN-Na 7716). — 350-600 m, 1984: 1 ♂ 15.7 mm, allotype (MNHN-Na 7715); 1 ovig. ♀ 22.6 mm (MNHN-Na 7719). — Stn 164, 21°47.3'S, 138°55.6'W, 360 m, 21.06.1989: 1 ♀ 16.2 mm (MNHN).

TYPES. — The type series consists of the specimens photographed. The holotype is the ovigerous female (cl = 26.6 mm) collected in the Tubuai Islands at Raevavae (MNHN-Na 13122). The other specimens photographed are paratypes.

DIAGNOSIS. — Rostrum 1.28-1.61 (avg. 1.4) times length of carapace, only slightly recurved, overreaching the scaphocerite by half or 2/5 of its length, armed with 3-5 dorsal and 11-14 ventral fixed teeth. The dorsal teeth are on the basal 3/5 of the rostrum, the ventral along whole length. Five to 8 small post-rostral teeth, usually all

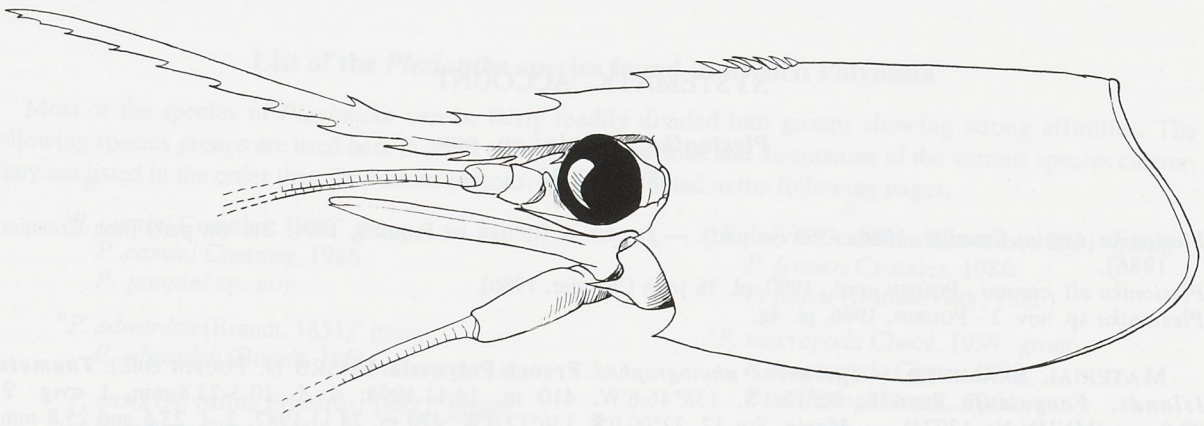


FIG. 1. — *Plesionika poupini* sp. nov., ovig. ♀ 26.6 mm, holotype (MNHN-Na 13122), French Polynesia, Tubuai, Islands, Raevavae, stn 99, 450 m: Lateral view of carapace.

movable. Eye sub-pyriform, maximum diameter about 1/5 carapace length, ocellus very clear. Stylocerite acute, just overreaching distal margin of the basal antennular segment. Scaphocerite nearly 2/3 length of carapace and about 4 times as long as wide, distolateral tooth falling slightly short of distal margin of blade. Maxilliped III and pereiopods I-IV with an epipod. Penultimate segment of maxilliped III as long as distal one. Pereiopods 2 subequal, with 19-21 carpal articles. Pereiopods III overreaching the scaphocerite by lengths of dactyl, propodus, carpus and about 1/7 of merus; dactyl short, about 1/15 as long as propodus. Abdomen without posteromesial tooth or median dorsal carina on 3rd somite, 4th and 5th pleuron with a posteroventral tooth, 6th somite 1.65 to 1.75 times as long as maximum height and 1.55 to 1.65 longer than 5th; telson 1.45 to 1.55 longer than 6th somite, with 5 pairs of dorsolateral spinules, including pair adjacent to lateral pair of posterior spines.

REMARKS. — As in previous papers (CHAN & YU, 1991; CHAN & CROSNIER, 1991), coloration is here employed as an important character for the identifications of the species of *Plesionika*. However, the use of coloration poses a difficult dilemma in the case of *P. carsini* Crosnier, 1986. As pointed out by POUPIN *et al.* (1990), two completely different patterns are present in the material of *"P. carsini"* from French Polynesia and these sometimes even occur in the same catch. One form has the body reddish with red and white stripes, only the antennular flagella are banded with red and white, and a large red spot is present on the dorsum of abdominal somite III (fig. 21, hereafter referred to as the "striped" form). The eggs of this form are bright blue. The other form is orange, with many conspicuous white spots evenly distributed over the entire body while both the antennular and antennal flagella are banded with red and white (fig. 22, hereafter referred to as the "spotted" form). The eggs of this form appear to be mud-green, but this may due to the eggs being near to hatching. Fresh material of these two forms can be readily separated on board ship when they just come out of the water. However, their coloration quickly fades after preservation and they become almost indistinguishable morphologically.

	rostrum/cl	rostral formula	number of postrostral teeth movable	scaphocerite length/width	MxP3 penultimate segment/distal segment	P II number of carpal articles	P III propodus/cl	P III propodus/dactylus
French Polynesia								
P. poupini	1.28-1.61 (1.40) n=14	5-8+3-5/11-14 (6.3+3.9/12.5) n=14	5-7 (6.3) n=13	3.7-4.4 (4.0) n=14	0.84-1.04 (0.96) n=12	19-21 (20.3) n=13	0.72-0.98 (0.89) n=10	11.8-18.1 (14.6) n=10
P. carsini	1.05-1.39 (1.23) n=14	5-7+2-6/10-15 (6.2+4.5/12.7) n=14	5-7 (6.2) n=14	3.8-4.6 (4.1) n=14	0.91-0.98 (0.94) n=7	18-23 (19.8) n=8	0.83-0.93 (0.87) n=8	11.2-18.4 (14.4) n=8
Taiwan								
P. carsini	1.12-1.38 (1.23) n=4	5-8+2-4/6-19 (6.4+3.2/11.5) n=8	5-7 (6.3) n=8	3.7-4.0 (3.8) n=7	0.87-0.98 (0.95) n=6	17-24 (20.2) n=13	0.73-0.93 (0.82) n=3	8.5-11.7 (9.7) n=3

TABLE 1. — Comparison of the morphological characters between *Plesionika carsini* Crosnier, 1986 (striped form) and *P. poupini* sp. nov. (spotted form).
Only data from specimens photographed in colour were used. Numbers in brackets represent the average values.

Our best efforts to find morphological differences between these two forms were mostly unsuccessful. Of the 54 French Polynesian specimens available for the present study, 37 are accompanied by photographs showing their fresh coloration. Amongst them, 17 specimens belong to the spotted form, while the other 20 are of the striped form. Samples of both forms contain specimens of all sizes and sexes, including ovigerous females. However, only 28 (14 specimens for each form) are almost intact and have a complete rostrum. Their morphological characteristics, including the shape of the dactyli of the posterior pereiopods, are essentially identical, except that the rostrum is slightly longer in the spotted form (Table 1). When rostral length is plotted against carapace length, the two forms fall quite well in two separate categories (fig. 2a). Figure 2a shows that, for specimens of similar sizes, the rostrum of the spotted form is always longer than that of the striped form. For example, the rostrum of adults is less than 1.3 times carapace length in the striped form, but usually more than 1.3 times as long as the carapace in the spotted form. Although the rostrum is relatively longer in small specimens (< 18 mm cl), it is 1.45 times the carapace length in the spotted form and less than 1.4 times as long as the carapace in the striped form.

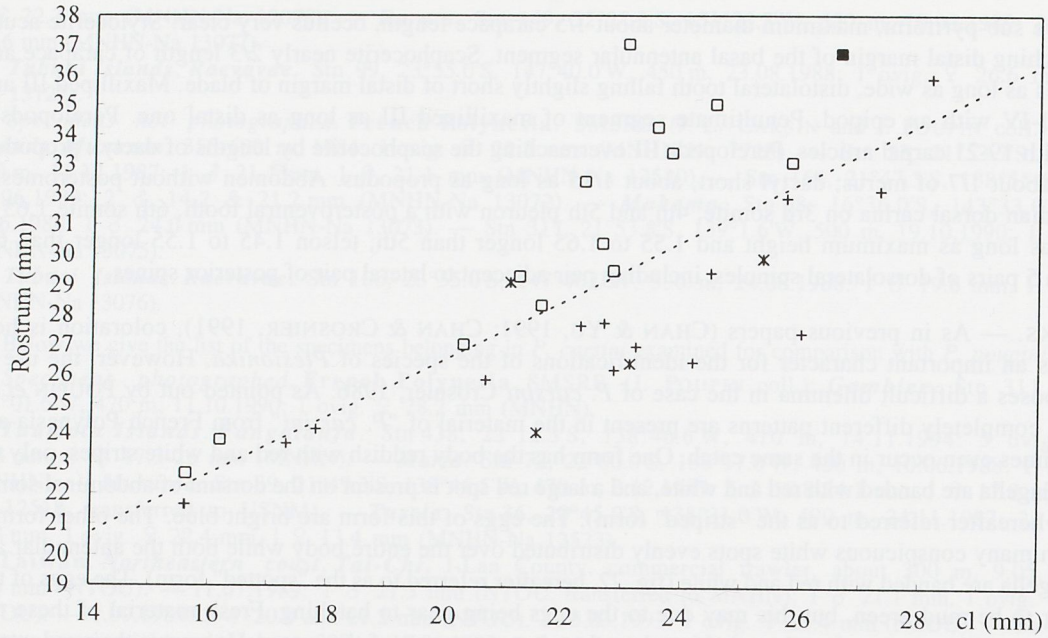


FIG. 2a. — Rostrum length/carapace length of the specimens assigned to *Plesionika carsini* Crosnier, 1986 (striped form) and *P. poupini* sp. nov. (spotted form) from specimens with colour photographs (unless otherwise stated, the specimens are from French Polynesia).

+, *P. carsini* with photo (stripped form, n = 14). — □, *P. poupini* with photo (spotted form, n = 13). — ✳, *P. carsini* from Taiwan (n = 4). — ■, *P. poupini* with photo (holotype).

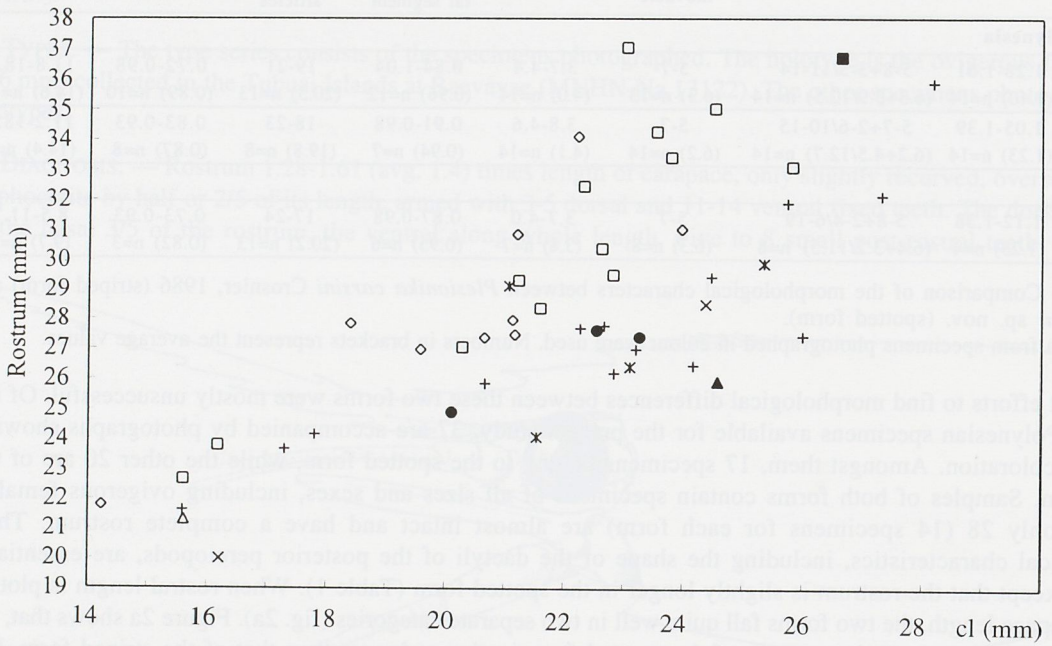


FIG. 2b. — Rostrum length/carapace length of the specimens assigned to *Plesionika carsini* Crosnier, 1986 and *P. poupini* sp. nov. in the present study (unless otherwise stated, the specimens are from French Polynesia).

+, *P. carsini* with photo (n=14). — ✳, *P. carsini* from Taiwan (n = 4). — ▲, *P. carsini* without photo (holotype). — Δ, *P. carsini* without photo (allotype) — ●, *P. carsini* without photo (paratypes). — x, *P. carsini* without photo. — □, *P. poupini* with photo (n=13). — ■, *P. poupini* with photo (holotype). — ◊, *P. poupini* without photo.

The fact that preserved material of the two forms can only be separated by a slight difference in the proportional length of the rostrum is not entirely satisfactory. The greatest difficulty is that the rostrum is often incomplete in the specimens of *Plesionika*, making positive identification impossible. However, the patterns of the two forms are so different that it is hard to believe that all the specimens could belong to the same species. It is significant that only the striped form is found in Taiwan (the Taiwanese material is somewhat redder, but this may due to the fact that the specimens were already dead when taken from fishing pots). The general characters of the Taiwanese material are very similar to those of the French Polynesian striped form (Table 1); only the dactylus of pereiopod III is somewhat longer (but this may be a general phenomena for species of this genus with a wide geographical distribution). Of the four Taiwanese specimens with a complete rostrum, three fall in the group of the French Polynesian striped form in fig. 2a. The fourth Taiwanese specimen (cl = 21.1 mm) with a relatively longer rostrum, also has an unusual high number of ventral rostral teeth (19), and is probably abnormal. Since no specimen with intermediate coloration has been found, and the difference in coloration appears to correlate quite well with the length of the rostrum, the striped and spotted forms are considered to have distinct specific status. Hence the rostral length of the types of *P. carsini*, as well as those specimens not accompanied by colour photographs, was plotted against carapace length to determine which forms they belong to (fig. 2b). All the types of *P. carsini* fall in the category of the striped form (only one non-type specimen [MNHN-Na 7718] listed in CROSNIER, 1986 falls in the range of the spotted form). Therefore, the name *P. carsini* should be used for the striped form and a new name, *P. poupini* sp. nov., is proposed for the spotted form.

SIZE. — Largest male and female 25.8 and 26.6 mm cl, respectively. Smallest ovigerous female 22.2 mm cl.

ETYMOLOGY. — This species is named after Joseph POUPIN of the SMSRB. Without his invaluable efforts in collecting many intact specimens and taking colour photographs of the fresh material, the recognition of this new species would probably have been impossible.

DISTRIBUTION. — At present known only from French Polynesia, at depths of 280-600 m.

Plesionika edwardsii (Brandt, 1851)

Fig. 23

Pandalus (Pontophilus) Edwardsii Brandt, 1851: 122 [type-locality: Mediterranean].
Pandalus (Parapandalus) longirostris Borradaile, 1900: 413, pl. 37, fig. 10 a-h [type-locality: New Britain].
Plesionika edwardsii - POUPIN, 1988: 28; 1996: pl. 3 h. — POUPIN *et al.*, 1990: 68, pl. 1 g. — CHAN & YU, 1991: 550, figs 2, 3 b.

MATERIAL EXAMINED. — **French Polynesia**. SMSRB (B. RICHER DE FORGES, J.-L. CARSIN and J. POUPIN coll.): ***Tuamotu Islands. Mururoa***. 250 m, 4.11.1978: 2 ex. (MNHN-Na 7236). — 350-400 m, 4.04.1979: 5 ex. (MNHN-Na 7239). — 1984: 9 ex. — 1984: 11 ex. — Stn 16, 21°50.0'S, 138°57.2'W, 390 m, 11.12.1986: 14 ex.
Tubuai Islands. Raevavae. Stn 100, 23°55.0'S, 147°40.0'W, 450 m, 24.08.1988: 1 ex. — ***Rapa***. Stn 101, 27°36.0'S, 144°16.0'W, 280 m, 26.08.1988: 4 ex. — Stn 430, 27°36.2'S, 144°16.3'W, 290 m, 17.08.1991: 5 ex. — ***Tubuai***: 400 m, 13.05.1979: 23 ex. (MNHN-Na 7254). — 200 m, 14.05.1979: 20 ex. [MNHN-Na 7243]. — 300 m: 88 ex. [MNHN-Na 7244]. — 300 m: 6 ex. (MNHN-Na 7238, transferred to USNM). — 300 m: 1 ex. (MNHN-Na 7241).
Society Islands. Tahiti (Vairao). October 1978: 5 ex. (MNHN-Na 7237).

DIAGNOSIS. — Detailed description and colour pattern of this species can be found in CHAN and YU (1991; also with full synonymy).

SIZE. — The largest male and female in the present French Polynesian material are 25.7 mm (about 28 mm in POUPIN *et al.*, 1990) and 26.1 mm cl, respectively. The smallest ovigerous female is 20.7 mm cl.

REMARKS. — This species has been recorded in French Polynesia by POUPIN (1988, 1996) and POUPIN *et al.* (1990). All (total number 194), but one of the French Polynesian specimens agree very well with the concept of this species as defined by CHAN & YU (1991). The exceptional specimen (12.0 mm cl) has only one post-rostral

tooth on the carapace, but it corresponds to *P. edwardsi* in all other characters. Therefore, it is still considered that the closely related *P. crosnieri* Chan & Yu, 1991 is not present in French Polynesian waters.

DISTRIBUTION. — Worldwide: Mediterranean, Atlantic and Indo-West Pacific, at depths of 50-680 m, commonly 200-400 m.

Plesionika reflexa Chace, 1985

Figs 3, 24

Plesionika reflexa Chace, 1985: 108, fig. 49 [type-locality: the Philippines]. — CROSNIER, 1986a: 362. — POUPIN, 1996, pl. 5 a.
Plesionika aff. *ensis* - POUPIN, 1988: 28 [non A. Milne Edwards, 1881].
Plesionika ensis - POUPIN *et al.*, 1990: 64, pl. 1 h [non A. Milne Edwards, 1881].

MATERIAL EXAMINED. — **French Polynesia**. SMSRB (J. POUPIN and B. RICHER DE FORGES coll.): ***Marquesas Islands***. ***Fatu Hiva***. Stn 61, 10°27.0'S, 138°41.0'W, 430 m, 28.01.1988: 17 ex. 8.3-17.4 mm.

Tuamotu Islands. ***Maria***. Stn 37, 22°00.0'S, 136°12.0'W, 470 m, 24.11.1987: 3 ex. 11.7-13.1 mm (MNHN-Na 12524). — ***Mururoa***. Stn 18, 21°49.9'S, 138°57.3'W, 500 m, 11.12.1986: 1 ex. 15.6 mm. — Stn 21, 21°49.9'S, 138°57.3'W, 630 m, 16.06.1987: 10 ex. 14.4-18.4 mm. — Stn 39, 21°49.3'S, 138°46.5'W, 470 m, 2.12.1987: 9 ex. 13.7-17.4mm (MNHN-Na 12522). — Stn 477, 21°51.3'S, 139°01.7'W, 800 m, 11.04.1995: 3 ex. 15.9-16.7 mm. — ***Tureia***. Stn 36, 20°45.0'S, 138°31.0'W, 490 m, 22.11.1987: 3 ex. 8.8-16.6 mm (MNHN-Na 12529).

Tubuai Islands. ***Tubuai***. 700 m, 14.05.1979: 45 ex. 10.3-20.5 mm (MNHN-Na 7263); 25 ex. 15.1-20.3 mm (MNHN-Na 7262). — 800 m, 14.5.1979: 6 ex. 15.4-19.2 mm (MNHN-Na 7261). — ***Rimatara***. Stn 109, 22°38.0'S, 152°50.0'W, 700 m, 5.09.1988: 18 ex. 14.1-18.0 mm (transferred to USNM).

DIAGNOSIS. — A detailed description of this species can be found in CHACE (1985), though there are still many uncertainties concerning the relationship between *P. reflexa* and *P. ensis* (A. Milne Edwards, 1881).

COLORATION. — The French Polynesian material is somewhat transparent with red tints on the carapace (including appendages), anterior half of rostrum, posterior margins of abdominal somites, pleopods and tail-fan. Eyes black. Eggs bluish.

SIZE. — For the French Polynesian material, the largest male and female are both about 20 mm cl, and smallest ovigerous female measured 12 mm cl (POUPIN *et al.*, 1990, under the name *"P. ensis"*).

REMARKS. — As mentioned by CROSNIER (1986), the material from French Polynesia has the dactylus of pereiopod III much shorter (0.09-0.14, avg. 0.11 as long as propodus; fig. 3b) than those from the Philippines (0.30-0.46 as long as propodus - CHACE, 1985; two paratypes and two other Philippine specimens were also examined). The short dactylus of the French Polynesian material is therefore more similar to that of *P. ensis* (A. Milne Edwards, 1881), described from the Antilles (with a ratio of 0.11-0.21, avg. 0.14; 20 specimens from the Antilles in MNHN examined; see also CHACE, 1985). The coloration (including eggs) appears to be rather similar for the French Polynesian material (fig. 24) and *P. ensis* (fig. 25, also see PAULMIER, 1993, pl. 15 figs 1-4, pl. 16 figs 1-3). However, the posterior spine of the abdominal somite III is very often curved upwards in the French Polynesian material (87.1%, n = 140), but not such condition occurs in the Antilles specimens.

The problem is complicated by the fact that specimens deposited at the MNHN, belonging to the *"P. ensis"* group from various localities, all show different proportional length of the dactylus of pereiopod III. The dactylus is longer in the west African specimens [0.26-0.41, avg. 0.31, as long as propodus, 10 specimens (MNHN-Na7865) from Gulf of Guinea examined; see also CHACE, 1985] but shorter in the few specimens from Kiribati and Seychelles examined [the ratios are 0.10 (n = 2) and 0.12 (n = 3), respectively]. CHACE (1985) also mentioned such variation on the relative length of the dactylus for specimens from western Africa, Indonesia and Hawaii. Furthermore, the dactylus of pereiopod III appears to be one third the length of the propodus in specimens from eastern Australia (KENSLEY *et al.*, 1987), but only about one fifth to one fourth of the propodus in material from the Arabian Sea (SUSEELAN & MOHAMED, 1969) and Japan (HAYASHI, 1986).

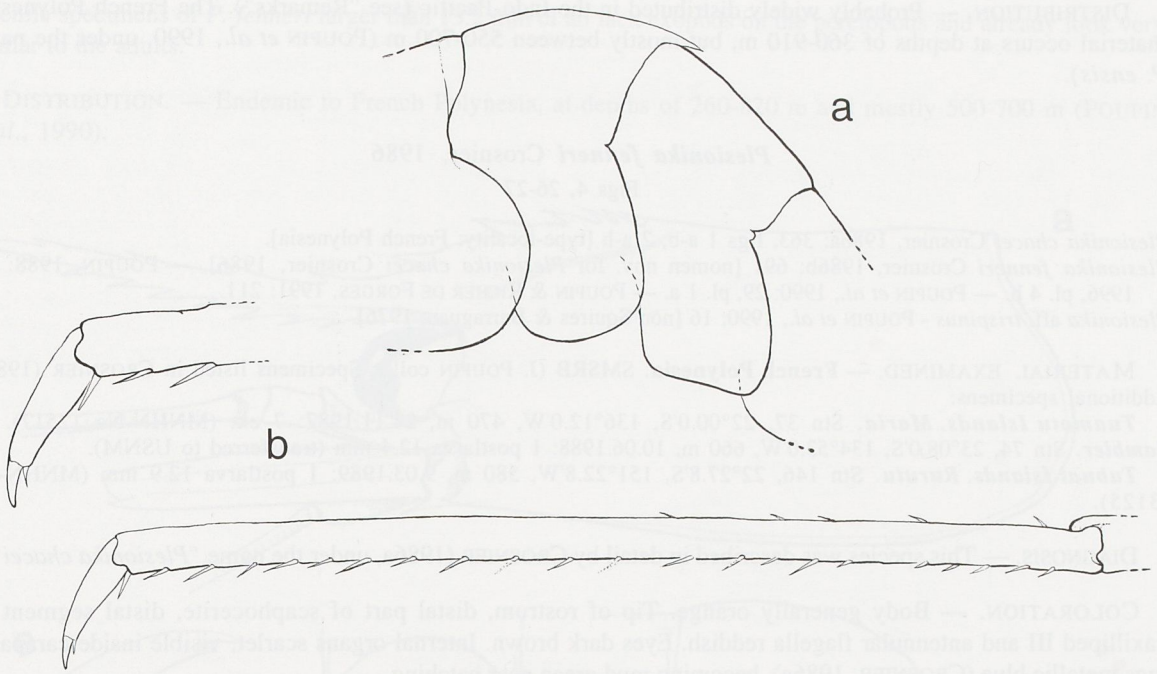


FIG. 3. — *Plesionika reflexa* Chace, 1985: **a**, ovig. ♀ 17.1 mm (MNHN-Na 7262), French Polynesia, Tubuai Islands, Tubuai, 700 m: lateral view of abdominal somites II to V. — **b**, ovig. ♀ 18.7 mm (MNHN-Na 7262), French Polynesia, Tubuai Islands, Tubuai, 700 m: propodus and dactylus of pereiopod III.

On the other hand, the posterior spine on the abdominal somite III of the material available from Seychelles, Kiribati and New Caledonia is frequently curved upwards, but not in eastern Atlantic specimens. The tendency of having a recurved posterior spine on abdominal somite III seems to be universal throughout the Indo-Pacific [e.g. Arabian Sea (SUSEELAN & MOHAMED, 1969); Japan (HAYASHI, 1986); northwestern Australia (HANAMURA & TAKEDA, 1987); eastern Australia (KENSLEY *et al.*, 1987)]. In the present study, it was also found that the rostrum of the French Polynesian material is generally shorter and has fewer ventral teeth (rostrum 1.6-2.5, avg. 2.1 times as long as carapace and bearing 28-42, avg. 35.7 ventral teeth, n = 27) than in *P. ensis* from the Atlantic (western Atlantic: rostrum 2.2-2.8, avg. 2.5 times carapace length and bearing 35-48, avg. 42 ventral teeth, n = 16; eastern Atlantic: rostrum 2.2-2.8, avg. 2.5 carapace length and having 39-50, avg. 44.4 ventral teeth, n = 7). However, the few specimens from the Kiribati and Seychelles have a slightly shorter rostrum (both avg. 2.2 cl, n = 2 and 3 respectively) and fewer ventral rostral teeth (avg. 37 and 38.7 teeth, n = 2 and 3 respectively), while those from New Caledonia have a longer rostrum (2.3-2.7cl, n = 3) but fewer ventral rostral teeth (35-38, n = 3)! Since the rostrum of *P. ensis/reflexa* is often broken when caught, additional intact specimens from various localities will be needed to determine whether the differences in the proportional length and armature of the rostrum are of any taxonomic value. Nevertheless, the absence of any specimen with a recurved posterior spine on the abdominal somite III in the Atlantic is sufficient reason not to synonymize *P. reflexa* with *P. ensis* (altogether, 91 Atlantic specimens were examined in the present study and in CHACE, 1985). For the time being, it may be more convenient to use the name *P. reflexa* for the French Polynesian or perhaps all the Indo-Pacific material, though the presence of some specimens from various Indo-Pacific localities with very straight posterior spine on the abdominal somite III is rather problematic (fig. 3a). Recent discoveries that a great diversity of species is actually contained in the "*P. martia* (A. Milne-Edwards, 1883)" (CHACE, 1985) and "*P. narval* (Fabricius, 1787)" (CHAN & CROSNIER, 1991) groups suggest that many more species may be also present in the material now identified as *P. ensis* and *P. reflexa*. On the other hand, it is also possible that the *P. ensis-P. reflexa* problem may be similar to the case of *P. edwardsii-P. crosnieri*, in which both species are distributed in the Indo-Pacific but only one of them occurs in the Atlantic (CHAN & YU, 1991).

DISTRIBUTION. — Probably widely distributed in the Indo-Pacific (see "Remarks"). The French Polynesian material occurs at depths of 360-910 m, but mostly between 550-700 m (POUPIN *et al.*, 1990, under the name *P. ensis*).

Plesionika fenneri Crosnier, 1986

Figs 4, 26-27

Plesionika chacei Crosnier, 1986a: 363, figs 1 a-b, 2 a-h [type-locality: French Polynesia].
Plesionika fenneri Crosnier, 1986b: 691 [nomen nov. for *Plesionika chacei* Crosnier, 1986]. — POUPIN, 1988: 28; 1996, pl. 4 b. — POUPIN *et al.*, 1990: 29, pl. 1 a. — POUPIN & RICHER DE FORGES, 1991: 211.
Plesionika aff. *trispinus* - POUPIN *et al.*, 1990: 16 [non Squires & Barraguan, 1976].

MATERIAL EXAMINED. — **French Polynesia**. SMSRB (J. POUPIN coll.): Specimens listed in CROSNIER (1986). Additional specimens:

Tuamotu Islands. ***Maria***. Stn 37, 22°00.0'S, 136°12.0'W, 470 m, 24.11.1987: 7 ex. (MNHN-Na 12517). — ***Gambier***. Stn 74, 23°08.0'S, 134°53.0'W, 660 m, 10.06.1988: 1 postlarva 12.4 mm (transferred to USNM).

Tubuai Islands. ***Rurutu***. Stn 146, 22°27.8'S, 151°22.8'W, 580 m, 9.03.1989: 1 postlarva 12.9 mm (MNHN-Na 13125).

DIAGNOSIS. — This species was described in detail by CROSNIER (1986a, under the name *"Plesionika chacei"*).

COLORATION. — Body generally orange. Tip of rostrum, distal part of scaphocerite, distal segment of maxilliped III and antennular flagella reddish. Eyes dark brown. Internal organs scarlet, visible inside carapace. Eggs metallic blue (CROSNIER, 1986a), becoming mud green near hatching.

SIZE. — Largest male and female 30 mm and 32 mm cl, respectively. Smallest ovigerous female 20 mm cl (POUPIN *et al.*, 1990).

REMARKS. — *P. fenneri* is one of the most abundant species of the genus in French Polynesia. Its characteristics are rather constant, except that the rostrum is often rather straight in males (also see CROSNIER, 1986a, fig. 1b). The main problem is posed by the two small specimens collected from Gambier and Rurutu, and preliminary identified by POUPIN *et al.* (1990) as *Plesionika* aff. *trispinus*. These two specimens are white in colour and look quite different from the other species of the genus (fig. 26). At first glance they show some resemblances to *P. picta* sp. nov. but closer examination shows that they actually belong to a species of the *"P. laevis"* group. However, they differ considerably from the typical *P. fenneri* (fig. 27) and *P. nesisi* (Burukovsky, 1986) by the carapace being more flattened and rectangular. Their rostra are rather straight and bear a laminate basal crest (fig. 4a). However, as discussed in the "Remarks" under *P. nesisi*, the shape of the rostrum is very variable for the species of the *"P. laevis"* group. On the other hand, the presence of rudimentary exopods on the anterior four pereiopods and the exopod of the maxilliped III being rather small and thin suggest that these two specimens are still in an early developmental stage. Therefore, they are possibly the postlarvae of either *P. fenneri* or *P. nesisi*. Since both specimens have one or two movable post-rostral teeth, the latter possibility is ruled out, though their carapaces also bear a weak upper lateral carina posteriorly. Moreover, the other characters of these two postlarvae agree quite well with those of *P. fenneri* (see CROSNIER, 1986a): rostrum 0.9-1.0 as long as carapace, bearing 6 dorsal and 9-10 ventral teeth; 5 post-rostral teeth present on carapace, with posteriormost one or two movable; eyes (sunken in the present specimens) appear to be subspherical and lacking ocellus; orbital margin regularly concave, upper part not continuous with lateral rostral carina; antennal spine rather small, while branchiostegal spine is well developed; scaphocerite 3.3-4.0 times as long as broad; maxilliped III with distal segment 1.6-1.8 times as long as penultimate segment; carpus of pereiopod II with 7 articles on the right side and 17-19 on the left; pereiopod III with propodus 6.5-7.3 times as long as dactylus; dorsal surface of abdominal somite III smooth; both abdominal pleura IV and V bearing distinct posteroventral denticles; and telson 1.6 times as long as abdominal somite VI. These two postlarvae are therefore tentatively identified as *P. fenneri*. More information on the larval development of *P. fenneri* will be needed to confirm the present identification. Nevertheless, if our identification is correct, these two specimens should be in the final postlarval stage, since

juvenile specimens of *P. fenneri* larger than 13.2 mm cl all lack exopods on the pereiopods and already look very similar to the adults.

DISTRIBUTION. — Endemic to French Polynesia, at depths of 260-820 m and mostly 500-700 m (POUPIN *et al.*, 1990).

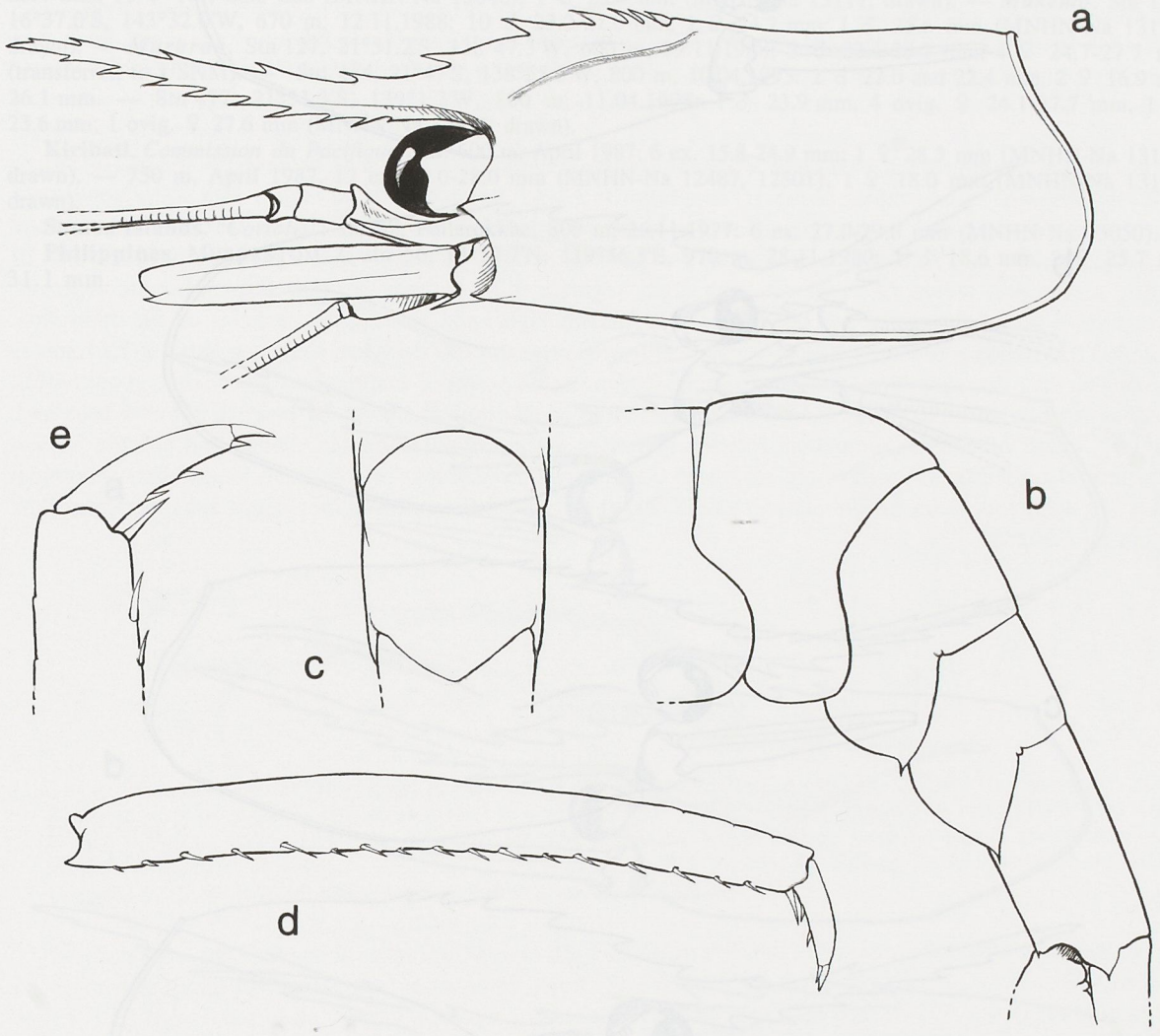


FIG. 4. — *Plesionika fenneri* Crosnier, 1986, postlarva 12.9 mm (MNHN-Na 13125), French Polynesia, Tubuai Islands, Rurutu, stn 146, 580 m: **a**, lateral view of carapace; **b**, lateral view of posterior abdomen; **c**, dorsal view of abdominal somite III; **d-e**, propodus and dactylus of pereiopod III.

Plesionika nesisi (Burukovsky, 1986)

Figs 5-10, 28

Heterocarpus nesisi Burukovsky, 1986: 62, fig. 1 [type-locality: East Pacific sea-mount]. — CHACE, 1989: 87.
Plesionika aff. *laevis* - POUPIN *et al.*, 1990: 72, pl. 2 a. [non A. Milne Edwards, 1883].
Plesionika nesisi - POUPIN, 1996, pl. 4e.

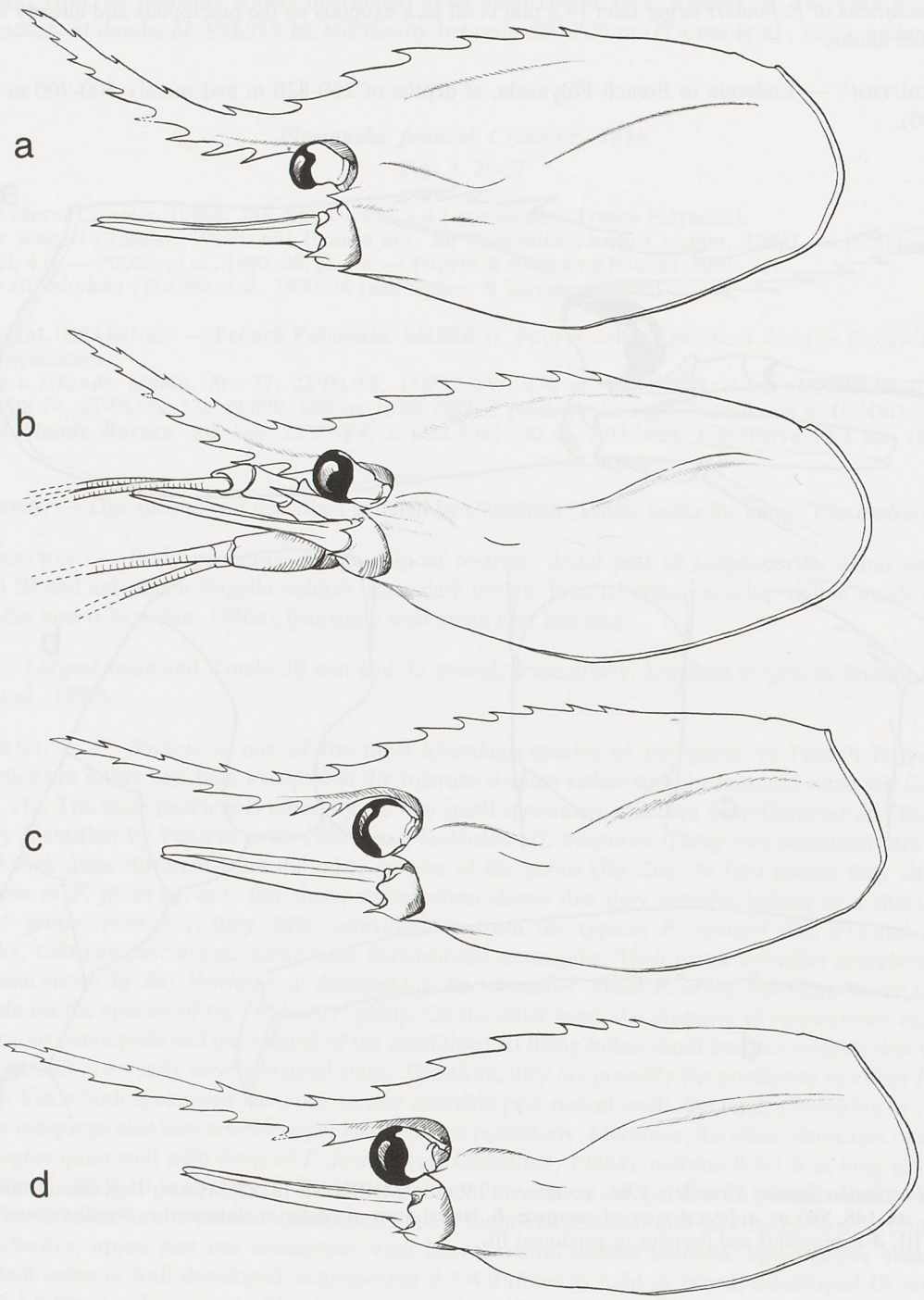


FIG. 5. — *Plesionika nesisi* (Burukovsky, 1986). Lateral view of carapace.

a, ovig. ♀ 26.7 mm (MNHN-Na 13118) with abdominal pleuron IV rounded, French Polynesia, Tuamotu Islands, Fangataufa, stn 85, 780 m . — **b**, ovig. ♀ 27.6 mm (MNHN-Na 13115) with abdominal pleuron IV pointed, Tuamotu Islands, Mururoa, stn 477, 800 m. — **c**, ♂ 25.6 mm (MNHN-Na 13120) with abdominal pleuron IV rounded, Tuamotu Islands, Makemo, stn 112, 670 m. — **d**, ♂ 25.9 mm (MNHN-Na 13117) with abdominal pleuron IV pointed, Tuamotu Islands, Fangataufa, stn 139, 720 m.

MATERIAL EXAMINED. — **East Pacific seamount**, 13°34'N, 120°33'W, 800 m: ♂ 26.0 mm, holotype (MSU).

French Polynesia. SMSRB (J. POUPIN coll.): ***Marquesas Islands. Hiva Oa***. Stn 293, 9°47.3'S, 139°11.8'W, 800 m, 30.08.1990: 1 ♂ 21.4 mm (MNHN-Na 13116, drawn).

Tuamotu Islands. Fangataufa. Stn 85, 22°13.0'S, 138°42.2'W, 780 m, 22.06.1988: 4 ♂ 23.5-25.1 mm, 6 ovig. ♀ 23.2-29.3 mm (MNHN-Na 13043, 13046); 1 ovig. ♀ 26.7 mm (MNHN-Na 13118, drawn). — Stn 118, 22°16.8'S, 138°41.8'W, 1050 m, 23.11.1988: 5 ♂ 16.4-24.7 mm, 2 ovig. ♀ 21.7 and 24.1 mm, 3 ♀ 19.0 & 20.3 mm (MNHN-Na 13045). — Stn 139, 22°18.0'S, 138°46.0'W, 720 m, 24.02.1989: 32 ♂ 18.5-26.8 mm, 2 ovig. ♀ 19.5 and 23.4 mm, 13 ♀ 18.1-28.6 mm (MNHN-Na 13048); 1 ♂ 25.9 mm (MNHN-Na 13117, drawn). — ***Makemo***. Stn 112, 16°37.0'S, 143°32.0'W, 670 m, 12.11.1988: 10 ♂ 23.2-27.0 mm, 1 ♀ 24.2 mm; 1 ♂ 25.6 mm (MNHN-Na 13120, drawn). — ***Mururoa***. Stn 127, 21°51.2'S, 138°47.3'W, 600 m, 29.11.1988: 3 ♂ 22.1-28.1 mm, 4 ♀ 24.7-27.7 mm (transferred to USNM). — Stn 474, 21°47'S, 138°55.5'W, 800 m, 10.04.1995: 2 ♂ 22.0 and 22.4 mm, 2 ♀ 16.9 and 26.1 mm. — Stn 477, 21°51.3'S, 139°1.7'W, 800 m, 11.04.1995: 1 ♂ 23.9 mm, 4 ovig. ♀ 24.1-27.7 mm, 1 ♀ 23.6 mm; 1 ovig. ♀ 27.6 mm (MNHN-Na 13115, drawn).

Kiribati. *Commission du Pacifique Sud*, 600 m, April 1987: 6 ex. 15.8-24.9 mm; 1 ♀ 28.3 mm (MNHN-Na 13119, drawn). — 750 m, April 1987, 12 ex. 18.0-28.0 mm (MNHN-Na 12487, 12501); 1 ♀ 18.0 mm (MNHN-Na 13121, drawn).

Samoa Islands. *"Coriolis"*: stn 92, Lallarokkhe, 800 m, 26.11.1977: 6 ex. 27.0-29.8 mm (MNHN-Na 13050).

Philippines. MUSORSTOM 2: stn 56, 13°57.7'N, 119°56.3'E, 970 m, 28.11.1980: 1 ♂ 18.6 mm, 2 ♀ 25.7 and 31.1 mm.

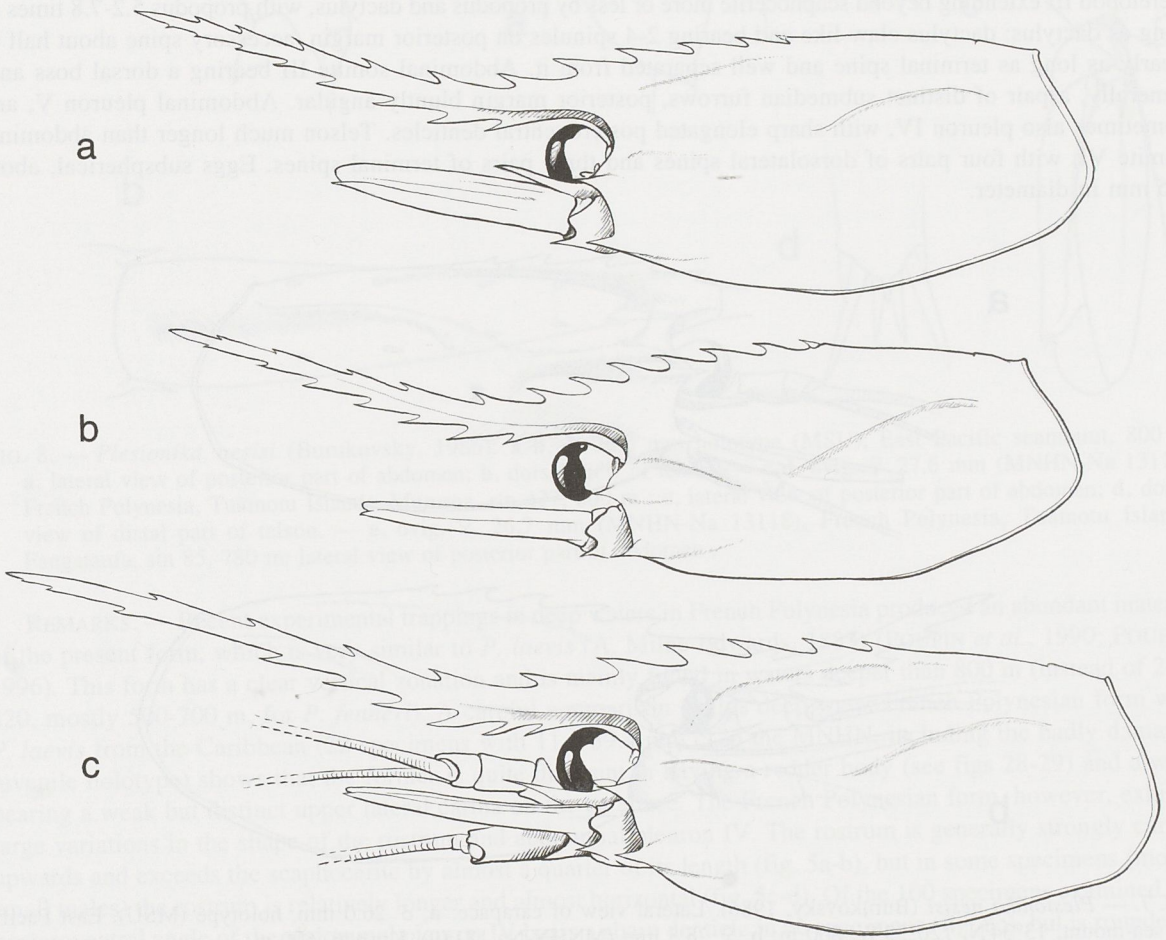


FIG. 6. — *Plesionika nesisi* (Burukovsky, 1986). Lateral view of carapace: **a**, ♂ 21.4 mm (MNHN-Na 13116), French Polynesia, Marquesas Islands, Hiva Oa, stn 293, 900 m. — **b**, ♀ 18.0 mm (MNHN-Na 13121), Kiribati, 750 m; **c**, ♂ 20.4 mm (MNHN-Na 12487), Seychelles, CEPROS, stn 3-14, 850-800 m.

Seychelles Islands. CEPROS: stn 3-14, 4°33'S, 56°27'E, 850-800 m, 22.10.1987: 1 ♂ 20.4 mm (MNHN-Na 12487). — Stn 5-25, 5°48.5'S, 56°43.2'E, 700-750 m, 24.10.1987: 1 ♂ 19.0 mm (MNHN-Na 12486).

Madagascar. *"Vauban"*: trawling 35, 12°49.5'S, 48°5.9'E, 760-810 m, 14.09.1972: 1 ♂ 22.8 mm, 1 ♀ 20.7 mm.

DIAGNOSIS. — Body rather robust. Rostrum about as long as carapace and armed along whole length with 5-8 (very rarely 3, 4 or 9) dorsal and 6-11 ventral teeth, generally curved upwards in females but nearly horizontal in males. Carapace with a low post-rostral crest, which bears 4-6 fixed post-rostral teeth and extends for about 4/5 of carapace length; antennal and branchiostegal spines very strong (branchiostegal spine relatively larger), both with weak lateral carina behind; upper lateral carina starting at orbital margin, slightly above antennal spine, and extending almost to posterior margin of carapace, weak, more or less interrupted at mid-length, and strongly curved in the posterior part; lower lateral carina continuous with branchiostegal spine, low and soon vanishing posteriorly; very weak hepatic groove present. Eyes quite large, slightly kidney-shaped and without distinct ocellus. Orbital margin regularly concave. Stylocerite tapered anteriorly and reaching between middle and distal end of second segment of antennular peduncle. Scaphocerite 3.4-4.4 times as long as broad, with distolateral tooth more or less extending to distal margin of lamella, basicerite spine elongate and exceeding proximal end of lateral margin of scaphocerite. Well developed epipods present on maxilliped III and anterior 4 pereiopods. Maxilliped III bearing a long and thread-like exopod, with distal segment 1.3-1.5 times as long as penultimate segment. Pereiopods II with 6-11 carpal articles on one side (usually right) and 18-21 carpal articles on the other side. Pereiopod III extending beyond scaphocerite more or less by propodus and dactylus, with propodus 5.2-7.8 times as long as dactylus; dactylus claw-like and bearing 2-4 spinules on posterior margin, accessory spine about half to nearly as long as terminal spine and well separated from it. Abdominal somite III bearing a dorsal boss and, generally, a pair of distinct submedian furrows, posterior margin bluntly angular. Abdominal pleuron V, and sometimes also pleuron IV, with sharp elongated posteroventral denticles. Telson much longer than abdominal somite VI; with four pairs of dorsolateral spines and three pairs of terminal spines. Eggs subspherical, about 0.5 mm in diameter.

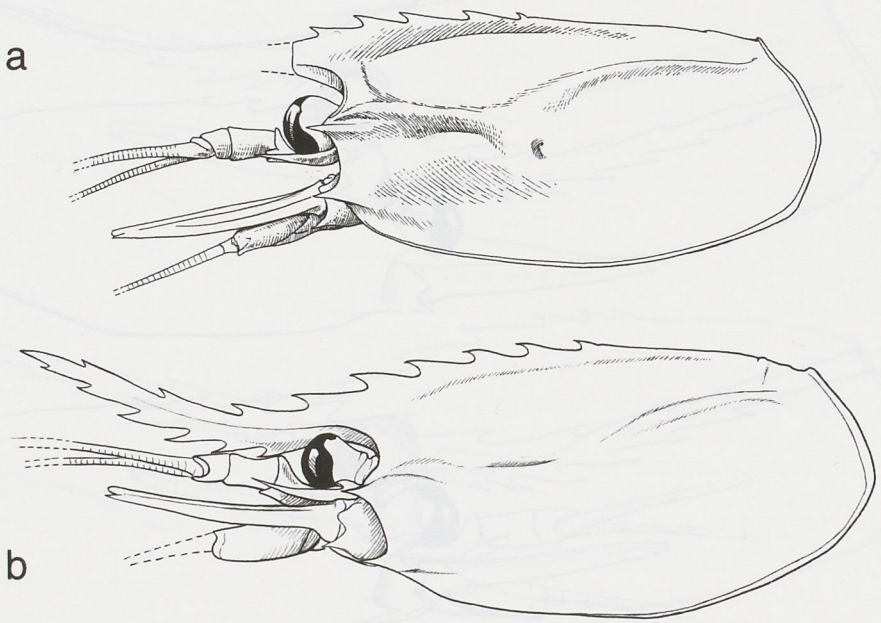


FIG. 7. — *Plesionika nesisi* (Burukovsky, 1986). Lateral view of carapace: **a**, ♂ 26.0 mm, holotype (MSU), East Pacific sea-mount, 13°34'N, 120°33'W, 800 m; **b**, ♀ 28.3 mm (MNHN-Na 13119), Kiribati, 600 m.

COLORATION. — Body, including appendages, generally reddish, colour slightly lighter at base of rostrum, as well as area between posterior carapace and anterior abdomen. Eyes browish-black. Eggs brown.

SIZE. — Largest male and female about 32.5 mm and 31.5 mm cl, respectively (POUPIN *et al.* 1990). Smallest ovigerous female 19.5 mm cl.

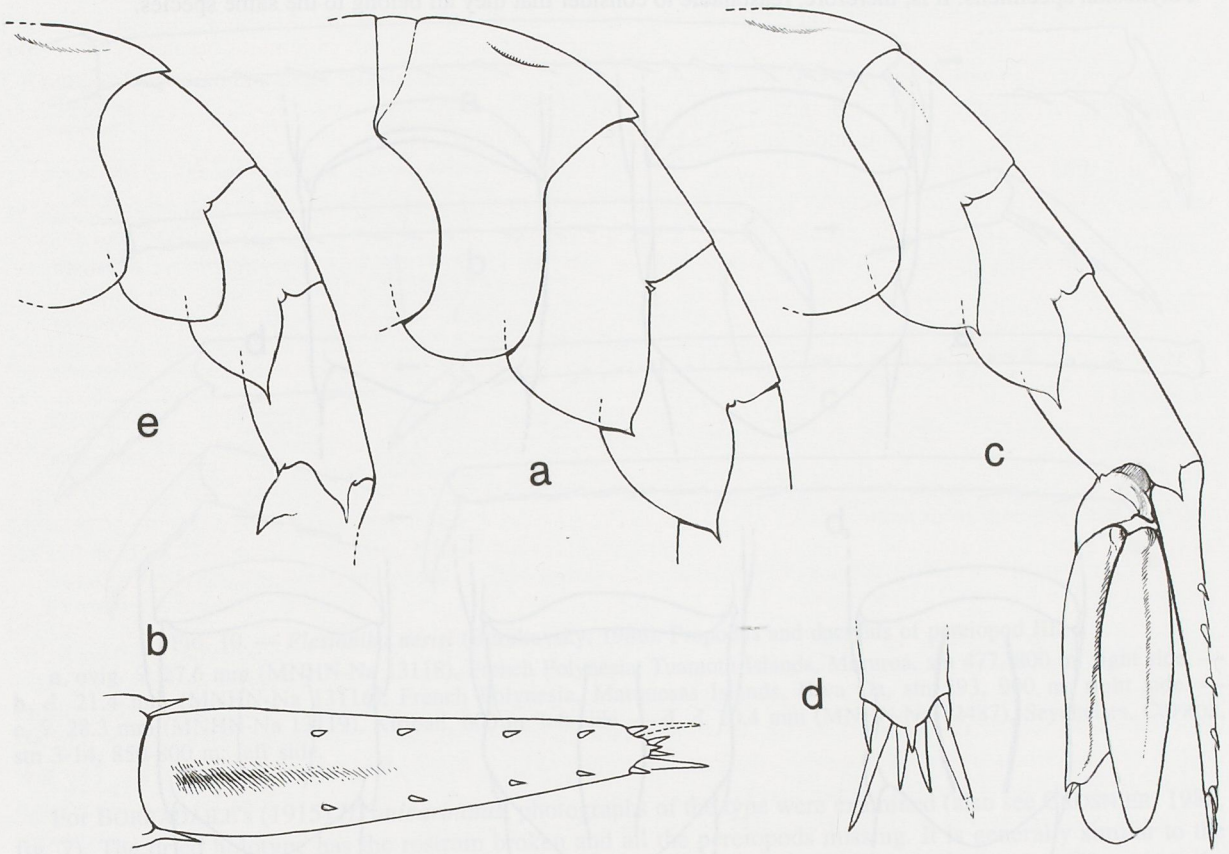


FIG. 8. — *Plesionika nesisi* (Burukovsky, 1986): **a-b**, ♂ 26.0 mm holotype (MSU), East Pacific seamount, 800 m: **a**, lateral view of posterior part of abdomen; **b**, dorsal view of telson. — **c-d**, ovig. ♀ 27.6 mm (MNHN-Na 13115), French Polynesia, Tuamotu Islands, Mururoa, stn 477, 800 m : **c**, lateral view of posterior part of abdomen; **d**, dorsal view of distal part of telson. — **e**, ovig. ♀ 26.7 mm (MNHN-Na 13118), French Polynesia, Tuamotu Islands, Fangataufa, stn 85, 780 m: lateral view of posterior part of abdomen .

REMARKS. — Recent experimental trappings in deep waters in French Polynesia produced an abundant material of the present form, which is very similar to *P. laevis* (A. Milne Edwards, 1883) (POUPIN *et al.*, 1990; POUPIN, 1996). This form has a clear vertical zonation and is mainly found in waters deeper than 800 m (instead of 260-820, mostly 500-700 m, for *P. fenneri*). A careful comparison of this deep water French Polynesian form with *P. laevis* from the Caribbean (22 specimens with 11.1-39.4 mm cl in the MNHN, including the badly damaged juvenile holotype) shows that the former is quite different in having a redder body (see figs 28-29) and always bearing a weak but distinct upper lateral carina on the carapace. The French Polynesian form, however, exhibits large variations in the shape of the rostrum and abdominal pleuron IV. The rostrum is generally strongly curved upwards and exceeds the scaphocerite by almost a quarter of its length (fig. 5a-b), but in some specimens (mostly small males) the rostrum is relatively longer and almost horizontal (fig. 5c-d). Of the 100 specimens examined, the posteroventral angle of the abdominal pleuron IV bears a sharp denticle in 66 specimens (fig. 8c), but is rounded in 20 others (fig. 8e), while in 14 specimens one side of the pleuron is rounded, while the other side bears a denticle. The degree of development of the lateral carapace carinae and the abdominal boss is also very variable in these specimens (e.g. tends to be weaker in small individuals, but this is not always size related; the same is also true

for the abdominal boss of *P. laevis*, that of the holotype being almost absent). The above characters, however, appear to vary independently, and specimens of all sizes with intermediate characters can often be found in both sexes (figs 5, 8-10). Moreover, no difference in coloration has been observed for these deep-water French Polynesian specimens. It is, therefore, reasonable to consider that they all belong to the same species.

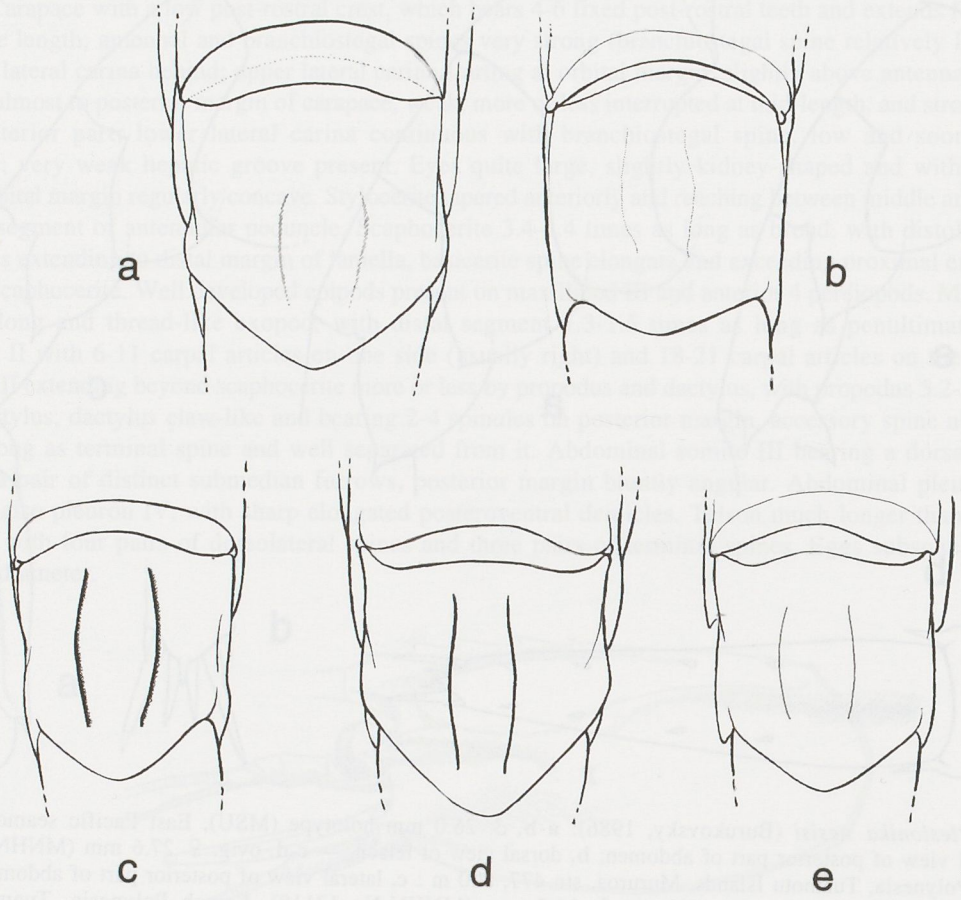


FIG. 9. — *Plesionika nesisi* (Burukovsky, 1986). Dorsal view of abdominal somite III.
a, ovig. ♀ 27.6 mm (MNHN-Na 13118), French Polynesia, Tuamotu Islands, Mururoa, stn 477, 800 m. — **b**, ♂ 21.4 mm (MNHN-Na 13116), French Polynesia, Marquesas Islands, Hiva Oa, stn 293, 800 m. — **c**, ♀ 18.0 mm (MNHN-Na 13121), Kiribati, 750 m. — **d**, ♀ 28.3 mm (MNHN-Na 13119), Kiribati, 600 m. — **e**, ♂ 20.4 mm (MNHN-Na 12487), Seychelles, CEPROS, stn 3-14, 850-800 m.

The discovery of *P. fenneri* brought up the problem of the generic affinity of the *"P. laevis"* group, which has characteristics intermediate between *Plesionika* and *Heterocarpus* A. Milne Edwards, 1881 (see BURUKOVSKY, 1986; CROSNIER, 1986a, 1988; CHACE, 1989). The present form no doubt belongs to this intermediate group. Actually there are three more species which probably could also be assigned to the *"P. laevis"* group. These are *Heterocarpus alexandri* A. Milne Edwards, 1883 from the western Atlantic, *H. unicarinatus* Borradaile, 1915 from Seychelles and *H. nesisi* Burukovsky, 1986 from the eastern Pacific. These three species are all described from a single specimen and very poorly known. The type-locality of *H. nesisi* is nearest to French Polynesia (i.e. from an underwater seamount, north-east of French Polynesia). A comparison of accurate drawings of the damaged holotype of *H. nesisi* (figs 7a, 8a-b; prepared at MNHN some years ago) shows that it is almost identical with the French Polynesian form. The rostrum of the holotype is missing in the MNHN drawings, but the original figure of

H. nesisi provided by BURUKOVSKY (1986) shows that it is also very similar to that of the French Polynesian material, except for a slightly longer length and a greater number of dorsal rostral teeth.

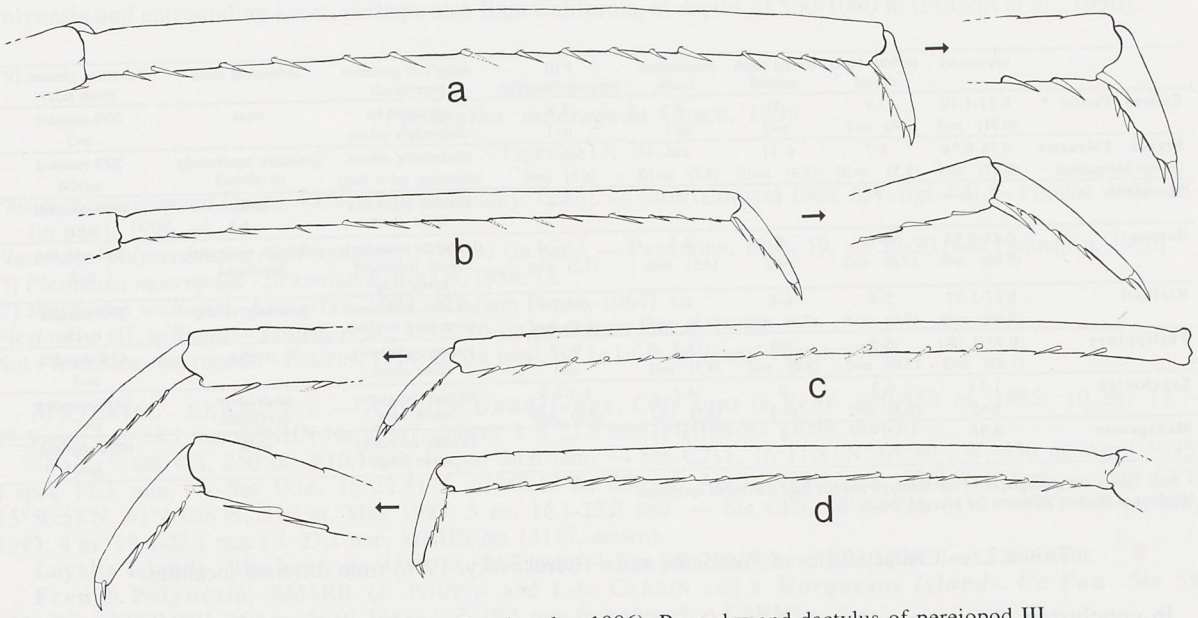


FIG. 10. — *Plesionika nesisi* (Burukovsky, 1986). Propodus and dactylus of pereiopod III.
a, ovig. ♀ 27.6 mm (MNHN-Na 13118), French Polynesia, Tuamotu Islands, Mururoa, stn 477, 800 m: right side. — **b**, ♂ 21.4 mm (MNHN-Na 13116), French Polynesia, Marquesas Islands, Hiva Oa, stn 293, 900 m: right side. — **c**, ♀ 28.3 mm (MNHN-Na 13119), Kiribati, 600 m: left side. — **d**, ♂ 20.4 mm (MNHN-Na 12487), Seychelles, CEPROS, stn 3-14, 850-800 m: left side.

For BORRADAILE's (1915) *H. unicarinatus*, photographs of the type were examined (also see CROSNIER, 1988, fig. 7). The dried holotype has the rostrum broken and all the pereiopods missing. It is generally similar to the French Polynesian form and has the upper lateral carina of the carapace medially interrupted. However, the abdominal boss is more pronounced in *H. unicarinatus* and there are only three post-rostral teeth present on the carapace.

The type of *H. alexandri* was described in detail by CHACE (1989). Although the rostrum of the type is broken (apparently very straight) and most of the thoracic appendages are missing, the remaining parts are very similar to those of the French Polynesian form. Nevertheless, the much smaller size of *H. alexandri* (holotype ovigerous female only 12.8 mm cl) suggests that it should be a distinct species. Photographs of the additional specimens mentioned by CHACE (1989) from Bahama Islands, Baja California and Hawaii were examined in the present study. The male from Bahama Islands is in a similar condition as the holotype of *H. alexandri* (i.e. rostrum broken and most of the pereiopods missing) and with almost the same characteristics (their sizes are also similar). As mentioned by CHACE (1989), the female from Baja California is much larger (about 31.5 mm cl) and with the abdominal boss rather weak. The general appearance of this specimen is more similar to the French Polynesian form (some of the French Polynesian specimens also have the transverse grooves on the anterior two abdominal somites somewhat indistinct) except for having pereiopods II with fewer carpal articles. However, the Hawaiian specimen reported by RATHBUN (1906) as *H. alexandri*, of which we were able to get good photos, looks very different and is generally more similar to the "typical" forms of *Plesionika* or *Pandalus*. No trace of a dorsal boss is present on the abdominal somite III and some of the post-rostral teeth appear to be movable. With the absence of all thoracic appendages in this Hawaiian specimen, there are even difficulties deciding which pandalid genus it belongs to! Therefore, the exact identity of RATHBUN's (1906) specimen may never be known. On the other hand,

it may be relevant to point out that the collection of MNHN includes a damaged eastern Atlantic specimen (Ibero-Maroccan Gulf, BALGIM, stn DW 96, 1250 m, adult female 11.8 mm cl, MNHN-Na 11919) very similar to *H. alexandri*, but with abdominal somite III smooth. This specimen probably represents an undescribed species of the *"P. laevis"* group (RASO, 1996: 741).

	rostrum/cl	rostral teeth dorsal	rostral teeth ventral	postrostral teeth	P III propodus/dactylus	dactyli of posterior pereiopods	abdominal boss	abdominal pleuron IV (both side)
Eastern Pacific *	0.71-1.10 (0.91) n=2	7-9 (8) n=2	7 n=2	4 n=2	7.8 n=1	appear to be moderately robust	weak	50% rounded n=2
French Polynesia (except Marquesas)	0.78-0.94 (0.87) n=9	3-7 (5.5) n=10	6-11 (7.9) n=10	4-6 (4.7) n=10	5.3-7.1 (6.3) n=9	moderately robust, accessory spine long	generally moderately developed	20% rounded n=100
Marquesas Is	1.10	7	8	4	5.2	slender, accessory spine short	weak	100% rounded n=1
Samoa	0.85-0.93 (0.89) n=2	6-8 (7.0) n=2	8 n=2	4-5 (4.5) n=6	7.1-7.3 (7.2) n=2	slender to moderately robust, accessory spine long	generally moderately developed	83% rounded n=6
Kiribati	0.82-1.07 (0.96) n=6	5-8 (7.0) n=6	6-8 (7.5) n=6	4-5 (4.5) n=6	6.5-7.4 (6.8) n=8	slender, accessory spine long to short	generally strong	79% rounded n=19
Philippines	0.93-1.10 (1.02) n=2	6-8 (7.0) n=2	7-9 (8.0) n=2	4-5 (4.5) n=2	6.15 n=1	slender, accessory spine short	strong	67% rounded n=3
Seychelles	1.35 n=2	6-7 (6.5) n=2	9 n=2	4-5 (4.5) n=2	6.2-6.9 (6.5) n=2	slender, accessory spine long	moderately developed	100% rounded n=2
Madagascar	0.98	7	8	5	-	slender, accessory spine long	weak	100% rounded n=2

* from figures and photographs of the holotype and the Baja California specimen.
Numbers in brackets represent the average values.

TABLE 2. — Characteristics of *Plesionika nesisi* (Burukovsky, 1996) from different localities.

In conclusion, the present French Polynesian form can probably be identified as *H. nesisi*. However, the problem becomes more complicated when more, similar specimens from various Indo-Pacific localities with slight differences are found in the MNHN collection (Table 2). The material from Kiribati has a slightly longer rostrum (fig. 7b) and a stronger abdominal boss (fig. 9c-d), while the abdominal pleuron IV is more often rounded, and the dactyli of posterior pereiopods are more slender, sometimes with a short accessory spine (fig. 10c). The few specimens from Samoa, the Philippines and Madagascar also usually have the abdominal pleuron IV rounded, but the degree of development of the abdominal boss and the dactyli of posterior pereiopods is intermediate between those of the French Polynesian and Kiribati material (figs 9-10). On the other hand, the two young males from the Seychelles look somewhat different to the French Polynesian material, because they have a much longer, straight rostrum (figs 6c, 9e). Nevertheless, this seems to be unimportant when considering the variations already exhibited in the different Indo-Pacific populations, as mentioned above. Moreover, two similar-sized specimens from Marquesas Islands (fig. 6a) and Kiribati (fig. 6b) have the rostrum quite similar to that of the Seychelles material. The two Seychelles specimens are very similar to the type of *H. unicarinatus*, which was collected from the same locality and is of similar size and the same sex. The holotype of *H. unicarinatus*, however, bears only three post-rostral teeth on the carapace, a condition that never occurs in all the specimens of this study (except for one French Polynesian specimen with an abnormal rostrum). For the time being, it seems appropriate to identify all the material from French Polynesia, Kiribati, Samoa, the Philippines, Madagascar and the two Seychelles specimens (MNHN) as *H. nesisi*. More material from the Seychelles will be needed to clarify the relationships between *H. nesisi* and *H. unicarinatus*.

The increasing number of species belonging to the *"P. laevis"* group may prompt some workers to follow CHACE's (1989) suggestion and propose a separate genus for them. There is no doubt that these species form a natural group. The complete absence of lateral carapace carina and abdominal boss in *P. fenneri* prevents the inclusion of the *"P. laevis"* group in *Heterocarpus*. However, no satisfactory character can be found to separate *P. fenneri* from *Plesionika* as currently defined, which can easily accommodate *H. nesisi*, *H. unicarinatus* and *H. alexandri* since some "typical" *Plesionika* species also bear similar lateral carinae on the carapace (e.g. *P. carinata* Holthuis, 1951 and *P. polyacanthomerus* Pequegnat, 1970, see also "Remarks" under *P. williamsi*).

We therefore prefer to follow CROSNIER (1986a, 1988) in putting all the members of the *"P. laevis"* group in *Plesionika* until this genus can be satisfactory subdivided.

DISTRIBUTION. — Indo-Pacific from Madagascar to Seychelles, Philippines, Samoa, Kiribati, French Polynesia and surrounding areas, perhaps also Baja California, at depths of 550-1080 m (POUPIN *et al.*, 1990).

Plesionika macropoda Chace, 1939

Figs 11-13, 30-31

Plesionika macropoda Chace, 1939: 37 [type-locality: Cuba]. — MONTERROSA, 1988: 637, figs 4-5. — POUPIN, 1994: 25 (in part); 1996, pl. 4d.
Plesionika polyacanthomerus Pequegnat, 1970: 97 (in part). — PAULMIER, 1993: 19, pls 19-20 [non Pequegnat, 1970].
[?] *Plesionika macropoda* - SPRINGER & BULLIS, 1956: 12.
[?] *Plesionika williamsi* - LEMAITRE, 1984: 435 [non Forest, 1964].
Plesionika aff. *williamsi* - POUPIN *et al.*, 1990: 16 (in part) [non Forest, 1964].
Not *Plesionika macropoda* - POUPIN, 1994: 25 (in part), pl. 1e [= *P. williamsi* Forest, 1964].

MATERIAL EXAMINED. — **Antilles**. ***Guadeloupe***, ***Côte sous le Vent***. 400-450 m, 1985: 10 ex. 13.7-22.5 mm; 1 ♂ 18.1 mm (MNHN-Na 12847, drawn); 1 ♂ 21.9 mm (MNHN-Na 13099, drawn).
"Polka": stn 4-3, 260 m, 3.10.1990: 1 spec 24.6 mm. — Stn C211, 16°11.81'N, 61°49.1'W, 450 m, April 1993: 1 spec 17.1 mm. — Stn D38, 16°22.51'N, 61°49.13'W, 500 m, April 1993: 3 ex. 23.8-25.0 mm. — Stn CP1, 15°50.57'N, 61°40.56'W, 310 m, May 1993: 3 ex. 16.1-23.0 mm. — Stn CP3, 16°0.11'N, 61°21.16'W, 400 m, May 1993: 4 ex. 19.6-23.1 mm (♂ 23.1 mm, MNHN-Na 13113, drawn).
Loyalty Islands. *"Vauban"*: stn 43: 1 ex. 24.7 mm. — Stn 90, 200-600 m, 1.03.1978: 1 ex. 26.4 mm.
French Polynesia. SMSRB (J. POUPIN and J.-L. CARSIN coll.): ***Marquesas Islands***. ***Ua Pou***. Stn 59, 9°23.0'S, 140°09.0'W, 450 m, 26.01.1988: 1 ♂ 19.1 mm [transferred to USNM].
Tuamotu Islands. ***Maria***. Stn 37, 22°00.0'S, 136°12.0'W, 470 m, 23.11.1987: 1 ♀ 19.1 mm (MNHN-Na 12526, drawn). — ***Gambier***. Stn 238, 23°01.1'S, 134°59.0'W, 500 m, 27.05.1990: 1 ♂ 14.6 mm, 1 ♀ 19.3 mm. — Stn 311, 23°04.5'S, 135°01.6'W, 470 m, 11.10.1990: 2 ♂ 23.1 mm (MNHN-Na 13112, drawn) and 25.7 mm. — ***Mururoa***. 1984: 1 ♀ 18.6 mm. — Stn 382, 21°46.4'S, 138°53.5'W, 400 m, 9.03.1991: 1 ovig. ♀ 26.9 mm. — Stn 476, 21°51.3'S, 139°01.2'W, 470 m, 11.04.1995: 1 ♂ 30.1 mm.
Tubuai Islands. ***Maria***. Stn 421, 21°47.7'S, 154°43.4'W, 500 m, 7.08.1991: 1 ♂ 28.9 mm [transferred to USNM].
Society Islands. ***Huanine***. Stn 405, 16°45.8'S, 151°03.8'W, 310 m, 6.05.1991: 1 ♀ 27.7 mm (MNHN-Na 13114, drawn); 1 ovig. ♀ 31.9 mm (MNHN-Na 13165, drawn).

DIAGNOSIS. — Detailed descriptions of this species can be found in CHACE (1939), MONTERROSA (1988) and PAULMIER (1993, under the name *P. polyacanthomerus*).

COLORATION. — Body light pink, with a mosaic patterns of light red markings on carapace and abdomen. Eyes dark brown. Pereiopods lighter in colour. Pleopods reddish. Eggs blue.

SIZE. — Largest male and largest female 30.2 mm and 31.9 mm cl, respectively. Smallest ovigerous female 22.5 mm cl.

REMARKS. — This species has been largely neglected since its original description in 1939. Only recently has it been redescribed and illustrated in detail by MONTERROSA (1988), PAULMIER [1993, under the name *P. polyacanthomerus* (non Pequegnat, 1970)] and POUPIN (1994). It is extremely similar to *P. williamsi* Forest, 1964, but almost none of the previous authors discussed their relationships. The present study shows that they do represent distinct species and even occur sympatrically in the Antilles and French Polynesia (see "Remarks" under *P. williamsi*). The colour photograph of *P. macropoda* (non Chace, 1939) provided by POUPIN (1994, pl. 1e) actually refers to *P. williamsi*, while those of *P. polyacanthomerus* (non Pequegnat, 1970) given by PAULMIER (1993, pls 19-20) represent true *P. macropoda*. It is not known whether the report of *P. williamsi* by LEMAITRE (1984) from the Bahamas and Gulf of Mexico truly refers to that species, since no details about the material was provided.

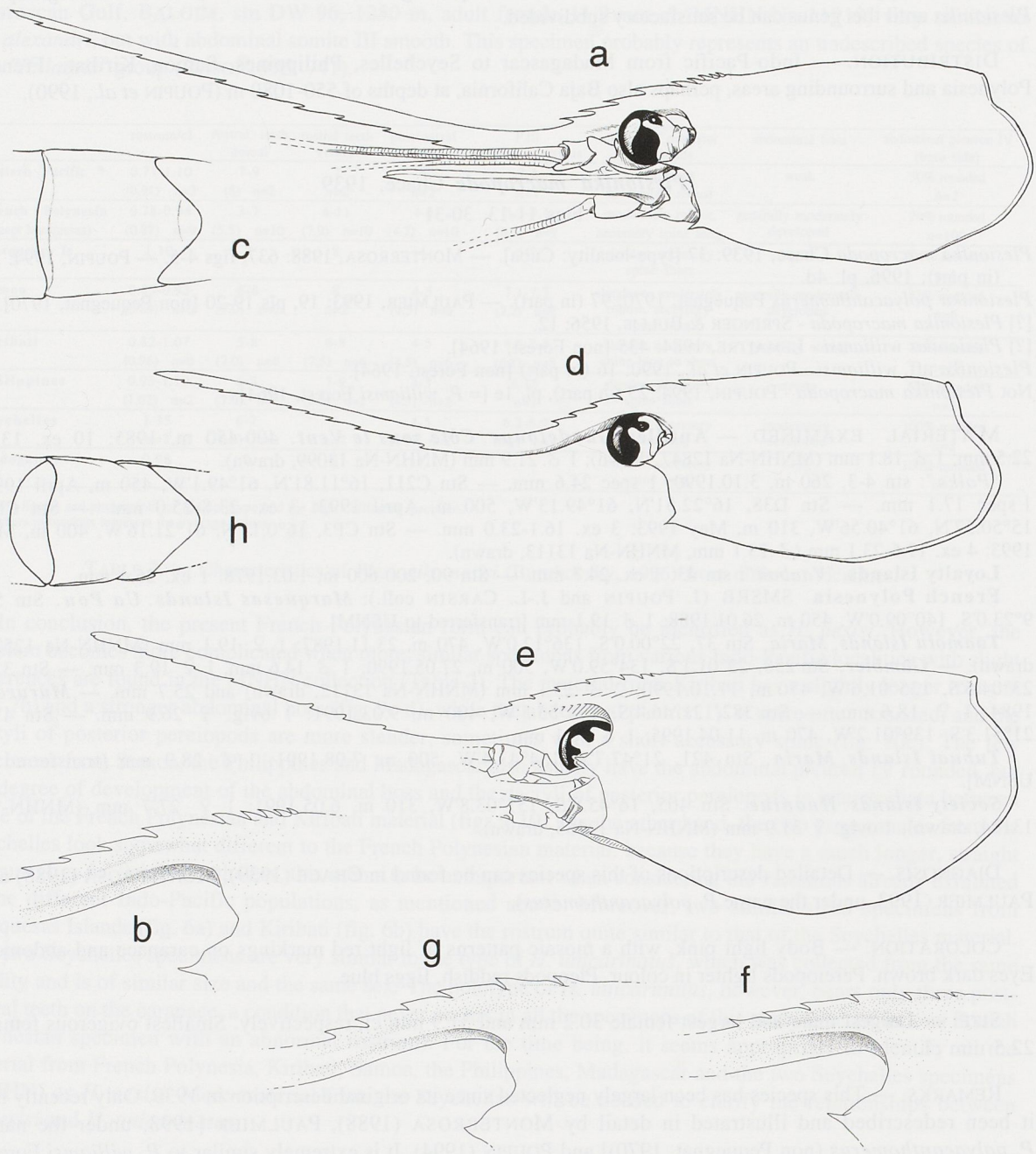


FIG. 11. — *Plesionika macropoda* Chace, 1939. **a-c**, ♂ 23.1 mm (MNHN-Na 13113), Antilles, *"Polka"*, stn CP3, 400 m: **a**, lateral view of carapace; **b**, dorsal rostral and post-rostral teeth enlarged; **c**, dorsal view of abdominal somite III. — **d**, ♂ 23.1 mm (MNHN-Na 13112), French Polynesia, Tuamotu Islands, Gambier, stn 311, 470 m: lateral view of carapace. — **e-f**, ovig. ♀ 31.9 mm (MNHN-Na 13165), French Polynesia, *"Marara"*, stn 405, 310 m: **e**, : lateral view of carapace; **f**, dorsal rostral and post-rostral teeth enlarged. — **g**, ♀ 19.1 mm (MNHN-Na 12526), French Polynesia, *"Marara"*, stn 37, 22°00.0'S, 136°12.0'W, 470 m, dorsal rostral and post-rostral teeth enlarged. — **h**, ♀ 27.7 mm (MNHN-Na 13114), French Polynesia, Society Islands, Huanine, stn 405, 310 m: dorsal view of abdominal somite III.

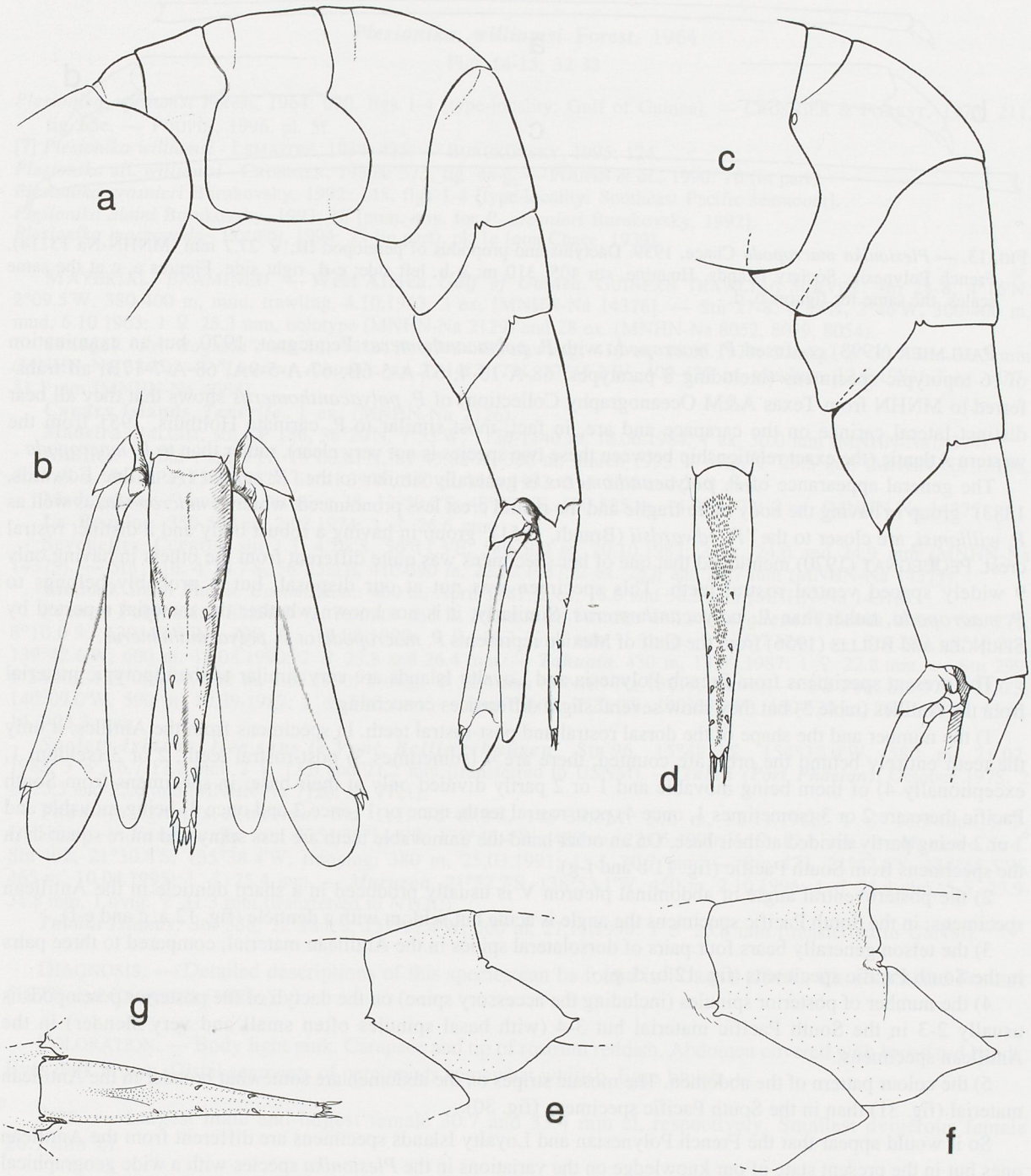


FIG. 12 a-d. — *Plesionika macropoda* Chace, 1939. **a-b**, ♂ 23.1 mm (MNHN-Na 13113), Antilles, *"Polka"*, stn CP3, 400 m: **a**, lateral view of abdomen and tailfan; **b**, dorsal view of tailfan. — **c**, ♂ 21.9 mm (MNHN-Na 13099), Antilles, La Guadeloupe, côte sous le Vent, 400-450 m: lateral view of posterior part of abdomen. — **d**, ♂ 18,1 mm (MNHN-Na 12847), *ibidem*: dorsal view of telson. — **e**, ovig. ♀ 31.9 mm (MNHN-Na 13165), French Polynesia, *"Marara"*, stn 405, 310 m: lateral view of fifth abdominal segment. — **f-g**, ♂ 23.1 mm (MNHN-Na 13112), French Polynesia, *"Marara"*, stn 311, 470 m: **f**, lateral view of fifth abdominal segment; **g**, dorsal view of telson.

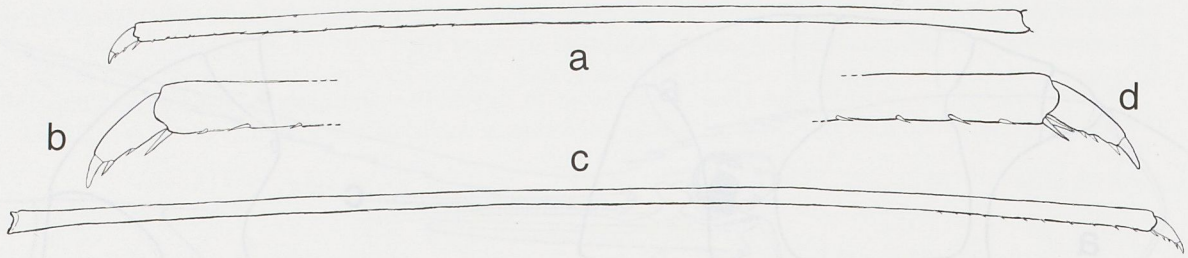


FIG. 13. — *Plesionika macropoda* Chace, 1939. Dactylus and propodus of pereiopod III, ♀ 27.7 mm (MNHN-Na 13114), French Polynesia, Society Islands, Huanine, stn 405, 310 m: **a-b**, left side; **c-d**, right side. Figures a, c at the same scales, the same for figures b, d.

PAULMIER (1993) confused *P. macropoda* with *P. polyacanthomerus* Pequegnat, 1970, but an examination of 16 topotypic specimens (including 8 paratypes: 68-A-13-4, 67-A-5-6B, 67-A-5-9A, 68-A-7-17B; all transferred to MNHN from Texas A&M Oceanography Collection) of *P. polyacanthomerus* shows that they all bear distinct lateral carinae on the carapace and are, in fact, most similar to P. carinata Holthuis, 1951 from the western Atlantic (the exact relationship between these two species is not very clear), rather than to *P. macropoda* .

The general appearance of *P. polyacanthomerus* is generally similar to the "*P. martia* (A. Milne Edwards, 1883)" group in having the body more fragile and the rostral crest less pronounced, while *P. macropoda*, as well as *P. williamsi*, are closer to the "*P. edwardsii* (Brandt, 1851)" group in having a robust body and a distinct rostral crest. PEQUEGNAT (1970) mentioned that one of her specimens was quite different from the others in having only 9 widely spaced ventral rostral teeth. This specimen was not at our disposal, but it probably belongs to *P. macropoda*, rather than *P. polyacanthomerus*. Similarly, it is not known whether the material reported by SPRINGER and BULLIS (1956) from the Gulf of Mexico represents *P. macropoda* or *P. polyacanthomerus*.

The present specimens from French Polynesia and Loyalty Islands are very similar to the topotypic material from the Antilles (table 3) but they show several slight differences concerning:

1) the number and the shape of the dorsal rostral and post-rostral teeth. In specimens from the Antilles, if only the teeth entirely behind the orbit are counted, there are 4 (sometimes 3) post-rostral teeth, 2 or 3 (seldom 1, exceptionally 4) of them being movable and 1 or 2 partly divided only at their base; in specimens from South Pacific there are 2 or 3 (sometimes 1, once 4) post-rostral teeth, none or 1 (once 2 and once 3) being movable and 1 or 2 being partly divided at their base. On an other hand the unmovable teeth are less spiny and more squarish in the specimens from South Pacific (fig. 11 b and f-g).

2) the posteroventral angle of abdominal pleuron V is usually produced in a sharp denticle in the Antillean specimens; in the South Pacific specimens the angle is acute but seldom with a denticle (fig. 12 a, c and e-f).

3) the telson generally bears four pairs of dorsolateral spines in the Antillean material, compared to three pairs in the South Pacific specimens (fig. 12 b, d, g).

4) the number of posterior spinules (including the accessory spine) on the dactyli of the posterior pereiopods is usually 2-3 in the South Pacific material but 3-4 (with basal spinules often small and very slender) in the Antillean specimens.

5) the colour pattern of the abdomen. The mosaic stripes on the abdomen are somewhat broader in the Antillean material (fig. 31) than in the South Pacific specimens (fig. 30).

So it would appear that the French Polynesian and Loyalty Islands specimens are different from the Antillean ones but in the present state of our knowledge on the variations in the *Plesionika* species with a wide geographical range, and taking into account the variations occasionally exhibited in a same individual (e.g. fig. 13) and those occuring in the different populations of *P. williamsi,* it seems reasonable not to separate the South Pacific material from the Antillean one, at least for the time being.

DISTRIBUTION. — Western Atlantic and southern Pacific: Caribbean and in the south Pacific, only known with certainty from the Loyalty Islands and French Polynesia, at depths of 260-600 m.

Plesionika williamsi Forest, 1964

Figs 14-15, 32-33

Plesionika williamsi Forest, 1964: 620, figs 1-4 [type-locality: Gulf of Guinea]. — CROSNIER & FOREST, 1973: 211, fig. 65e. — POUPIN, 1996, pl. 5f.
[?] *Plesionika williamsi* - LEMAITRE, 1984: 435. — BURUKOVSKY, 1995: 124.
Plesionika aff. *williamsi* - CROSNIER, 1986a: 373, fig. 4a-g. — POUPIN *et al.*, 1990: 16 (in part).
Plesionika crosnieri Burukovsky, 1992: 145, figs 1-4 [type-locality: Southeast Pacific seamount].
Plesionika alaini Burukovsky, 1993: 18 [nom. nov. for *P. crosnieri* Burukovsky, 1992].
Plesionika macropoda - POUPIN, 1994: 25 (in part), pl. 1e [non Chace, 1939].

MATERIAL EXAMINED. — **West Africa**. ***Gulf of Guinea***. GUINEAN TRAWLING SURVEY: stn 28-8, 4°16'N, 2°09.5'W, 380-400 m, mud, trawling, 4.10.1963: 3 ex. [MNHN-Na 14376]. — Stn 27-8, 4°39'N, 2°46'W, 300-400 m, mud, 6.10.1963: 1 ♀ 25.3 mm, holotype (MNHN-Na 2129) and 28 ex. (MNHN-Na 8052, 8039, 8054).

Senegal. *"Pr. Bogucki"*: stn 11, 14°24'N, 17°34'W, trawling, 416 m, 26.05.1979: 2 ovig. ♀ 30.7 and 31.3 mm (MNHN Na 3845). — *"Laurent Amaro"*: stn 2, 14°21.7'N, 17°35.2'W, 400-420 m, trawling, 12.6.1981: 3 ex. 30.7-31.1 mm [MNHN-Na 4088].

Canary Islands. ***Tenerife***. 1 ex. (MNHN-Na 2126).

Madeira. BALGIM: stn CP 156, 36°20'N, 7°53'W, 1130-1140 m, 18.06.1984: 1 ex. 30.0 mm (MNHN-Na14374).

Antilles. *"Polka"*: stn Y11, 16°00.01'N, 61°45.82'W, 500 m, March 1993: 1 ovig. ♀ 29.5 mm (MNHN-Na 13106, drawn). — Stn EP1, 15°50.93'N, 61°41.39'W, 560 m, May 1993: 2 ♂ 20.0 and 24.3 mm.

Madagascar. *"Vauban"*: trawling 38, 12°50.0'S, 48°09.1'E, 580-585 m, 14.09.1972: 7 ex. (MNHN-Na 14375).

La Reunion. 350-500 m, 2.02.1974: 1 ♂ 26.6 mm.

Seychelles. CEPROS: stn 1.3, 4°08'S, 56°11.3'E, 580-500 m, 20.10.1987: 2 ex. 24.0 and 24.9 mm (MNHN-Na 14373). — Stn 3.16, 4°34.7'S, 56°25.6'E, 410-390 m, 22.10.1987: 2 ex. 25.6 and 25.7 mm (MNHN-Na 14377).

Kiribati. *South Pacific Commission*:: 400 m, April 1987: 2 ex. 18.0 and 30.5 mm (MNHN-Na 14378).

French Polynesia. SMSRB (J. POUPIN and B. RICHER DE FORGES coll.): ***Marquesas Islands***. ***Eiao***. Stn 279, 8°10.0'S, 139°42.0'W, 400 m, 18.08.1990: 3 ♀ 16.1-27.4 mm, 1 ovig. ♀ 26.7 mm. — Stn 280, 8°10.3'S, 139°42.6'W, 600 m, 18.08.1990: 2 ♂ 23.8 and 26.4 mm. — ***Tahuata***. 430 m, 13.09.1987: 1 ♀ 22.8 mm. — Stn 299, 9°54.5'S, 139°08.2'W, 350 m, 1.09.1990: 1 ovig. ♀ 30.4 mm (MNHN-Na 13019, drawn). — ***Ua Pou***. Stn 57, 9°23.0'S, 140°09.0'W, 590 m, 10.09.1987: 1 ♂ 14.3 mm. — Stns 59-60, 9°23.0'S, 140°09.0'W, 450-520 m, 26.01.1988: 11 ♂ 14.3-23.3 mm.

Society Islands. ***Îles sous le Vent***. ***Bellingshausen***. Stn 96, 15°48.0'S, 154°32.0'W, 580 m, 21.07.1988: 3 ♂ 16.7-17.2 mm, 2 ♀ 13.6 and 21.2 mm [transferred to USNM]. — ***Tahiti (Port Phaeton)***. October 1978: 2 ♂ 23.5 and 25.6 mm (MNHN-Na 7720, Na 7721).

Tuamotu Islands. ***Makemo***. Stn 111, 16°40.0'S, 143°39.0'W, 500 m, 12.11.1988: 1 ♂ 18.9 mm, 1 ♀ 16.7 mm. — ***Fangataufa***. Stn 235, 22°14.6'S, 138°46.4'W, 480 m, 22.05.1990: 1 ♀ 17.7 mm. — ***Marutea Sud***. Stn 402, 21°30.8'S, 135°38.4'W, trapping, 380 m, 25.03.1991: 1 ♂ 30.7 mm. — Stn 473, 21°47.0'S, 138°55.5'W, 465 m, 10.04.1995: 1 ♂ 25.4 mm. — ***Mururoa***. 21°52.7'S, 138°53.1'W, 450 m, 2.10.1996: 1 ♂ 25.4 mm, 5 ♀ 23.9-31.8 mm, 1 ovig. ♀ 31.3 mm (transferred to NTOU).

Tubuai Islands. Stn 338, 22°28.6'S, 151°22.4'W, 500 m, 27.11.1990: 1 ♂ 25.8 mm [transferred to USNM].

DIAGNOSIS. — Detailed descriptions of this species can be found in FOREST (1964), CROSNIER and FOREST (1973) and CROSNIER (1986a).

COLORATION. — Body light pink. Carapace and tip of rostrum reddish. Abdomen covered with broad red bands. Eyes dark brown. Distal segments of pereiopods somewhat whitish. Eggs bluish.

SIZE. — Largest male and largest female 30.7 and 33.4 mm cl, respectively. Smallest ovigerous female 26.7 mm cl.

REMARKS. — The present form has been reported by CROSNIER (1986a) from French Polynesia under the name *P.* aff. *williamsi*. However, the differences mentioned by CROSNIER (1986a) between the French Polynesian and the topotypic material are found to be rather variable in the specimens available for the present study. Nevertheless, there appears to be a link between the shape of the posterior margin of the abdominal somite III and the length of rostrum, as well as the number of rostral teeth. For those 39 specimens with the posterior margin of the abdominal tergite III produced into a sharp angle (in 13 specimens) or even a small spine (in 26 specimens, fig.

14b), the rostrum is relatively shorter (1.4-2, avg. 1.7 carapace length; with small individuals generally having a relatively longer rostrum) and has more dorsal teeth (9-11, 8 in only one specimen) but fewer ventral teeth (7-12, fig. 14a). On the other hand, those specimens with the posterior margin of abdominal tergite III bluntly angular or rounded (fig. 11h) generally have a longer rostrum (1.8-2.1, avg. 1.9 carapace length) with fewer dorsal teeth (6-9, 11 in only one specimen) but more ventral teeth (9-14, fig. 11d-e). Furthermore, colour photographs of fresh specimens from French Polynesia showed that the above morphological differences are always accompanied by the presence or absence of red bands on the abdomen. Colour photographs of 10 red banded specimens are available (fig. 32). The specimens used for six of them (i.e. stn 235, 299, 473 and Belingshausen, Ua Pou, Mururoa) are deposited at the Paris Museum; they all have pointed abdominal tergite III, as well as a shorter rostrum. On the other hand, the 4 colour photographs of unbanded specimens (fig. 30), from stn 311, 383, 405 and 476, all correspond to individuals with rounded abdominal tergite III and a longer rostrum. It is, therefore, highly probable that two distinct species are present in the French Polynesian material.

Plesionika macropoda	**Antilles**	**Loyalty Islands**	**French Polynesia**
Total length/cl	1.7-2.3 (2.0) n=15	1.8-2.0 n=2	1.8-2.1 (1.9) n=8
Dorsal teeth	7-10 (8.7) n=19	6-7 n=2	6-11 (7.5) n=10
Ventral teeth	9-13 (11.1) n=16	12 n=2	9-14 (11.1) n=8

Plesionika williamsi	**Antilles**	**Gulf of Guinea**	**Senegal**	**Madeira**	**La Reunion**	**Seychelles**	**Kiribati**	**French Polynesia**
Total length/cl	1.5-1.7 (1.6) n=3	1.1-1.5 (1.3) n=20	1.2-1.3 n=2	1.7 n=1	1.5 n=1	1.6-1.8 (1.7) n=4	1.5 n=1	1.4-2.0 (1.7) n=23
Dorsal teeth	8-10 (9.9) n=3	9-12 (10.4) n=24	10 n=3	10 n=1	11 n=1	9-12 (10.8) n=4	9-10 (9.5) n=2	8-11 (9.7) n=31
Ventral teeth	9-11 (9.7) n=3	6-12 (9.9) n=20	8-13 n=2	11 n=1	7 n=1	8-10 (9.3) n=4	12 n=1	7-12 (9.8) n=23

Numbers in brackets represent the average values.

TABLE 3. — Comparisons of the rostrum between *Plesionika macropoda* Chace, 1939 (*i.e.* specimens with abdominal somite III rounded) and *P. williamsi* Forest, 1964 (*i.e.* specimens with abdominal somite III pointed) from different localities.

An examination of 32 specimens from the type series (including the holotype) of *P. williamsi* from the Gulf of Guinea shows that they all have pointed abdominal somites III (also varying from a sharp angle to bearing a distinct denticle, figs 14e-f). However, the rostrum of the types are considerably shorter (1.1-1.5, avg. 1.3 carapace length) than those of the French Polynesian material with a pointed abdominal tergite III, thought the number of rostral teeth are very similar. When a range of material from western Africa to the Indian Ocean and southern Pacific is compared, the differences in the proportional length of the rostrum exhibited in the various populations seem to represent natural variations of a single species with a very wide geographical distribution (Table 3). Although the specimens of the Indo-Pacific material with a longer rostrum show some resemblances with *P. carinata* Holthuis, 1951 (with a type locality close to that of *P. williamsi*), the size of *P. carinata* is much smaller (usually less than 20 mm cl) and it always bears a distinct lateral carina on the carapace [specimens from West Africa reported in CROSNIER and FOREST (1973) deposited at MNHN were examined]. In *P. williamsi*, only rudimentary lateral carina is sometimes present on the carapace and mainly in very large specimens.

Slight differences in the number of spines on the telson, the shape of the dactyli of the posterior pereiopods and abdominal pleuron V are also observed in the various populations. Although the telson has generally been described as having four pairs of dorsolateral spines in *P. williamsi* (FOREST, 1964; CROSNIER & FOREST, 1973), sometimes three or five pairs of dorsolateral spines are present and the number of spines on the left and right sides

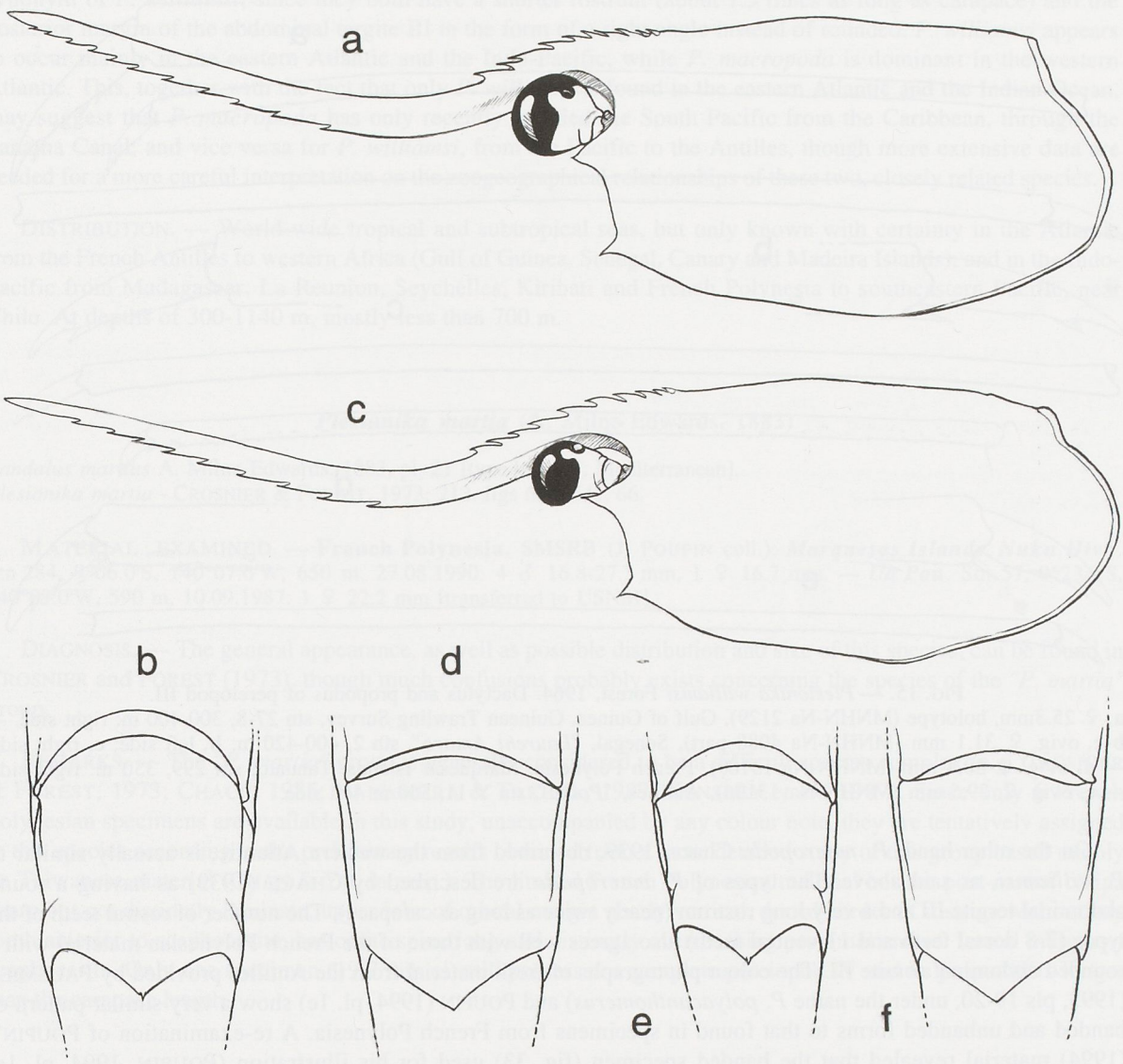


FIG. 14. — *Plesionika williamsi* Forest, 1964. **a-b**, ovig. ♀ 30.4 mm (MNHN-Na 13109), French Polynesia, Marquesas Islands, Tahuato, stn 299, 350 m: **a**, lateral view of carapace ; **b**, dorsal view of abdominal somite III. — **c-d**, ovig. ♀ 29.5 mm (MNHN-Na 13106), Antilles, *"Polka"*, stn Y11, 560 m: **c**, lateral view of carapace; **d**, dorsal view of abdominal somite III. — **e**, ♀ 25.3 mm, holotype (MNHN-Na 2129), Gulf of Guinea, Guinean Trawling Survey, stn 27-8, 300-400 m: dorsal view of abdominal somite III. — **f**, ♀ 29.0 mm (MNHN-Na 14376 part), Gulf of Guinea, Guinean Trawling Survey, stn 28-8, 380-400 m: dorsal view of abdominal somite III.

are often unequal (see CROSNIER, 1986a, figs 4d, g). Nevertheless, the South Pacific material usually has only three pairs of dorsolateral spines on the telson. The number of spinules on the posterior border (including the accessory spine) of the dactyli of posterior pereiopods varies from 1-4 (but mostly 2-3) and such variation can sometimes occur in the same specimen (fig. 15). Similarly, the posterolateral angle of abdominal pleuron V may be round to sharp, or produced into a distinct denticle, and the shape of the pleuron is sometimes different between the left and right sides in the same individual. Therefore, the differences suggested by CROSNIER (1986a) for the French Polynesian material appear to be unimportant.

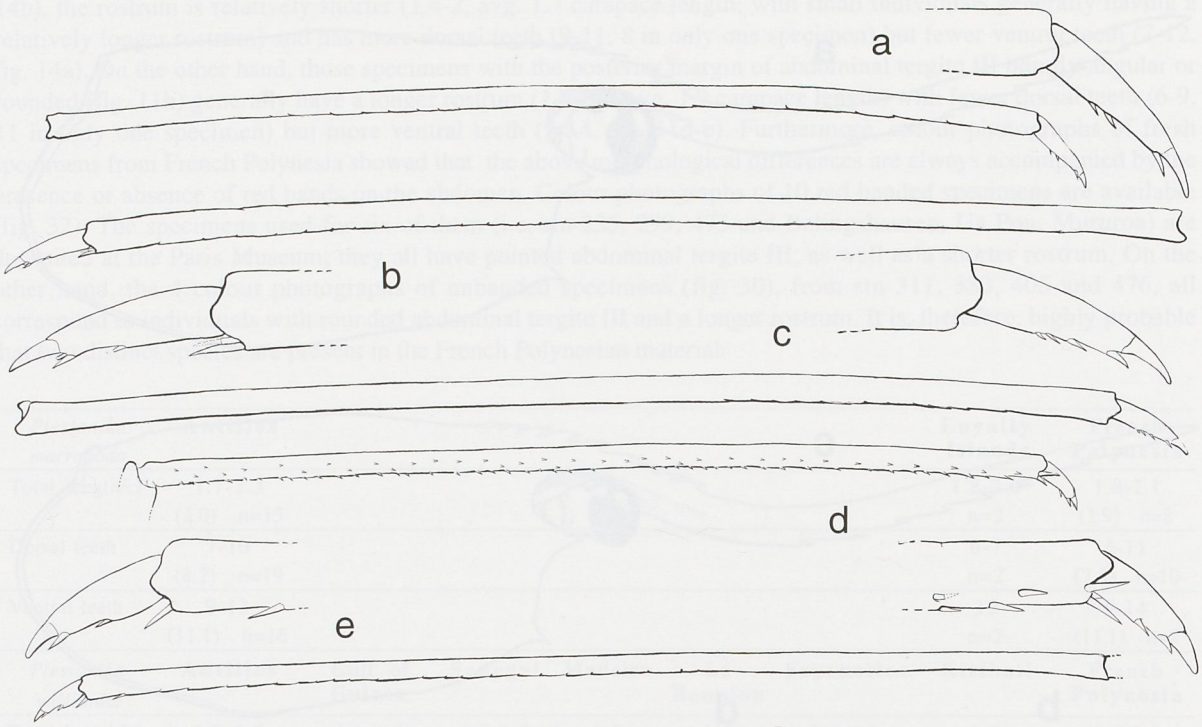


FIG. 15. — *Plesionika williamsi* Forest, 1964. Dactylus and propodus of pereiopod III.
a, ♀ 25.3mm, holotype (MNHN-Na 2129), Gulf of Guinea, Guinean Trawling Survey, stn 27-8, 300-400 m: right side. — **b-c**, ovig. ♀ 31.1 mm (MNHN-Na 4088 part), Senegal, *"Laurent Amaro"*, stn 2, 400-420 m: **b**, left side; **c**, right side. — **d**, ovig. ♀ 30.4 mm (MNHN-Na 13109), French Polynesia, Marquesas Islands, Tahuato, stn 299, 350 m: right side. — **e**, ovig. ♀ 29.5 mm (MNHN-Na 13106), Antilles, *"Polka"*, stn Y 11, 560 m: left side.

On the other hand, *P. macropoda* Chace, 1939, described from the western Atlantic, is actually similar to *P. williamsi*, as said above. The types of *P. macropoda* are described by CHACE (1939) as having a round abdominal tergite III and a very long rostrum (nearly twice as long as carapace). The number of rostral teeth of the types (7-8 dorsal teeth and 11 ventral teeth) also agrees well with those of the French Polynesian material with a rounded abdominal somite III. The colour photographs of fresh material from the Antilles provided by PAULMIER (1993, pls 19-20, under the name *P. polyacanthomerus*) and POUPIN (1994, pl. 1e) show a very similar pattern of banded and unbanded forms to that found in specimens from French Polynesia. A re-examination of POUPIN's (1994) material revealed that the banded specimen (fig. 33) used for his illustration (POUPIN, 1994, pl. 1e; specimen from Stn EP1, not CP1 as indicated in the caption) also has a pointed abdominal tergite III and a shorter rostrum (fig. 14c-d), while another specimen (from Stn 211, fig. 31) with colour photograph showing an unbanded abdomen has the typical characteristics of *P. macropoda* (fig. 11a-c). Therefore, it appears that two distinct forms are also present in the Antilles.

After comparing many specimens and colour photographs of fresh material from various localities in both the Indo-Pacific and Atlantic, we conclude that the name *P. williamsi* can probably be applied to the banded form with a pointed abdominal tergite III and shorter rostrum. For the unbanded form with a rounded abdominal tergite III and longer rostrum, the name *P. macropoda* seems to be appropriate for the time being, even if the differences observed between the Atlantic and the South Pacific specimens leave open the question of distinguishing the specimens of these two areas by two different specific names (see p. 208). Both species have a very wide geographical distribution and sometimes occur sympatrically (a situation which seems to be rather common in *Plesionika* for very similar species). If the above conclusion is correct, *P. crosnieri* Burukovsky, 1992 (junior homonym of *P. crosnieri* Chan & Yu, 1991) recently described from the southeastern Pacific, should be treated as a junior

synonym of *P. williamsi*, since they both have a shorter rostrum (about 1.5 times as long as carapace) and the posterior margin of the abdominal tergite III in the form of a right angle instead of rounded. *P. williamsi* appears to occur mainly in the eastern Atlantic and the Indo-Pacific, while *P. macropoda* is dominant in the western Atlantic. This, together with the fact that only *P. williamsi* is found in the eastern Atlantic and the Indian Ocean, may suggest that *P. macropoda* has only recently invaded the South Pacific from the Caribbean, through the Panama Canal, and vice versa for *P. williamsi*, from the Pacific to the Antilles, though more extensive data are needed for a more careful interpretation on the zoogeographical relationships of these two, closely related species.

DISTRIBUTION. — World-wide tropical and subtropical seas, but only known with certainty in the Atlantic from the French Antilles to western Africa (Gulf of Guinea, Senegal, Canary and Madeira Islands); and in the Indo-Pacific from Madagascar, La Reunion, Seychelles, Kiribati and French Polynesia to southeastern Pacific, near Chile. At depths of 300-1140 m, mostly less than 700 m.

Plesionika martia (A. Milne Edwards, 1883)

Pandalus martius A. Milne-Edwards, 1883, pl. 21 [type-locality: Mediterranean].
Plesionika martia - CROSNIER & FOREST, 1973: 212, figs 63d, 64e, 66.

MATERIAL EXAMINED. — **French Polynesia**. SMSRB (J. POUPIN coll.): ***Marquesas Islands. Nuku Hiva***. Stn 284, 9°06.0'S, 140°07.6'W, 650 m, 27.08.1990: 4 ♂ 16.8-27.3 mm, 1 ♀ 16.7 mm. — ***Ua Pou***. Stn 57, 9°23.0'S, 140°09.0'W, 590 m, 10.09.1987: 1 ♀ 22.2 mm [transferred to USNM].

DIAGNOSIS. — The general appearance, as well as possible distribution and size of this species, can be found in CROSNIER and FOREST (1973), though much confusions probably exists concerning the species of the *"P. martia"* group.

REMARKS. — The *"P. martia"* group is generally considered to be a difficult species complex (e.g. CROSNIER & FOREST, 1973; CHACE, 1985; HANAMURA & TAKEDA, 1987; KENSLEY *et al.*, 1987). Since only 6 French Polynesian specimens are available in this study, unaccompanied by any colour note, they are tentatively assigned to this species according to the preliminary results obtained from a more detailed study of this group based mainly on Taiwanese material (CHAN & YU, in prep.). The limited French Polynesian material has the post-rostral carina sharp but not distinctly laminate, upper lobe of orbital margin nearly vertical, dorsal border of rostrum without any tooth anterior to scaphocerite, basicerite spine long and distinctly overreaching proximal end of lateral margin of scaphocerite. Only one specimen (19.7 mm cl) still possesses a complete pereiopod IV and its propodus is longer than the carapace length.

Plesionika semilaevis Bate, 1888

Plesionika semilaevis Bate, 1888: 644, pl. 113 fig.3 (in part) [type-locality: the Philippines]. — CHACE, 1985: 113, figs 51-54.

MATERIAL EXAMINED. — **French Polynesia**. SMSRB (B. RICHER DE FORGES coll.): ***Tubuai Islands. Tubuai***. 800 m, 14.05.1979: 2 ♂ 16.1 and 17.8 mm.

DIAGNOSIS. — The general characters and other information such as possible distribution and size of this species can be referred to CHACE (1985), though it should be borne in mind that the taxonomy of the *"P. martia"* group is probably confused.

REMARKS. — Only two French Polynesian specimens are available in this study and they lack a colour record. Similar to the situation of the material identified as *P. martia* (A. Milne Edwards, 1883), these two specimens are here tentatively assigned to *P. semilaevis* according to the preliminary results of a more detailed study of the

"P. martia" group (CHAN & YU, in prep.). The French Polynesian material has the eye kidney shaped, post-rostral carina high and laminate; upper lobe of orbital margin strongly recurved backwards; basicerite spine very long and far exceeding proximal end of lateral margin of scaphocerite. The rostrum is broken and all the posterior pereiopods are incomplete in these two specimens.

Plesionika erythrocyclus sp. nov.

Figs 16, 34-35

Plesionika rostricrescentis - KING, 1984: 178, fig. Pr. [non Bate, 1888].
Plesionika sp. nov. 1 - POUPIN, 1996, pl. 4a.

MATERIAL EXAMINED. — **French Polynesia**. SMSRB (J.-L. CARSIN and J. POUPIN coll.): ***Tuamotu Islands***. ***Mururoa***. 350-600 m, 1984: 1 ovig. ♀ 10.7 mm (MNHN-Na 13123). — Stn 499, 21°47.6'S, 138°55.7'W, 200 m, 5.05.1996: 1 ovig. ♀ 11.6 mm (transferred to NTOU).

Tubuai Islands. ***Rurutu***. Stn 356, 22°30.3'S, 151°21.7'W, 260 m, 10.12.1990: 1 ovig. ♀ 10.6 mm (transferred to USNM).

Taiwan. ***North-eastern coast***, Su-Aou, I-Lan County, commercial trawler, about 300 m, 22.05.1990: 1 ♀ 10.3 mm (NTOU-P 1990-5-22).

TYPES. — The ovigerous female (10.7 mm cl) (MNHN-Na 13123) from Mururoa is the holotype. All the other specimens from Polynesia are paratypes.

DESCRIPTION. — Body somewhat robust in appearance. Rostrum with lateral carina distinct on basal half and not continuous with orbital margin, curving downward at base, but abruptly upturned after passing the eye, more or less (0.9-1.1) as long as carapace and just overreaching scaphocerite; dorsal border bearing only 2 small apical teeth and 1-2 fixed basal teeth above eye; ventral border with 7-9 evenly distributed teeth between level of eye and tip; post-rostral crest low and armed with 5-6 movable teeth (anteriormost one occasionally situated just above orbital margin). Orbital margin regularly concave, with lower lobe somewhat truncate. Eye subspherical and bearing distinct ocellus. Antennal spine large and elongate. Pterygostomian spine sharply pointed but small. Stylocerite tapered anteriorly and extending to around basal or middle part of distal segment of antennular peduncle. Scaphocerite 3.9-4.6 times as long as broad, with distolateral tooth more or less reaching distal margin of lamella. Basicerite spine moderately long and extending to proximal end of outer margin of scaphocerite.

Maxilliped III bearing well developed epipod and a long exopod, with penultimate segment 0.6-0.7 times as long as distal segment; overreaching scaphocerite by 1/3-1/2 of distal segment. Anterior four pereiopods all bearing well developed epipods. Pereiopod I overreaching scaphocerite by 1/2-4/5 propodus and entire dactylus. Pereiopod II bearing 20-22 carpal articles on the right side and 76-83 carpal articles on the left side, longer one exceeding scaphocerite by slightly more than lengths of dactylus, propodus and carpus. Pereiopod III exceeding scaphocerite by 2/3-3/4 of propodus and entire dactylus; dactylus conical, short, 0.14-0.15 times as long as propodus, posterior margin bearing 2-5 spinules, accessory spine about half to almost as long as, and abutting with, terminal spine. Pereiopods IV and V similar to pereiopod III, with pereiopod IV overreaching scaphocerite by 1/3-1/2 of propodus and entire dactylus, and pereiopod V by slightly more than length of dactylus.

Abdominal somite III slightly arched dorsally, with posterior margin convex. Both abdominal pleura IV and V each bearing a distinct posteroventral denticle. Telson 1.3-1.5 times longer than abdominal somite VI, with three pairs of dorsolateral and three pairs of terminal spines. Eggs suboval, about 0.4 mm in diameter.

COLORATION. — Body covered with orange-red tints and a few irregular yellowish stripes, each abdominal somite having a transverse white band near posterior border, somite I also bearing a broad transverse red band (the yellow stripes and white bands quickly fade when the specimens are less fresh). Eyes black. Dorsal surface of abdominal tergite III bearing a pair of large, white-margined, red circular spots, while that of tergite VI has a pair of smaller red spots. Tip of rostrum reddish. Thoracic appendages, antennal and antennular flagella with red bands. Exopods of uropods with two pairs of red dots along outer margin. Eggs a rather light orange.

SIZE. — Largest female 11.6 mm cl. Smallest ovigerous female 10.6 mm cl. Males unknown.

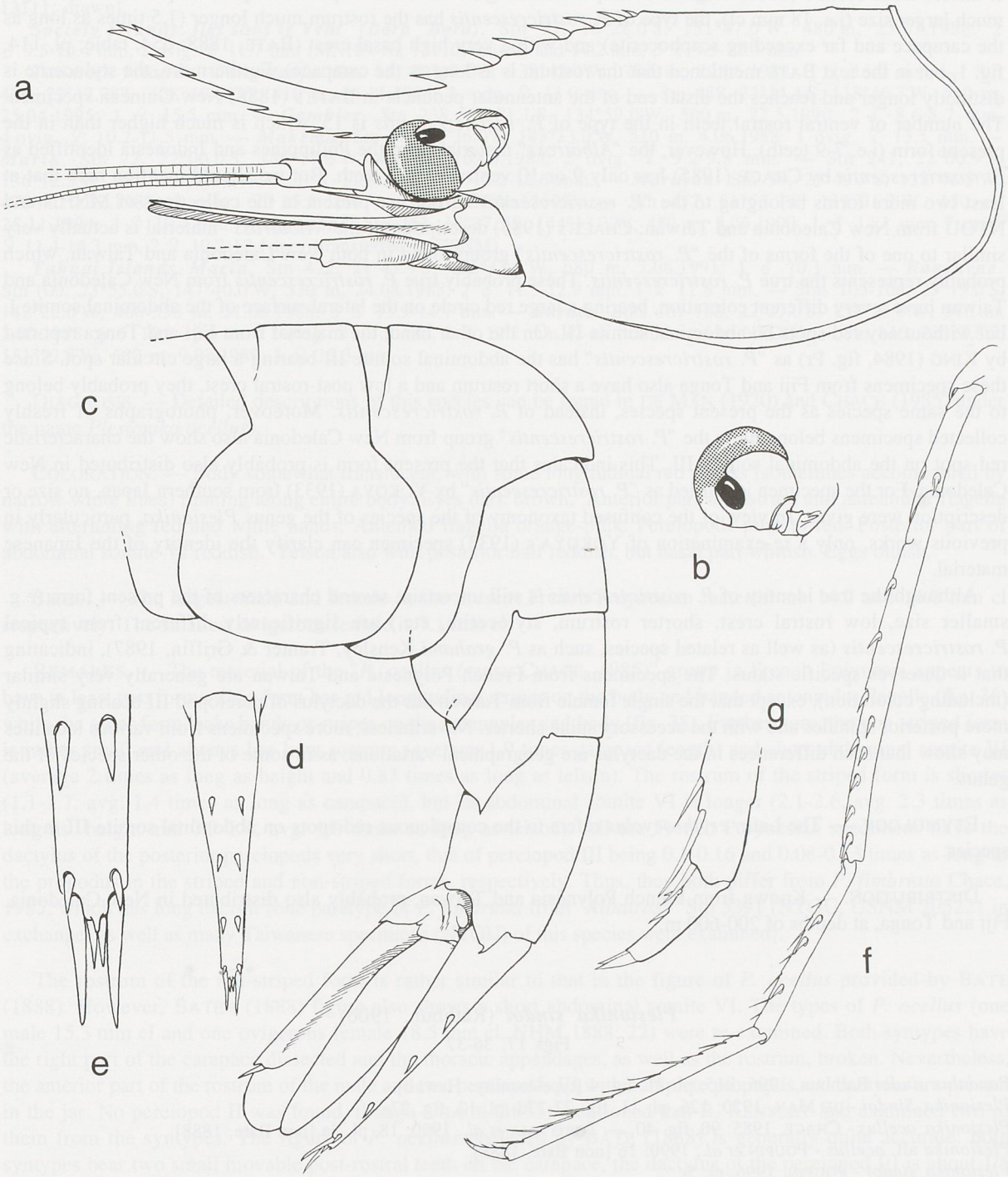


FIG. 16. — *Plesionika erythrocyclus* sp. nov. Ovig. ♀ 10.7 mm, holotype (MNHN-Na 13123), French Polynesia, Tuamotu Islands, Mururoa, 350-600 m: **a**, lateral view of carapace; **b**, eye; **c**, lateral view of abdomen and tailfan; **d**, dorsal view of telson; **e**, dorsal view of tip of telson; **f**, left pereiopod III; **g**, left dactyl of pereiopod III. Figures a-d and f at the same scale.

REMARKS. — The present species is very close to *P. rostricrescentis* (Bate, 1888), described from New Guinea. It differs from BATE's (1888) original description and figures in some important aspects. Apart from having a much larger size (i.e. 18 mm cl), the type of *P. rostricrescentis* has the rostrum much longer (1.5 times as long as the carapace and far exceeding scaphocerite) and with a very high basal crest (BATE, 1888: 654, table; pl. 114, fig. 1, but in the text BATE mentioned that the rostrum is as long as the carapace). Furthermore, the stylocerite is distinctly longer and reaches the distal end of the antennular peduncle in BATE's (1888) New Guinean specimen. The number of ventral rostral teeth in the type of *P. rostricrescentis* is 15, which is much higher than in the present form (i.e. 7-9 teeth). However, the *"Albatross"* material from the Philippines and Indonesia identified as *P. rostricrescentis* by CHACE (1985) has only 9 or 10 ventral rostral teeth. But we should mention here that at least two more forms belonging to the *"P. rostricrescentis"* group are present in the collections of MNHN and NTOU from New Caledonia and Taiwan; CHACE's (1985) description of the *"Albatross"* material is actually very similar to one of the forms of the *"P. rostricrescentis"* group found in both New Caledonia and Taiwan, which probably represents the true *P. rostricrescentis*. These probably true *P. rostricrescentis* from New Caledonia and Taiwan have a very different coloration, bearing a large red circle on the lateral surface of the abdominal somite I, but without any red spots on abdominal somite III. On the other hand, the material from Fiji and Tonga reported by KING (1984, fig. Pr) as *"P. rostricrescentis"* has the abdominal somite III bearing a large circular spot. Since these specimens from Fiji and Tonga also have a short rostrum and a low post-rostral crest, they probably belong to the same species as the present species, instead of *P. rostricrescentis*. Moreover, photographs of freshly collected specimens belonging to the *"P. rostricrescentis"* group from New Caledonia also show the characteristic red spot on the abdominal somite III. This indicates that the present form is probably also distributed in New Caledonia. For the specimen identified as *"P. rostricrescentis"* by YOKOYA (1933) from southern Japan, no size or description were given. In view of the confused taxonomy of the species of the genus *Plesionika*, particularly in previous works, only a re-examination of YOKOYA's (1933) specimen can clarify the identity of the Japanese material.

Although the true identity of *P. rostricrescentis* is still uncertain, several characters of the present form (e.g. smaller size, low rostral crest, shorter rostrum, stylocerite, etc.) are significantly different from typical *P. rostricrescentis* (as well as related species, such as *P. grahami* Kensley, Tranter & Griffin, 1987), indicating that it deserves specific status. The specimens from French Polynesia and Taiwan are generally very similar (including coloration), except that the single female from Taiwan has the dactylus of pereiopod III bearing slightly more posterior spinules and with the accessory spine shorter. Nevertheless, more specimens from various localities may show that such differences in the dactylus are geographical variations, as in some of the other species of the genus.

ETYMOLOGY. — The Latin *erythrocyclus* refers to the conspicuous red spots on abdominal somite III in this species.

DISTRIBUTION. — Known from French Polynesia and Taiwan, probably also distributed in New Caledonia, Fiji and Tonga, at depths of 200-600 m.

Plesionika sindoi (Rathbun, 1906)

Figs 17, 36-37

Pandalus sindoi Rathbun, 1906: 915, pl. 21, fig. 4 [type-locality: Hawaii].
Plesionika Sindoi - DE MAN, 1920: 126, pl. 11, fig. 27-27d, pl. 12, fig. 27e.
Plesionika ocellus - CHACE, 1985: 90, fig. 40. — TORIYAMA *et al.*, 1990: 18, pl. 3a [non Bate, 1888].
Plesionika aff. *ocellus* - POUPIN *et al.*, 1990: 16 [non Bate, 1888].
Plesionika sindoi - POUPIN, 1996, pl. 5c.
Not *Plesionika sindoi* - BALSS, 1925: 279, figs 49-52, pl. 26 [= *P. indica* De Man, 1917].

MATERIAL EXAMINED. — **Hawaii**. *"Albatross"*: stn 3998, vicinity of Kauai Island, 430-417 m, 14.06.1902: 2 ♂ 10.3 and 13.1 mm, syntypes (USNM).

French Polynesia. SMSRB (J. POUPIN coll.): ***Marquesas Islands. Fatu Hiva***. Stn 306, 10°31.1'S, 138°39.4'W, 250 m, 4.09.1990: 5 ovig. ♀ 7.1-7.9 mm (2 ex. transferred to NTOU); 1 ovig. ♀ 7.3 mm (MNHN-Na 13111, drawn).

Society Islands. Îles sous le Vent (Bora Bora). Stn 97, 16°28.0'S, 151°47.0'W, 480 m, 23.07.1988: 2 ♂ 9.5-10.4 mm, 2 ovig. ♀ 11.7 mm (MNHN-Na 13110, drawn) and 14.2 mm, 3 ♀ 9.5-12.0 mm.

Tuamotu Islands. Fangataufa. Stn 85, 22°13.0'S, 138°42.2'W, 780 m, 22.06.1988: 1 ♂ 11.2 mm. — Stn 438, 22°12.28'S, 138°46.64'W, 410 m, 14.11.1994: 1 ovig. ♀ 13.0 mm. — Stn 488, 22°14.4'S, 138°46.7'W, 510 m, 25.04.1995: 1 ♀ 15.5 mm. — ***Gambier***. Stn 238, 23°01.1'S, 134°59.0'W, 500 m, 27.5.1990: 2 ♂ 8.6-8.7 mm, 4 ovig. ♀ 10.2-11.5 mm. — ***Makemo***. Stn 68, 16°36.0'S, 143°33.0'W, 510 m, 4.06.1988: 1 ovig. ♀ 13.5 mm. — ***Maria***. Stn 72, 22°00.0'S, 136°17.0'W, 430 m, 10.06.1988: 2 ovig. ♀ 9.2-9.8 mm. — Stn 241, 22°00.9'S, 136°12.5'W, 380 m, 30.05.1990: 1 ♂ 11.3 mm, 5 ♀ 10.2-12.6 mm. — ***Mururoa***. Stn 39, 21°49.3'S, 138°46.5'W, 470 m, 2.12.1987: 2 ovig. ♀ 15.1-16.0 mm (MNHN-Na12525). — Stn 457, 21°53.9'S, 139°01.3'W, 450 m, 25.11.1994: 1 ♀ 10.7 mm. — ***Tuanake***. Stn 253, 16°37.3'S, 144°13.3'W, 450 m, 5.06.1990: 1 ♂ 14.1 mm, 7 ovig. ♀ 11.4-14.3 mm, 2 ♀ 10.2-12.1 mm (transferred to USNM).

Tubuai Islands. Maria. Stn 422, 21°47.9'S, 156°43.8'W, 680 m, 7.08.1991: 1 ♂ 10.1 mm. — ***Raevavae***. Stn 100, 23°55.0'S, 147°40.0'W, 530 m, 24.08.1988: 2 ♂ 11.5-12.9 mm, 1 ♀ 11.8 mm. — Stns 105-106, 23°19.0'S, 142°22.0'W, 460-550 m, 31.08.1988: 3 ♂ 13.9-14.7 mm. — ***Rurutu***. Stns 107-108, 22°27.0'S, 151°23.0'W, 570 m, 3.09.1988: 6 ♂ 10.8-12.6 mm, 1 ovig. ♀ 14.5 mm, 1 ♀ 12.2 mm (2 ex. transferred to NTOU). — Stn 146, 22°27.8'S, 151°22.8'W, 580 m, 9.03.1989: 1 ♀ 12.3 mm.

DIAGNOSIS. — Detailed descriptions of this species can be found in DE MAN (1920) and CHACE (1985, under the name *Plesionika ocellus*).

COLORATION. — Body somewhat translucent, with some longitudinal red stripes (sometimes accompanied by narrow white lines) running along entire body. Eyes dark brown. Anterior part of rostrum and antennular flagella with alternating red and white bands. Antennal flagella orange-pink. Pereiopods pink to red. Posterior part of abdominal somite VI reddish. Telson also with posterior half reddish, but basal part whitish. Eggs bluish.

SIZES. — The largest male and female in the present French Polynesian material are 14.7 and 16.0 mm cl respectively. The smallest ovigerous female is 7.1 mm cl.

REMARKS. — The material of the "*P. ocellus* (sensu CHACE, 1985)" group in French Polynesia appears to have at least two forms. One form has red longitudinal stripes on the body and banded antennular flagella (fig. 36) while the other form lacks bands or stripes on the antennules and body (fig. 38). Furthermore, the non-striped form is rather small and always has long rostrum (average 1.9 times carapace length) and short abdominal somite VI (average 2 times as long as height and 0.83 times as long as telson). The rostrum of the striped form is shorter (1.1-1.7, avg. 1.4 times as long as carapace), but its abdominal somite VI is longer (2.1-2.6, avg. 2.3 times as long as height and 0.9-1.1, avg. 1.0 times as long as telson). All the French Polynesian specimens have the dactylus of the posterior pereiopods very short, that of pereiopod III being 0.1-0.16 and 0.08-0.13 times as long as the propodus in the striped and non-striped forms, respectively. Thus, they both differ from *P. fimbriata* Chace, 1985, which has long dactyli [one paratype of *P. fimbriata* from *"Albatross"* Stn 5391 (NTOU, USNM 205221 in exchange) as well as many Taiwanese specimens (NTOU) of this species were examined].

The rostrum of the red-striped form is rather similar to that in the figure of *P. ocellus* provided by BATE (1888). However, BATE's (1888) figure also shows a short abdominal somite VI. The types of *P. ocellus* (one male 15.3 mm cl and one ovigerous female 18.5 mm cl, NHM 1888: 22) were re-examined. Both syntypes have the right part of the carapace dissected and the thoracic appendages, as well as the rostrum, broken. Nevertheless, the anterior part of the rostrum of the male and two pereiopods III with complete propodus and dactylus are present in the jar. No pereiopod II was found, though CHACE (1985) mentioned that B. KENSLEY had examined two of them from the syntypes. The figure of *P. ocellus* provided by BATE (1888) is generally quite accurate: both syntypes bear two small movable post-rostral teeth on the carapace, the dactylus of the pereiopod III is about 1/5 the length of the propodus, and the telson is almost 1.5 times longer than abdominal somite VI. Surprisingly, a distinct posteroventral denticle is present on the abdominal pleuron IV in both syntypes. Therefore, the characteristics of the types of *P. ocellus* conform well to *P. chacei* described by HAYASHI (1986) from Japan [two

specimens of this species from Taiwan (NTOU) were compared]. Thus, *P. ocellus* (Bate, 1888) must be considered as a senior synonym of *P. chacei* Hayashi, 1986 (new synonymy).

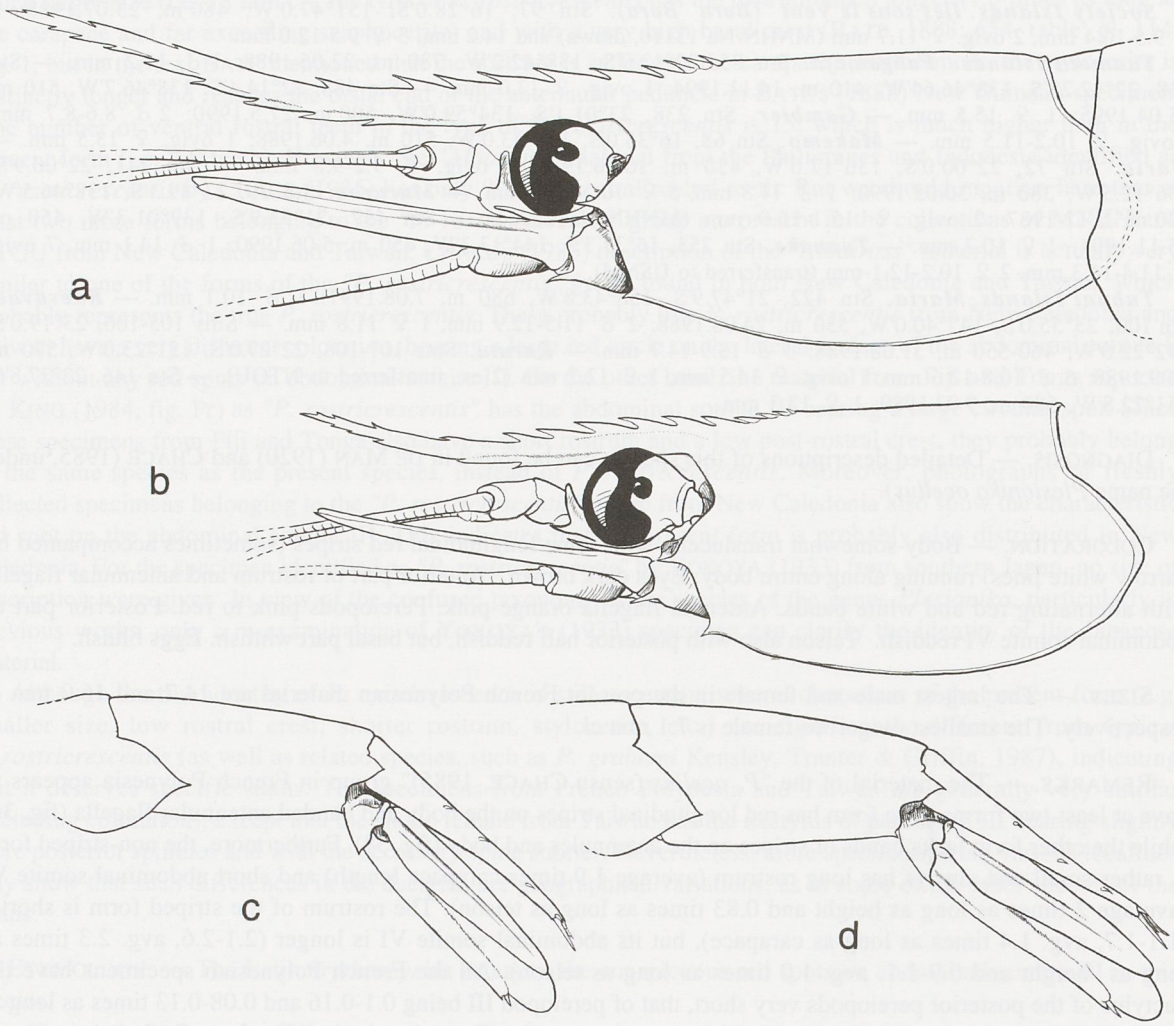


FIG. 17. — *Plesionika sindoi* (Rathbun, 1906). **a**, **c**, ovig. ♀ 11.7 mm (MNHN-Na 13110), French Polynesia, Society Islands, Bora Bora, st. 97, 480 m: **a**, lateral view of carapace; **c**, lateral view of posterior abdomen and tailfan. — **b**, **d**, ovig. ♀ 7.3 mm (MNHN-Na 13111), French Polynesia, Marquesas Islands, Fatu Hiva, stn 306, 250 m: **b**, lateral view of carapace; **d**, lateral view of posterior part of abdomen and tailfan.

With respect to RATHBUN's (1906) *P. sindoi*, an examination of two male syntypes from Hawaii (USNM) shows that they both lack posteroventral denticle on the abdominal pleuron IV and generally are similar to CHACE's (1985) *P. ocellus* from the Philippines [9 ex., 8.3-12.9 mm cl, *"Albatross"* Stn 5519, 8°47'N, 123°31'15"E, 333 m, 9.8.1909, were examined (NTOU, USNM 221351 in exchange)] as well as to the Indonesian material reported by DE MAN (1920). Thus, the name *P. sindoi* should be revived and CHACE's (1985) Philippines material actually belongs in this species. For RATHBUN's (1906) "? *P. ocellus*", an examination of specimens from the lot used for her illustration [RATHBUN, 1906, pl. 21, fig. 1; *"Albatross"* Stn 3858, Hawaii, Pailolo Channel, Mokuhooniki Islet, 35°N, 8°01'E, 234-252 m, 9.04.1902, 2 males 14.0-14.7 mm cl, 1 ovig. female 11.3 mm cl (NTOU, USNM 30495 in exchange)] shows that they all have a posteroventral denticle on abdominal

pleuron IV and belong to the true *P. ocellus*, instead of *P. fimbriata* as considered by CHACE (1985). Generally, the body of *P. ocellus* is more robust than in *P. sindoi*, while that of *P. fimbriata* is somewhat intermediate. The rostrum of the smaller male syntype of *P. sindoi* (i.e. the specimen of pl. 21, fig. 4 in RATHBUN, 1906) is 1.48 times carapace length and has four movable post-rostral teeth. The rostrum of the larger male is broken, but three movable post-rostral teeth are present on the carapace. As for the posterior three pereiopods, only the right pereiopod IV is still attached to the body in the larger male and its dactylus is 0.09 times as long as the propodus. Only a loose pereiopod V was found in the jar and the dactylus is 0.06 times as long as the propodus. The abdominal somites VI of the two syntypes are 2.2 and 2.4 times as long as high and 0.96 times as long as the telson. Therefore, the striped form of the French Polynesian material with relatively shorter rostrum, but longer abdominal somite VI, fits well with the characteristics of *P. sindoi*, while the non-striped form proves to be new and is described below as *P. protati* sp. nov.

The intensity of the red longitudinal stripes on the body appears to be rather variable in the present species (the coloration of the Japanese material was figured by TORIYAMA *et al.* (1990, pl. 3a, under the name *P. ocellus*). In large individuals, the stripes are broad and deep in colour but in small specimens they are somewhat pale. Furthermore, the rostrums of small ovigerous females (particularly those from Stn 306, figs 17b, 37) are rather short, and their eggs are somewhat greenish. The shape of the accessory spines on the dactyli of the posterior pereiopods also appears to be variable in the present species. In the types (only dactylus of pereiopod IV still present) and small individuals of the French Polynesian material, the accessory spine is about half as long as, and abuts with, the terminal spine. However, in large individuals of the French Polynesian material the accessory spine is shorter and well separated from the terminal spine, as in CHACE's (1985, fig. 40g) Philippines specimens. Since specimens with intermediate characteristics can be found, they are all identified as the same species for the time being. On the other hand, the report of the present species from the Nicobar Islands by BALSS (1925) clearly represents *P. indica* De Man, 1917, whereas that by CALMAN (1939) from the Gulf of Aden is probably correct. The exact identities of the specimens reported as *P. ocellus* by ALCOCK (1901) from the Andaman Sea, by PARISI (1919) from Japan, and by HANAMURA and TAKEDA (1987) from northwest Australia are unclear.

DISTRIBUTION. — West and South Pacific: known with certainty from Japan, South China Sea, the Philippines, Indonesia, Hawaii and French Polynesia. Probably also present in the Indian Ocean (see "Remarks" above). At depths of 150-800 m, mostly between 300-600 m.

Plesionika protati sp. nov.

Figs 18, 38

Plesionika sp. nov. 4 - POUPIN, 1996, pl. 4h.

MATERIAL EXAMINED. — **French Polynesia**. SMSRB (J. POUPIN coll.): ***Marquesas Islands. Fatu Hiva***. Stn 303, 10°31.4'S, 138°39.2'W, 210 m, 3.09.1990: 12 ovig. ♀ 7.8-12.5 mm, 4 ♀ 7.9-10.3 mm (MNHN-Na 13182). — ***Nuku Hiva (baie Anaho)***. Stn 495, 8°45.4'S, 140°03.7'W, 230 m, 11.02.1996: 5 ovig. ♀ 8.8-12.2 mm (MNHN-Na 13274). — ***Tahuata***. Stn 300, 9°54.5'S, 139°07.9'W, 190 m, 1.09.1990: 1 ovig. ♀ 9.5 mm (MNHN-Na 13271, drawn), 14 ovig. ♀ 7.2-9.9 mm, 1 ♀ 8.3 mm (2 ex. transferred to NTOU, others to USNM).

TYPES. — The ovigerous female (9.5 mm cl) from the Marquesas Islands (Tahuata) is the holotype (MNHN-Na 13271). The other specimens are paratypes.

DESCRIPTION. — Body of slender appearance. Rostrum long and far overreaching scaphocerite, about 1.9 (1.8-2.2) times as long as carapace length, slightly S-shaped and armed throughout length with 8-12 dorsal and 6-10 ventral teeth. Three-4 post-rostral teeth present on carapace, 2-4 of them with basal sutures and slightly movable. Orbital margin regularly concave, with lower lobe very slightly convex. Eye subspherical, bearing a distinct ocellus. Both antennal and pterygostomian spines well developed, former elongated and much longer than latter. Stylocerite tapered anteriorly and just exceeding basal segment of antennular peduncle. Scaphocerite 5.3-6.6 times

as long as broad, with distolateral tooth overreaching distal margin of lamella. Basicerite spine moderately long, more or less reaching proximal end of outer margin of scaphocerite.

Maxilliped III bearing well developed epipod and long exopod, with penultimate segment 1.3-1.4 times as long as distal segment, overreaching scaphocerite by 1/2-1/3 of penultimate segment and entire length of distal segment. Well developed epipods present on anterior four pereiopods. Pereiopod I overreaching scaphocerite by about 1/2 carpus and other distal segments. Pereiopods II subequal and bearing 20-23 carpal articles, exceeding scaphocerite by 1/2-3/5 carpus and other distal segments. Pereiopod III exceeding scaphocerite by slightly more than lengths of dactylus, propodus and carpus, with dactylus short and 0.10-0.16 times as long as propodus; dactylus elongate, conical and lacking spinules on posterior border, with accessory spine half to almost as long as, and abutting, terminal spine. Posterior two pereiopods similar to pereiopod III, with pereiopod IV exceeding scaphocerite by about carpus and pereiopod V by 2/3-3/4 carpus as well as other distal segments.

Abdominal somite III slightly arched dorsally and with posterior margin convex. Posteroventral denticle present on abdominal pleuron V, but absent on pleuron IV. Abdominal somite VI about twice (1.8-2.4) as long as high. Telson 1.0-1.3 (avg. 1.2) times longer than abdominal somite VI, with three pairs of dorsolateral and three pairs of terminal spines. Eggs suboval, about 0.5 mm in diameter.

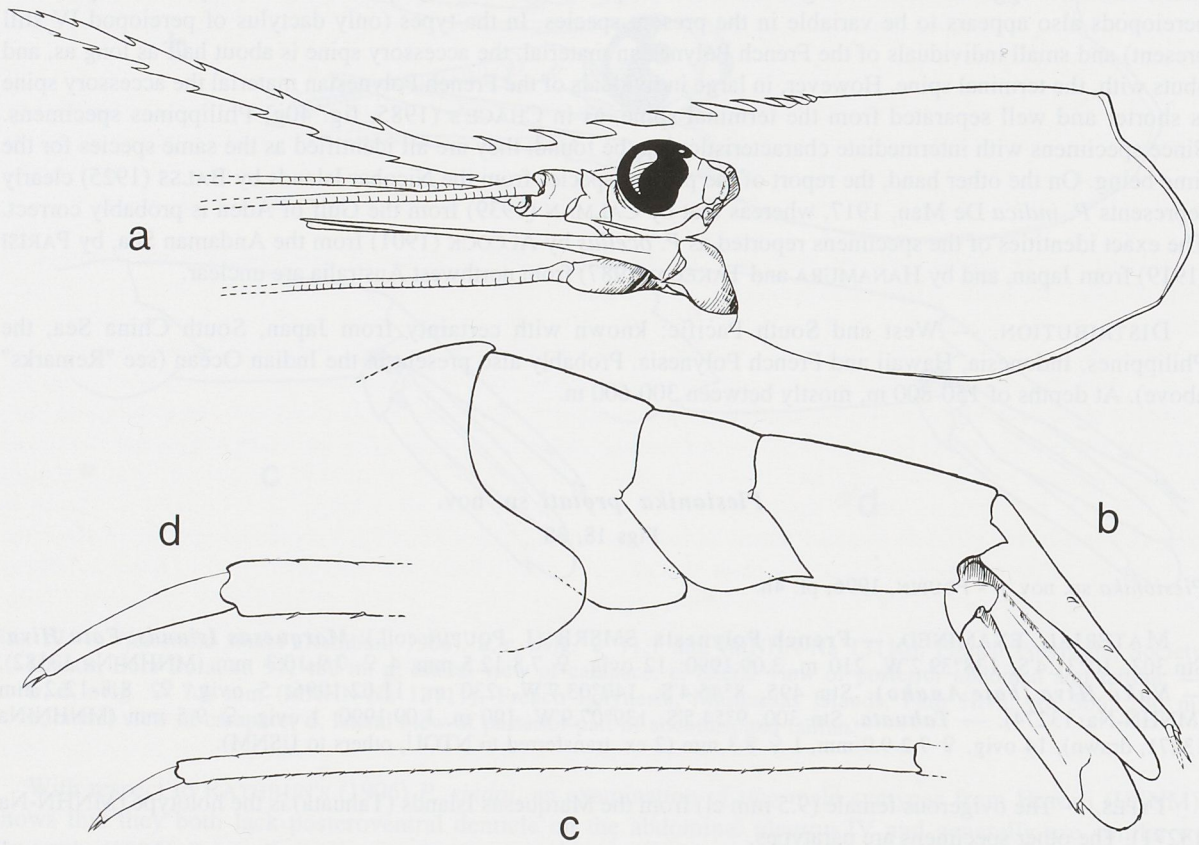


FIG. 18. — *Plesionika protati* sp. nov. Ovig. ♀ 9.5 mm, holotype (MNHN-Na 13271), French Polynesia, Marquesas Islands, Tahuata, stn 300, 190 m: **a**, lateral view of carapace; **b**, lateral view of posterior part of abdomen and tailfan; **c-d**, dactylus and propodus of left pereiopod III.
Figures a-b at the same scale.

COLORATION. — Body translucent and slightly red. Eyes dark brown. Antennular flagella white, antennal flagella reddish. Tip of rostrum reddish. Pereiopods mainly white. Pleopods slightly reddish, with lateral margins

somewhat whitish. Distal margins of uropods yellow. Organs inside the carapace visible as reddish. Eggs bluish to turquoise.

SIZE. — Largest female 12.5 mm cl. Smallest ovigerous female 7.2 mm cl. Males unknown.

REMARKS. — Other than having a smaller size and different coloration, the present form has a longer rostrum and shorter abdominal somite VI than *P. sindoi* (Rathbun, 1906). The shortest rostrum recorded for the present form is 1.8 times carapace length, which is just longer than the longest rostrum found in *P. sindoi* (1.7 times carapace length). The abdominal somite VI of *P. sindoi* is always more than 2.1 times as long as high and often as long as or longer than the telson. However, in the present form the abdominal somite VI is always shorter than the telson and with only four specimens having the abdominal somite VI more than 2.1 times as long as high. The shape of the rostral teeth situated above the orbit is also somewhat different between the two forms: those of *P. sindoi* have very wide bases (much wider than high) and the dorsal margin somewhat concave, whereas those of *P. protati* are more slender (base narrower than high) and with the dorsal margin somewhat convex. Thus, it seems justified to separate the present form from *P. sindoi*.

The specimens from northwestern Australia reported by HANAMURA and TAKEDA (1987) as *P. ocellus* are all in very poor conditions (rostrum, all pereiopods, and telson incomplete). It is not known whether they belong to *P. fimbriata* Chace, 1985, *P. sindoi* or the present new species. HANAMURA and TAKEDA (1986) mentioned that the specimens have the abdominal somite VI about 1.8 times as long as high, but in their figure it is more than twice as long as high!

ETYMOLOGY. — This new species is named after Charles PROTAT, Captain of the fishing vessel *"Marara"*, for his excellent help in collecting most of the specimens for this study.

DISTRIBUTION. — Only known with certainty from French Polynesia, at depths of 190-210 m.

Plesionika payeni sp. nov.

Figs 19, 39

Plesionika sp. nov. 5 - POUPIN, 1996, pl. 5g.

MATERIAL EXAMINED. — **French Polynesia**. SMSRB (J. POUPIN coll.): ***Tuamotu Islands***. ***Mururoa***. Stn 475, 21°51.2'S, 139°00.6'W, 250 m, 11.04.1995: 1 ovig. ♀ 8.2 mm (MNHN-Na 13272). — Stn 499, 21°47.6'S, 138°55.7'W, 200 m, 5.05.1996: 1 ovig. ♀ 8.4 mm (MNHN-Na 13273).

TYPES. — The ovigerous female (8.4 mm cl) (MNHN-Na 13273) collected at station 499 of the *"Marara"*, off Mururoa (Tuamotu Islands), is the holotype. The other specimen (station 475) is a paratype.

DESCRIPTION. — Rather small, with body slender. Rostrum with lateral carina in basal half, continuous with orbital margin, slightly curving downwards in basal part, but distinctly curved upwards after passing antennular peduncle, far exceeding scaphocerite and 1.6 times as long as carapace length; holotype with dorsal border, (fig. 19e), bearing 7 teeth (including one subapical tooth), with distal teeth smaller and further apart; ventral border armed with 6 teeth, posteriormost tooth large, situated just above second segment of antennular peduncle and far away from other ventral teeth, which are restricted to distal 2/5 of rostrum and separated by slightly decreasing space from base to tip; in the paratype (fig. 19a), the tip of the rostrum is broken and only 5 dorsal and 4 ventral teeth can be seen. Post-rostral carina not particularly elevated, bearing 5 movable post-rostral teeth. Orbital margin with feeble upper and lower lobes, middle part regularly concave. Eye subspherical and bearing a distinct ocellus. Antennal and pterygostomian spines both well developed. Stylocerite sharply pointed and strongly curving upwards, more or less extending to distal end of basal segment of antennular peduncle. Scaphocerite 4.4-5.3 times as long as broad, with distolateral tooth distinctly exceeding distal margin of lamella. Basicerite spine sharp but short, just failing to reach proximal end of outer margin of scaphocerite.

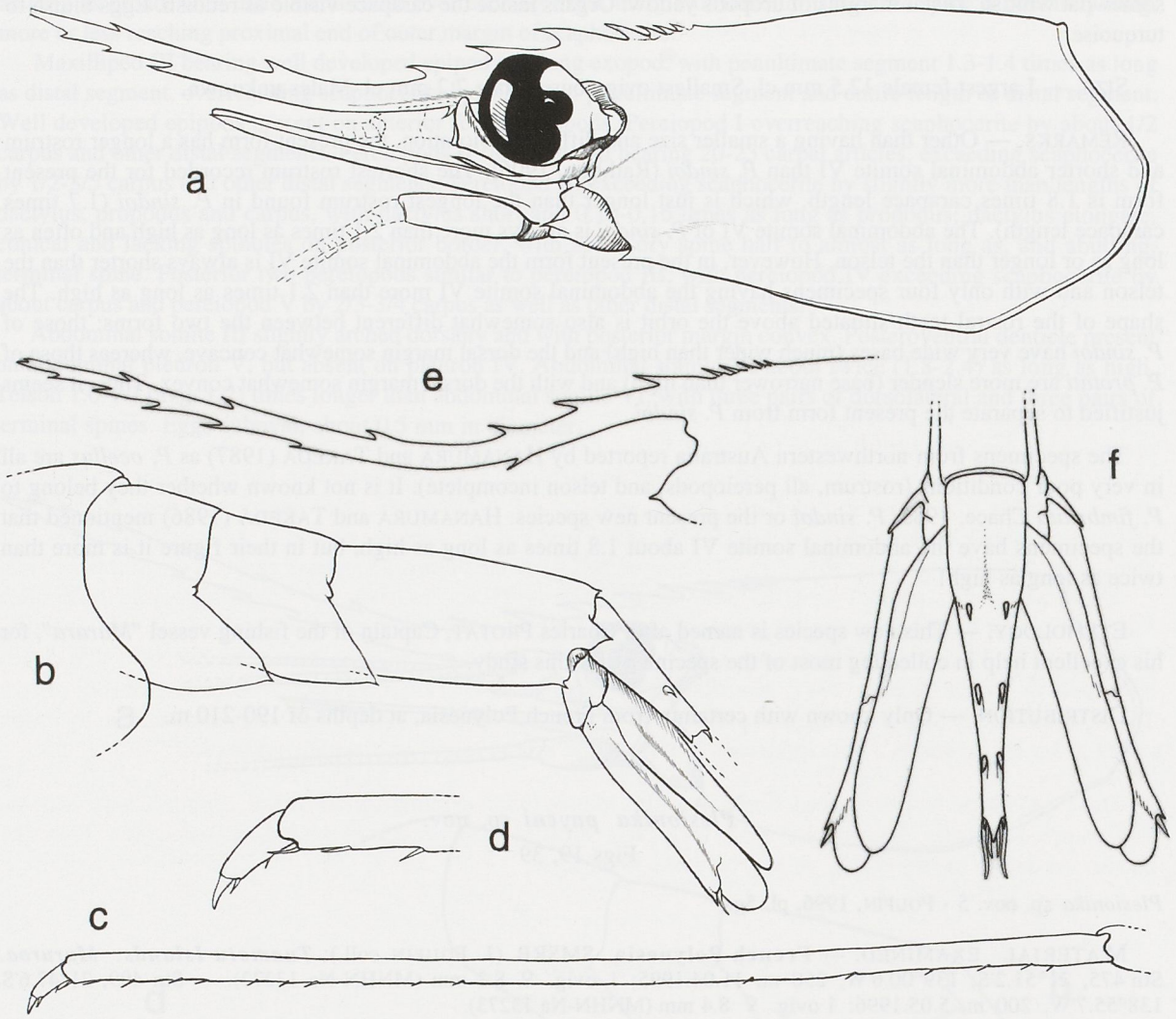


FIG. 19. — *Plesionika payeni* sp. nov. **a-d**: ovig. ♀ 8.2 mm, paratype (MNHN-Na 13272), French Polynesia, Tuamotu Islands, Mururoa, stn 475, 250 m: **a**, lateral view of carapace; **b**, lateral view of posterior part of abdomen and tailfan; **c-d**, propodus and dactylus of pereiopod III. — **e-f**: ovig. ♀ 8.4 mm, holotype (MNHN-Na 13273), *ibidem*, st. 499, 200 m: **e**, rostrum; **f**, telson and uropods. Figures a-b at the same scale.

Maxilliped III bearing a small but distinct epipod and a long ramous exopod, with penultimate segment 1.0-1.1 times as long as distal segment; overreaching scaphocerite by about 1/4 of penultimate segment and entire distal segment. Anterior four pereiopods bearing small to rudimentary epipods; that on pereiopod I small but distinct, while those of other pereiopods are progressively more reduced posteriorly, those of pereiopods III and IV nearly absent. Pereiopod I overreaching scaphocerite by 1/3-1/2 carpus as well as other distal segments. Pereiopods II subequal, with 20-22 carpal articles, exceeding scaphocerite by lengths of dactylus, propodus and 1/2-2/3 of carpus. Pereiopod III exceeding scaphocerite by lengths of dactylus, propodus, carpus and about 1/5 of merus; dactylus conical and short, 0.05-0.06 as long as propodus, posterior margin bearing only one spinule near middle, accessory spine about half as long as terminal spine and well separated from latter. Posterior two pereiopods similar to pereiopod III, with pereiopod IV overreaching scaphocerite by entire carpus and pereiopod V by 4/5 carpus as well as other distal segments.

Abdominal somite III very slightly arched dorsally, with posterior margin convex. Abdominal pleura IV and V both bearing a distinct posteroventral denticle. Abdominal somite VI 2.4-2.5 times as long as high. Telson very slightly longer (1.04 times) than abdominal somite VI, with three pairs of dorsolateral and three pairs of terminal spines. Eggs suboval, about 0.4 mm in diameter.

COLORATION. — Body yellowish, bearing a lateral white line and a longitudinal red stripe along dorsal midline. A discontinuous, longitudinal red line also present laterally on carapace. Rostrum with anterior two thirds reddish, posterior third transparent. Eyes dark brown. Outer margin of scaphocerite reddish. Antennular flagella whitish; antennal flagella reddish. Pereiopods reddish, with dactyli whitish, basal segments somewhat yellowish. Abdomen yellowish, but abdominal somite VI and tailfan entirely covered with broad, longitudinal red and white stripes. Eggs light blue.

SIZE. — Only two specimens are known, both ovigerous females, of 8.2 and 8.4 mm cl.

REMARKS. — This small and colourful species can be readily separated from most of the other species of the genus by having reduced epipods on the maxilliped III and four anterior pereiopods. The other characters, such as rostrum moderately long and bearing only a few teeth on both the dorsal and ventral borders, post-rostral teeth not crest-like, pereiopods II subequal, both abdominal pleura IV and V bearing a distinct posteroventral denticle and telson having three dorsolateral spines, align it somewhat with the true *P. ocellus* (Bate, 1888). Apart from the fact that the epipods on the anterior four pereiopods are all well developed in *P. ocellus*, this French Polynesian form is much smaller in size and has a very different coloration (e.g. fig. 39 and HAYASHI, 1986, fig. 82). Moreover, the arrangement of rostral teeth (particularly the posteriormost ventral tooth being separated very far from the other teeth in the French Polynesian material), the length of abdominal somite VI, and the shape of the orbital margin and dactyli of the posterior pereiopods, are very different between the two species.

The epipods of maxilliped III and the anterior four pereiopods in this French Polynesian form are all small and progressively reduced posteriorly, with that of pereiopod II already very minute and those of pereiopods III and IV almost absent. Therefore, the epipods of the pereiopods may easily be overlooked, as in the species of the "*P. edwardsii* (Brandt, 1851)" group. Nevertheless, it can still be readily separated from those poorly known species described as lacking epipods on the pereiopods [e.g. *P. minor* Calman, 1939 and *P. costelloi* (Yaldwyn, 1971)] by the shape of the rostrum (e.g. length and arrangement of rostral teeth) and pereiopods (e.g. relative length of left and right pereiopod II, shape of dactyli of posterior pereiopods). Hence there is little doubt that this French Polynesian species is new to science.

Only two specimens of this new species were available in the present study. The holotype is intact (though with some pereiopods detached) but the paratype has the tip of the rostrum broken (still carrying five dorsal and four ventral teeth) and the telson broken in half. However the specimens are essentially identical in all other respects.

ETYMOLOGY. — This new species is named after Dr C. PAYEN, head of SMSRB, for his constant help and interest in the deep water fauna studies of French Polynesia.

DISTRIBUTION. — At present only known from Tuamotu Islands (Mururoa) in French Polynesia, at depths of 200-250 m.

Plesionika picta sp. nov.

Figs 20, 40

Plesionika sp. nov. 2 - POUPIN, 1996, pl. 4f.

MATERIAL EXAMINED. — **French Polynesia**. SMSRB (J. POUPIN coll.). ***Marquesas Islands. Ua Pou (Vaiehu Bay)***. Stn 60, 9°23.0'S, 140°09.0'W, 520 m, 26.01.1988: 1 ♀ 14.4 mm (MNHN-Na 13067).

Tuamotu Islands. Fangataufa. Stn 440, 22°14.06'S, 138°47.74'W, 650 m, 15.11.1994: 1 ♂ 12.5 mm, 1 ♀ 13.4 mm [transferred to NTOU]. — ***Gambier***. Stn 74, 23°08.0'S, 134°53.0'W, 660 m, 10.06.1988: 1 ♂ 12.3 mm (MNHN-Na 13069).

Tubuai Islands. Maria. Stn 422, 21°47.9'S, 154°43.8'W, 680 m, 7.08.1991: 2 ♂ 11.2 and 15.2 mm, 1 ovig. ♀ 14.8 mm; 1 ♀ 11.1 mm [transferred to USNM]. — ***Rurutu***. Stn 107-108, 22°27.0'S, 151°23.0'W, 570 m, 3.09.1988: 1 ♂ 15.2 mm, 1 ♀ 10.2 mm (MNHN-Na 13070). — Stn 146, 22°27.8'S, 151°22.8'W, 580 m, 9.03.1989: 1 ♂ 14.8 mm (MNHN-Na 13124, drawn); 1 ♂ 13.4 mm (MNHN-Na 13289, drawn); 2 ♂ 13,4 and 15.5 mm, 1 ♀ 12.8 mm (MNHN-Na 13066). — Stn 399, 22°28.4'S, 151°23'W, 710 m, 27.11.1990: 2 ♂ 12.3 and 15.8 mm (MNHN-Na 13068).

TYPES. — The male (14.8 mm cl) collected at station 146 of the *"Marara"*, off Rurutu (Tubuai Islands), is the holotype (MNHN-Na 13124). The other specimens are paratypes.

DESCRIPTION. — Body somewhat robust in appearance. Rostrum with lateral carina very strong in basal half and more or less continuous with orbital margin, basal half rather broad and nearly horizontal, while distal half is narrow and gently to distinctly curved upwards, overreaching scaphocerite, and about 0.9 times (0.8-1.1) as long as carapace; dorsal border bearing 2-5 (mostly 3-4) teeth, dorsal teeth generally restricted to basal 3/5 of rostrum; ventral border with 5-10 (mostly 8-9) evenly distributed teeth. Post-rostral carina elevated and somewhat lamellate but not crest-like; 7-10 post-rostral teeth present, with anteriormost tooth (very rarely anterior two teeth) fixed, while posterior 6-9 teeth are movable and bear a distinct basal suture. Orbital margin with upper lobe nearly straight and dorsally slightly inclined forwards, middle part regularly concave, while lower lobe is slightly convex. Eye roughly kidney-shaped, bearing a distinct ocellus. Antennal spine absent (replaced by a broad angle) or minute. Pterygostomian spine small but sharply pointed. Stylocerite narrow and tapered distally, strongly curving upwards and extending to distal end of basal segment or middle of second segment of antennular peduncle. Scaphocerite 3.1-3.9 (avg. 3.6) times as long as broad, with distolateral tooth more or less reaching distal margin of lamella. Basicerite spine moderately long and just overreaching proximal end of outer margin of scaphocerite.

Maxilliped III bearing well developed epipod and long strip-like exopod, with penultimate segment 0.9-1.0 times as long as distal segment; overreaching scaphocerite by more or less entire distal segment. Anterior two pereiopods bearing well developed epipods, epipod on pereiopod III smaller and sometimes even rudimentary, pereiopods IV almost always lacking epipod (see Remarks below) and pereiopods V always without. Pereiopod I overreaching scaphocerite by lengths of dactylus, propodus and 1/3-1 of carpus. Pereiopods II subequal, bearing 15-21 (av. 17) carpal articles, exceeding scaphocerite by lengths of dactylus, propodus and 2/5-1/2 of carpus. Pereiopod III exceeding scaphocerite by entire carpus and a small part of merus (up to 1/5) as well as other distal segments; dactylus conical, short, 0.08-0.13 (av. 0.10) times as long as propodus, posterior margin usually bearing one spinule, accessory spine abutting, and slightly shorter than, terminal spine. Posterior two pereiopods similar to pereiopod III, with pereiopod IV overreaching scaphocerite from 2/3 carpus to a small part of merus and pereiopod V by 1/2-4/5 carpus as well as other distal segments.

Abdominal somite III slightly arched dorsally, with posterior margin convex. Both abdominal pleura IV and V bearing a distinct posteroventral denticle. Telson 1.3-1.5 times longer than abdominal somite VI, with four pairs of dorsolateral and three pairs of terminal spines. Eggs suboval, about 0.4 mm in diameter.

COLORATION. — Carapace reddish, with posterior margin white. Rostrum transparent, but with tip reddish. Eyes dark brown. Thoracic appendages and antennal flagella reddish. Antennular flagella reddish, but with a white band at middle. Abdomen and tailfan almost transparent, with alternated broad red and white bands on somites I to V. Pleopods mostly transparent.

SIZE. — Largest female (ovigerous) 14.8 mm cl. and largest male 15.8 mm cl. Only the largest female is ovigerous.

REMARKS. — The present form differs from most other species of the genus in bearing epipods on the anterior three pereiopods, but lacking them on the last two. At present, only *P. intermedia* Chace, 1985 from the Philippines has such an arrangement of epipods on the pereiopods in the genus. However, almost all the major characters are different between the present species and *P. intermedia*, which belongs to the "*P. martia* (A. Milne Edwards, 1883)" group. The general appearance (ignoring the gill formula) of the present form (e.g. many movable

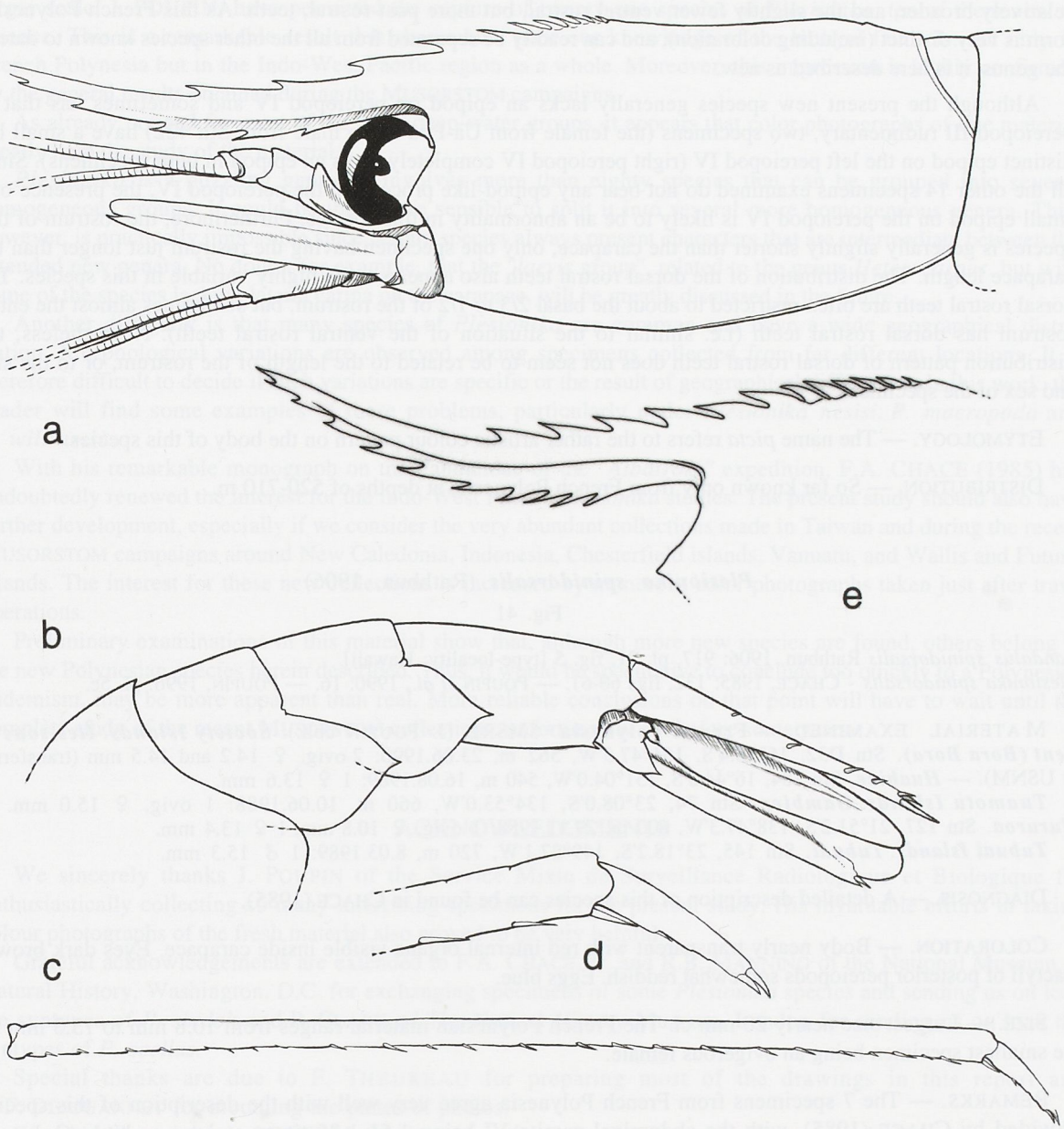


FIG. 20. — *Plesionika picta* sp. nov. ♂ 14.8 mm, holotype (MNHN-Na 13124), French Polynesia, Tubuai Islands, Rurutu, stn 146, 580 m: **a**, lateral view of carapace; **b**, lateral view of posterior part of abdomen and tailfan; **c-d**, propodus and dactylus of pereiopod III. — **e**, ♂ 13.4 mm, paratype (MNHN-Na 13289), *ibidem*, rostrum.
Figures a-b at the same scale.

post-rostral teeth, pereiopod II subequal, four distolateral spines on telson, etc.), indicates that it is more closely related to the "*P. carsini* Crosnier, 1986" group. Nevertheless, the present species is probably unique in the genus in having the antennal spine absent or very minute, and the scaphocerite somewhat oblique and not horizontal (i.e. with inner side remarkably higher than the outer side). Further differences of the present form from *P. carsini*, as well as from *P. poupini* sp. nov., are its much smaller size (ovigerous female only 14.8 mm cl), the rostrum and pereiopods relatively shorter, the dactyli of the posterior pereiopods relatively longer while the scaphocerite is

relatively broader, and the slightly fewer ventral rostral, but more post-rostral, teeth. As this French Polynesian form is very distinct (including coloration), and can readily be separated from all the other species known to date in the genus, it is here described as new.

Although the present new species generally lacks an epipod on pereiopod IV and sometimes has that of pereiopod III rudimentary, two specimens (the female from Ua-Pou and a male from Stn 422) have a small but distinct epipod on the left pereiopod IV (right pereiopod IV completely lacks an epipod in both specimens). Since all the other 14 specimens examined do not bear any epipod-like process on the pereiopod IV, the presence of a small epipod on the pereiopod IV is likely to be an abnormality in this species. Furthermore, the rostrum of this species is generally slightly shorter than the carapace, only one specimen having the rostrum just longer than the carapace length. The distribution of the dorsal rostral teeth also appears to be highly variable in this species. The dorsal rostral teeth are often restricted to about the basal 2/3 to 1/2 of the rostrum, but sometimes almost the entire rostrum has dorsal rostral teeth (i.e. similar to the situation of the ventral rostral teeth). Nevertheless, the distribution pattern of dorsal rostral teeth does not seem to be related to the length of the rostrum, or to the size and sex of the specimens.

ETYMOLOGY. — The name *picta* refers to the rather artistic colour pattern on the body of this species.

DISTRIBUTION. — So far known only from French Polynesia, at depths of 520-710 m.

Plesionika spinidorsalis (Rathbun, 1906)

Fig. 41

Pandalus spinidorsalis Rathbun, 1906: 917, pl. 21, fig. 5 [type-locality: Hawaii].
Plesionika spinidorsalis - CHACE, 1985: 132, figs 60-61. — POUPIN *et al.*, 1990: 16. — POUPIN, 1996: pl. 5e.

MATERIAL EXAMINED. — **French Polynesia**. SMSRB (J. POUPIN coll.): ***Society Islands. Îles sous le Vent (Bora Bora)***. Stn D32, 16°28.4'S, 151°47.5'W, 562 m, 23.06.1990: 2 ovig. ♀ 14.2 and 14.5 mm (transferred to USNM). — ***Huahine***. Stn 184, 16°44.5'S, 151°04.0'W, 540 m, 16.08.1989: 1 ♀ 13.6 mm.
Tuamotu Islands. Gambier. Stn 74, 23°08.0'S, 134°53.0'W, 660 m, 10.06.1988: 1 ovig. ♀ 15.0 mm. — ***Mururoa***. Stn 127, 21°51.2'S, 138°47.3'W, 600 m, 29.11.1988: 1 ovig. ♀ 10.8 mm, 1 ♀ 13.4 mm.
Tubuai Islands. Tubuai. Stn 145, 23°18.2'S, 149°27.1'W, 720 m, 8.03.1989: 1 ♂ 15.3 mm.

DIAGNOSIS. — A detailed description of this species can be found in CHACE (1985).

COLORATION. — Body nearly transparent with red internal organs visible inside carapace. Eyes dark brown. Dactyli of posterior pereiopods somewhat reddish. Eggs blue.

SIZE. — Largest size nearly 20 mm cl. The French Polynesian material ranges from 10.8 mm to 15.3 mm cl, the smallest specimen being an ovigerous female.

REMARKS. — The 7 specimens from French Polynesia agree very well with the description of this species provided by CHACE (1985), with the abdominal somite VI being 1.51-1.86 times as long as high. Only one specimen (15.3 mm cl) has the rostrum intact, being 0.6 times as long as carapace length. The eggs of this species are about 0.4 mm in diameter.

DISTRIBUTION. — Western Pacific, recorded from Hawaii, French Polynesia, Indonesia, the Philippines and probably also present in the South China Sea. At depths of 100-1250 m, mostly more than 400 m deep.

CONCLUSION

As a result of the scarcity of deep-water collections, no specimen of *Plesionika* had been collected from French Polynesia until 1978. The SMSRB deep-trap fishing operations, conducted by B. RICHER DE FORGES and, on a

larger scale, J. POUPIN, have permitted the capture of twenty-one species of *Plesionika*, ten of them new to science. This is a remarkable result that shows how poor our knowledge of the bathyal fauna is, not only in French Polynesia but in the Indo-West Pacific region as a whole. Moreover, this impression is highly confirmed by the general results obtained during the MUSORSTOM campaigns.

As already noticed for most of the other deep-water groups, it appears that color photographs of live material greatly help the study of the material.

Plesionika is a puzzling genus. It involves more than eighty species that can be grouped into several homogeneous groups. It could be then more sensible to split it into several more homogeneous genera. This, however, is practically impossible since certain species always present characters that are intermediate between the intended new genera. No doubt, for example, that the "*laevis* group", related to the genus *Heterocarpus*, but with some of the species lacking lateral carina on the carapace, will be greatly discussed in the future.

Another difficulty is that many species of *Plesionika* are common and have a wide geographical distribution. Morphological variations are observed among specimens collected from far different locations. It is therefore difficult to decide if such variations are specific or the result of geographical differences. In this work, the reader will find some examples of these problems, particularly under *Plesionika nesisi*, *P. macropoda* and *P. williamsi*.

With his remarkable monograph on the Pandalidae of the *"Albatross"* expedition, F.A. CHACE (1985) has undoubtedly renewed the interest for the Indo-West Pacific *Plesionika* studies. The present study should also have further development, especially if we consider the very abundant collections made in Taiwan and during the recent MUSORSTOM campaigns around New Caledonia, Indonesia, Chesterfield islands, Vanuatu, and Wallis and Futuna islands. The interest for these new collections is increased by numerous color photographs taken just after trawl operations.

Preliminary examinations of this material show that, although more new species are found, others belong to the new Polynesian species herein described. Thus, it would be speculative to conclude too quickly to a Polynesian endemism, may be more apparent than real. More reliable conclusions on that point will have to wait until the complete study of the recent MUSORSTOM collections, unfortunately not before some years.

ACKNOWLEDGMENTS

We sincerely thanks J. POUPIN of the Service Mixte de Surveillance Radiologique et Biologique for enthusiastically collecting so many interesting specimens for the present study. His invaluable efforts in taking colour photographs of the fresh material also proved to be very helpful.

Grateful acknowledgements are extended to F.A. CHACE, Jr. and R.B. MANNING of the National Museum of Natural History, Washington, D.C. for exchanging specimens of some *Plesionika* species and sending us on loan the syntypes of *P. sindoi*; and P. CLARK of The Natural History Museum, London for sending us on loan the syntypes of *P. ocellus*.

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We also like to thank ORSTOM (Institut français de Recherche scientifique pour le Développement en Coopération) for providing a short-term research grant to the first author to study at the Museum national d'Histoire naturelle, Paris, thereby making the present work possible.

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COLORED PHOTOGRAPHS

FIG. 21. — *Plesionika carsini* Crosnier, 1986. French Polynesia, Tuamotu Islands, Fangataufa, stn 438, 22°12.3'S, 138°46.6'W, 410 m.

FIG. 22. — *Plesionika poupini* sp. nov., paratype, French Polynesia, Tuamotu Islands, Fangataufa, stn 438, 22°12.3'S, 138°46.6'W, 410 m.

FIG. 23. — *Plesionika edwardsii* (Brandt, 1851). French Polynesia, Tuamotu Islands, Mururoa, stn 452, 21°53,0'S, 139°02.9'W, 330 m.

FIG. 24. — *Plesionika reflexa* Chace, 1985. French Polynesia, Tubuai Islands, Rapa, stn 465, 27°35.9'S, 144°27.6'W, 765 m.

FIG. 25. — *Plesionika ensis* (A. Milne Edwards, 1881). Antilles, *"Polka"*, stn DP1, 15°50.82'N, 61°40.75' W, 460 m.

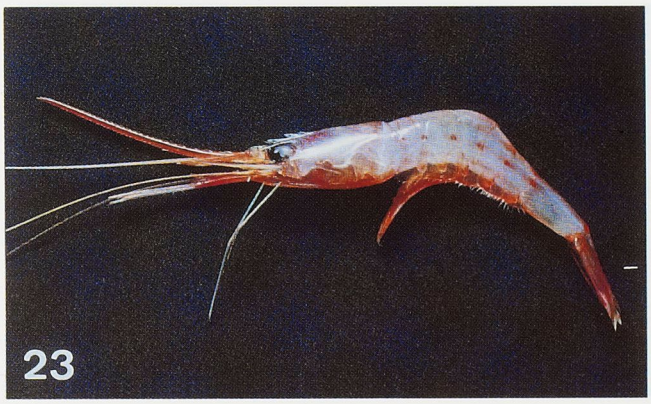
FIG. 26. — *Plesionika fenneri* Crosnier, 1986, juvenile. French Polynesia, Tubuai Islands, Rurutu, stn 146, 22°27.8'S, 151°22.8'W, 580 m.

FIG. 27. — *Plesionika fenneri* Crosnier, 1986. French Polynesia, Tuamotu Islands, Mururoa, stn 229, 21°51.9'S, 139°2.2'W, 490 m.

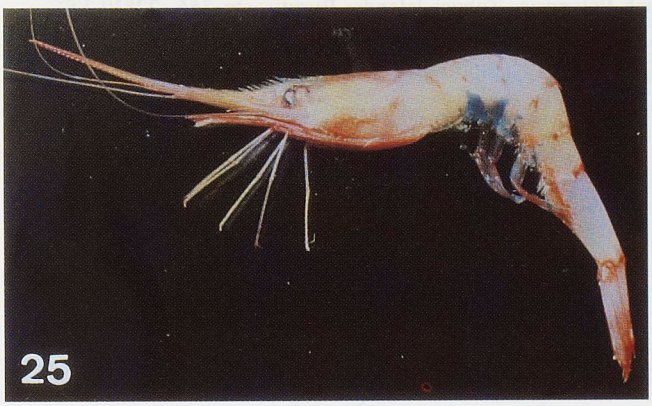
FIG. 28. — *Plesionika nesisi* (Burukovsky, 1986). French Polynesia, Tuamotu Islands, Fangataufa, stn 85, 22°13.0'S, 138°42.2'W, 780 m.

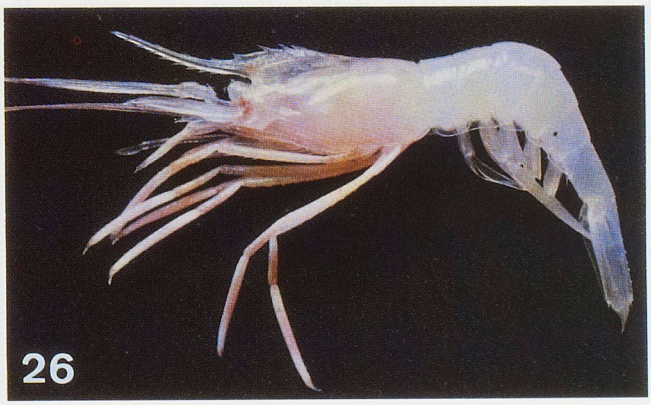

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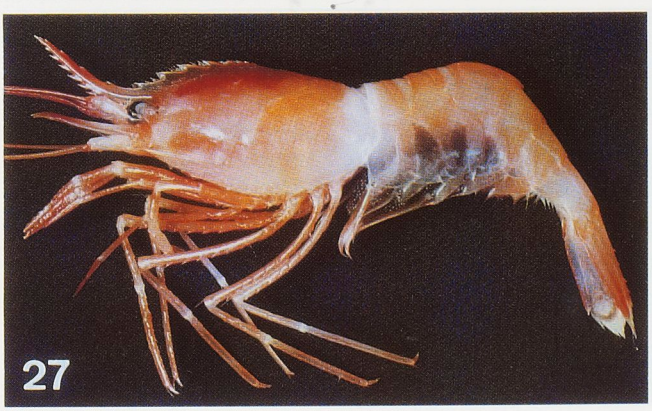

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FIG. 29. — *Plesionika laevis* (A. Milne Edwards, 1883). Antilles, *"Polka"*, stn DP1, 15°50.82'N, 61°40.75' W, 460 m.

FIG. 30. — *Plesionika macropoda* Chace, 1939. French Polynesia, Society Islands, Huahine, stn 405, 16°45.8'S, 151°3.8'W, 310 m.

FIG. 31. — *Plesionika macropoda* Chace, 1939. Antilles, *"Polka"*, stn C211, 6°11.81'N, 61°49.1'W, 450 m.

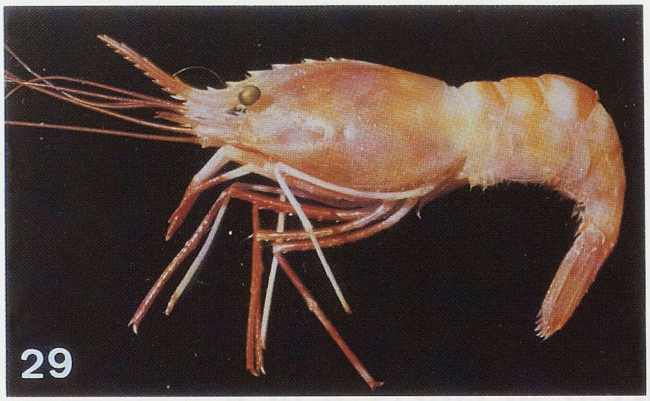
FIG. 32. — *Plesionika williamsi* Forest, 1964. French Polynesia, Marquesas Islands, Ua Pou, stn 59-60, 9°23.0'S, 140°09.0'W, 450-520 m.

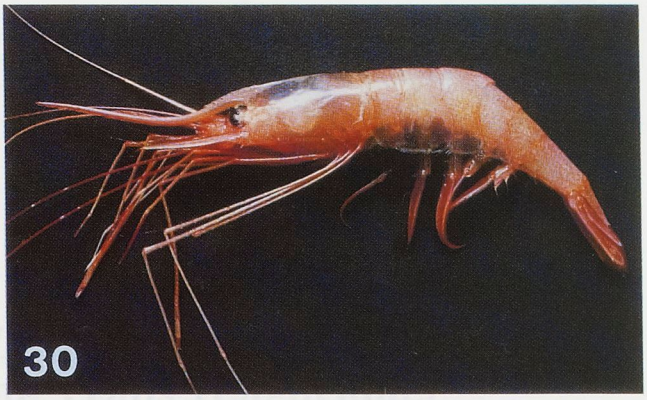
FIG. 33. — *Plesionika williamsi* Forest, 1964. Antilles, *"Polka"*, stn EP1, 15°50.93'N, 61°41.39'W, 560 m.

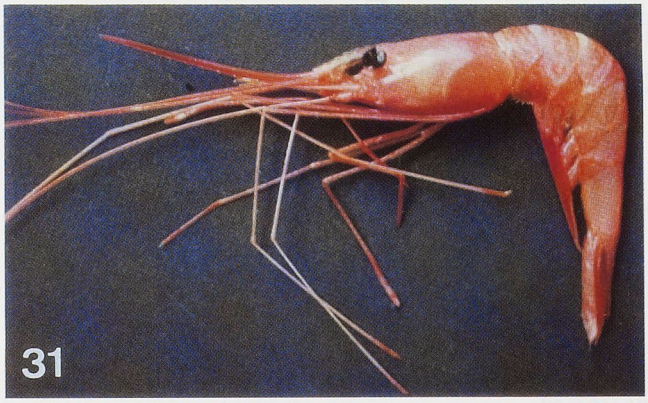
FIG. 34. — *Plesionika erythrocyclus* sp. nov., paratype. French Polynesia, Tubuai Islands, Rurutu, stn 356, 22°30.3'S, 151°21.7'W, 260 m.

FIG. 35. — *Plesionika erythrocyclus* sp. nov., Taiwan, northeastern coast, about 300 m.

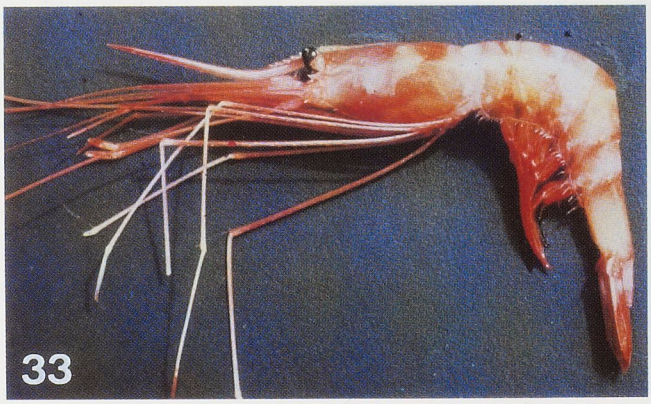
FIG. 36. — *Plesionika sindoi* (Rathbun, 1906). French Polynesia, Tuamotu Islands, Makemo, stn 250, 16°34.9'S, 143°27.2'W, 435 m.

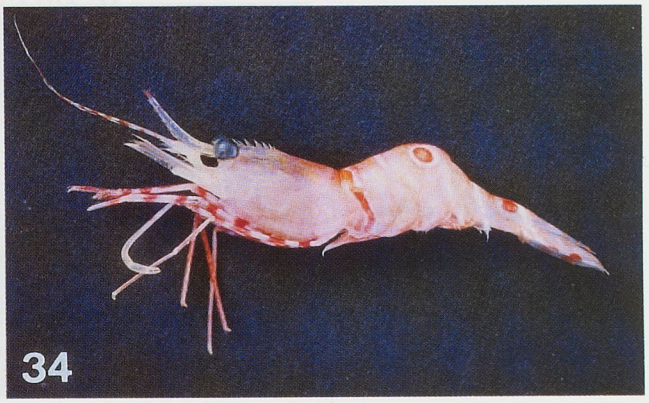

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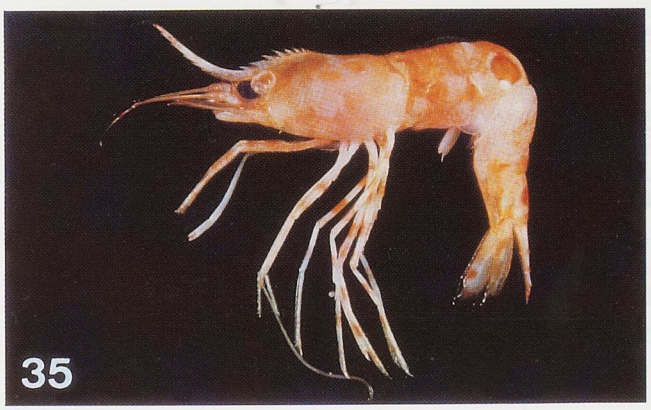

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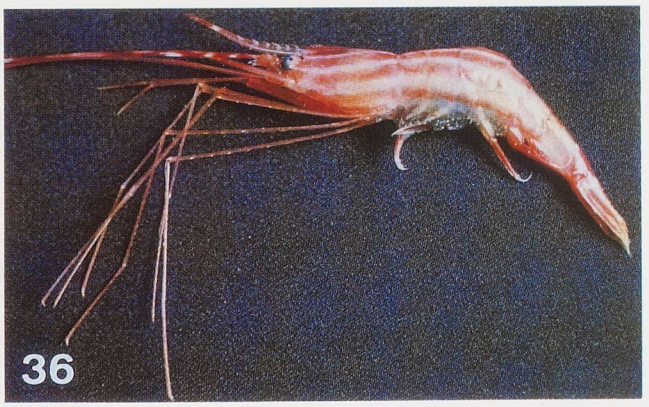

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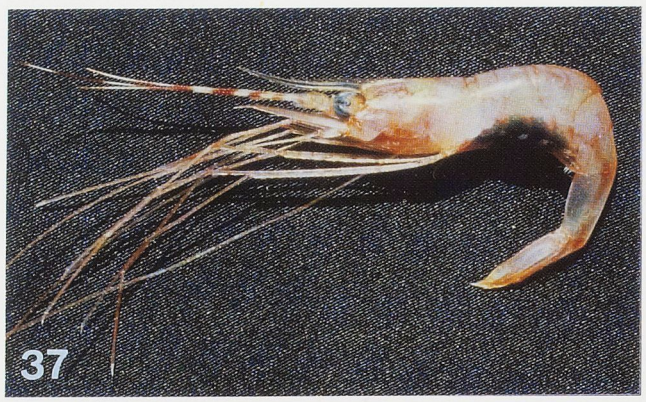

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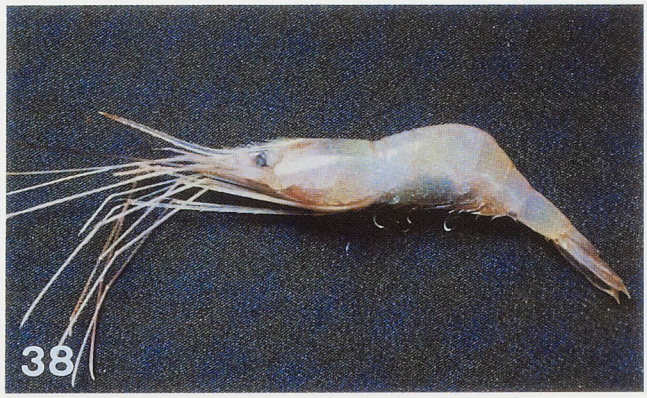

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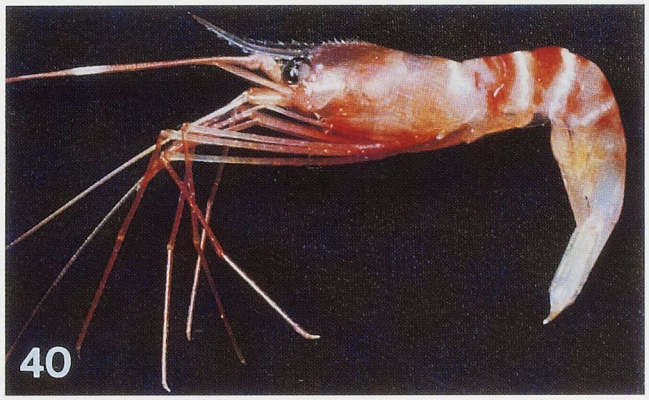

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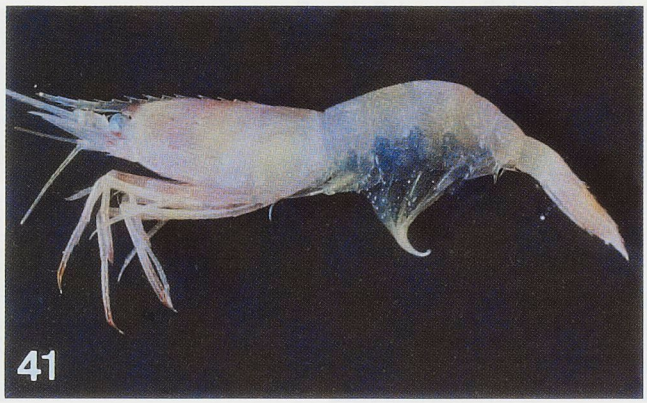


FIG. 37. — *Plesionika sindoi* (Rathbun, 1906). French Polynesia, Marquesas Islands, Fatu Hiva, stn 306, 10°31.1'S, 138°39.4'W, 250 m.

FIG. 38. — *Plesionika protati* sp. nov., from the type series. French Polynesia, Marquesas Islands, Tahuata, stn 300, 9°54.5'S, 139°7.9'W, 190 m.

FIG. 39. — *Plesionika payeni* sp. nov., holotype. French Polynesia, Tuamotu Islands, Mururoa, stn 475, 21°51.2'S, 139°00.6'W, 250 m, 11.04.1995.

FIG. 40. — *Plesionika picta* sp. nov., paratype. French Polynesia, Tubuai Islands, Rurutu, stn 339, 22°28.4'S, 151°23.0'W, 710 m.

FIG. 41. — *Plesionika spindorsalis* (Rathbun, 1906). French Polynesia, Society Islands, Bora Bora, stn D32, 16°28.37'S, 151°47.52'W, 562 m.

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Crustacea Decapoda: *Diacanthurus* gen. nov., a new genus of hermit crabs (Paguridae) with both Recent and fossil representation, and the descriptions of two new species

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ABSTRACT

The new genus, *Diacanthurus*, is proposed for a group of three Recent and one fossil species formerly assigned to the heterogeneous genus *Pagurus* Fabricius. In addition to the transfer of *Pagurus clifdenensis* Hyden & Forest (fossil), *P. spinulimanus* (Miers), *P. rubricatus* (Henderson), and *P. ophthalmicus* (Ortmann), two new species, *Diacanthurus ecphyma* sp. nov. from New Caledonia and Western Australia, and *D. richeri* sp. nov. from New Caledonia are assigned to this new genus. Expanded diagnoses or descriptions and illustrations of all Recent species are provided.

RÉSUMÉ

Crustacea Decapoda : *Diacanthurus* gen. nov., nouveau genre de Paguridae représenté par des formes actuelles et une forme fossile. Description de deux espèces nouvelles.

Le nouveau genre *Diacanthurus* est proposé pour un groupe comprenant trois espèces actuelles et une espèce fossile précédemment attribuées au genre hétérogène *Pagurus* Fabricius. En plus de *Pagurus clifdenensis* Hyden & Forest (fossile), *P. spinulimanus* (Miers), *P. rubricatus* (Henderson) et *P. ophthalmicus* (Ortmann), transférés au genre *Diacanthurus*,

McLAUGHLIN, P.A. &, FOREST, J., 1997. — Crustacea Decapoda: *Diacanthurus* gen. nov., a new genus of hermit crabs (Paguridae) with both Recent and fossil representation, and the descriptions of two new species. *In:* A. CROSNIER (ed.), Résultats des Campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176**: 235-259. Paris ISBN: 2-85653-511-9.

deux espèces nouvelles sont décrites: *D. ecphyma* sp. nov., de Nouvelle-Calédonie, des îles Chesterfield et d'Australie occidentale, et *D. richeri*, de Nouvelle-Calédonie. Des diagnoses développées ou des descriptions, ainsi que des illustrations, sont fournies pour toutes les espèces actuelles.

Diacanthurus gen. nov. se distingue des autres genres de Paguridae par la structure particulière du telson : les deux lobes postérieurs sont symétriques ou presque, en forme de croissants, avec un sommet aigu, et séparés par une profonde incision médiane dont les bords internes portent chacun une forte épine. D'autres traits morphologiques caractérisent encore le genre, comme le grand développement de l'article basilaire des pédoncules oculaires.

Les différences entre les espèces portent notamment sur la forme et l'ornementation des chélipèdes qui présentent un remarquable gradient évolutif suivant la séquence *D. richeri*, *D. ophthalmicus*, *D. clifdenensis*, *D. spinulimanus*, *D. ecphyma* et *D. rubricatus*. Ce gradient porte sur la largeur relative et l'asymétrie des mains, qui s'accroissent, alors que les tubercules et dents de la face dorsale sont de plus en plus développés.

En dehors des deux espèces nouvelles, à distribution néo-calédonienne, le nouveau genre est représenté dans plusieurs régions de l'Indo-Ouest Pacifique : Nouvelle-Zélande (*D. spinulimanus* et *D. rubricatus*), Japon (*D. ophthalmicus*) et aussi Australie occidentale (*D. ecphyma*).

Les distributions bathymétriques diffèrent suivant les espèces. Celles-ci sont surtout représentées entre 200 et 400 mètres, à l'exception de *D. ophthalmicus*, capturé entre 100 et 200 mètres, et de *D. spinulimanus*, le plus souvent recueilli par moins de 100 mètres de profondeur.

INTRODUCTION

HYDEN and FOREST (1980) described a new species of pagurid, *Pagurus clifdenensis* Hyden & Forest, from the early Miocene of southern New Zealand. At the time, the authors noted the similarities between their fossil species and two Recent New Zealand species, *Pagurus spinulimanus* (Miers, 1876) and *Pagurus rubricatus* (Henderson, 1888). Recognizing the distinctiveness of all three taxa, HYDEN and FOREST (1980) indicated that these species would be transferred to a new genus when revisionary studies of the New Zealand pagurid fauna were completed.

Certain characters, not available in the fossil species, clearly set the two Recent species apart from other *Pagurus* species, particularly the structure of the telson. It is, as the generic name *Diacanthurus* implies, composed of two very prominent spines (Fig. 1a). This unique telson structure was also depicted by MIYAKE (1978) for the Japanese species, *Pagurus ophthalmicus* (Ortmann, 1892). An examination of ORTMANN's holotype by one of us (PMcL) confirmed similarities indicative of a close phylogenetic relationship among the three Recent taxa. During studies of the MUSORSTOM collections from New Caledonia, two additional and undescribed species have been recognized that share all of the morphological characteristics of *Diacanthurus* as defined herein.

MATERIALS AND METHODS

The holotypes of *Pagurus rubricatus* and *P. spinulimanus* were borrowed from The Natural History Museum, London (NHM); the holotype of *P. ophthalmicus* was borrowed from the Musée Zoologique, Université Louis Pasteur, Strasbourg (MZUS). The MUSORSTOM collections are the property of the Muséum national d'Histoire naturelle, Paris (MNHN); the specimen from Western Australia is the property of the Western Australian Museum, Perth (WAM). Supplemental materials of *P. rubricatus* and *P. spinulimanus* have come from the collections of the New Zealand Oceanographic Institute (NZOI); National Museum of New Zealand, Wellington, (NMNZ), now the Museum of New Zealand Te Papa Tongarewa (MoNZ), and include collections originally belonging to the Zoology Department, Victoria University of Wellington (VUZ); Portobello Marine Laboratory, University of Otago (PMLUO); and the personal collection of one of the authors (PMcL). Supplemental specimens of *P. ophthalmicus* from the R/V *Albatross* Northwest Pacific Expedition are the property of the National Museum of Natural History, Smithsonian Institution (USNM); additional specimens from Japan are from the collections of Zoology, Crustacea, Natural History Museum and Institute, Chiba (CBM-ZC), and PMcL's personal collection. Specimens have, for the most part, been returned to their institutions of origin; however, some paratypes of the new species have been deposited in the USNM. Most station data for the French bathyal faunal expeditions in New Caledonia are documented in RICHER DE FORGES (1990, 1993) and RICHER DE FORGES and CHEVILLON (1996). The abbreviations BS, DW, and CP refer to bottom station, Waren dredge and beam trawl, respectively. The

measurement of shield length, given in parentheses ( ), and measured from the midpoint of the anterior margin of the shield (broadly rounded rostral projection) to the midpoint of the posterior margin of the shield, provides an indication of animal size. Measurements of the ocular peduncle refer exclusively to the length of the distal segment, and are measured from the base to the distal margin (or apex) of the cornea along the lateral face; corneal diameter represents maximum width of the cornea. Lengths of the dactyls and propodi of the ambulatory legs were measured on the lateral faces from the dorsodistal margin (excluding the claw of the dactyl) to the dorsoproximal margin. Terminology for the diagnoses and descriptions follows that of McLAUGHLIN (1974, 1997). Two keys to the species are presented. The first is based principally on characters of the chelipeds and ambulatory legs, which may be lost in preserved specimens, thus rendering the key useless. The second, which is based essentially on characters of the ocular peduncles and telson is less subject to the drawbacks than the first, is highly reliable for large specimens, but may not be as applicable to small specimens. It is hoped that between the two, accurate identifications of these generally quite similar species can be made.

Genus *DIACANTHURUS* nov.

Pagurus Fabricius, 1775: 410 (in part).
Eupagurus Brandt, 1851: 105 (in part).

TYPE SPECIES. — *Eupagurus spinulimanus* Miers, 1876. Gender masculine.

DIAGNOSIS. — Eleven pairs of phyllobranchiate gills. Rostrum obsolete to broadly rounded. Ocular peduncles well developed, intersegmental articulating membrane very prominent; ocular acicles widely separated, dorsal surface flattened or slightly convex, very broadly triangular, produced distally and with strong terminal, marginal or submarginal spine or spines. Antennal peduncles with supernumerary segmentation. Mandible with deeply concave inner surface; ultimate segment of 3-segmented palp with 2 or 3 rows of short stiff bristles in distal half and 1 row of finer setae proximally. Maxillule (Fig. 1b) with internal endopodal lobe well developed, external lobe obsolete. Maxilla (Fig. 1c) with moderately broad, proximally subrectangular scaphognathite. First maxilliped (Fig. 1d) with basal portion of exopod somewhat bulbous. Third maxilliped (Fig. 1e) with crista dentata well developed and 1 accessory tooth.

Chelipeds unequal. Left cheliped with some degree of clockwise rotation of propodal-carpal articulation; dorsolateral margin of chela weakly to strongly inflated proximally. Ambulatory legs with dactyls and propodi of second and third pereopods similar. Fourth pereopods semichelate; propodal rasp consisting of several rows of small corneous scales.

Males with paired gonopores, almost completely masked by ventral fringe of long stiff setae, no sexual tubes; no paired pleopods, 3 unpaired, uniramous or very unequally biramous left pleopods (pl_3-pl_5). Females with paired gonopores; no paired pleopods, 4 biramous left pleopods (pl_2-pl_5), first 3 egg-carrying, last as in males.

Abdomen with somites delimited by strong transverse fibrils. Tergite of sixth abdominal segment with deep median transverse groove. Uropods strongly asymmetrical. Telson (Fig. 1a) with an indentation on the lateral margins; posterior lobes generally symmetrical, each with primarily "half-moon" contour, blade-like lateral margin and acute terminal angle, usually broadly separated and with distinct median cleft, inner margins each with 1 prominent spine in basal half.

ETYMOLOGY. — From the Greek *di* meaning two, *acantha* meaning spine, and *oura* meaning tail, referring to the distinctive telson characteristic of this genus.

Keys to the Recent species of *Diacanthurus*

1. Carpi of third pereopods each with row of spines on dorsal margin **2**
— Carpi of third pereopods with only spine at dorsodistal angle (sometimes 1 additional spinule proximally) **4**

2. Ocular peduncles short (Fig. 2d), stout, corneas noticeably dilated. Maximum width of palm of right chela at least 1.25 (usually 1.5) times length of dorsomesial margin ..... ***D. rubricatus***

— Ocular peduncles moderately long, not particularly stout, corneas not noticeably dilated. Maximum width of palm of right chela only slightly greater than length of dorsomesial margin **3**

3. Dactyl of right chela with row of short spines or spinulose tubercles on dorsomesial surface; usually with 2 or 3 longitudinal rows of nearly coalesced, often blunt tubercles on dorsal surface. Spines on carpi of third pereopods weakly developed ..... ***D. ophthalmicus***

— Dactyl of right chela with row of long spines on dorsomesial surface; 2 or 3 longitudinal rows of well-spaced, often acute tubercles on dorsal surface. Spines of carpi of third pereopods strongly developed ..... ***D. ecphyma*** sp. nov.

4. Ocular peduncles short (Fig. 2c), moderately stout; antennal peduncles reaching beyond bases of corneas. Dorsal surfaces of palms of both chelas with numerous moderately closely-spaced quite small tubercles or spinules ..... ***D. richeri*** sp. nov.

— Ocular peduncles long (Fig. 2e), moderately slender; antennal peduncles not usually reaching to bases of corneas. Dorsal surfaces of palms of both chelae with relatively few, widely-spaced irregular longitudinal rows of moderately large tubercles ..... ***D. spinulimanus***

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1. Corneas slightly dilated. Ratio of peduncular length to corneal diameter between 3.5 and 4:1 ..... ***D. spinulimanus***

— Corneas moderately or strongly dilated. Ratio of peduncular length to corneal diameter less than 3:1 ..... **2**

2. Ratio of peduncular length to corneal diameter between 2:1 and 2.5:1 ..... **3**

— Ratio of peduncular length to corneal diameter less than 2:1 ..... **4**

3. Telson longer than broad. Palm of right chela strongly asymmetrical; strong spines on mesial margin and on distal half of lateral margin ..... ***D. ecphyma*** sp. nov.

— Telson as long as broad. Palm of right chela almost symmetrical; both margins with regular spines of moderate size ..... ***D. ophthalmicus***

4. Ocular acicles unidentate. Telson longer than broad. Maximum width of palm of right chela more than 1.25 times length of dorsomesial margin. Antennal peduncles equal to or slightly longer than ocular peduncles ..... ***D. rubricatus***

— Ocular acicles usually bidentate (at least on 1 side). Telson as long as broad. Maximum width of palm of right chela only slightly greater than length of dorsomesial margin. Antennal peduncles shorter than ocular peduncles ..... ***D. richeri*** sp. nov.

Diacanthurus ecphyma sp. nov.

Figs 2a, 3a-i

MATERIAL EXAMINED. — **New Caledonia**. CHALCAL: stn D 65, 22°11.50'S, 159°15.40'E, 305 m, 27.07.1984: 1 ♂ (4.4 mm) (MNHN Pg 5479).

SMIB 4: stn DW 43, 24°46.6'S, 168°08.8'E, 245 m, 08.03.1989: 2 ♂, 1 ♀ (3.6-5.6 mm) (USNM 276062).

BERYX 11: stn 18, 24°48'S, 168°09'E, 250-270 m, 16.10.1992: 1 ♀ (4.2 mm) (MNHN Pg 5478).

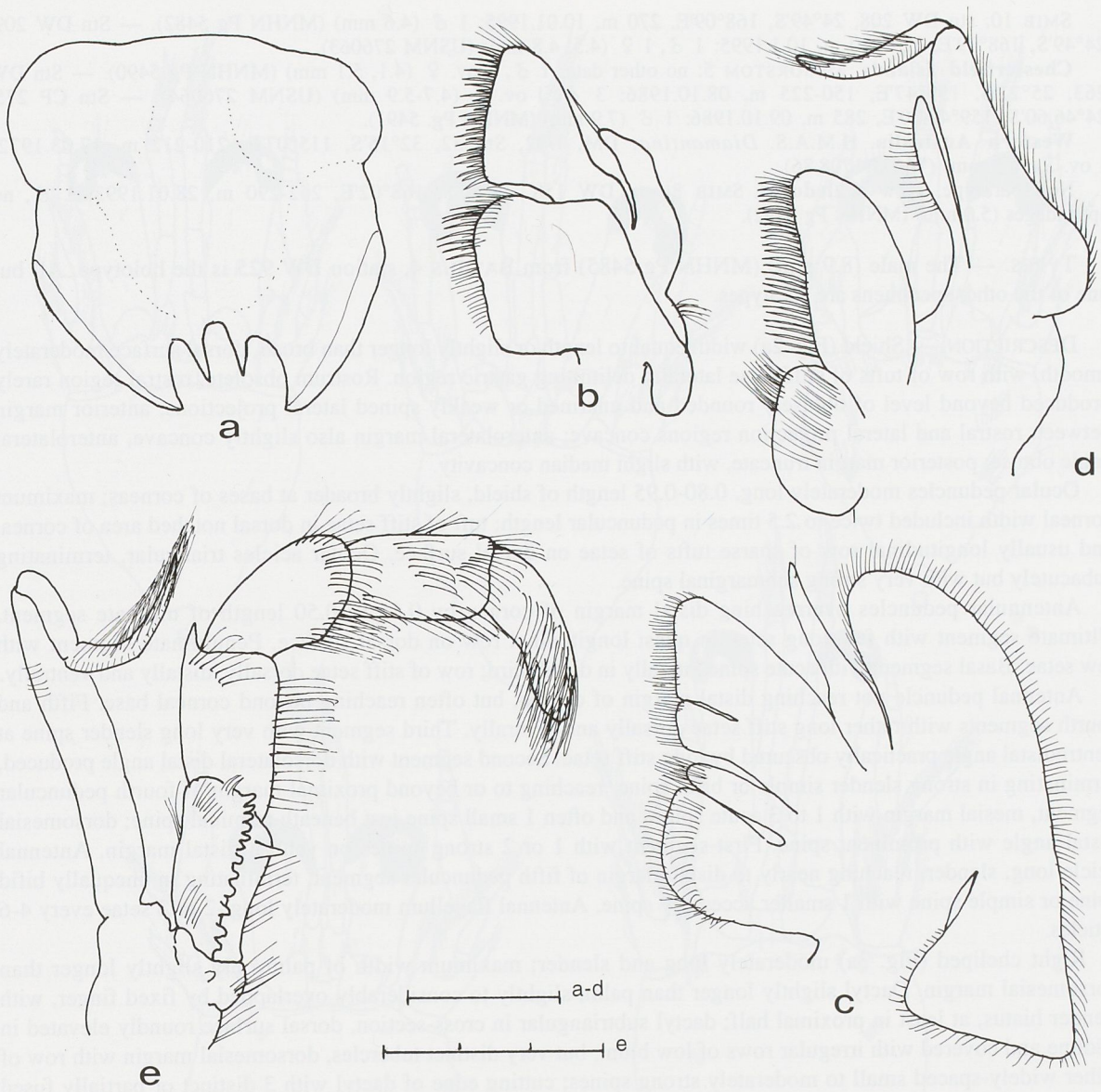


FIG. 1. — **a**, *Diacanthurus ophthalmicus* (Ortmann, 1892), ♀ holotype (6.2 mm) from Sagami Bay, Japan: telson. — **b-e**, *Diacanthurus spinulimanus* (Miers, 1876), ♂ (8.7 mm) from Paria Rock, Hawks Bay, New Zealand: **b**, maxillule (external view); **c**, maxilla (external view); **d** first maxilliped (external view); **e**, third maxilliped (internal view). Scales equal 1.0 mm (a-d) and 3.0 mm (e).

SMIB 8: stn DW 155, 24°45'S, 168°08'E, 257-262 m, 28.01.1993: 1♂ (5.4 mm) (MNHN Pg 5480). — Stn DW 159, 24°46'S, 168°08'E, 241-245 m, 28.01.1993: 1 ♂ (2.8 mm). — Stn DW 170, 23°41'S, 168°01'E, 241-244 m, 29.01.1993: 1 ov. ♀ (5.8 mm) (MNHN Pg 5481).

BATHUS 4: stn DW 904, 18°59'S, 163°11'E, 461 m, 04.08.1994: 1 ov. ♀ (8.9 mm) (MNHN Pg 5483). — Stn DW 924, 18°54'S, 163°24'E, 344-360 m, 07.08.1994: 2 ov. ♀ (7.6, 7.9 mm) (MNHN Pg 5484). — Stn DW 925, 18°54'S, 163°23'E, 370-405 m, 07.08.1994: 1 ♂, 2 ♀ (4.6-8.9 mm) (MNHN Pg 5485). — Stn DW 926, 18°56'S, 163°25'E, 325-330 m, 07.08.1994: 1 ♀ (4.0 mm) (MNHN Pg 5486). — Stn CP 936, 19°03'S, 163°28'E, 258-252 m, 08.08.1994: 2 ♂ (8.3, 8.5 mm) (MNHN Pg 5487). — Stn CP 939, 18°58'S, 163°25'E, 304-320 m, 08.08.1994: 1 ♂ (9.2 mm) (MNHN Pg 5488). — DW 942, 19°04'S, 163°28'E, 270-264 m, 08.08.1994: 1 ♂ (4.9 mm) (MNHN Pg 5489).

HALICAL 1: stn DW 01, 18°56'S, 163°24'E, 380-400 m, 23.11.1994: 2 ♀ (6.8, 8.7 mm) (MNHN Pg 5477).

SMIB 10: stn DW 208, 24°49'S, 168°09'E, 270 m, 10.01.1995: 1 ♂ (4.6 mm) (MNHN Pg 5482). — Stn DW 209, 24°49'S, 168°09'E, 329-560 m, 10.1.1995: 1 ♂, 1 ♀ (4.5, 4.8 mm) (USNM 276063).

Chesterfield Islands. MUSORSTOM 5: no other data: 1 ♂, 1 ov. ♀ (4.1, 5.1 mm) (MNHN Pg 5490). — Stn DW 263, 25°22'S, 159°47'E, 150-225 m, 08.10.1986: 3 ♂, 1 ov. ♀ (4.7-5.9 mm) (USNM 276064). — Stn CP 275, 24°46.60'S, 159°40.30'E, 285 m, 09.10.1986: 1 ♂ (7.9 mm) (MNHN Pg. 5491).

Western Australia. H.M.A.S. *Diamantina*: DM. 1/72, Stn 32, 32°15'S, 115°07'E, 210-212 m, 17.03.1972: 1 ov. ♀ (6.3 mm) (WAM 1708.86).

Non paratype. **New Caledonia**. SMIB 8: stn DW 158, 24°46'S, 168°02'E, 262-290 m, 28.01.1993: 1 ♂, no appendages (5.0 mm) (MNHN Pg 5492).

TYPES. — The male (8.9 mm) (MNHN Pg 5485) from BATHUS 4, station DW 925 is the holotype. All but one of the other specimens are paratypes.

DESCRIPTION. — Shield (Fig. 2a) width equal to length or slightly longer than broad, dorsal surface moderately smooth, with row of tufts of stiff setae laterally delimiting gastric region. Rostrum obsolete, rostral region rarely produced beyond level of obtusely rounded and unarmed or weakly spined lateral projections; anterior margin between rostral and lateral projection regions concave; anterolateral margin also slightly concave, anterolateral angle obtuse; posterior margin truncate, with slight median concavity.

Ocular peduncles moderately long, 0.80-0.95 length of shield, slightly broader at bases of corneas; maximum corneal width included twice to 2.5 times in peduncular length; tuft of stiff setae in dorsal notched area of cornea, and usually longitudinal row of sparse tufts of setae on dorsal surface. Ocular acicles triangular, terminating subacutely but with very strong submarginal spine.

Antennular peduncles overreaching distal margin of cornea by 0.15 to 0.50 length of ultimate segment. Ultimate segment with few long setae in quasi longitudinal row on dorsal surface. Penultimate segment with few setae. Basal segment with acute spine laterally in distal third; row of stiff setae dorsally, distally and ventrally.

Antennal peduncle not reaching distal margin of cornea, but often reaching beyond corneal base. Fifth and fourth segments with rather long stiff setae dorsally and ventrally. Third segment with very long slender spine at ventrodistal angle practically obscured by long stiff setae. Second segment with dorsolateral distal angle produced, terminating in strong slender simple or bifid spine, reaching to or beyond proximal margin of fourth peduncular segment, mesial margin with 1 to 3 acute spines and often 1 small spine just beneath terminal spine; dorsomesial distal angle with prominent spine. First segment with 1 or 2 strong spines on ventral distal margin. Antennal acicle long, slender, reaching nearly to distal margin of fifth peduncular segment, terminating in unequally bifid spine or simple spine with 1 smaller accessory spine. Antennal flagellum moderately long; 2 or 3 setae every 4-6 articles.

Right cheliped (Fig. 3a) moderately long and slender; maximum width of palm only slightly longer than dorsomesial margin. Dactyl slightly longer than palm, slightly to considerably overlapped by fixed finger, with slender hiatus, at least in proximal half; dactyl subtriangular in cross-section, dorsal surface roundly elevated in midline and covered with irregular rows of low blunt, but very distinct tubercles, dorsomesial margin with row of rather widely-spaced small to moderately strong spines; cutting edge of dactyl with 3 distinct or partially fused calcareous teeth proximally and several small to moderately large more distinct molar-like teeth in distal half, terminating in calcareous claw; mesial face rounding into ventral surface and provided with tufts of long stiff setae. Palm equal to or shorter than carpus; dorsomesial margin with row of small to large, often slender acute or subacute spines, dorsomesial distal angle with cluster of low but distinct tubercles; dorsal surface of palm and fixed finger covered, but not densely, with small conical spinules or subacute tubercles, usually not obscured by mat of very short fine setae (Fig. 3b), frequently 1 sparse row of slightly stronger conical tubercles in midline of palm, dorsoproximal margin sometimes with 1 or 2 moderate to very prominent spines medially; dorsolateral margin with row of usually very much smaller spines on palm becoming considerably stronger on fixed finger; cutting edge of fixed finger with row of distinct or somewhat fused calcareous teeth proximally, several more distinct teeth distally, terminating in calcareous claw; inner faces of dactyl and fixed finger each often with several additional calcareous teeth; mesial face of palm relatively smooth or with low protuberances and moderately long and stiff setae, ventral surface and lateral face both with rows of tufts of setae. Carpus about as long as merus; dorsomesial margin with row of long, slender, very acute spines and adjacent second smaller and somewhat irregular row;

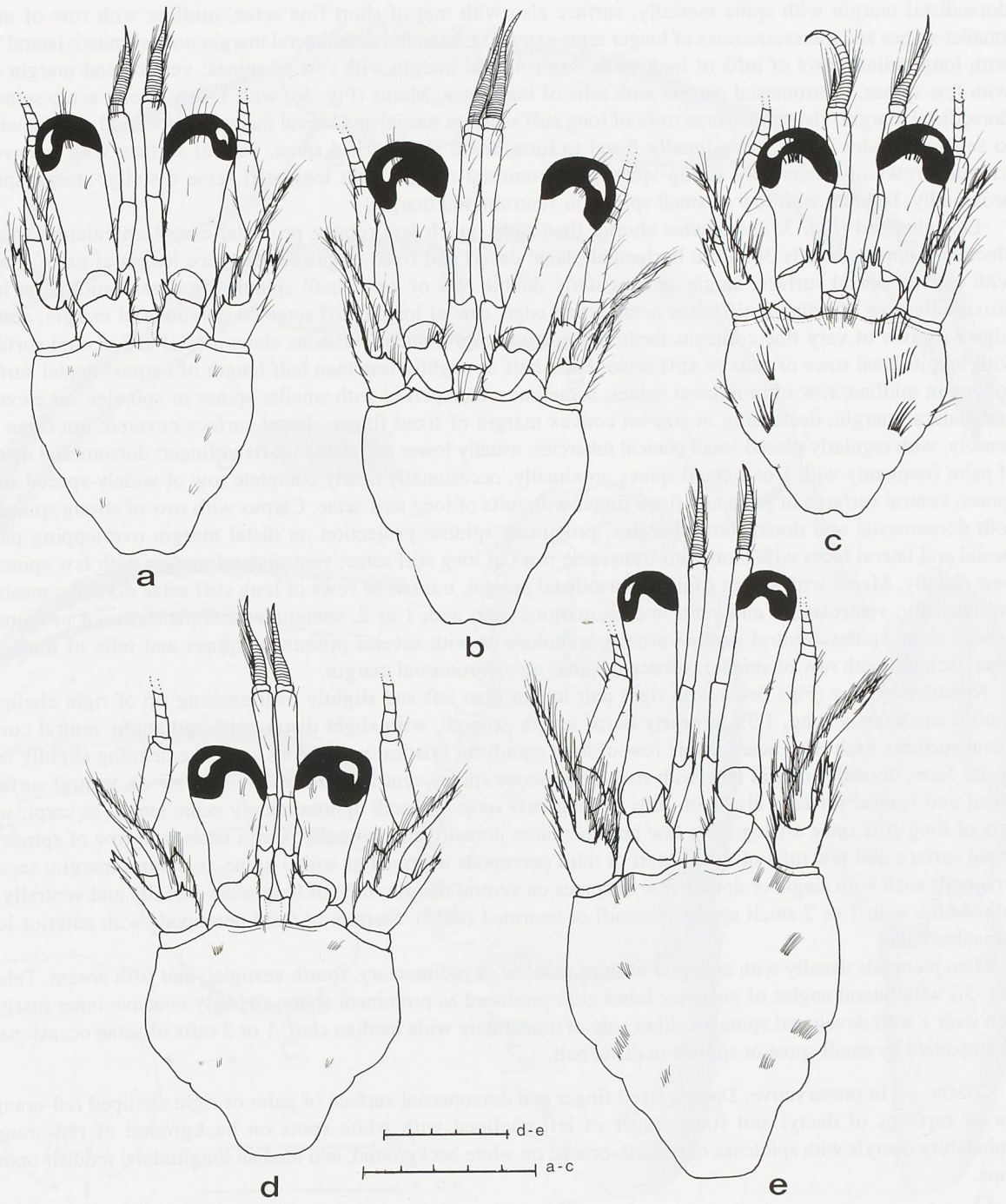


FIG. 2. — Shield and cephalic appendages.

a, *Diacanthurus ecphyma* sp. nov., ♂ (5.9 mm) from MUSORSTOM 5 Stn DW 263. — **b**, *Diacanthurus ophthalmicus* (Ortmann, 1892), ov. ♀ (6.4 mm) from Minabe, Wakayama, Japan. — **c**, *Diacanthurus richeri* sp. nov., ♂ (5.9 mm) SMIB 8 Stn DW 190. — **d**, *Diacanthurus rubricatus* (Henderson, 1888), ♀ (8.4 mm) from NZOI Stn D 121. — **e**, *Diacanthurus spinulimanus* (Miers, 1876), ♀ (12.0 mm) from Paria Rock, Hawks Bay, New Zealand.

Scales equal 5.0 mm.

dorsodistal margin with spine mesially, surface also with mat of short fine setae, midline with row of much smaller spines and transverse rows of longer setae extending laterally, dorsolateral margin not delimited; lateral face with longitudinal rows of tufts of long setae, ventrolateral margin with row of spines; ventrodistal margin also with few spines, ventromesial margin with tufts of long setae. Merus (Fig. 3c) with 1 very strong acute spine on dorsodistal margin; short transverse rows of long stiff setae on mesial and lateral faces; ventrolateral margin with 3 to several slender spines, occasionally fused to form broad single trifid spine, ventral surface with transverse irregular rows of moderately strong spines, ventromesial margin with long stiff setae distally, strong spines proximally. Ischium with row of small spines on ventromesial margin.

Left cheliped (Fig. 3d) somewhat shorter than right, much less robust; propodal-carpal articulation rotated clockwise approximately 30° from horizontal plane; dactyl and fixed finger nearly twice length of palm. Dactyl with convex dorsal surface, single or irregularly double row of very small spinules in dorsal midline at least proximally, row of tufts of stiff setae near cutting edge, row of longer stiff setae on dorsomesial margin; cutting edge with row of very fine corneous teeth, terminating in prominent corneous claw; mesial and ventral surfaces with longitudinal rows of tufts of stiff setae. Palm half or slightly less than half length of carpus; dorsal surface convex in midline; row of prominent spines, sometimes interspersed with smaller spines or spinules, on elevated dorsolateral margin, decreasing in size on convex margin of fixed finger; dorsal surface covered, but often not densely, with regularly placed small conical tubercles, usually lower and flatter on fixed finger; dorsomesial margin of palm frequently with 1 or 2 small spines proximally, occasionally nearly complete row of widely-spaced small spines; ventral surfaces of palm and fixed finger with tufts of long stiff setae. Carpus with row of strong spines on both dorsomesial and dorsolateral margins, prominent spinose projection on distal margin overlapping palm; mesial and lateral faces with numerous transverse rows of long stiff setae; ventrolateral margin with few spines at least distally. Merus with strong spine at dorsodistal margin, transverse rows of long stiff setae dorsally, mesially and laterally; ventrolateral and ventromesial margins each with 1 or 2, sometimes complete row of prominent, slender acute spines; ventral surface usually spinulose or with several prominent spines and tufts of long stiff setae. Ischium with row of smaller, subacute spines on ventromesial margin.

Ambulatory legs (Figs 3e-h) with right pair longer than left and slightly overreaching tip of right cheliped. Dactyls moderately long, 1.35 to nearly twice length propodi, with slight distal twist and slight ventral curve; dorsal surfaces each with nearly triple row of long spiniform bristles or corneous spines, extending slightly onto mesial faces dorsally; mesial face with row of corneous spines ventrally and additional row on ventral surface; dorsal and ventral surfaces also with tufts of long stiff setae. Propodi approximately same length as carpi, with tufts of long stiff setae arising from low protuberances dorsally and ventrally. Carpi each with row of spines on dorsal surface and few tufts of setae. Meri of third pereopods unarmed or with 1 spine on ventral margin; second pereopods each with single or double row of spines on ventral margin; tufts of long setae dorsally and ventrally on both. Ischia with 1 or 2 small spines (second) or unarmed (third). Sternite of third pereopods with anterior lobe semisubcircular.

Male pleopods usually with endopod of third reduced or rudimentary, fourth vestigial, and fifth absent. Telson (Fig. 3i) with lateral angles of posterior lobes each produced as prominent spine; strongly concave inner margins each with 1 well developed spine on either side of moderately wide median cleft, 1 or 2 tufts of setae occasionally accompanied by small spine or spinule in distal half.

COLOR. — In preservative: Dactyl, fixed finger and dorsomesial surface of palm of right cheliped red-orange. Dorsal surfaces of dactyl and fixed finger of left cheliped with white spots on background of red-orange. Ambulatory dactyls with splotches of reddish-orange on white background, and median longitudinal reddish-orange stripe.

ETYMOLOGY. — A noun in apposition, from the Greek, *ekphyma*, meaning an eruption of pimples, and referring to the pimple-like appearance of the left chela.

DISTRIBUTION. — New Caledonia and Chesterfield Islands; Western Australia; 212-461 m (at least).

REMARKS. — *Diacanthurus ecphyma* bears a strong resemblance to *D. ophthalmicus*, but is easily distinguished from the latter species by: 1) the clearly distinct rows of subacute to blunt tubercles on the dorsal

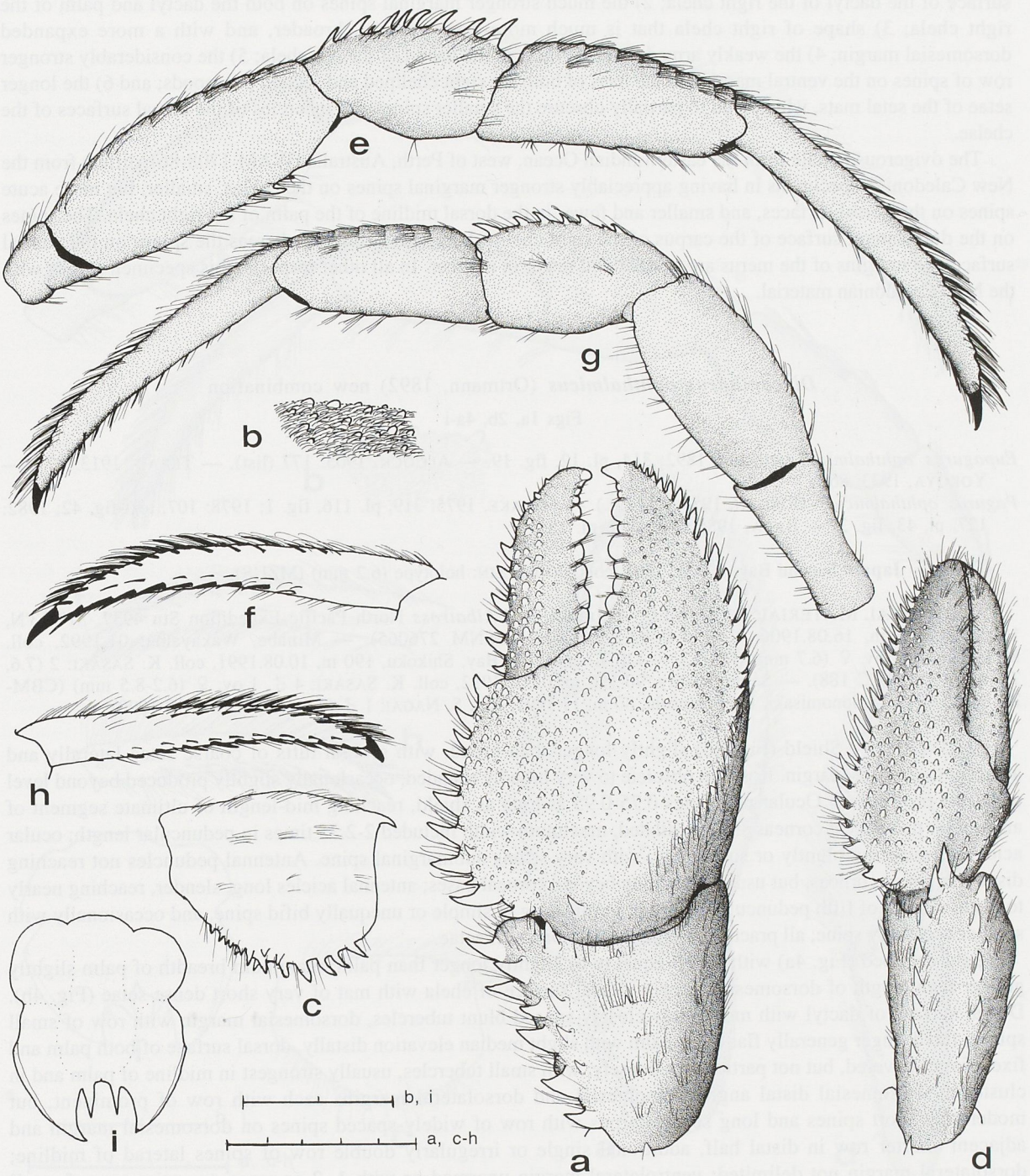


FIG. 3. — *Diacanthurus ecphyma* sp. nov., ♂ (5.9 mm) from MUSORSTOM 5 Stn DW 263: **a**, chela and carpus of right cheliped (surface setal mat not shown); **b**, enlarged area of dorsal surface of palm of right chela showing setal mat; **c**, merus of right cheliped (lateral view); **d**, chela and carpus of left cheliped (surface setal mat not shown); **e**, right second pereopod (lateral view); **f**, dactyl of right second pereopod (mesial view); **g**, left third pereopod (lateral view); **h**, dactyl of left third pereopod (mesial view); **i**, telson.

Scales equal 2.0 mm (b, i) and 5.0 mm (a, c-h).

surface of the dactyl of the right chela; 2) the much stronger marginal spines on both the dactyl and palm of the right chela; 3) shape of right chela that is much more asymmetrical, broader, and with a more expanded dorsomesial margin; 4) the weakly armed dorsal surface of the dactyl of the left chela; 5) the considerably stronger row of spines on the ventral margins of the meri of both the right cheliped and second pereopods; and 6) the longer setae of the setal mats, which tend to partially obscure the smaller spines and tubercles of the dorsal surfaces of the chelae.

The ovigerous female from the eastern Indian Ocean, west of Perth, Australia (WAM 1708-86), differs from the New Caledonian specimens in having appreciably stronger marginal spines on the chelas, smaller, but more acute spines on the dorsal surfaces, and smaller and fewer in the dorsal midline of the palm of the right chela. The spines on the dorsolateral surface of the carpus of the right cheliped are also stronger, whereas the spines on the ventral surface and margins of the merus are smaller and fewer in number. In all other respects, this specimen agrees with the New Caledonian material.

Diacanthurus ophthalmicus (Ortmann, 1892) new combination

Figs 1a, 2b, 4a-i

Eupagurus ophthalmicus Ortmann, 1892: 314, pl. 12, fig. 19. — Alcock, 1905: 177 (list). — Terao, 1913: 371. — Yokoya, 1933: 86.

Pagurus ophthalmicus - Gordan, 1956: 333 (lit.). — Miyake, 1975: 319, pl. 116, fig. 1; 1978: 107, text-fig. 42; 1982: 127, pl. 43, fig. 3. — Baba, 1986: 209, 305, pl. 153.

Type. — **Japan**. Sagami Bay, 100 m, 1881, coll. Döderlein: holotype (6.2 mm) (MZUS).

Additional Material examined. — **Japan**. R/V *Albatross* North Pacific Expedition Stn 4937, 31° 13'N, 130°43'E, 106 m, 16.08.1906: 1 ♂, 4 ♀ (4.8-6.2 mm) (USNM 276065). — Minabe, Wakayama, 01.1992, coll. M. Imafuku: 1 ov. ♀ (6.7 mm) (PMcL). — Off Kochi, Tosa Bay, Shikoku, 190 m, 10.08.1991, coll. K. Sasaki: 2 (7.6, 7.7 mm) (CBM-ZC 188). — Same locality, 90-190 m, 07.07.1992, coll. K. Sasaki: 4 ♂, 1 ov. ♀ (6.2-8.5 mm) (CBM-ZC 192). — Off Shionomisaki, Kii Peninsula, 80 m, 11.1991, coll. S. Nagai: 1 ♂ (7.6 mm) (CBM-ZC 1099).

Diagnosis. — Shield (Fig. 2b) slightly longer than broad, with several tufts of coarse setae laterally and adjacent to anterior margin. Rostrum obsolete to very broadly rounded, occasionally slightly produced beyond level of lateral projections. Ocular peduncles 0.75-0.95 as long as shield, reaching mid-length of ultimate segment of antennular peduncles; corneas slightly dilated, maximum width included 2-2.35 times in peduncular length; ocular acicles terminating bluntly or subacutely, with very strong submarginal spine. Antennal peduncles not reaching distal margin or corneas, but usually reaching beyond corneal bases; antennal acicles long, slender, reaching nearly to distal margin of fifth peduncular segment, terminating in simple or unequally bifid spine, and occasionally with smaller accessory spine, all practically obscured by long stiff setae.

Right cheliped (Fig. 4a) with dactyl equal to or slightly longer than palm; maximum breadth of palm slightly greater than length of dorsomesial margin; dorsal surface of chela with mat of very short dense setae (Fig. 4b). Dorsal surface of dactyl with moderately closely-spaced blunt tubercles, dorsomesial margin with row of small spines; fixed finger generally flattened, palm with slight median elevation distally, dorsal surface of both palm and fixed finger covered, but not particularly densely, with small tubercles, usually strongest in midline of palm and in cluster at dorsomesial distal angle; dorsomesial and dorsolateral margins each with row of prominent, but moderately short spines and long setae. Carpus with row of widely-spaced spines on dorsomesial margin and adjacent shorter row in distal half, additional single or irregularly double row of spines laterad of midline; dorsolateral margin not delimited; ventrolateral margin unarmed or with 1, 2 or more, to entire row of small spines. Merus (Fig. 4c) with 1 very strong spine on dorsodistal margin; ventromesial and ventrolateral margins each with acute spines and long setae, at least distally, ventral surface with few spines.

Left cheliped (Fig. 4d) with covering of short dense setae on chela; longitudinal row of small tubercles on dorsal midline of dactyl; dorsal surface of palm and fixed finger with spinules or tubercles, dorsolateral margin with row of prominent spines. Carpus with 2 longitudinal rows of spines on dorsal surface and prominent dorsodistal

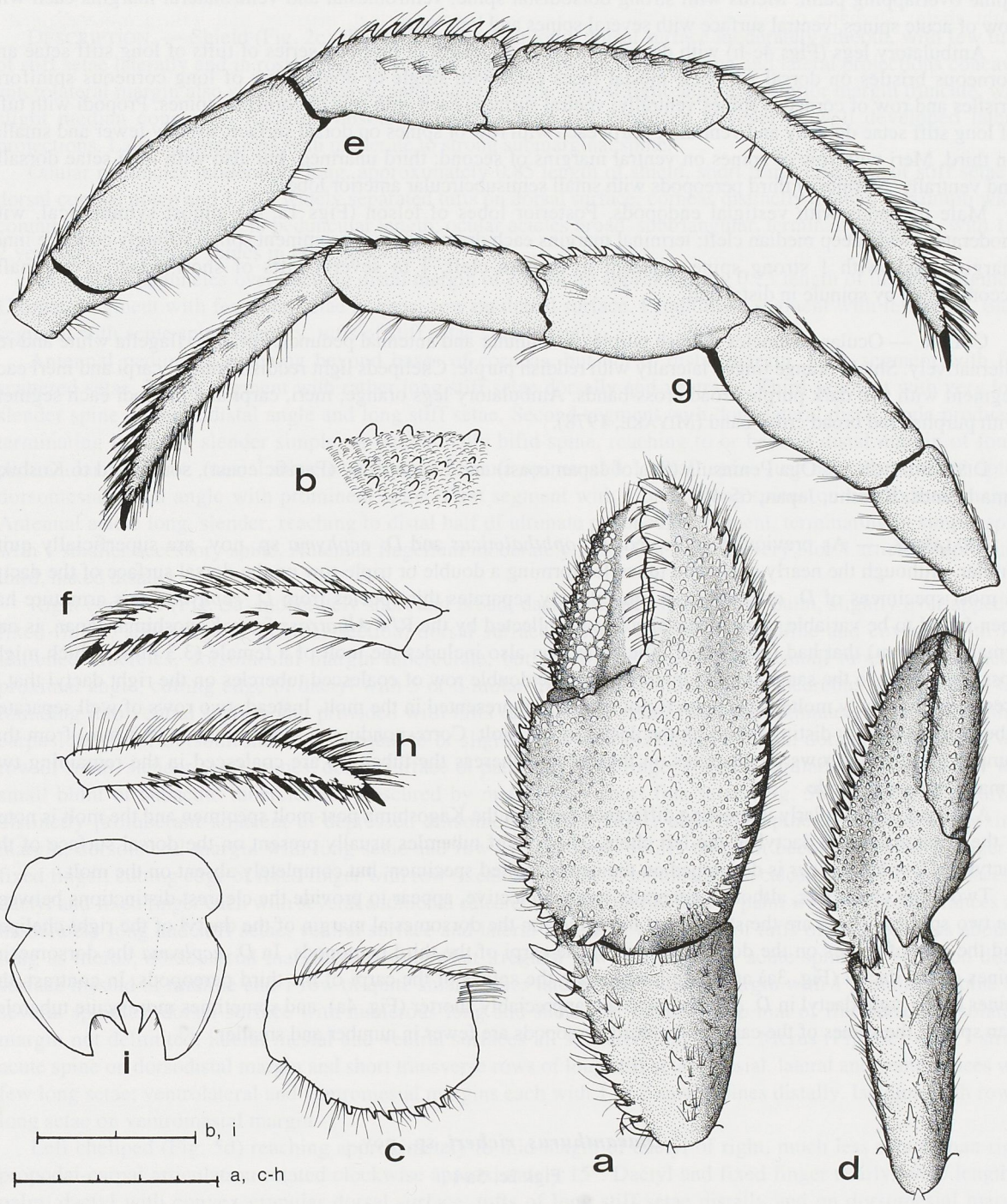


FIG. 4. — *Diacanthurus ophthalmicus* (Ortmann, 1892), ov. ♀ (6.4 mm) from Minabe, Wakayama, Japan: **a**, chela and carpus of right cheliped (surface setal mat not shown); **b**, enlarged area of dorsal surface of palm of right chela showing setal mat; **c**, merus of right cheliped (lateral view); **d**, chela and carpus of left cheliped (surface setal mat not shown); **e**, right second pereopod (lateral view); **f**, dactyl of right second pereopod (mesial view); **g**, left third pereopod (lateral view); **h**, dactyl of left third pereopod (mesial view); **i**, telson.

Scales equal 2.0 mm (b, i) and 5.0 mm (a, c-h).

spine overlapping palm. Merus with strong dorsodistal spine; ventromesial and ventrolateral margins each with row of acute spines, ventral surface with several spines and long setae.

Ambulatory legs (Figs 4e-h) with dactyls 1.35 to 1.50 length of propodi, series of tufts of long stiff setae and corneous bristles on dorsal surfaces; mesial faces each with single or double row of long corneous spiniform bristles and row of corneous spines ventrally; ventral surfaces each with row of corneous spines. Propodi with tufts of long stiff setae dorsally and ventrally. Carpi each with row of spines on dorsal surface, usually fewer and smaller on third. Meri with row of spines on ventral margins of second; third unarmed, but also with long setae dorsally and ventrally. Sternite of third pereopods with small semisubcircular anterior lobe.

Male pleopods with vestigial endopods. Posterior lobes of telson (Figs 1a, 4i) almost symmetrical, with moderately wide deep median cleft; terminal margins each drawn out into prominent spine; strongly concave inner margins each with 1 strong spine adjacent to median cleft, 1 to several tufts of short setae, occasionally accompanied by spinule in distal half.

COLOR. — Ocular peduncles reddish purple. Antennular and antennal peduncles orange; flagella white and red alternatively. Shield orange tinged laterally with reddish purple. Chelipeds light reddish orange; carpi and meri each segment with two dark purple broad cross-bands. Ambulatory legs orange; meri, carpi and propodi each segment with purplish red broad cross-band (MIYAKE, 1978).

DISTRIBUTION. — Oga Peninsula (Sea of Japan coast) and Sagami Bay (Pacific coast), southward to Koshiki-jima Islands, Kyushu, Japan; 65-400 m.

REMARKS. — As previously indicated, *D. ophthalmicus* and *D. ecphyma* sp. nov. are superficially quite similar. Although the nearly coalesced tubercles forming a double or triple row on the dorsal surface of the dactyl in most specimens of *D. ophthalmicus* immediately separates this species from *D. ecphyma*, this armature has been found to be variable. Among the specimens collected by the R/V *Albatross* from Kagoshima, Japan, is one female (5.3 mm) that had just molted. The collection also includes the molt of a female (3.3 mm), which might possibly belong to the same animal. Interestingly, the double row of coalesced tubercles on the right dactyl that is present in the newly molted specimen is not similarly represented in the molt. Instead, two rows of well separated tubercles are clearly distinguished on the dactyl of the molt. Corresponding, a second female (5.8 mm) from that sample has distinct rows of tubercles on the dactyl, whereas the tubercles are coalesced in the remaining two females and single male.

A second, and similarly interesting difference between the Kagoshima post-molt specimen and the molt is noted in the armature of the dactyl of the left chela. The row of tubercles usually present on the dorsal surface of the dactyl in *D. ophthalmicus* is developed on the newly molted specimen, but completely absent on the molt.

Two other characters, although generally more subjective, appear to provide the clearest distinctions between the two species. These are the strength of the spines on the dorsomesial margin of the dactyl of the right cheliped and the row of spines on the dorsal surfaces of the carpi of the third pereopods. In *D. ecphyma* the dorsomesial spines of the dactyl (Fig. 3a) are quite long, as are the spines of the carpi of the third pereopods. In contrast, the spines of the right dactyl in *D. ophthalmicus* are appreciably shorter (Fig. 4a), and sometimes more acute tubercles than spines; the spines of the carpi of the third pereopods are fewer in number and smaller.

Diacanthurus richeri sp. nov.

Figs 2c, 5a-i

MATERIAL EXAMINED. — **New Caledonia**. SMIB 8: stn DW 187, 23°18'S, 168°06'E, 390-540 m, 31.01.1993: 1 ♀ (3.6 mm) (USNM 276065). — Stn DW 190, 23°18'S, 168°05'E, 305-310 m, 31.01.1993: 1 ♂, 1 ♀ (5.7, 5.8 mm) (MNHN Pg 5493).

BATHUS 2: stn DW 729, 22°52'S, 167°11'E, 400 m, 12.05.1993: 1 ♂ (3.5 mm) (MNHN Pg 5494).

BATHUS 3: stn DW 830, 23°19'S, 168°01'E, 361-365 m, 29.11.1993: 1 ♂, 1 ♀ (3.5, 6.2 mm) (MNHN Pg 5495).

TYPES. — The female (6.2 mm) from BATHUS 3 Stn DW 830 is the holotype. The others are paratypes.

DESCRIPTION. — Shield (Fig. 2c) slightly broader than long, dorsal surface moderately smooth, with few tufts of stiff setae laterally and in rostral region; anterior margin between rostral region and lateral projections concave; anterolateral margin also slightly concave, anterolateral angle almost right-angled; posterior margin truncate, with slight median concavity. Rostrum obsolete; rostral region not produced to level of well developed lateral projections. Lateral projections with moderate to strong submarginal spine.

Ocular peduncles moderately long, approximately 0.85 length of shield, short transverse row of stiff setae in dorsal corneal notch and 1 or 2 widely separated tufts on dorsal surface; corneas distinctly dilated, maximum width contained 1.50 to 2.0 times in peduncular length; ocular acicles broad, subtriangular, terminally truncate, with 1 or 2 very strong terminal spines in large specimens.

Antennular peduncles overreaching distal margin of cornea by approximately 0.25 length of ultimate segment. Ultimate segment with few long setae in quasi-row on dorsal surface. Penultimate segment with few setae. Basal segment with acute spine laterally, tufts of stiff setae ventrodistally.

Antennal peduncles reaching beyond bases of corneas, but not to distal margin. Fifth segment with few scattered setae. Fourth segment with rather long stiff setae dorsally and ventrally. Third segment with very long slender spine at ventrodistal angle and long stiff setae. Second segment with dorsolateral distal angle produced, terminating in strong slender simple, or occasionally bifid spine, reaching to or beyond distal margin of fourth peduncular segment; mesial margin with 2 or 3 acute spines and 1 small spine just beneath terminal spine; dorsomesial distal angle with prominent spine. First segment with 1 or 2 strong spines on ventrodistal margin. Antennal acicle long, slender, reaching to distal half of ultimate peduncular segment, terminating in simple spine with 1 smaller accessory spine. Antennal flagellum moderately long; 1 or 2 setae every 3 or 4 articles in proximal third, naked distally.

Right cheliped (Fig. 5a) moderately short and broad; dactyl slightly shorter than palm, slightly overlapped by fixed finger; subtriangular in cross-section; dorsal surface roundly elevated in midline and covered with low flattened tubercles, dorsomesial margin tuberculate, but not well defined, 1 or 2 small tuberculate spines at proximal angle; cutting edge of dactyl with 5 or 6 molar-like teeth, terminating in calcareous tooth; mesial face rounding into ventral surface and provided with tufts of long stiff setae. Palm approximately equal to length of carpus; length of dorsomesial margin equal to or slightly less than maximum breadth; dorsomesial margin with row of small, slender acute spines, dorsal surface of palm and fixed finger covered regularly but not densely with small blunt or subacute tubercles not obscured by mat of very short fine setae (Fig. 5b); dorsomesial surface distinctly protuberant adjacent to depressed dorsomesial distal angle; usually 1 spine in midline at proximal margin, dorsolateral margin with long setae and row of very small spines on palm becoming much stronger on fixed finger; cutting edge of fixed finger with row of calcareous teeth, terminating in calcareous claw; inner faces of dactyl and fixed finger each with several additional calcareous teeth; mesial face of palm with low protuberances and moderately long and stiff setae; ventral surface and lateral face both with rows of tufts of setae. Carpus about as long as merus; dorsomesial margin with somewhat irregular row of long, very acute spines, 1 spine on dorsal surface mesiad of midline and 1 row of quite small spines laterad; dorsodistal margin with 1 prominent spine and several spinules; dorsal surface with numerous long and short stiff setae, but no mat of fine setae; dorsolateral margin not delimited, lateral mesial and ventral surfaces all scattered long setae. Merus (Fig. 5c) with 1 strong acute spine on dorsodistal margin and short transverse rows of long stiff setae; mesial, lateral and ventral faces with few long setae; ventrolateral and ventromesial margins each with 1 or 2 small spines distally. Ischium with row of long setae on ventromesial margin.

Left cheliped (Fig. 5d) reaching approximately to mid-length of dactyl of right, much less robust than right; propodal-carpal articulation rotated clockwise approximately 15°. Dactyl and fixed finger nearly twice length of palm; dactyl with convex granular dorsal surface, tufts of long stiff setae distally and on dorsomesial margin; cutting edge with row of very fine corneous teeth, terminating in prominent corneous claw; mesial and ventral surfaces with tufts of stiff setae. Palm half or slightly less than half length of carpus; dorsal surface roundly elevated in midline, row of slender spines on dorsolateral margin, decreasing in size on fixed finger; dorsal surface covered with mat of short fine setae and uniform but not densely packed small tubercles; dorsomesial margin with

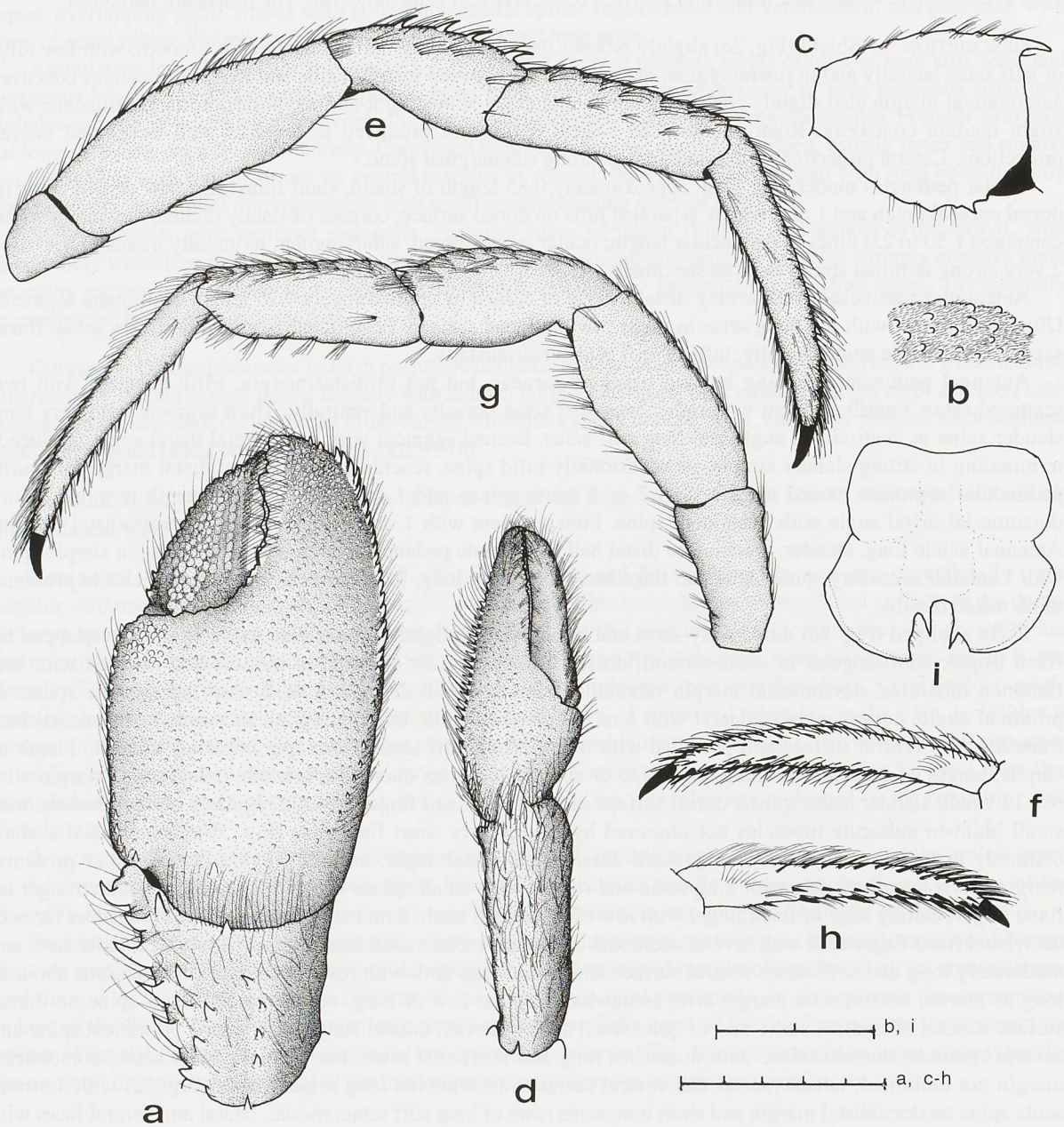


FIG. 5. — *Diacanthurus richeri* sp. nov., ♂ (5.9 mm) SMIB 8 Stn DW 190: **a**, chela and carpus of right cheliped (surface setal mat not shown); **b**, enlarged area of dorsal surface of palm of right chela showing setal mat; **c**, merus of right cheliped (lateral view); **d**, chela and carpus of left cheliped (surface setal mat not shown); **e**, right second pereopod (lateral view); **f**, dactyl of right second pereopod (mesial view); **g**, left third pereopod (lateral view); **h**, dactyl of left third pereopod (mesial view); **i**, telson.
Scales equal 2.0 mm (b, i) and 5.0 mm (a, c-h).

1 or 2 small spines in proximal third; ventral surfaces of palm and fixed finger with tufts of long stiff setae. Carpus with row of strong spines on both dorsomesial and dorsolateral margins, prominent spine on distal margin overlapping palm; mesial and lateral faces with numerous transverse rows of long stiff setae. Merus with small

spine at dorsodistal margin, transverse rows of long stiff setae dorsally, mesially and laterally; ventrolateral and ventromesial margins each with row of small spines, ventral surface with tufts of long stiff setae. Ischium with row of very small spines on ventromesial margin.

Ambulatory legs (Figs 5e-h) generally similar. Dactyls approximately 1.25 length propodi; with slight distal twist and slight ventral curve; dorsal surfaces each with transverse rows of long corneous spines-like bristles; mesial faces each with row of corneous spines ventrally and frequently also dorsally; ventral surfaces each with row of corneous spines, dorsal and ventral surfaces also with tufts of long stiff setae. Propodi same length as carpi or slightly longer, with tufts of long stiff setae arising from low protuberances dorsally and ventrally. Carpi of second each with 3 or 4 widely-spaced strong spines on dorsal surface; third with 1 spine at dorsodistal angle and few tufts of setae. Meri with low protuberances and tufts of long setae dorsally and ventrally. Ischia unarmed. Sternite of third pereopods with anterior lobe semisubcircular, slightly skewed.

Males pleopods with endopods usually absent. Telson (Fig. 5i) with lateral angles of posterior lobes not strongly produced, terminally subacute; inner margins nearly perpendicular, each usually with 1 spine on either side of moderately wide median cleft (only 1 in holotype), often extending more than 0.50 length of margin.

COLOR. — In preservative: Only faint tinge of reddish-yellow remaining on chelae.

ETYMOLOGY. — This species is named in honor of Bertrand RICHER DE FORGES, of ORSTOM, a principal collector for the MUSORSTOM campaigns.

HABITAT. — Not known.

DISTRIBUTION. — New Caledonia; 305-400 m (at least).

REMARKS. — In lacking a row of spines on the dorsal margins of the carpi of the third pereopods, *D. richeri* appears most closely allied to *D. spinulimanus*. However, the two species are easily separated by the differences in armature of the dorsal surfaces of the chelae. Additionally, *D. richeri* frequently has a pair of strong spines on each ocular acicle in large specimens. Of the six specimens available, the three largest specimens all have a pair of spines on each acicle. In the three smaller specimens, the terminal acicular margin is straight, with a strong spine developed mesially, and in one of the three a second small spine is present laterally on one acicle. The terminal margins of the acicles in *D. spinulimanus* are triangular and only a single spine has been observed in all of the specimens examined.

One small, questionably female specimen (3.5 mm) (MNHN Pg 5494) possessed both female gonopores and what appeared to be a small right male gonopore. Unpaired pleopods three to five had moderately well developed exopods, but very rudimentary endopods were present only on the third and fourth. The second pleopod was uniramous and rudimentary; however, in small female specimens of all species of *Diacanthurus*, the second pleopod is appreciably less developed than either the third or fourth.

Diacanthurus rubricatus (Henderson, 1888) new combination

Figs 2d, 6a-j

Eupagurus rubricatus Henderson, 1888: 69, pl. 7. fig. 4. — G.M. THOMSON, 1899: 180. — ALCOCK, 1905: 176 (list). — CHILTON, 1911: 297. — E.F. THOMPSON, 1930: 272.
Eupagurus intermedius - CHILTON, 1911: 297; not *Eupagurus intermedius* Lenz, 1901.
Pagurus rubricatus - GORDAN, 1956: 335 (lit). — HAND, 1975: 510. — PROBERT *et al.*, 1979: 381 (list). — HYDEN & FOREST, 1980: 473. — SCHEMBRI, 1982a: 101, figs 1-12. — SCHUCHERT, 1996: 48.
"Pagurus" rubricatus - SCHEMBRI, 1982b: 868; 1988: 93. — SCHEMBRI & MCLAY, 1983: 34, figs 21, 24.

TYPE. — **New Zealand**. Holotype (6.6 mm; abdomen missing) (NHM 1888.33).

ADDITIONAL MATERIAL EXAMINED. — **New Zealand**. Off Napier: 37 m, 11.1923: coll. W.J. PHILLIPPS: 1 ♂, 1 ♀ (11.2, 14.9 mm) (NMNZ). — Off Banks Peninsula, Trawler *Phyllis*, 36-18 m, 21.08.1929: 1 ♂ (15.5 mm) (MNHN-Pg

5496). — Portobello Marine Laboratory: stn MU 66-75, East of Taiaroa Head, 51-55 m, 09.12.1966: 1 ♂ (16.6 mm) (PMLUO).

R.V. *Kaharoa* (coll. M. MORRISON): stn 10, 36°55'S, 176°17'E, 348-352 m, 09.04.1996: 1 ♂ (10.0 mm) (PMcL). — Stn 26, 37°05'S, 176°15'E, 395-399 m, 13.04.1996: 1 ♀ (9.7 mm) (PMcL). — Stn 55, 36°54'S, 176°18'E, 442-445 m, 22.04.1996: 1 ♂ (9.9 mm) (PMcL).

NZOI: stn A 901, 43°17'S, 177°04'E, 251 m, 08.09.1963: 1 ov. ♀ (11.9 mm) (NZOI). — Stn C 753, 35°20'S, 172°52'E, 190 m, 17.03.1962: 1 ♀ (7.7 mm) (NZOI). — Stn F 739, 37°36'S, 179°06'E, 529-459 m, 27.03.1967: 2 ♂ (3.9, 5.2 mm) (NZOI). — Stn D 121, 43°16'S, 177°10'E, 210 m, 11.10.1963: 1 ♂, 2 ♀, 2 ov. ♀ (6.8-16.4 mm) (NZOI). — Stn D 267, 40°50'S, 173°43'E, 60 m, 06.10.1964: 1 ♀ (3.9 mm) (NZOI). — Stn E 106, 43°55'S, 177°10'W, 180 m, 11.10.1964: 2 ♂, 5 ♀ (7.6-15.5 mm) (NZOI). — Stn E 114, 43°35'S, 176°15'W, 135 m, 13.10.1964: 2 ♂, 2 ♀ (3.3-7.3 mm) (NZOI). — Stn E 727, 37°40'S, 177°12'E, 300-278 m, 25.03.1967: 1 ♀ (8.5 mm) (NZOI). — Stn E 759, 43°45'S, 173°40'E, (?)1951-2134 m, 31.03.1967: 1 ♀ (5.0 mm) (NZOI). — Stn E 785, 44°00'S, 168°18'E, 282 m, 17.10.1967: 1 ov. ♀ (11.9 mm) (NZOI). — Stn F 741, 40°30'S, 174°30'E, 117 m, 02.04.1967: 1 ♂, 1 ♀ (5.2, 8.3 mm) (NZOI).

DIAGNOSIS. — Shield (Fig. 2d) subquadrate, slightly broader than long, moderately flat, with lateral tufts of setae. Rostrum virtually obsolete to obtusely rounded, sometimes produced slightly beyond level of weakly developed lateral projections, large specimens occasionally with small rostral protuberance. Ocular peduncles moderately stout, 0.50-0.90 length of shield (0.50-0.75 in large specimens); corneas somewhat dilated, corneal diameter included 1.25 to 1.80 in peduncular length; ocular acicles broad basally, slender and acuminate distally, with usually strong submarginal spine. Antennular and antennal peduncles overreaching distal margin of corneas. Antennal acicle long, slender, reaching distal half or nearly to distal margin of fifth peduncular segment, mesial margin setose.

Chelipeds with distal segments usually covered with short matted setae (Fig. 6b); dactyl of right cheliped (Fig. 6a) with several rows of rounded tubercles on dorsal surface; palm with dorsomesial margin commonly inflated, maximum breadth of palm usually at least 1.50 times length of dorsomesial margin, or often in very large specimens only 1.25 times; dorsal surface elevated in midline, frequently more prominently produced distally, and with inverted, quasi V-shaped series of large blunt tubercles; remainder of dorsal surface with scattered rounded tubercles at least partially obscured by setae, dorsomesial and dorsolateral margins each with row of spines. Carpus with strong row of spines on dorsomesial margin, dorsal surface with conical spines, strongest and most numerous mesiad of midline, partially obscured by setae; distal margin with 1 or 2 prominent spines. Merus (Fig. 6c) with strong spine at dorsodistal margin; ventrolateral margin with row of small spines or spinules and prominent spinose protuberance proximally.

Left cheliped (Fig. 6d) with propodal-carpal articulation rotated clockwise 45-60° from horizontal plane. Dorsal surface of dactyl with dense mat of setae usually obscuring several irregular rows of small spines or spinulose tubercles; dorsolateral margin of palm strongly convex, somewhat elevated proximally and armed with blunt spines, dorsal surface covered by short dense setae, often completely obscuring irregular rows of small spines or spinulose tubercles. Dorsal surface of carpus with 2 rows of spines. Merus with strong spine on dorsodistal margin; ventromesial and ventrolateral margins each with row of slender spines.

Ambulatory legs (Figs 6e-h) usually slightly overreaching tip of right cheliped; dactyls considerably longer than propodi, slightly twisted; dorsal margins each with row of long corneous spiniform bristles, but few additional setae; mesial faces each with dorsal and ventral row of small corneous spinules; ventral margins each with row of long corneous spines interspersed with shorter corneous spines or spiniform bristles. Propodi with transverse setose ridges dorsally and fewer similar ridges ventrally. Carpi of both second and third with spinose dorsal margins. Meri of second each with row of widely-spaced low, sometimes spinulose protuberances or small spines on ventral margins; third unarmed. Sternite of third pereopods with subquadrate to subrectangular anterior lobe.

Male pleopods usually uniramous; third occasionally with vestige of endopod. Telson (Figs 6i, j) with posterior lobes laterally convex or nearly straight, mesially concave and drawn out into strong terminally blunt or acute "half-moon"; 1 strong, but usually quite short spine basally on either side of broad, often moderately deep median cleft, occasionally 1 or 2 spinules on inner margin.

COLOR. — Ocular peduncle white with red longitudinal stripe ventrally; antennules white; antennae uniformly reddish-brown; chelipeds and ambulatory legs yellow-brown ground color tending to white ventrally, with bright

red bands on distal ends of meri and patch of same color on mesial faces at proximal ends of carpi; carpi also with light purple longitudinal stripe on dorsal margins (SCHEMBRI & MCLAY, 1983).

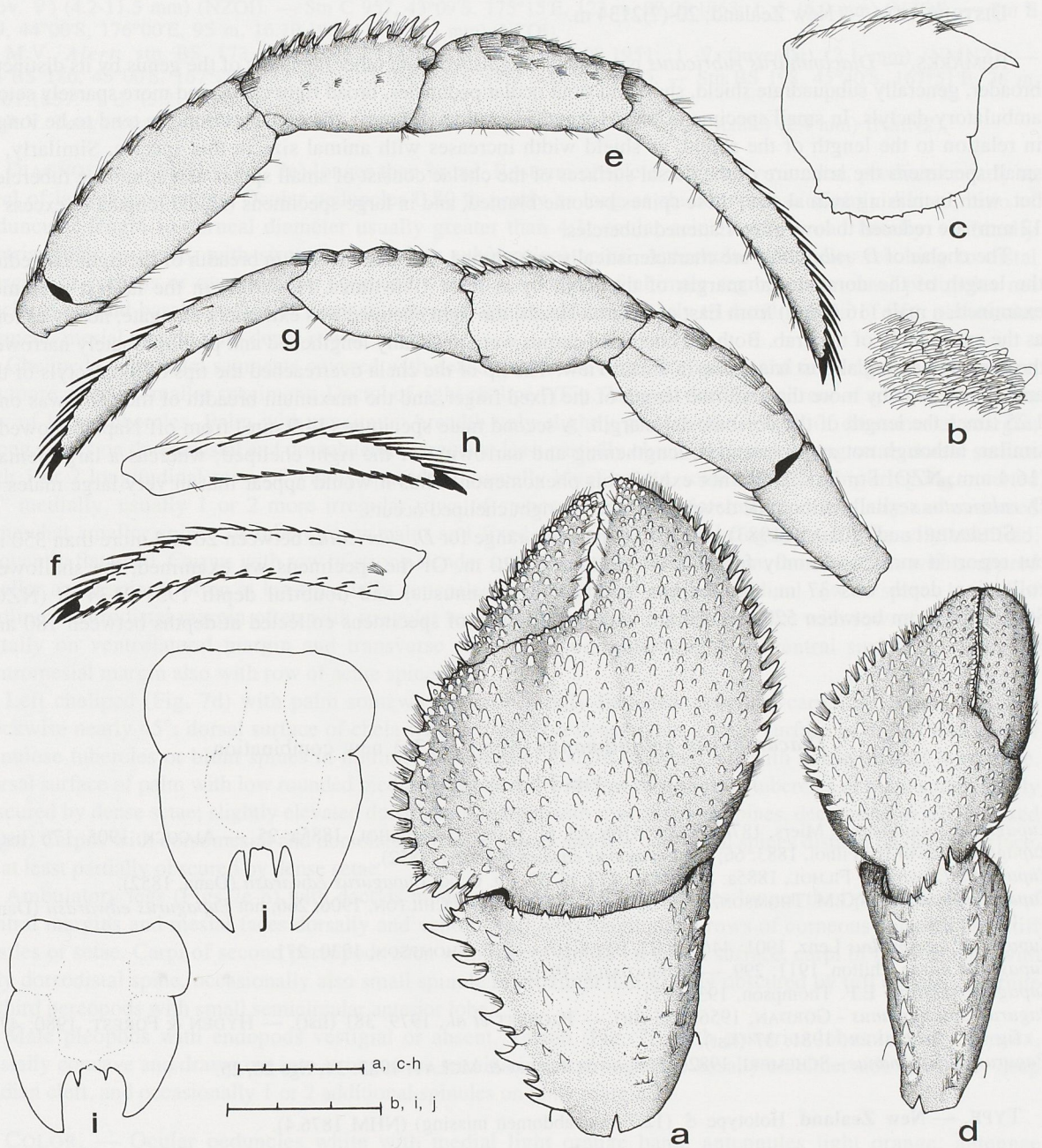


FIG. 6. — *Diacanthurus rubricatus* (Henderson, 1888), a-i, ♀ (8.4 mm) from NZOI Stn D 121; j, ♀ (9.6 mm) from Bay of Plenty, New Zealand: **a**, chela and carpus of right cheliped (surface setal mat not shown); **b**, enlarged area of dorsal surface of palm of right chela showing setal mat; **c**, merus of right cheliped (lateral view); **d**, chela and carpus of left cheliped (surface setal mat not shown); **e**, right second pereopod (lateral view); **f**, dactyl of right second pereopod (mesial view); **g**, left third pereopod (lateral view); **h**, dactyl of left third pereopod (mesial view); **i-j**, telson.
Scales equal 3.0 mm (b, i, j) and 5.0 mm (a,c-h).

HABITAT. — Found occupying variety of gastropod shells, which may be covered with the hydrozoan *Hydractinia rubricata* Schuchert, or may carry the anemones *Paracalliactis rosea* Hand and *Calliactis conchicola* Parry.

DISTRIBUTION. — New Zealand; 20-(?)2134 m.

REMARKS. — *Diacanthurus rubricatus* is easily distinguished from other members of the genus by its distinctly broader, generally subquadrate shield, short and stout ocular peduncles, broad right chela, and more sparsely setose ambulatory dactyls. In small specimens (shield lengths less than 4.0 mm), the ocular peduncles tend to be longer in relation to the length of the shield, as shield width increases with animal size in this species. Similarly, in small specimens the armature of the dorsal surfaces of the chelae consist of small spines and spinulose tubercles; but, with increasing animal size, these spines become blunted, and in large specimens (shield lengths in excess of 12 mm) are reduced to low, often flattened tubercles.

The chelae of *D. rubricatus* are characteristically quite broad, with the maximum breadth of the right exceeding the length of the dorsomesial margin of the palm by at least 1.50 times. However, in the largest specimen examined, a male (16.6 mm) from East of Taiaroa Heads, the right cheliped was extremely elongate, nearly as long as the entire body of the crab. Both the chela and carpus were unusually lengthened and proportionately narrower, the chela appearing almost triangular in dorsal view. The tip of the chela overreached the tips of the dactyls of the ambulatory legs by more than half the length of the fixed finger, and the maximum breadth of the palm was only 1.25 times the length of the dorsomesial margin. A second male specimen (14.9 mm) from off Napier showed a similar, although not as pronounced, lengthening and narrowing of the right cheliped; whereas a large female (16.4 mm, NZOI Stn D 121) did not exhibit this phenomenon. Thus it would appear that in very large males of *D. rubricatus* sexually dimorphic development of the right cheliped occurs.

SCHEMBRI and McLAY (1983) give the bathymetric range for *D. rubricatus* between 20 and more than 350 m, but report it most commonly found between 40 and 220 m. Of the specimens we examined, the shallowest collection depth was 37 m, the deepest, apart from the unusual and doubtful depth 1951-2134 m (NZOI Stn E 759) from between 529 and 459 m, with the majority of specimens collected at depths between 180 and 300 m.

Diacanthurus spinulimanus (Miers, 1876) new combination

Figs 1 b-e, 2e, 7a-i

Eupagurus spinulimanus Miers, 1876a: 222; 1876b: 63, pl. 1, fig. 6. — FILHOL, 1885a: 25. — ALCOCK, 1905: 176 (list).
Eupagurus Edwardsii Filhol, 1883: 66; not *Eupagurus edwardsii* (Dana, 1852).
Eupagurus Edwardsi - FILHOL, 1885a: 25; 1885b: 412, pl. 52, fig. 6; not *Eupagurus edwardsii* (Dana, 1852).
Eupagurus edwardsi - G.M. THOMSON, 1899: 182, pl. 20, figs 6-7. — CHILTON, 1906: 266; not *Eupagurus edwardsii* (Dana, 1852).
Eupagurus intermedius Lenz, 1901: 446, pl. 32, figs 8-10. — E.F. THOMPSON, 1930: 271.
Eupagurus norae Chilton, 1911: 299. — BORRADAILE, 1916: 95.
Eupagurus chiltoni E.F. Thompson, 1930: 271.
Pagurus spinulimanus - GORDAN, 1956: 335 (lit). — PROBERT *et al.*, 1979: 381 (list). — HYDEN & FOREST, 1980: 473, fig. 3b. — RAINER, 1981: 37 (list).
'Pagurus' spinulimanus - SCHEMBRI, 1982b: 868. — SCHEMBRI & McLAY, 1983: 34, figs 20, 25.

TYPE. — **New Zealand**. Holotype ♂ (12.7 mm; abdomen missing) (NHM 1876.4).

ADDITIONAL MATERIAL EXAMINED. — **New Zealand**. No specific locality: 1790-1795, H. FILHOL id.: 1 ♂, 1 ♀ (5.1, 5.8 mm) (MNHN). — Cook Strait, H. FILHOL id.: 1 ♀ (7.2 mm) (MNHN). — VUZ Stn GUJ 166, 1 ♀ (7.1 mm) (NMNZ). — VUZ Stn H, 1 ♀ (6.3 mm) (NMNZ). — Great Omaha Bay: 26-30 m, 17.07.1995-15.12.1995, coll. R. TAYLOR: 2 ♂, 3 ♀ (2.2-9.1 mm) (PMcL). — Colville Channel: Marine Prawn Survey Stn 90, 48 m, 14.11.1962: 1 ♂, 2 ♀ (3.4-5.7 mm) (NZOI). — Paria Rock, Hawke Bay: 12 m, 29.7.1991, coll. C. DUFFY: 4 ♂, 4 ♀ (2 ov.) (7.1-14.9 mm) (PMcL). — Off Cuvier I.: Marine Fisheries Dept., 46-51 m, 11.01.1964: 1 ov. ♀ (10.7 mm) (NZOI).

NZOI: Stn, B 225, 46°50'S, 168°18'E, 31 m, 21.01.1960: 1 ♂, 1 ♀ (12.4, 13.2 mm) (NZOI). — Stn B 263, 46°55'S, 168°24'E, 53 m, 27.05.1960: 1 ♀ (10.0 mm) (NZOI). — Stn B 605, 46°23'S, 167°22'E, 73 m, 17.10. 1962: 1 ♀ (3.4 mm) (NZOI). — Stn B 619, 44°42'S, 167°33.2'E, 95 m, 19.10.1962: 1 ♀ (6.5 mm) (NZOI). — Stn C 814, 37°40'S, 178°56'E, 194 m, 25.02.1962: 1 ♂ (5.4 mm) (NZOI). — Stn C 844, 41°38'S, 175°11'E, 88 m, 01.03.1962: 1 ♂, 2 ♀ (1 ov. ♀) (4.2-11.5 mm) (NZOI). — Stn C 957, 43°09'S, 175°15'E, 123 m, 07.03.1963: 1 ♂ (6.0 mm) (NZOI). — Stn E 139, 44°00'S, 176°00'E, 95 m, 16.10.1964: 1 ♀ (4.1 mm) (NZOI).

M.V. *Alert*: stn BS 173, 40°52.2'S, 114°57.2'E, 59 m, 10.08.1951: 1 ♀ (juvenile) (2.1 mm) (NMNZ). — Stn BS 186, 45°00'S, 167°20'E, 37 m, 23.03.1949: 1 ♀ (8.9 mm) (NMNZ). — Stn BS 198, 45°40'S, 167°51'E, 36 m, 13.01.1957: 1 ♂ (3.2) (NMNZ).

R.V. *Tangaroa*: stn BS 732, 37°46.5'S, 176°38.5'E, 39 m, 21.01.1979: 1 ?♂ (juvenile) (2.4 mm) (NMNZ).

DIAGNOSIS. — Shield (Fig. 2e) longer than broad. Rostrum obsolete or broadly rounded, produced nearly to level of lateral projections. Ocular peduncles 0.80 to nearly as long as shield; corneae slightly dilated, ratio of peduncular length to corneal diameter usually greater than 4:1; ocular acicles very broad basally, terminally subtriangular to ovate, with strong marginal or submarginal spine. Antennular peduncles reaching to distal margins of corneas or overreaching corneas by up to 0.5 length of ultimate segment. Antennal peduncles not reaching beyond basal margins of corneas; antennal acicles reaching nearly to distal margin of fifth peduncular segment, mesial margin with dense row of long setae.

Chelipeds with distal segments covered with dense short setae (Fig. 7b); spines and tubercles usually smaller, but more acute in smaller specimens. Dactyl of right cheliped (Fig. 7a) with dorsolateral row of spines and median row of large tubercles. Palm with maximum breadth only slightly greater than length of dorsomesial margin; strong spines on dorsomesial and dorsolateral margins at least partially obscured by dense long setae; dorsal surface with 1 or 2 longitudinal rows of widely-spaced tall, usually blunt spines, sometimes forming irregular inverted "V" medially, usually 1 or 2 more irregular rows of spines or tubercles laterally and mesially and scattered somewhat smaller spines or tubercles on palm and fixed finger; tip of fixed finger usually heavily calcified, frequently flattened. Carpus with row of strong slender spines on dorsomesial margin; dorsal surface with scattered smaller acute spines, often at least partially concealed by dense setae and longitudinal row of spines laterad of midline; ventrodistal margin often with irregular row of small spines. Merus (Fig. 7c) with row of acute spines distally on ventrolateral margin and transverse rows of spines extending onto ventral surface proximally; ventromesial margin also with row of acute spines.

Left cheliped (Fig. 7d) with palm somewhat dorsoventrally flattened, propodal-carpal articulation twisted clockwise nearly 45°; dorsal surface of chela with mat of short dense setae. Dorsal surface of dactyl with row of spinulose tubercles or blunt spines in midline, dorsomesial margin unarmed but with dense tufts of long setae. Dorsal surface of palm with low rounded median ridge armed with row of spinulose tubercles or blunt spines nearly obscured by dense setae; slightly elevated dorsolateral margin with row of strong spines, decreasing in size on fixed finger. Carpus with dorsomesial and dorsolateral row of spines and few additional spines distally on dorsal surface, all at least partially obscured by dense setae.

Ambulatory legs (Figs 7e-h) with dactyls moderately stout, 1.35-1.75 times longer than propodi, dorsal and ventral margins and mesial faces dorsally and ventrally all with longitudinal rows of corneous spinules and stiff bristles or setae. Carpi of second pereopods each with row of spines on dorsal surface; carpi of third usually with only dorsodistal spine, occasionally also small spinule in proximal half usually obscured by tuft of setae. Sternite of third pereopods with small semicircular anterior lobe.

Male pleopods with endopods vestigial or absent. Telson (Fig. 7i) with posterior lobes laterally convex, mesially concave and drawn out into strong acute termination; 1 strong spine basally on either side of usually deep median cleft, and occasionally 1 or 2 additional spinules on inner margin.

COLOR. — Ocular peduncles white with medial light orange band; antennules light orange; antennae reddish brown with white bars; chelipeds and ambulatory legs orange-brown ground color and darker brown areas and distinctive purple and dark red patches on regions of articulation of carpi and meri (SCHEMBRI & MCLAY, 1983).

HABITAT. — Occupies variety of gastropod shells and may carry the anemone *Calliactis conchicola* on the shell; on muddy sand substrates.

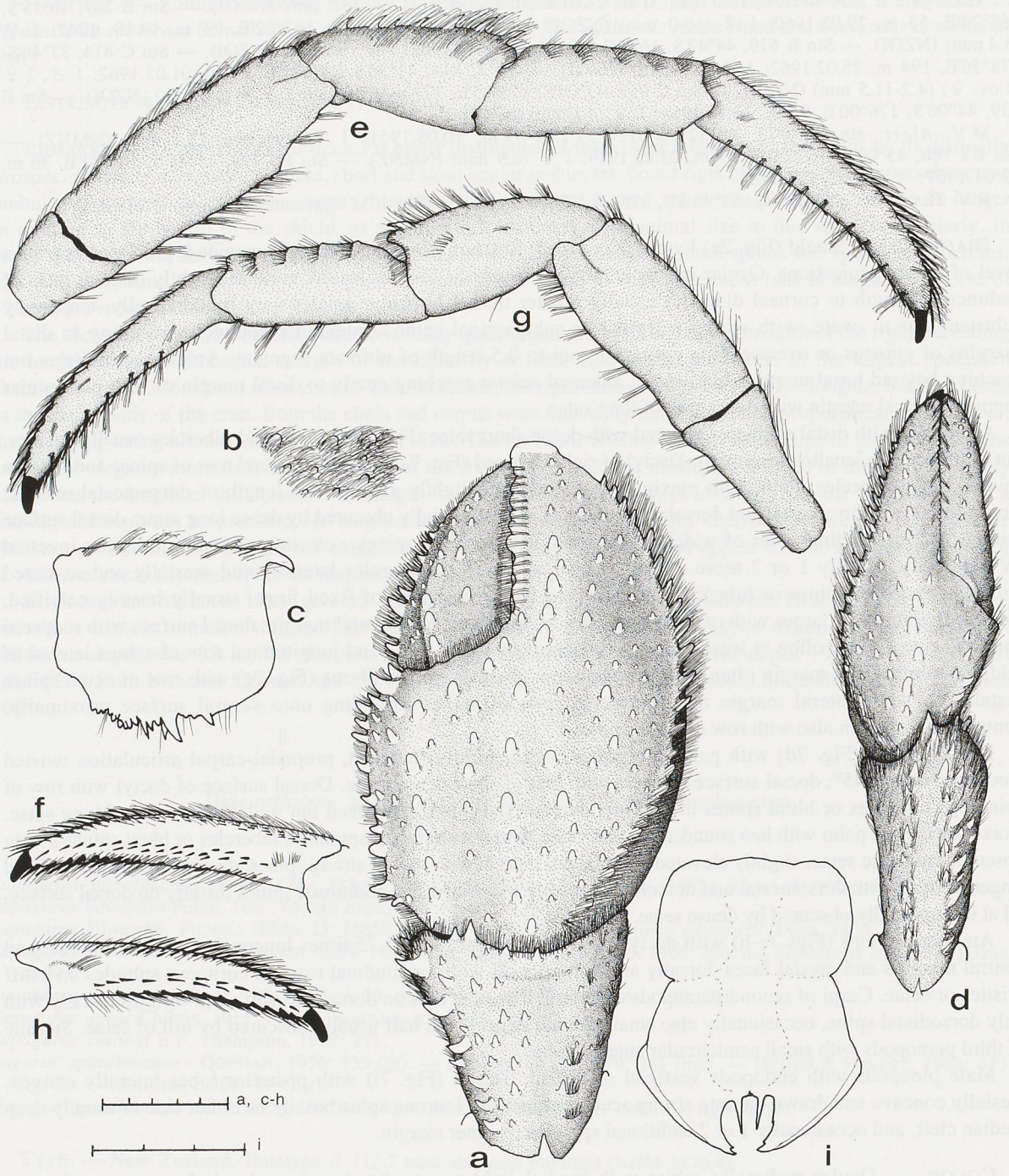


FIG. 7. — *Diacanthurus spinulimanus* (Miers, 1876), a-i, ♀ (12.0 mm) from Paria Rock, Hawks Bay, New Zealand: **a**, chela and carpus of right cheliped (surface setal mat not shown); **b**, area of dorsal surface of palm of right chela showing setal mat; **c**, merus of right cheliped (lateral view); **d**, chela and carpus of left cheliped (surface setal mat not shown); **e**, right second pereopod (lateral view); **f**, dactyl of right second pereopod (mesial view); **g**, left third pereopod (lateral view); **h**, dactyl of left third pereopod (mesial view); **i**, telson.

Scales equal 3.0 mm (i) and 5.0 mm (a, c-h).

DISTRIBUTION. — New Zealand and Chatham Islands; 12-194 m.

REMARKS. — The questionably juvenile male specimen (2.4 mm) has much longer and more acute spines of the dorsal surface of the palm of the left cheliped than any other specimens examined within the size range of 2.1 to 2.6 mm, but in all other respects agrees with small specimens of *D. spinulimanus*.

Diacanthurus spinulimanus is immediately distinguished from all other species of the genus by the much longer and more slender ocular peduncles, and only slightly dilated corneas (peduncular length to corneal diameter equal to or greater than 4:1). As previously indicated, *D. spinulimanus* appears most closely allied to *D. richeri* sp. nov. The irregular rows of large, widely-spaced tubercles on the dorsal surface of the palm of the right chela of *D. spinulimanus* immediately distinguishes this species from *D. richeri*.

DISCUSSION

The species of *Diacanthurus* present an extremely similar morphological module, despite their broad latitudinal range (Japan to southern Western Australia and southern New Zealand). Not only the unique structure of the telson, which immediately sets the species now assigned to *Diacanthurus* apart from other species of *Pagurus*, but several additional characters, taken in concert, demonstrate this homogeneity and provide the rationale for establishing a separate genus. These characters include the very clearly two-segmented ocular peduncles, the distinctive ocular acicles, the shape of the left chela and its propodal-carpal articulation, the strong molar-like dentition of the cutting edges of the dactyl and fixed finger of the right chela, the covering of the dorsal surfaces of the chelae with mats of fine setae, and the masking of the male gonopores by prominent tufts of long setae.

Although POWAR (1969) reported a three-segmented peduncle for *Diogenes miles* Fabricius, 1787 and several other decapod taxa, we accept the views of JACKSON (1913) and MAKAROV (1938, 1962) that a two-segmented ocular peduncle is characteristic of pagurids, as it is typical for decapods in general (cf. BALSS, 1940). However, the basal segment is usually small and there is relatively little flexibility between the two segments. In *Diacanthurus* the basal segment is enlarged; the extensive articulating membrane between the two segments permits considerable intersegmental flexibility. The ocular acicles are exceptionally prominent, broad, flattened, terminally straight, blunt or subacute, and with one or two very large marginal or submarginal spines.

The conformation of the left chela, although not unique, is unusual and seen consistently only in one other pagurid genus, i.e., *Australeremus* McLaughlin, 1981. The proximal portion of the dorsolateral margin of the palm is often considerably expanded, always strongly armed, and generally elevated above the dorsolateral surface, whereas this margin on the fixed finger, while still armed, is depressed well below the dorsolateral surface. The propodal-carpal articulation is rotated clockwise 15-60° from the horizontal plane, giving the palm an oblique flexion. SCHEMBRI (1982a) suggested that the expanded lateral margin in *D. rubricatus* was an adaptation for digging, while the more concave ventral surface provided an efficient scoop for collecting sediment.

Similarly, the strong molar-like armature of the cutting edges of the dactyl and fixed finger of the right chela is not unique to *Diacanthurus* (e.g., see MCLAUGHLIN, 1974), but the relative uniformity of development among its members suggests similarities in feeding behavior. SCHEMBRI (1982a) suggested that this dentition in *D. rubricatus* was an adaptation for cracking molluscan shells. SCHEMBRI (1982b) described feeding in *D. rubricatus* and *D. spinulimanus* as practically identical.

Tufts of setae in close proximity to male gonopores are not uncommon among pagurids; however, in certain genera the presence of a distinctive tuft masking the gonopore is considered a diagnostic character, i.e. a prominent tuft masks the right gonopore in *Pagurixus* Melin, 1939 or left gonopore in *Paguridium* Forest, 1961. In *Diacanthurus* such tufts of stiff setae mask both gonopores.

The fossil record of pagurids is poor and specimens usually consist only of chelae or remnants of them (e.g., VAN STRAELEN, 1925; RATHBUN, 1926, 1935), some of which can only questionably be assigned to the Section Paguridea (sensu FOREST, 1987). GLAESSNER (1969) reported the first records for the Section in general, as Late Jurassic, and the Paguridae, in particular, as the Late Cretaceous; FÖRSTER (1985) placed pagurids first in the Early Liassic. However, these early records are derived from chelae attributed to genera such as *Goniochirus*

Étallon, 1861, *Orhomalus* Étallon, 1861 and *Paleopagurus* Van Straelen, 1925, whose assignment to the Paguridea is uncertain, at best. As previously indicated, *"Pagurus" clifdenensis* is from the Altonian stage, Early Miocene, and only one of two fossil hermit crabs reported from New Zealand: FELDMAN and KEYES (1992) mentioned *Pagurus* sp. (without description) from the southern portion of North Island, from the Late Miocene to the Early Pleistocene.

"Pagurus" clifdenensis' position within the Paguridae is without question; it is preserved occupying the shell of *Struthiolaria subspinosa* Marwick. That it is correctly assignable to *Diacanthurus* is based on the structure, armature, and apparent indications of setation of both chelipeds. HYDEN and FOREST (1980) compared the fossil with *D. spinulimanus*; however, an even greater similarity is seen between *D. clifdenensis* and *D. ecphyma* sp. nov. In both species the dorsal surface of the palm of the right chela is covered, but not densely, with small spines or tubercles, the margins each carry a row of spines, those of the dorsolateral margin smaller on the palm, but increasing in size on the fixed finger; the dorsal surfaces of the dactyls each have several longitudinal rows of small spines or tubercles and a marginal row of spines. Like all other species of *Diacanthurus*, the cutting edge of the dactyl and fixed finger each is provided with a row of strong molar-like teeth. The armature of the palms of the left chelas of the fossil and *D. ecphyma* also are very similar. The illustrations of the in situ carpi of the right and left chelipeds of *D. clifdenensis* (HYDEN & FOREST, 1980: text-fig. 2), while distinct from, are comparable with those of *D. ecphyma*, in having a marginal row of spines on the right accompanied by an irregular adjacent row; the left carpi of both species have two rows of strong dorsal spines, with a prominent dorsodistal spine.

There appears to be an evolutionary trend in the shape and armature of the chelipeds in species of *Diacanthurus* in the following in sequence, fossil included: *D. richeri*, *D. ophthalmicus*, *D. clifdenensis*, *D. spinulimanus*, *D. ecphyma*, *D. rubricatus*. Beginning with *D. richeri* where the right palm is almost symmetrical, without any expansion of the dorsomesial margin and weak armature, a pattern of enlargement of the dorsal surface, expansion of the dorsomesial margin, and increasing strength of armature can be followed through *D. ophthalmicus*, *D. clifdenensis* and *D. spinulimanus* to *D. ecphyma* and *D. rubricatus*. A similar, but not as distinctive progression can be seen in expansion and armature of the dorsolateral margin of the left palm, and among Recent species in the amount of rotation in the propodal-carpal articulation. In *D. richeri* there is little, if any, marginal expansion; the armature is weak; and the rotation slight. *Diacanthurus ophthalmicus*, *D. clifdenensis*, *D. spinulimanus*, and *D. ecphyma*, all exhibit slightly greater expansions of the dorsolateral margin, and increases both in the strength of the marginal spines, and in the Recent species, the degree of propodal-carpal rotation. Expansion and rotation reach the maximum in *D. rubricatus*, although the marginal spines tend to become more blunted with increasing animal size.

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8

Crustacea Decapoda : Cyclodorippidae récoltés dans l'archipel de Vanuatu (Brachyura)

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RÉSUMÉ

Six espèces de Cyclodorippidae, dont une nouvelle, *Tymolus daviei*, ont été récoltées dans l'archipel de Vanuatu, en 1994, lors de la campagne MUSORSTOM 8. L'espèce nouvelle a également été trouvée en Nouvelle-Calédonie. Jusqu'à présent, aucun représentant du genre *Tymolus* n'avait été signalé dans cette région. Les cinq autres espèces, connues d'autres zones de l'Indo-Ouest Pacifique, sont recensées pour la première fois dans l'archipel de Vanuatu : *Krangalangia spinosa* (Zarenkov, 1970), connue d'Australie, de Nouvelle-Calédonie, des îles Chesterfield et des îles Wallis et Futuna; *Krangalangia orstom* Tavares, 1993, connue des îles Loyauté et Wallis et Futuna ; *Ketamia limatula* Tavares, 1993, connue d'Indonésie (Amboine); *Phyllotymolinum crosnieri* Tavares, 1993, connue de Nouvelle-Calédonie; et *Xeinostoma richeri* Tavares, 1993, connue des îles Chesterfield et Wallis et Futuna.

ABSTRACT

Crustacea Decapoda: Cyclodorippidae from the Vanuatu Archipelago (Brachyura).

Six species belonging in the family Cyclodorripidae were collected from the Vanuatu Archipelago, in 1994, during the MUSORSTOM 8 cruise. One of them, *Tymolus daviei*, is new and has been found too in New Caledonia; it constitutes the first record of the genus *Tymolus* in this area. The five other species, already known from other localities within the Indo-Pacific, are recorded for the first time from the Vanuatu Archipelago: *Krangalangia spinosa* (Zarenkov, 1970), known from Australia, New Caledonia, Chesterfield and Wallis and Futuna Islands; *Krangalangia orstom* Tavares, 1993, known from Loyauté and Wallis and Futuna Islands; *Ketamia limatula* Tavares, 1993, known from Indonesia; *Phyllotymolinum crosnieri* Tavares, 1993, known from New Caledonia; and *Xeinostoma richeri* Tavares, 1993, known from Chesterfield and Wallis and Futuna Islands.

TAVARES, M., 1997. — Crustacea Decapoda : Cyclodorippidae récoltés dans l'archipel de Vanuatu (Brachyura). *In*: A. CROSNIER (ed.), Résultats des campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176**: 261-271. Paris ISBN 2-85653-511-9.

INTRODUCTION

Dans la très vaste région qu'est l'Indo-Ouest-Pacifique, les connaissances actuelles sur les Cyclodorippidae sont limitées à quelques zones seulement : Madagascar, la Réunion, Japon, Vietnam, Philippines, Indonésie, Australie, îles Chesterfield, Nouvelle-Calédonie, îles Loyauté, Vanuatu, et îles Wallis et Futuna. Néanmoins, les données acquises laissent entrevoir que l'océan Indo-Ouest-Pacifique possède une faune cyclodorippidienne qui lui est propre : sur les cinq genres connus dans la région, seul *Corycodus* A. Milne Edwards, 1880, est représenté ailleurs (par une espèce aux Caraïbes) et les vingt-quatre espèces qui y ont été dénombrées sont toutes exclusivement indo-ouest pacifiques (TAVARES, 1991a, 1991b, 1992a, 1992b, 1993, 1994).

En 1994, une campagne, MUSORSTOM 8 (RICHER DE FORGES, FALIEX & MENOU, 1996), a été faite dans l'archipel de Vanuatu, dans le cadre de l'exploration de la faune bathyale du Sud-Ouest Pacifique menée par le Muséum national d'Histoire naturelle et l'Institut français de Recherche scientifique pour le Développement en Coopération (ORSTOM). L'étude du matériel alors récolté est présentée ici. À l'exception d'une espèce nouvelle appartenant au genre *Tymolus*, genre qui n'avait jamais été recensé au delà de la côte est-australienne, les composantes faunistiques du Vanuatu sont essentiellement celles des zones mentionnées dans le paragraphe précédent.

Des spécimens de l'espèce nouvelle ayant également été récoltés en Nouvelle-Calédonie, lors des campagnes BATHUS 1 et 2, campagnes faites par le Centre ORSTOM de Nouméa (RICHER DE FORGES & CHEVILLON, 1996), ceux-ci sont étudiés en même temps que ceux du Vanuatu.

Le matériel étudié ici est déposé au Muséum national d'Histoire naturelle, Paris (MNHN), à l'Australian Museum, Sydney (AMS), et à l'Universidade Santa Úrsula, Rio de Janeiro (USU). Lorsqu'aucune mention du lieu de dépôt n'est mentionnée, cela implique que le matériel se trouve au Muséum national d'Histoire naturelle.

La terminologie utilisée pour désigner les différentes structures de la carapace est celle de TAVARES (1991b). Les abréviations suivantes ont été employées pour certains appendices : P2, P3, P4, P5 = péréiopodes 2, 3, 4 et 5 ; Pl 1 = pléopode 1. Les mesures données pour les spécimens correspondent respectivement à la longueur (rostre inclus) et à la largeur de la carapace, exprimées en millimètres. Les abréviations employées dans les listes de matériel examiné sont : st. = station, DW = drague Warén; CP = chalut à perche.

ÉTUDE TAXONOMIQUE

Genre ***TYMOLUS*** Stimpson, 1858

Tymolus Stimpson, 1858 : 163 [espèce-type : *Tymolus japonicus* Stimpson, 1858].

REMARQUES. — Le développement accentué du mérus des P2 et P3 (mérus aussi long que l'ensemble carpe+ propode+dactyle, voire beaucoup plus long chez *T. brucei* Tavares, 1991, et *Tymolus daviei* sp. nov.) et l'atrophie très importante des péréiopodes 4 et 5 constituent les traits les plus marquants du genre *Tymolus* (fig. 2). Si, P4 et P5 sont très réduits et grêles, leur coxa n'est jamais fusionnée avec le basis, et tous leurs articles sont mobiles; il est à noter toutefois que ces deux péréiopodes ne sont pas identiques : l'ischion de P5 est presque quatre fois plus long que celui de P4. Par sa forme, la coxa de P4 est similaire à celle des P2 et P3. Quant à la coxa de P5, elle se modifie pour former un long tube pénien (fig. 1 A-B), qui n'est pas en rapport avec l'atrophie de P5 mais concourt à la protection du pénis. Comme l'a bien montré GUINOT (1969a, 1969b, 1969c, 1979a, voir aussi TAVARES, 1992c), il existe chez les Brachyoures plusieurs mécanismes de protection du pénis pouvant mettre en jeu : 1) l'abdomen (formation d'un processus aliforme émanant du troisième segment abdominal et qui vient recouvrir partiellement le pénis; 2) le sternum (sternites 7 et 8, ou alors sternite 8 seul); 3) la coxa (formation d'un tube pénien); 4) les parois péniennes par sclérification. Le cas de *Tymolus daviei* sp. nov. apparaît typique des crabes

Podotremata, c'est-à-dire formation d'un tube pénien d'origine coxale. Ce type de formation existe chez des Cymonomidae, Dynomenidae, Homolodromiidae, et Raninidae (GUINOT, 1979a : 191-195, fig. 43 A-I, fig. 46 F). La sclérification des parois du pénis a été constatée chez des Podotremata, par exemple chez *Dromia personata* (Linnaeus, 1758) (HARTNOLL, 1975 : 665, GUINOT, 1979a : 191) ; mais aussi chez des Heterotremata, par exemple *Dorippe lanata* (Linnaeus, 1767) (GUINOT, 1979a : 195, fig. 46F). Les mécanismes de protection faisant intervenir l'abdomen ou le sternum semblent plus courants chez les crabes de l'assemblage Heterotremata+ Thoracotremata (GUINOT, 1969a, 1969b, 1969c, 1979a, 1979b; TAVARES, 1992c).

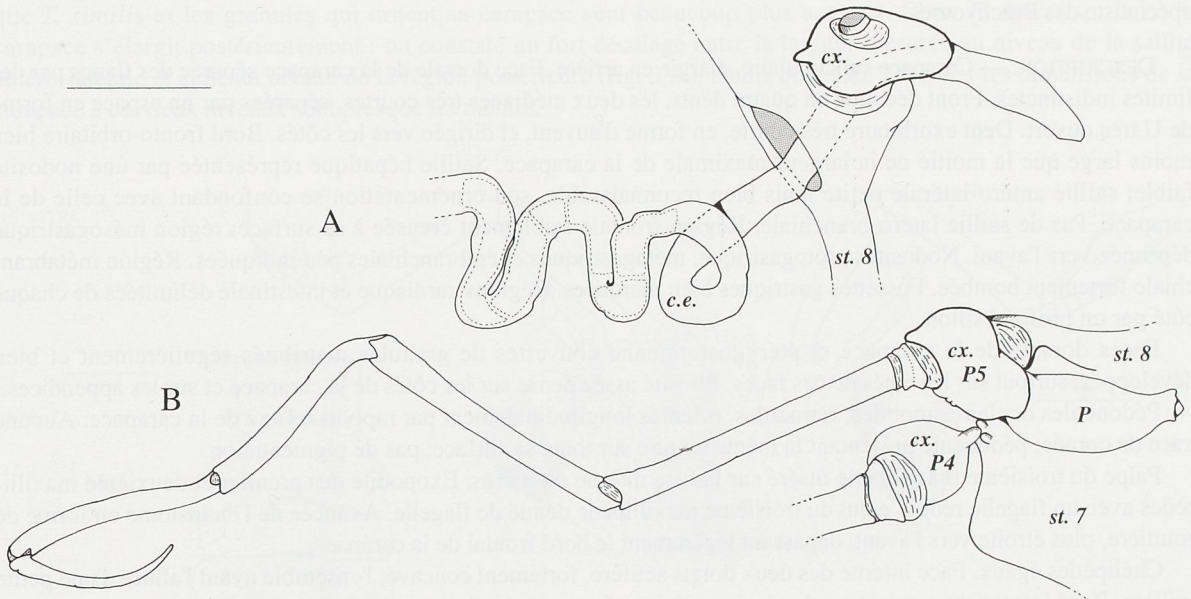


FIG. 1. — *Tymolus daviei* sp. nov., ♂, BATHUS 2, st. CP 743. **A**, Trajet du canal éjaculateur qui débouche sur le pénis en passant par la coxa de P5. ***c.e.***, canal éjaculateur; ***cx.***, coxa de P5 droit; ***st. 8***, sternite 8. — **B**, vue de la région sternale au niveau des coxae de P4 et P5 droits. ***cx. P4, cx. P5***, coxae de P4 et de P5; ***P***, pénis; ***st. 8***, ***st. 7***, sternites 8 et 7. Échelle = 1 mm.

Chez *Tymolus daviei* sp. nov., le canal éjaculateur traverse la coxa de P5 et débouche à l'extrémité d'un long pénis (fig. 1 A). Lorsque le pénis émerge de la coxa, sa partie proximale est incluse par celle-ci qui, en se prolongeant, forme le tube pénien (fig. 1 A-B). La partie molle et transparente du pénis, non recouverte par la coxa, et dont les proportions sont proches de celles du Pl1, est complètement cachée sous l'abdomen. Chez *Tymolus daviei* sp., nov. le canal éjaculateur (fig. 1 A) contient une substance dont l'apparence est essentiellement celle trouvée par HARTNOLL (1975 : 665) chez *Dromia personata* : "an opaque white mass consisting of sperms embedded in a viscid medium".

Tymolus daviei sp. nov.

Fig. 1 A-B, 2 , 3 A-C

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BATHUS 1 : st. CP 698, 17.03.1993, 20°34,18'S, 164°57,32'E, 713-950 m : 1 ♂ juvénile.

BATHUS 2 : st. CP 743, 14.05.1993, 22°35,56'S, 166°26,23'E, 713-950 m : 5 ♂, 21 ♀ (dont 2 juvéniles); 1 ♂, 3 ♀ (USU 600). — St. CP 762, 16.05.1993, 22°18,9'S, 166°09,8'E, 620-700 m : 8 ♂, 4 ♀; 1 ♂ (USU 601). — St. CP 741, 14.05.1993, 22°35,5'S, 166°26,2'E, 700-950 m : 5 ♂, 1 ♀. — St. CP 766, 17.05.1993, 22°10'S, 166°1,7'E, 650-724 m : 7 ♂, 2 ♀. — St. CP 767, 17.05.1993, 22°10,5'S, 165°59,1'E, 1060-1450 m : 1 ♂ (front partiellement endommagé). — St. CP 756, 16.05.1993, 22°22,2'S, 166°13,2'E, 672 m : 1 ♀.

Vanuatu. MUSORSTOM 8 : st. CP 975, 22.09.1994, 19°23,60'S, 169°28,93', 566-536 m : 1 ♀. — St. CP 1047, 30.09.1994, 16°53,62'S, 168°10,49'E, 486-494 m : 1 ♂, 1 ♀, 1 ♀ ovig. — St. CP 1051, 1.10.1994, 16°36,63'S, 167°59,90'E, 558-555 m : 1 ♀ — St. CP 1053, 1.10.1994, 16°29,23'S, 167°58,70'E, 536-519 m : 2 ♂, 1 ♀.

TYPES. — *Holotype* : mâle 10 x 11 mm, BATHUS 2, st. CP 743 (MNHN-B 25248). *Paratypes* : les autres spécimens mentionnés ci-dessus.

LOCALITÉ-TYPE. — Nouvelle-Calédonie, 22°35,56'S-166°26,23'E, 713-950 m.

ÉTYMOLOGIE. — Nous dédions cette espèce à notre collègue Peter DAVIE du Queensland Museum à Brisbane, spécialiste des Brachyoures.

DESCRIPTION. — Carapace subcirculaire, élargie en arrière. Face dorsale de la carapace séparée des flancs par des limites indistinctes. Front découpé en quatre dents, les deux médianes très courtes, séparées par un espace en forme de U très ouvert. Dent exorbitaire très courte, en forme d'auvent, et dirigée vers les côtés. Bord fronto-orbitaire bien moins large que la moitié de la largeur maximale de la carapace. Saillie hépatique représentée par une nodosité faible; saillie antéro-latérale petite mais bien reconnaissable, son ornementation se confondant avec celle de la carapace. Pas de saillie latéro-branchiale. Région frontale faiblement creusée à sa surface; région mésogastrique déprimée vers l'avant. Nodosités protogastrique, métagastriques et épibranchiales peu indiquées. Région métabranchiale fortement bombée. Fossettes gastriques bien marquées. Régions cardiaque et intestinale délimitées de chaque côté par un profond sillon.

Faces dorsale de la carapace et ptérygostomienne couvertes de granules distribués régulièrement et bien développés, surtout sur les côtés de ces faces. Pilosité assez dense sur les côtés de la carapace et sur les appendices.

Pédoncules oculaires mobiles, rétractiles, orientés longitudinalement par rapport à l'axe de la carapace. Aucune trace de cornée; pédoncule présentant la même texture sur toute sa surface; pas de pigmentation.

Palpe du troisième maxillipède inséré sur la face interne du mérus. Exopodite des premier et deuxième maxillipèdes avec un flagelle réduit, celui du troisième maxillipède dénué de flagelle. Avancée de l'endostome en forme de gouttière, plus étroite vers l'avant, dépassant légèrement le bord frontal de la carapace.

Chélipèdes égaux. Face interne des deux doigts sétifère, fortement concave, l'ensemble ayant l'allure d'une petite cuillère. Bord interne du carpe muni de plusieurs épines fortes et aiguës.

P2 et P3 similaires, très allongés. Mérus de P2 plus long que l'ensemble carpe+propode+dactyle. Tiers distal du dactyle des P2 et P3 comprimé dorsoventralement. P4 et P5 considérablement atrophiés. Abdomen femelle formé de six segments et avec des pléopodes sur les segments 2-5 seulement. Abdomen mâle formé de cinq segments. Sternum thoracique avec la suture 6/7 non interrompue.

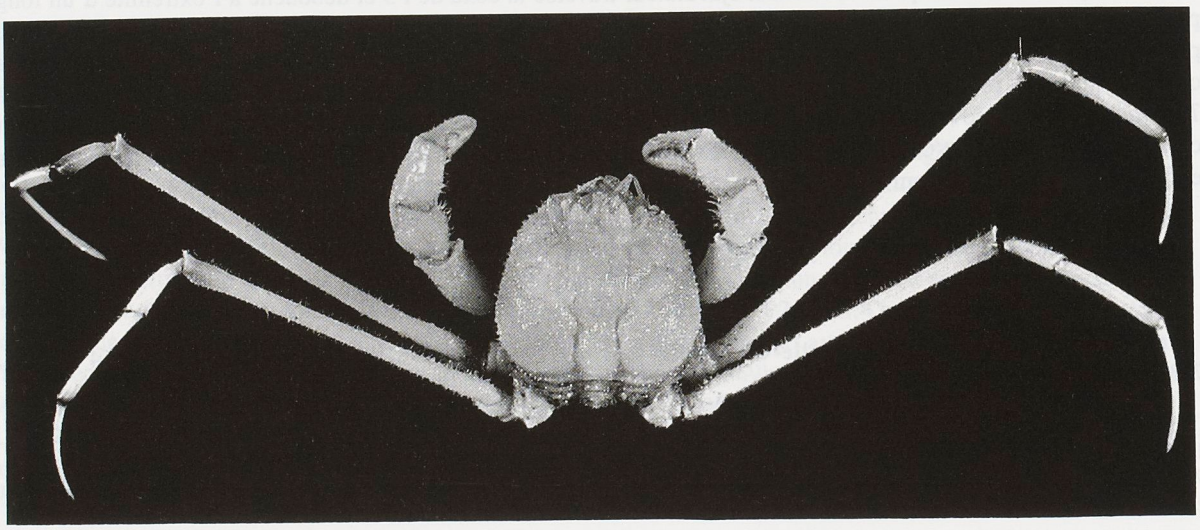


FIG. 2. — *Tymolus daviei* sp. nov., ♂ holotype 10 x 11 mm (MNHN-B 25248) : vue d'ensemble du corps.

DISTRIBUTION. — Nouvelle-Calédonie, entre 620 et 1450 m de profondeur; Vanuatu, entre 486 et 566 m.

Le genre *Tymolus* était connu de l'océan Indien occidental (côte africaine) jusqu'en Australie orientale. Sa distribution est ici étendue vers l'est jusqu'à la pente externe sud-ouest de la Nouvelle-Calédonie et au Vanuatu.

REMARQUES. — *Tymolus daviei* sp. nov., voisin de *T. similis* (Grant, 1905), se distingue essentiellement de celui-ci par les dents frontales médianes très courtes (nettement plus longues chez *T. similis* chez lequel les deux dents sont séparées par un espace en forme de V assez profond); par la dent exorbitaire très courte et dirigée obliquement vers les côtés (allongée et moins inclinée chez *T. similis*); et par la région métabranchiale de la carapace fortement bombée (faiblement bombée chez *T. similis*). Par ailleurs, *T. daviei* est bien plus grand que *T. similis* et les granules qui ornent sa carapace sont beaucoup plus accusés. Chez *T. daviei* sp. nov., la carapace s'élargit postérieurement : on constate un fort décalage entre la largeur mesurée au niveau de la saillie antéro-latérale et celle au niveau de la région postérieure (fig. 3 A), tandis que chez *T. similis* les dimensions de la carapace à ces deux niveaux sont presque les mêmes.

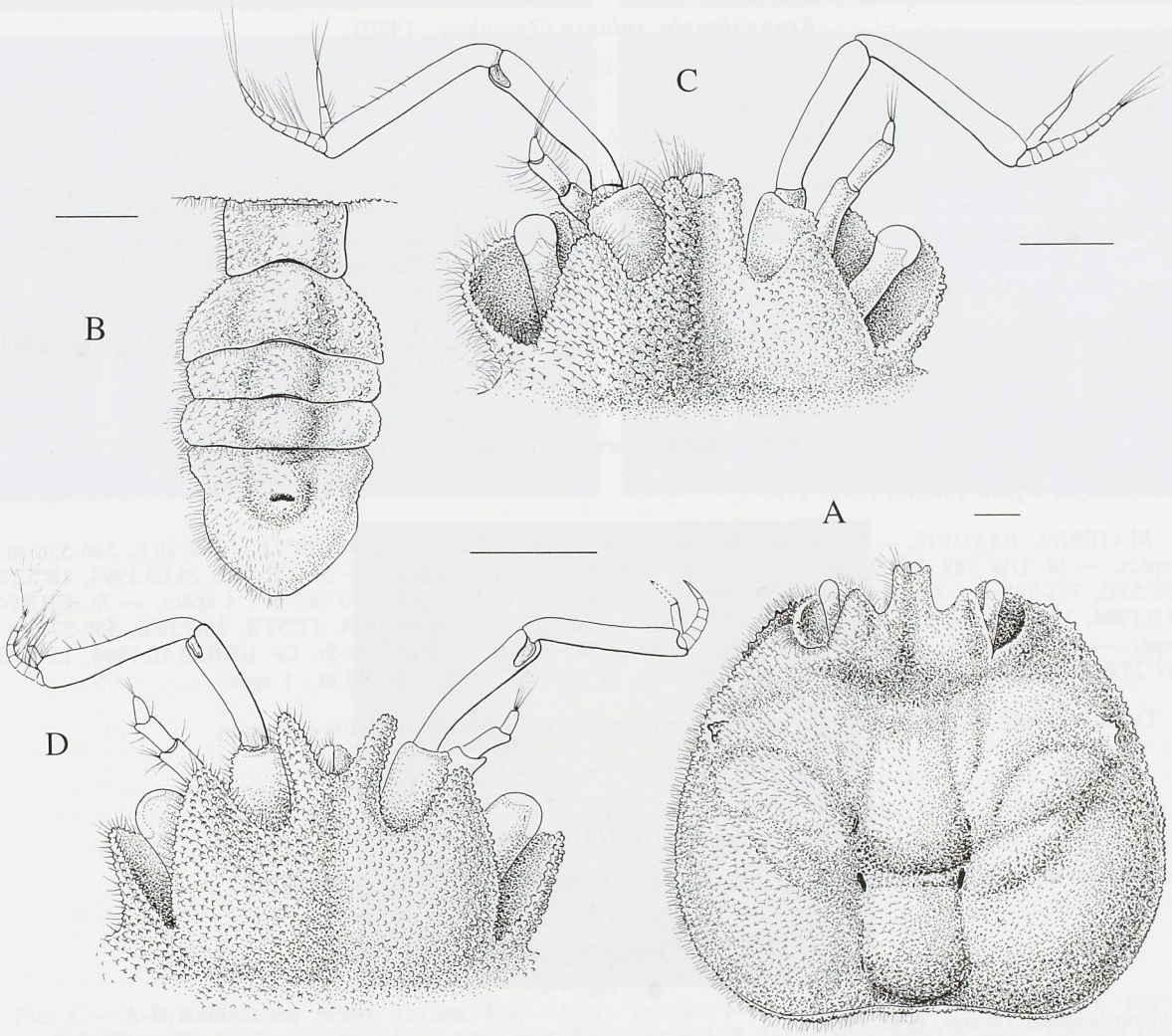


FIG. 3 A-C. — *Tymolus daviei* sp. nov., ♂ holotype 10 x 11 mm (MNHN-B 25248): **A**, vue d'ensemble de la carapace; **B**, face dorsale de l'abdomen; **C**, bord frontal de la carapace. Échelles = 1 mm.

FIG. 3 D. — *Tymolus similis* (Grant, 1905), Victoria, Bass Strait, Babel Island, 1913, 90-144 m : ♂ 5 x 4 mm (AMS E-4818) : bord frontal de la carapace. Échelles = 1 mm.

Tymolus daviei sp. nov. ressemble à *T. brucei* Tavares, 1991, par le mérus de P2 plus long que l'ensemble carpe+propode+dactyle. Néanmoins, à l'exemple de *T. similis*, les deux espèces se distinguent aisément par les caractères mentionnés ci-dessus.

Jusqu'à présent le genre *Tymolus* renfermait six espèces actuelles : *T. brucei* Tavares, 1991; *T. dromioides* (Ortmann, 1892); *T. japonicus*, Stimpson, 1858; *T. similis* (Grant, 1905); *T. truncatus* (Ihle, 1916); *T. uncifer* (Ortmann, 1892) (TAVARES, 1991b, 1992b). Il faut y ajouter quatre espèces fossiles, toutes japonaises : trois du Miocène (*T. ingens* Takeda & Tomida, 1984; *T. itoigawai* Takeda & Tomida, 1984; et *T. kamadai* Imaizumi, 1952), ainsi qu'une espèce non encore décrite du Pliocène (KATO, SUZUKI & KARASAWA, 1994).

Genus ***KRANGALANGIA*** Tavares, 1992

Krangalangia Tavares, 1992a : 514 [espèce-type : *Cyclodorippe (Cyclodorippe) rostrata* Ihle, 1916].

Krangalangia spinosa (Zarenkov, 1970)

Fig. 4 D

Cyclodorippe spinosa Zarenkov, 1970 : 460.
Krangalangia spinosa - TAVARES, 1992a : 514; 1993 : 296.

MATÉRIEL EXAMINÉ. — **Vanuatu**. MUSORSTOM 8 : st. CP 956, 20.09.1994, 20°33'S, 169°35'E, 1175-1210 m: 11 spécs. — St. DW 959, 20°20,52'S, 169°48,24'E, 436-475 m, 20.09.1994 : 1 spéc. — St. DW 987, 23.09.1994, 19°22'S, 169°34'E, 1050-1040 m : 4 spécs. — St. 991, 24.09.1994, 18°51,26'S, 168°52,19'E, 936-910 m : 6 spécs. — St. CP 1036, 29.09.1994, 18°01'S, 168°48'E, 920-950 m : 6 spécs. — St. CP 1037, 29.09.1994, 18°03'S, 168°54'E, 1058-1086 m : 17 spécs. — St. CP 1127, 10.10.1994, 15°58'S, 166°37'E, 1052-1058 m : 4 spécs.

DISTRIBUTION. — N'était connue jusqu'à présent que d'Australie, de Nouvelle-Calédonie, des îles Chesterfield et des îles Wallis et Futuna.

Krangalangia orstom Tavares, 1993

Krangalangia orstom Tavares, 1993 : 299.

MATÉRIEL EXAMINÉ. — **Vanuatu**. MUSORSTOM 8 : st. CP 975, 22.09.1994, 19°23'S, 169°28'E, 566-536 m : 4 spécs. — St. DW 989, 23.09.1994, 19°13'S, 169°20'E, 650-669 m : 5 spécs. — St. CP 992, 24.09.1994, 18°52'S, 168°55'E, 775-748 m : 8 spécs. — St. CP 993, 24.9.1994, 18°48'S, 168°54'E, 780-783 m : 4 spécs. — St. CP 994, 24.9.1994, 18°47'S, 168°56'E, 649-641 m : 14 spécs. — St. CP 1027, 28.09.1994, 17°53'S, 168°39'E, 550-571 m : 1 spéc. — St. CP 1035, 29.09.1994, 17°56'S, 168°44'E, 765-780 m : 1 spéc. — St. CP 1080, 5.10.1994, 15°57'S, 167°27'E, 799-850 m : 4 spécs. — St. 1113, 8.10.1994, 14°52'S, 167°06'E, 736-700 m : 1 spéc.

DISTRIBUTION. — N'était connue jusqu'à présent que des îles Loyauté et Wallis et Futuna.

Genus ***KETAMIA*** Tavares, 1992

Ketamia Tavares, 1992a : 514 [espèce-type : *Cyclodorippe (Cyclodorippe) depressa* Ihle, 1916].

Ketamia limatula Tavares, 1993

Fig. 4 C

Ketamia limatula Tavares, 1993 : 303.

MATÉRIEL EXAMINÉ. — **Vanuatu**. MUSORSTOM 8 : st. DW 1000, 25.09.1994, 18°49'S, 169°00'E, 90-200 m : 1 spéc. — St. CP 1001, 25.09.1994, 18°49'S, 168°59'E, 150-250 m : 2 spécs.

DISTRIBUTION. — N'était connue jusqu'à présent que d'Indonésie (Amboine).

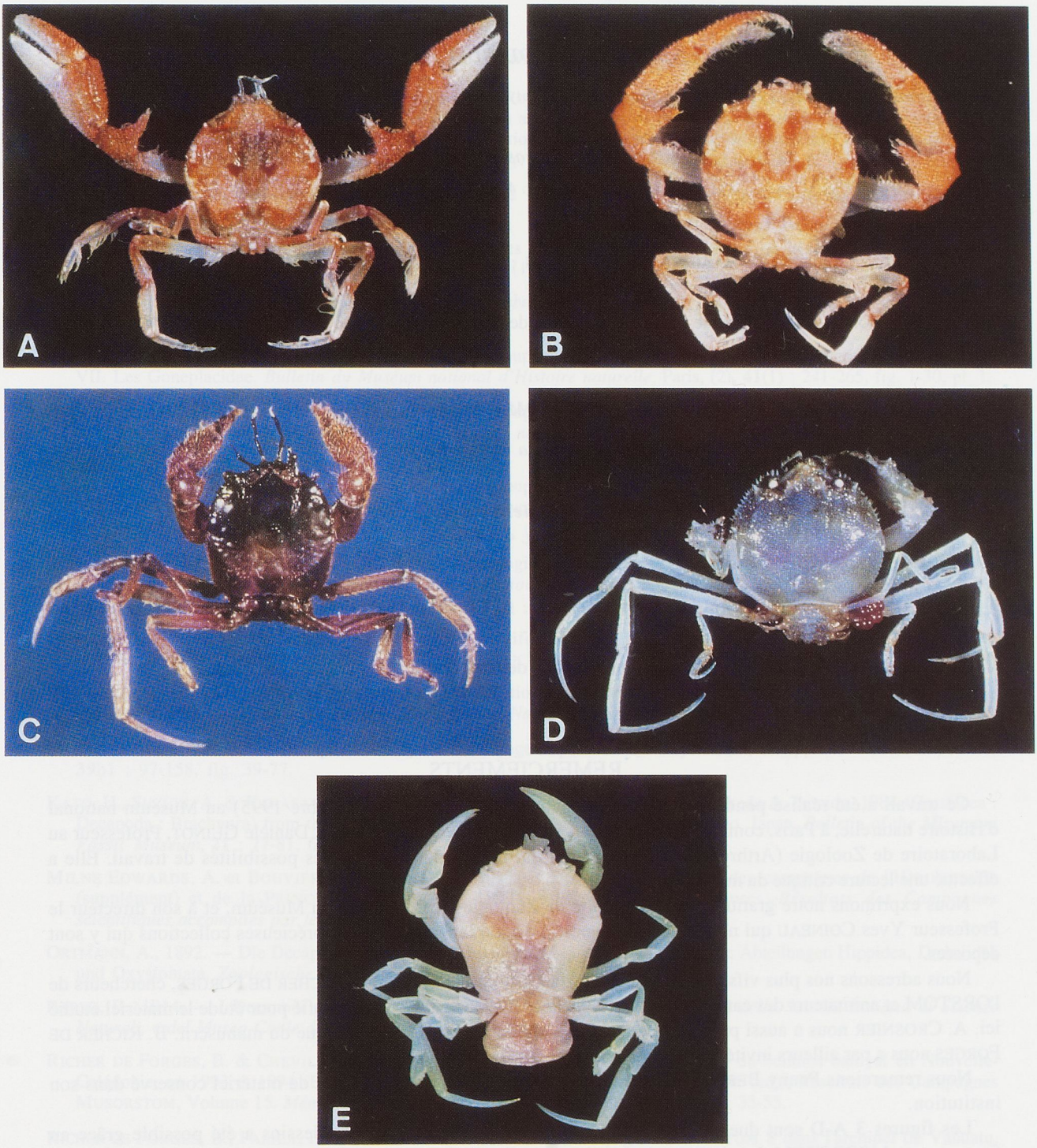


FIG. 4. — **A-B**, *Xeinostoma richeri* Tavares, 1993 : **A**, ♂, Vanuatu, MUSORSTOM 8, st. CP 1024, 17°48'S, 168°39'E, 335-370 m; **B**, ♂, Nouvelle-Calédonie, SMIB 8, st. DW 165, 24°47'S, 168°03'E, 372-660 m. — **C**, *Ketamia limatula* Tavares, 1993, ♂, Vanuatu, MUSORSTOM 8, st. CP 1001, 18°49'S, 168°59'E, 150-250 m. — **D**, *Krangalangia spinosa* (Zarenkov, 1970), ♀ ovigère, Vanuatu, MUSORSTOM 8, st. CP 1039, 18°01'S, 168°48'E, 920-950 m. — **E**, *Phyllotymolinum crosnieri* Tavares, 1993, ♀ ovigère, Nouvelle-Calédonie, BATHUS 3, st. DW 836, 23°02'S, 166°59'E, 295-306 m.

Genus *PHYLLOTYMOLINUM* Tavares, 1993

Phyllotymolinum Tavares, 1993 : 285 [espèce-type : *Phyllotymolinum crosnieri* Tavares, 1993].

Phyllotymolinum crosnieri Tavares, 1993

Fig. 4 E

Phyllotymolinum crosnieri Tavares, 1993 : 286.

MATÉRIEL EXAMINÉ. — **Vanuatu**. MUSORSTOM 8 : st. CP 1018, 27.9.1994, 17°52'S, 168°25'E, 300-301 m: 2 spécs (USU).

DISTRIBUTION. — N'était connue jusqu'à présent que de Nouvelle-Calédonie.

Genus *XEINOSTOMA* Stebbing, 1920

Xeinostoma Stebbing, 1920 : 243 [espèce-type : *Xeinostoma eucheir* Stebbing, 1923].

Xeinostoma richeri Tavares 1993

Fig. 4 A-B

Xeinostoma richeri Tavares, 1993 : 293.

MATÉRIEL EXAMINÉ. — **Vanuatu**. MUSORSTOM 8 : st. CP 1024, 28.09.1994, 17°48'S, 168°39'E, 335-370 m : 1 spéc.

DISTRIBUTION. — N'était connue jusqu'à présent que des îles Chesterfield et Wallis et Futuna.

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9

Crustacea Decapoda: A revision of the Indo-Pacific species of the genus *Calappa* Weber, 1795 (Calappidae)

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ABSTRACT

The Indo-Pacific species of *Calappa* Weber, 1795 are revised. Specimens have been collected from the intertidal to depths over 380 m, with nine species from water depths greater than 100 m.

One new genus of calappid crab is established: *Calappula*, for *Calappa saussurei* Rathbun, 1898 and *C. tortugae* Rathbun, 1933 from each side of the Central American Isthmus. Five new species are described: *C. conifera*, *C. matsuzawa*, *C. monilicanthus*, *C. sebastieni*, and *C. torulosa*. All taxa are described and illustrated, detailed synonymies are listed, and a key is provided.

RÉSUMÉ

Crustacea Decapoda : Une révision des espèces indo-ouest pacifiques du genre *Calappa* Weber, 1795 (Calappidae).

Les espèces indo-ouest pacifiques du genre *Calappa* Weber, 1795 sont revues. Les récoltes ont été faites de la zone intertidale jusqu'à plus de 380 m de profondeur. Neuf espèces ont été récoltées à plus de 100 m de profondeur.

Un genre nouveau *Calappula* est établi pour *Calappa saussurei* Rathbun, 1898 et *C. tortugae* Rathbun, 1933, qui se trouvent de part et d'autre de l'isthme de l'Amérique centrale. Cinq espèces nouvelles sont décrites : *C. conifera*, *C. matsuzawa*, *C. monilicanthus*, *C. sebastieni*, and *C. torulosa*. Toutes les espèces sont décrites et figurées, des synonymies détaillées sont fournies et une clé d'identification est proposée.

INTRODUCTION

"Box crabs", or "shame-faced crabs", characteristically barricaded behind flexed massive chelae and with legs tucked under the eaves of their carapace, are among the most distinctive crabs in tropical and subtropical seas.

GALIL, B., 1997. — Crustacea Decapoda: A revision of the Indo-Pacific species of the genus *Calappa* Weber, 1795 (Calappidae) *In*: A. CROSNIER (ed.), Résultats des Campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176**: 271-335. Paris ISBN 2-85653-511-9.

Because they are commonly found in shallow waters or hauled in from as deep as 380 m, owing to their size and brightly-colored carapace they were described early and often. However, this same seemingly distinctive and familiar shape was the cause of some taxonomic confusion. HERBST (1799: 22) already wrote in apparent pique: "Genauer lassen sich die Verschiedenheiten jetzt erwähnter Arten unmöglich durch eine blosse Beschreibung verständlich machen". HERBST's vexation finds an echo in MONOD (1928: 109): "Le genre *Calappa* est extrêmement homogène et comprend une vingtaine d'espèces souvent très voisines les unes des autres et que l'on pourrait ranger en une série linéaire.... Cette homogénéité si remarquable du genre *Calappa* rend parfois la distinction des espèces rien moins que facile, ce qui explique les incertitudes taxonomiques des carcinologistes à leur sujet".

A study of the extensive collections of the Muséum national d'Histoire naturelle, Paris (MNHN), Nationaal Natuurhistorische Museum, Leiden (formerly Rijksmuseum van Natuurlijke History (RMNH)), National Museum of Natural History, Smithsonian Institution, Washington (USNM), together with material made available by the American Museum of Natural History, New York (AMNH), The Natural History Museum and Institute, Chiba (CMB ZC), Institute of Oceanology, Chinese Academy of Sciences, Qingdao (IOCAS), Natural History Museum of Los Angeles (LAM), Museo Zoologico, Universita degli studi di Firenze (MF), The Natural History Museum, London (NHM), Naturhistorisches Museum, Wien (NMW), Zoological Reference Collection, National University of Singapore (NUS); Queensland Museum, Brisbane (QM), South African Museum, Cape Town (SAM), Senckenberg Museum, Frankfurt (SMF), Tel Aviv University (TAU), and the Zoologisk Museum, Copenhagen (ZM) has enabled re-examination of most type specimens and much of the published material.

The present study divides the Indo-Pacific species between *Calappa* Weber, 1795 and a new genus, *Calappula*, and describes five new species. Descriptive and distributional information is presented as well as detailed references to literature. All taxa examined have been photographed and illustrated, and a key is presented for their identification. Measurements refer to carapace length and are given in mm.

In the lists of Material examined, the names of the cruises are in capital letters. The names of vessels are in italic letters and quoted. Station numbers of the MUSORSTOM cruises are often preceded by two capital letters, denoting the gear used: DW means Warren dredge, CP beam trawl.

SPECIES LIST

Genus ***CALAPPA***

Calappa bicornis Miers, 1884
C. calappa (Linnaeus, 1758)
C. capellonis (Laurie, 1906)
C. clypeata (Borradaile, 1903)
C. conifera sp. nov.
C. convexa Saussure, 1853
C. depressa Miers, 1886
C. dumortieri Guinot, 1962
C. gallus (Herbst, 1803)
C. hepatica (Linnaeus, 1758)
C. japonica Ortmann, 1892
C. lophos (Herbst, 1782)
C. matsuzawa sp. nov.
C. monilicanthus sp. nov.
C. philargius (Linnaeus, 1758)
C. pustulosa Alcock, 1896
C. sebastieni sp. nov.
C. torulosa sp. nov.
C. undulata Dai, 1991
C. yamasitae Sakai, 1980

Genus ***CALAPPULA***

Calappula saussurei comb. nov.

SYSTEMATIC ACCOUNT

CALAPPA Weber, 1795

Calappa Weber, 1795: 92.

Type species: *Cancer granulatus* Linnaeus, 1758, by subsequent designation LATREILLE, 1810: 422. Gender feminine. Name placed on the Official List of Generic Names in Zoology by the International Commission on Zoological Nomenclature in their Opinion 712 (1964, *Bull. zool. Nomencl.*, **21**: 336-351).

Lophos De Haan, 1837: 69, pls E, 19 fig. 1, 20 fig.1.

Type species: *Cancer lophos* Herbst, 1782, by absolute tautonymy. Gender masculine.

Camara De Haan, 1837: 69, pl. E.

Type species: *Cancer fornicatus* Fabricius, 1781: 502 (= *Cancer calappa* Linnaeus, 1758: 630), by monotypy. Gender feminine. Incorrectly cited as *Camera* by DE HAAN, 1850, Fauna Japonica (Crust.) (Index: 237).

Gallus De Haan, 1837: 70, pl. E.

Type species: *Cancer gallus* Herbst, 1803, by monotypy and absolute tautonymy. Gender masculine. This name is invalid as it is a junior homonym of *Gallus* Brisson, 1760, for a genus of Aves.

Pistor Gistel, 1848: viii. A new replacement name for *Gallus* De Haan, 1837. Type species thereby *Cancer gallus* Herbst, 1803. Gender masculine.

DIAGNOSIS. — Carapace typically convex, regions undefined, furrows bordering cardiac region most pronounced. Front, triangulate, as wide as orbit. Anterolateral margin arcuate, crenate, dentate or granulate. Posterolateral margin typically expanded, clypeiform, concealing flexed ambulatory legs underneath. Eye filling orbit, eyestalk short, cornea large. Supraorbital margin swollen medially, bifissured. Antennules folding nearly vertically. Basal article of antennae dilate, forming inner orbital margin. Buccal cavity elongate, anteriorly divided by median septum. Outer maxillipeds gaping, exposing mandibles, lamellar processes of first maxillipeds. Subhepatic regions and outer maxillipeds densely setose. Chelipeds massive, subequal, fitting closely. Merus with transverse dentate crest externally, distalmost tooth largest, keel- like. Carpus trigonal. External surface of chela swollen, upper margin crested, with foliate lobes; laminar tooth proximally near lower margin, lower margin with two subparallel files of tubercles, converging distally; internal surface densely setose along lower margin. Larger dactylus proximally with crochet tooth fitting into molariform depression, dactylus' upper margin setose, granulate. Pereiopods smooth, laterally compressed, dactyli styliform. Male abdomen five-segmented, second segment trilobate, bearing transverse granulate carina. First male pleopod stout, tapering, distally spinulose. Second male pleopod filamentose.

ETYMOLOGY. — From *Kelapa*, coconut in Malay. "Maleits *Cattam Calappa*, naar de gedaante van een *Calappusdop*" (RUMPHIUS, 1741).

REMARKS. — All but one of the Indo-Pacific species treated here belong to *Calappa* Weber, 1795. These species are characterized by bifissured supraorbital border, buccal cavity with median septum anteriorly, and clypeiform expansion on posterolateral margin. Among the 20 species described here, some seem more clearly allied. The *"philargius"* group comprises four species - *C. philargius*, *C. lophos*, *C. dumortieri* and a new species - distinguished by nearly smooth carapace, external surface of chela with prominent ridge running subparallel to lower margin, first male pleopod markedly curved distad, and second pleopod with stubby digitate tip. The *"gallus"* group encompasses eight species - *C. gallus*, *C. capellonis*, *C. undulata*, *C. yamasitae* and four new species - characterized by depressed hepatic region, and having second male pleopod with subdistal denticulate flange and digitate tip. The *"hepatica"* group includes two species - *C. hepatica* and *C. depressa* - possessing anteriorly spatulate basal antennal article and second male pleopod with spatulate tip.

Most of the Indo-Pacific species of *Calappa*, excluding the recently described species, are widely distributed. One species, *C. convexa*, is confined to tropical west America, another, *C. dumortieri*, to the Red Sea. Two species cover nearly the entire range: *C. gallus* is found from the Red Sea to Hawaii and *C. hepatica* ranges from

the Red Sea to Clipperton Is. All but four species - *depressa, gallus, japonica, pustulosa* - are found in waters no deeper than 150 m (table 1).

Depth (m)	50	100	150	200	250	300
C. bicornis	----------					
C. calappa	----------					
C. capellonis	----------					
C. clypeata	----------					
*C. conifera**	-------					
C. convexa	----------					
C. depressa	----------					350 →
C. dumortieri	----------					
C. gallus	----------					
C. hepatica	----------					
C. japonica	----------					380 →
C. lophos	----------					
*C. matsuzawa**	?					
*C. monilicanthus**	---------					
C. philargius	----------					
C. pustulosa	----------					
*C. sebastieni**	---					
*C. torulosa**	----------					
*C. undulata**	-------					
*C. yamasitae**	?					
Calappula saussurei	----------					

TABL. 1. — Vertical distribution of the Indo-Pacific species of *Calappa* and *Calappula*.
* New species or species known from less than 5 specimens.

Key to the Indo-Pacific species of *Calappa* and *Calappula*

1. Supraorbital border unifissured; buccal cavity lacking median septum anteriorly; milled ridge vertically transversing interior surface of chela ..... ***Calappula saussurei*** comb. nov.
— Supraorbital border bifissured; buccal cavity with median septum anteriorly, no milled ridge on interior surface of chela ..... ***Calappa*** ...2

2. Carapace subcircular, with only moderate clypeiform expansions ..... ***C. pustulosa***
— Carapace not subcircular because of well-developed clypeiform expansions **3**

3. Clypeiform expansions of carapace entire and smooth ..... ***C. calappa***
— Clypeiform expansions of carapace dentate or laciniate **4**

4. External surface of chela nearly smooth, with ridge running subparallel to lower margin, first male pleopod markedly curved distad **5**
— External surface of chela granulate, tuberculate, first male pleopod only slightly curved **8**

5. Posterior margin of carapace bearing median tooth **6**
— Posterior margin of carapace lacking median tooth **7**

6. Median tooth on posterior margin of carapace rounded, shorter than adjacent teeth, carpus and chela each with large maroon spot, maroon crescents encircle eyes . ***C. philargius***
— Median tooth on posterior margin of carapace conical, as long as adjacent teeth, carapace densely covered with minute maroon spots, posterolateral teeth pale yellow ..... ***C. dumortieri***

7. Posterolateral margins laciniate ..... ***C. lophos***
— Posterolateral margins lamellar, granulate ..... ***C. monilicanthus*** sp. nov.

8. Second male pleopod with subdistal denticulate flange and digitate tip (figs 5d, 23d).... **9**
— Second male pleopod otherwise **16**

9. Carapace 1.6 wide as long **10**
— Carapace 1.4 wide as long, or less **11**

10. Carapace coarsely granulate, branchial regions with mammilate tubercles ..... ***C. yamasitae***
— Carapace minutely granulate, branchial regions with flattened lumps ..... ***C. sebastieni*** sp. nov.

11. Hepatic region somewhat depressed **12**
— Hepatic region markedly depressed **15**

12. Tubercles on branchial regions contiguous, mammilate **13**
— Tubercles on branchial regions otherwise **14**

13. Front projecting, bidentate; large tubercles anteriorly on clypeiform process ..... ***C. capellonis***
— Front truncate, obtuse; no tubercles anteriorly on clypeiform process ..... ***C. torulosa*** sp. nov.

14. Carapace posteriorly rugose, front quadridentate, keel-like tooth proximally on external surface of chela ..... ***C. matsuzawa*** sp. nov.
— Carapace posteriorly nearly glabrous, front bidentate, no keel-like tooth proximally on external surface of chela ..... ***C. undulata***

15. Front bidentate, anterolateral margin arcuate, prominently dentate, conical tubercles anteriorly on external surface of chela ..... ***C. conifera*** sp. nov.
— Front truncate, anterolateral margin sinuous, unevenly granulate, rounded tubercles anteriorly on external surface of chela ..... ***C. gallus***

16. Second male pleopod tip spatulate (figs 9d, 14d)..... **17**
— Second male pleopod tip otherwise **19**

17. Carapace granulate, tuberculate, clypeiform process with transverse granulate rows, basal antennal article anteriorly spatulate **18**
— Carapace finely punctate, clypeiform process smooth, basal antennal article with anterior proximal angle produced ..... ***C. clypeata***

18. Carapace convex, 1.6-1.7 wide as long ..... ***C. hepatica***
— Carapace flattened, 1.4 wide as long ..... ***C. depressa***

19. Front projecting, with two triangular teeth separated by deep sulcus; anterolateral margin prominently dentate, anteriormost tooth largest; second male pleopod with subdistal denticulate flange and pod-like tip ..... ***C. bicornis***
— Front not projecting, with two rounded teeth separated by wide sulcus; anterolateral margin unevenly granulate; second male pleopod otherwise **20**

20. Carapace lavender finely spotted with white; second male pleopod distally sickle-shaped . ..... ***C. convexa***
— Carapace with yellow-tipped red tubercles; second male pleopod distally crook-like .... ***C. japonica***

Calappa bicornis Miers 1884

Fig. 1 a, 2, 4 a, 29

Calappa gallus var. *bicornis* Miers, 1884: 550.
Calappa bicornis - RATHBUN, 1911: 197, pl. 17 fig. 8. — IHLE, 1918: 308 (list). — SAKAI, 1937: 95, pl. 17 fig. 4. — GUINOT, 1967: 245 (list). — SERÈNE, 1968: 41 (list). — TAKEDA & KOYAMA, 1974: 104, pl. 10 fig. a. — SAKAI, 1976: 132, pl. 40 fig. 1. — TAKEDA, 1982: 106, fig. 312. — MIYAKE, 1983: 23, pl. 8 fig. 1. — TAKEDA & SHIKATANI, 1990: 477.
Calappa gallus - RATHBUN, 1937: 214 (part).
Not *Calappa bicornis* Manning & Chace, 1990: 45 (= *C. galloides* Stimpson, 1859).

MATERIAL EXAMINED. — **Seychelles**. Providence I., 35 m, coll. H.M.S. *"Alert"*: 1 ♀ holotype, 33.3 mm (NHM 1882.24). — 62 m, 20.10.1905, coll. *"Sealark"*: 1 ♂ 40.3 mm (USNM 41056). — N. of Bird I., 3°42'S, 55°13'E, sandy bottom with calcareous algae, 50-52 m, 22.12.1992, coll. *"Tyro"* : 1 ♀ 16.1 mm (RMNH).

REVES 2: stn 1, 5°24.8'S, 57°03.5'E, 55 m, 2.09.1980: 1 ♂ 19.4 mm (MNHN). — Stn 38, 5°03.5'S, 56°50.5'E, 44 m, 13.09.1980: 1 ♀ 15.5 mm (MNHN).

Madagascar. *North-west coast*, 13°05'S, 48°21'E, 50 m, 19.06.1967, coll. A. CROSNIER: 1 ♂ 39.4 mm, 1 ♀ 36.4 mm (MNHN).

Réunion I. 150 m, 1966, coll. M. GUÉZÉ: 2 ♂ 53.3, 60.6 mm (MNHN).

Indonesia. 5°48'S, 106°12'E, 38 m, sand, 27.07.1922, coll. Th. MORTENSEN: 1 ♀ 50.0 mm (ZM CRU1828).

South China Sea. Macclesfield Bank, 37-79 m: 1 ♂ 46.6 mm (NHM).

Philippines. *"Albatross"*: stn 5151, Sirun I., 5°24.40'N, 120°28.15'E, 43 m, 18.02.1908: 1 ♂ 31.5 mm (USNM). — Stn 5165, Tawitawi grp., Observation I., 16 m, 24.02.1908: 1 ♂ 21.5 mm (USNM 122722).

Japan. 1 ♂ 62.3 mm, 1 ♀ 63.4 mm, coll. T. SAKAI (SMF 22940). — Shikoku I., Tosa Bay, coll. K. SAKAI: 1 ♀ 57.9 mm (USNM 286118). — Cape Muroto, 14.10.1986, coll. K. MATSUZAWA, det. K. SAKAI: 1 ♂ 55.9 mm (SMF). — Honshu I., Kii Peninsula, coll. T. SAKAI: 1 ♂ 49.0 mm (NHM 1961.6.5.26). — Minabe, 30 m, coll. T. SAKAI: 1 ♂ 37.7 mm (USNM 123312), 2 ♂ 49.4, 54.5 mm (USNM 268805).

DESCRIPTION. — Carapace moderately convex, 1.2-1.3 wide as long, deep longitudinal groove separating gastrocardial from branchial regions, hepatic region depressed. Surface prominently tuberculate, branchial tubercles largest, conical, intestinal region with granulate tubercles. Front projecting, with two triangular teeth separated by deep sulcus. Anterior margin of basal antennal article bidentate, peduncle emerging from distal angle, tubercle at base of peduncle. Afferent branchial canal ending below orbit in tridentate process. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. First maxillipeds with triangular notch on anterointernal margin. Anterolateral margin setose, carinate, with granulate, triangular teeth, anteriormost tooth

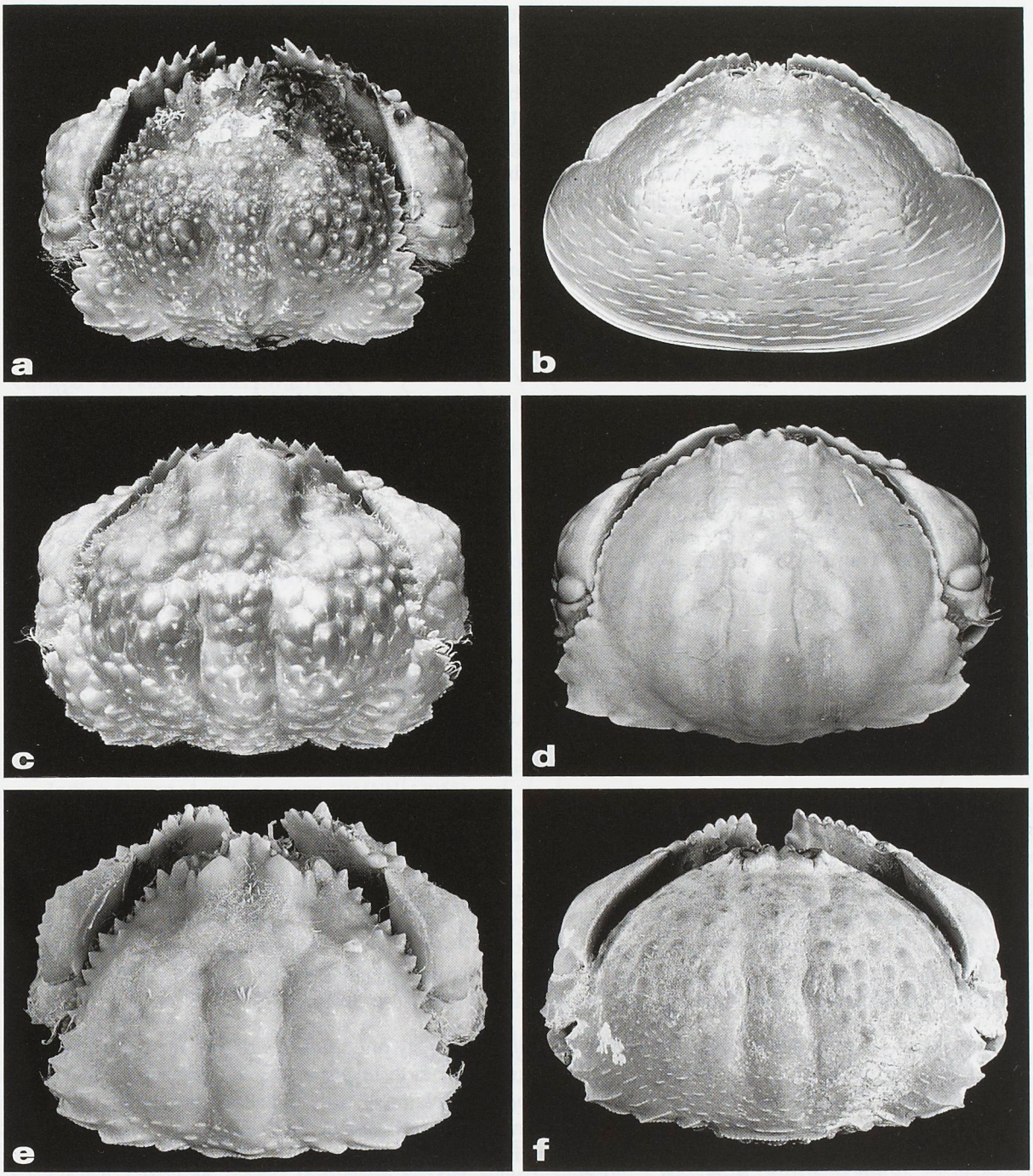


FIG. 1. — Whole crab, dorsal view: **a**, *Calappa bicornis* Miers, 1884, ♂ 39.4 mm, Madagascar, 13°05'S, 48°21'E, 50 m (MNHN). — **b**, *Calappa calappa* (Linnaeus, 1758), ♂ 55.4 mm, Madagascar, Nosy Be, 4 m (MNHN). — **c**, *Calappa capellonis* (Laurie, 1906), ♂ 36.6 mm, Seychelles, "REVES 2", stn 25, 4°54.6'S, 55°20.5'E, 60 m (MNHN). — **d**, *Calappa clypeata* (Borradaile, 1903), ♂ 36.0 mm, Madagascar, Majunja, *"Vauban"* stn 129, 15°25'S, 46°03.5'E, 57 m (MNHN). — **e**, *Calappa conifera* sp. nov., ♂ 18.6 mm, South Africa, holotype (SAM A43141). — **f**, *Calappa convexa* Saussure, 1853, ♂ 68.1 mm, Panama (USNM 144344).

large. Posterolateral margin setose, marginally beaded, four anterior teeth rounded, distalmost largest, two posterior teeth shallow, beaded median ridges setose. Posterior margin sinuous, beaded. Merus of cheliped distally with setose quadrilobate lamina. Carpus distally with four prominent tubercules. External surface of chela sparsely granulate, obliquely traversed by three rows of conical tubercles, median row most prominent. Crest of larger chela cut into seven conical teeth increasing in size distally. Unevenly granulate ridge running subparallel to beaded lower margin, from proximal tooth to base of fixed finger. Lower margin narrow, two beaded rows contiguous distally. Internal surface of chela inferiorly granulate, with beaded row parallel to lower margin. First male pleopod stout, slightly curved, tapering apically, distally spinulate; second pleopod slender, subdistal denticulate flange and podlike tip.

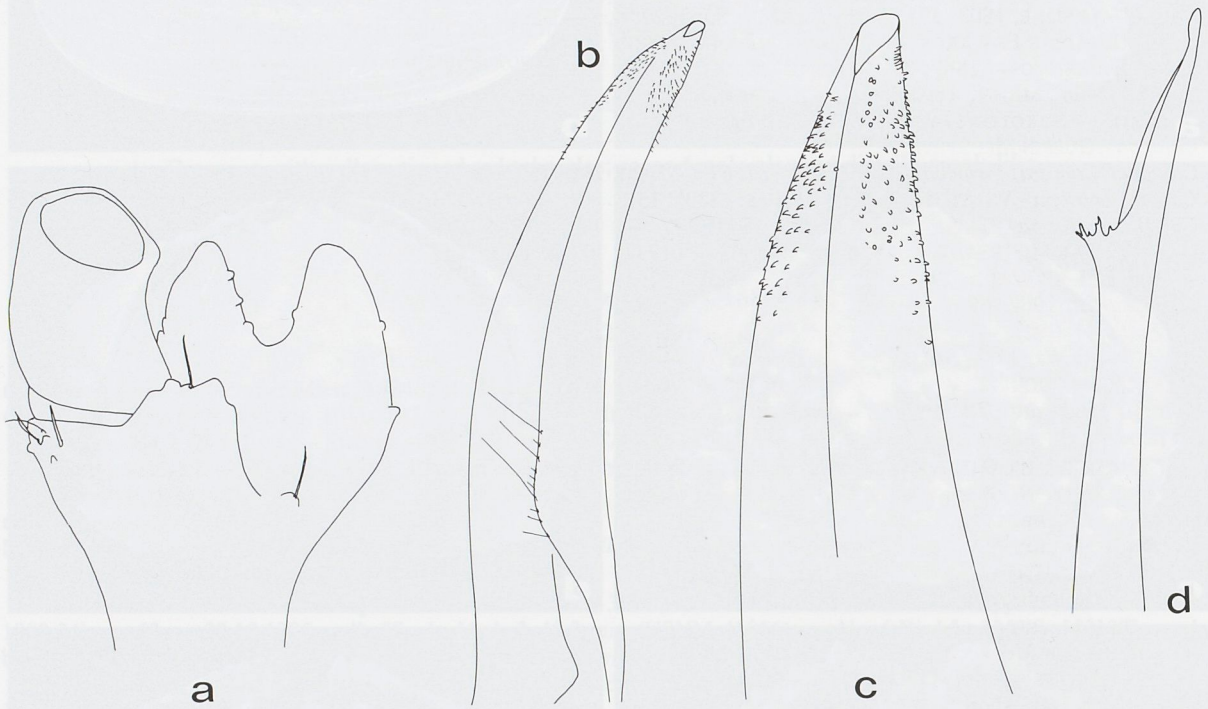


FIG. 2. — *Calappa bicornis* Miers, 1884, ♂ 39.4 mm, Madagascar, 13°05'S, 48°21'E, 50 m (MNHN): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

Color. — Carapace orange-yellow with red markings across branchial region. Chela internally with red reticulate pattern. Ambulatories striped in red. Color photograph in MIYAKE (1983).

REMARKS. — MIERS (1884), while describing *bicornis* as a variety of *C. gallus*, wrote "It may not improbably prove to be a distinct species". RATHBUN (1911) first recognized it as distinct species and then submerged it within *C. gallus* (1937) together with *C. galloides* and *C. capellonis*, claiming wide variation "in relative length and breadth due to greater or less convexity; in size and prominence of dorsal tubercles; and in distinctness of rostral teeth, some having four teeth, others having no median sinus".

C. bicornis differs from both *C. gallus* and *C. capellonis* in having anterior margin of basal antennal article bidentate rather than concave; front prominently bidentate rather than truncate; conical rather than foliate teeth on cheliped crest and in form of second male pleopod. The damaged female specimen (USNM 112522) from St. Helena I., identified by CHACE (1966) as *C. gallus* and by MANNING & CHACE (1990) as *C. bicornis*, is assigned to *C. galloides*.

DISTRIBUTION (fig. 29). — Seychelles, Madagascar, Philippines, Japan. Sand and pebble bottoms, 15-150 m.

Calappa calappa (Linnaeus, 1758)

Fig. 1 b, 3, 4 b, 29

Cancer calappoides Rumphius, 1741: 21, pl. 11 figs 2-3.
Cancer calappa Linnaeus, 1758: 630; 1764: 449; 1767: 1048. — Herbst, 1785: 196, pl. 12 figs 73-74. — Fabricius, 1793: 454.
Cancer flosculosus Seba, 1759, pl. 19 fig. 24.
Cancer heracleoticus Seba, 1759: 51, pl. 20 figs 7-8.
Cancer fornicatus Fabricius, 1781: 502; 1793: 453.
Calappa fornicata - Weber, 1795: 92. — Fabricius, 1798: 345. — Bosc, 1802: 183; 1830: 213 (nec pl. 3 fig. 3). — Latreille, 1803: 393; 1806: 28; 1817: 50; 1829: 66. — Desmarest, 1825: 109. — Guérin Méneville, 1827: 4. — H. Milne Edwards, 1837: 106. — Dana, 1853: 394, pl. 25 fig.1. — A. Milne Edwards, 1868: 72; 1874: 56. — Hilgendorf, 1869: 92. — Brito Capello, 1871: 133, pl. 2 fig. 5. — Hoffmann, 1874: 41. — Nauck, 1880: 46. — Ortmann, 1892: 569. — Alcock, 1896: 142. — Bouvier, 1915: 216. — Serène, 1937: 78; 1968: 41 (list). — Sokolowsky, 1945: 74, pl. 2 figs 7-9.
Calappa - Guérin Méneville, 1827: 4.
Calappa (Camara) fornicata - de Haan, 1837: 69. — Herklots, 1861: 25.
Camara calappa - White, 1847: 44. — Miers, 1880: 315.
Calappa calappa - Rathbun, 1906: 887; 1911: 197. — Parisi, 1914: 286. — Ihle, 1918: 184. — Balss, 1922: 123. — T. Sakai, 1934: 284; 1936: 43, text-fig. 6; 1937: 90, pl. 17 fig. 1; 1956: 8; 1965: 55 (list); 1976: 129, pl. 39 figs 1, 3. — Ward, 1942: 69. — Dawydoff, 1952: 139. — Utinomi, 1956: 70, pl. 35 fig. 7. — Tyndale-Biscoe & George, 1962: 69. — Michel, 1964: 36. — Tinker, 1965: 70, pl. 23. — Guinot, 1967: 245 (list). — Serène, 1968: 41 (list). — Takeda, 1973: 83; 1982: 105, fig. 308. — Matsuzawa, 1977, pl. 91 fig. 1. — Miyake, 1983: 19, pl. 7 fig. 1. — Nomura *et al.*, 1988: 64. — Takeda & Shikatani, 1990: 477. — Chen, 1993: 678, fig. 1. — Yamaguchi & Baba, 1993: 306, fig. 92. — Allen & Steene, 1994: 154.
Calappa formicata - Zimsen, 1964: 650 [erroneous spelling].

Material examined. — **Kenya**. Andromache Reef, off Mombasa, 16.11.1964: 7 juv. 10.8-25.6 mm (USNM).

Seychelles. N. of Bird Id., 3°42'S, 55°13'E, 45-55 m, 21.12.1992, coll. *"Tyro"*: 1 ♀ 35.8 mm (RMNH). — Aldabra I., coll. W.L. Abbott: 2 ♂ 55.5, 62.7 mm (USNM 17746).

Madagascar. N.W. coast, Nosy Be, 4 m, April 1959, coll. & det. A. Crosnier: 3 ♂ 25.1-55.4 mm; 2 ♀ 22.3, 23.5 mm (MNHN). — Nosy Be, intertidal, September 1959, coll. & det. A. Crosnier: 1♀ 68.4 mm (MNHN). — W coast, Morombe, coll. B. Koechlin: 1 ♂ 61.9 mm (MNHN-B 12333).

Indian Ocean. 1 dry specimen (RMNH 43055).

Indonesia. *Moluccas*. 1821-1822, coll. C.G.C. Reinwardt, det. Herklots as *C. (Camara) Fornicata*, redet. L.B. Holthuis: 1 dry specimen (RMNH 43057). — 1895, coll. W.A. Moraux: 1 ♀ 76.5 mm (RMNH 7294). — Amboina Bay, shore at lowtide, February 1922, coll. Th. Mortensen: 1 ♀ 70.9 mm (ZM CRU1793). — Ternate. coll. H.A. Bernstein: 1 ♂ 71.0 mm (RMNH 761).

Irian Jaya. Sekru, coll. K. Schadler: 1 dry specimen (RMNH 43056). — Manokwari, 1954, coll. J.C. Bauwens: 1 ♀ 73.6 mm (RMNH 12842). — Mansiman nr Manokwari, July 1952, coll. J.C. Bauwens: 1 ♂ 69.6 mm (RMNH 9861).

Sulawesi. Selat Lembeh, Pulau Lembeh, 01°29'N, 12°5.15'E, sandy bay, 5-10 m, 21.10.1994, coll. Sulawesi Exped: 1 ♀ 34.0 mm (RMNH).

Papua New Guinea. Bismarck Arch., New Britain, Kilenge, 28 July 1973, coll. A.A. Gerbrands: 1 ♂ 75.1 mm (RMNH 29377).

Philippines. Borocay I., January 1979, coll. J.P. Naciart: 1 ♀ 31.3 mm (MNHN).

Japan. 1 ♂ 54.0 mm (RMNH 762). — Shikoku I., Kochi-Ken, Nakamura, Saga, 33°04'N, 133°06.6'E, 10-20 m, 29.10.1979, coll. M. Türkay: 1 ♂ 54.5 mm (SMF 18674). — Cape Muroto, 14.10.1986, coll. K. Matsuzawa, det. K. Sakai: 1 ♂ 56.4 mm (SMF). — Kushimoto, Wakayama, 20 m, March 1995, coll. K. Nomura: 1 ♀ 60.4 mm (SMF).

Bonin Is. Coll. C.B. Clausen, 16.06.1913: 2 ♂ 42.3, 45.1 mm (ZM CRU1799).

New Caledonia. Coll. Cloue: 2 specimens (MNHN B.10799).

French Polynesia. Society Is., Raiatea I., 1908, coll. A. Canque: 2 specimens (MNHN-B 4076). — Marquesas Is., Nuku Hiva I., coll. M. Mercier: 1 ♀ 39.9 mm (MNHN-B 45).

Hawaii Is. Ohau I., Makapuu Pt., 4 m, colls Roper, Sweeny & Young: 1 ♂ 42.6 mm; 1 ♀ 45.9 mm (USNM 268811).

Description. — Carapace markedly convex, 1.6-1.7 wide as long, regions undefined. Surface minutely squamose, anteriorly with barely distinguished flattened tubercles, posteriorly with minutely beaded transverse lines, increasing in length laterally, longest line running parallel to posterior margin. Front projecting, with two

triangular teeth separated by deep sulcus. Anterior margin of basal antennal article bicuspidate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in rounded granulate process. Endostomial septum visible with first maxillipeds closed, anterior margin straight. Anterior margin of first maxillipeds straight. Anterolateral margin carinate, scalloped. Clypeiform process greatly developed, Posterolateral margin entire, smooth. Posterior margin smooth. Merus of cheliped distally with well developed laminar carina, margin setose. External surface of chela with minutely beaded transverse lines, increasing in length inferiorly, interspaced with granules. Crest of larger chela with six teeth, proximalmost lowest. External beaded row on lower margin running entire length of chela, internal row only distal half. Internal surface of chela inferiorly granulate, with beaded row parallel to lower margin. First male pleopod stout, nearly straight, distally spinulate; second pleopod slender, straight, subdistal denticulate flange and digitate tip.

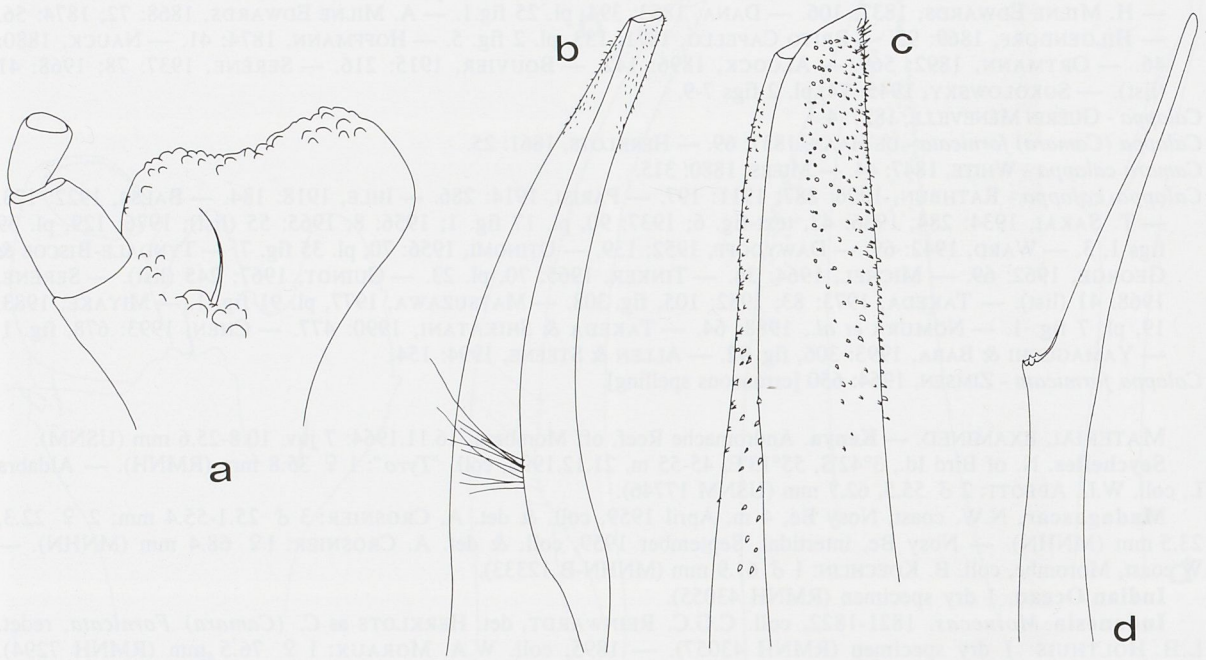


FIG. 3. — *Calappa calappa* (Linnaeus, 1758), ♂ 55.4 mm, Madagascar, Nosy Be, 4 m (MNHN) : **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

Color. — TINKER (1965) wrote "A form of this species, in which the back of the carapace is covered by dark spots of varying sizes, occurs in Hawaii, Japan, and probably elsewhere" and presented BW photos of both forms (pl. 23). SAKAI (1976) collected in one location both "Uniformly light yellowish brown" specimens (pl. 39 fig. 1) and those with "dark purplish mottles of various sizes" (pl. 39 fig. 3). MIYAKE (1983, pl. 7 fig. 1) and ALLEN and STEENE (1994: 154) provided color photographs of both forms. MATSUZAWA (1977, pl. 91 fig. 1) furnished us with an excellent color photo of a remarkable leopard-patterned specimen, its carapace densely covered with chocolate colored irregular spots.

REMARKS. — RUMPHIUS (1741: 21, pl. 11 figs 2-3) description and drawings being very clear, there has never been any confusion over the identity of this aptly named "broken coconut-shell crab". Though LINNAEUS (1758, 1764, 1767) described correctly its "Habitat in Asia", HERBST (1785) wrote "Ihr Ausenthalt ist in dem ost-und westindischen Meere", FABRICIUS (1793, 1798) "Habitat in Oceano Americano" and LATREILLE (1803) "Il se trouve dans l'océan Américain". This was set right again by LATREILLE (1806).

C. calappa is easily distinguished from all its congeners in having margins of clypeiform expansions entire. Examination of both spotted and uniformly-colored specimens revealed no morphological differences.

DISTRIBUTION (fig. 29). — East Africa to Japan, Australia and Hawaii. On sandy bottoms, intertidal to 50 m.

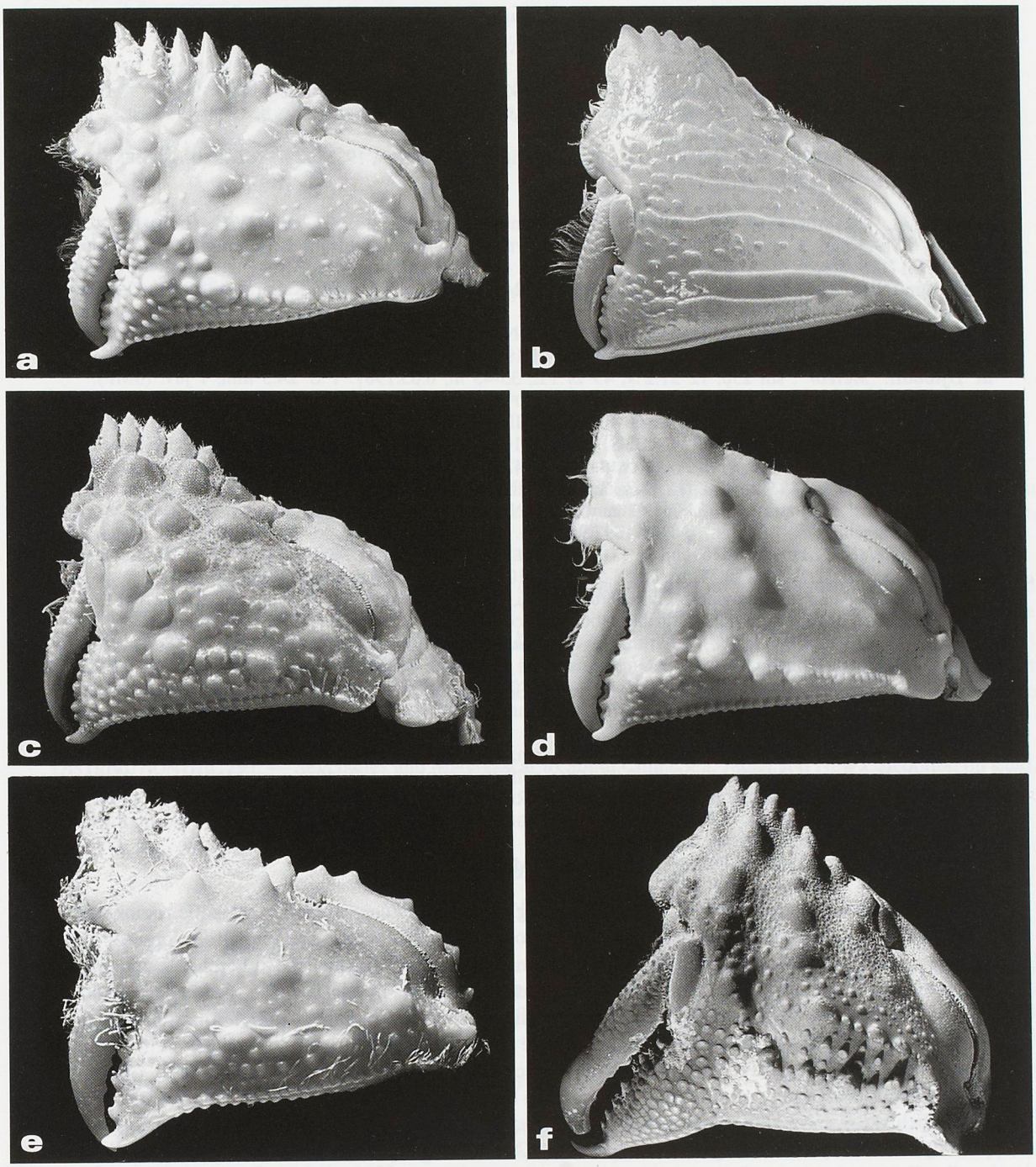


FIG. 4. — Cheliped, external view: **a**, *Calappa bicornis* Miers, 1884, ♂ 39.4 mm, Madagascar, 13°05'S, 48°21'E, 50 m (MNHN). — **b**, *Calappa calappa* (Linnaeus, 1758), ♂ 55.4 mm, Madagascar, Nosy Be, 4 m (MNHN). — **c**, *Calappa capellonis* (Laurie, 1906), ♂ 36.6 mm, Seychelles, "REVES 2", stn 25, 4°54.6'S, 55°20.5'E, 60 m (MNHN). — **d**, *Calappa clypeata* (Borradaile, 1903), ♂ 36.0 mm, Madagascar, Majunja, *"Vauban"* stn 129, 15°25'S, 46°03.5'E, 57 m (MNHN). — **e**, *Calappa conifera* sp. nov., ♂ 18.6 mm, South Africa, holotype (SAM A463). — **f**, *Calappa convexa* Saussure, 1853, ♂ 68.1 mm, Panama (USNM 144344).

Calappa capellonis (Laurie, 1906)

Fig. 1 c, 4 c, 5, 29, 35 a

Calappa gallus capellonis Laurie, 1906: 355. — URITA, 1926: 37. — SAKAI, 1934: 284; 1937: 95, pl. 17 fig. 3; 1976: 131, text-fig. 73. — SERÈNE, 1968: 41 (list). — TAKEDA & SUGA, 1979: 43. — MIYAKE, 1983: 199 (list).
Calappa gallus - RATHBUN, 1937: 214 (part).
Calappa capellonis - TAKEDA & KOYAMA, 1974: 104, pl. 10 fig. b. — TAKEDA, 1983: 125. — TAKEDA & SHIKATANI, 1990: 477. — CHEN, 1993: 685, fig. 6.

MATERIAL EXAMINED. — **Sri Lanka**. Gulf of Manaar, Pearl banks, 1902, coll. W.H. HERDMAN: 2 ♂ 32.8, 21.7 mm; 1 ♀ 19.5 mm; 1 juv. (NHM 1907.5.22.13-15), Syntypes. — Coral reefs, 1 ♂ 16.0 mm; 1 ♀ 25.3 mm (NHM 1907.5.22.16-17), Syntypes. — 1 ♀ 37.2 mm (NHM 75.14). — Gulf of Manaar, coll. Miss HERDMAN: 1 (broken); 5 juvs 12.1-17.7 mm (NHM 1934.1.15-18). — 1 ♂ 21.2 mm (NHM 1934.1.16.12). — Off Kaltura, coll. Miss HERDMAN: 1 ♂ 17.6 mm (NHM 1934.1.19-22). — Aripu coral reefs, coll. Miss HERDMAN: 1 ♀ 13.6 mm (NHM 1934.1.19-22). — N. of Cheval, 10 m. coll. Miss HERDMAN: 1 juv. 7.6 mm (NHM 1934.1.19-22). — W. of Periya Paar, 57-80 m, 1902, coll. Miss HERDMAN: 2 juvs 12.2, 10.9 mm (NHM 1934.1.19-22).

nr Djibouti. *"Meteor"*: stn 236, 12°21.2'N, 43°27.1'E, 35-45 m, 6.03.1987: 1 ♂ 24.3 mm, 1 juv. (SMF).

Seychelles. Off Mahe, 40 m, 1974, coll. C. RATCLIFFE: 1 ♂ 38.1 mm (NHM). — REVES 2: stn 25, 4°54.6'S, 55°20.5'E, 60 m, 8.09.1980: 1 ♂ 36.6 mm; 1 ♀ 40.0 mm (MNHN).

Madagascar. *West coast*: *"FAO 60"*, 16°33'S, 44°19'E, 10 m: 1 ♂ 46.9 mm; 1 ♀, 25.0 mm (MNHN). — NW coast, baie d'Ambaro, 9 m, 27.07.1958, coll. A. CROSNIER: 2 ♂ 42.9, 27.9 mm (MNHN). — Nosy Be, 15 m, January 1962, coll. A. CROSNIER: 1 ♂ 45.9 mm; 1 ♀ 32.3 mm (MNHN). — NW coast, 13°05'S, 48°21'E, 50 m, 19.06.1967, coll. R. PLANTE: 1 ♂ 47.4 mm; 3 ♀ 31.7-42.2 mm (MNHN).

Pakistan. Karachi: 1 ♀ 21.1 mm (NHM 1897.9.12.25).

Indonesia. *Celebes*. Menado, 1836, coll. A.J. VAN DELDEN: 1 ♀ 24.1 mm (RMNH 760). — *Irian Jaya*. Tiger I., S. of Pulau Tarupa Kecil, 6°32.7'S, 121°8.7'E, sand, 53-57 m, 18.10.1984: 1 ♂ 17.6 mm (RMNH).

New Guinea. Padaido Is., Geelvinck Bay, February 1956, coll. T. ABBOTT: 1 ♂ 20.1 mm (RMNH 27085).

Japan. Honshu I., Wakayama-Ken, Minabe, 6.06.1974, coll. T. SAKAI: 1 ♀ 49.1 mm (SMF 22937).

Taiwan. Takao, 3.12.1914, id. M.J. RATHBUN as *C. gallus*: 1 ♀ 37.6 mm (USNM 47933).

Australia. NW shelf, coll. *"Solea"*: 1 ♀ 17.3 mm; 3 juvs (QM W19796). — 19°29.6'S, 118°52.2'E, 38-39 m, 30.08.1983, coll. *"Solea"*: 3 juvs (QM W19793). — 19°05.4'S, 118°53.9'E, 80 m, 30.10.1983, coll. *"Solea"*: 1 ♀ 16.5 mm; 1 juv. (QM W19792). — Southport: 1 ♀ 41.3 mm (QM W105). — 12°6.4'S, 143°17.6'E, 16 m, September 1979: 1 ♂ 22.7 mm (QM W9878).

New Caledonia. Ilôt Maître, 28.05.1984: 1 ♂ 48.9 mm; 1 ♀ 45.5 mm (MNHN). — Ilôt Maître, 28.05.1984: 1 ♂ 49.0 mm; 1 ♀ 36.7 mm (MNHN). — 30 m, 3.07.1986, coll. P. LABOUTE: 1 ♀ 40.4 mm (MNHN). — North lagoon, stn DW 1215, 19°48'S, 163°4'E, 26 m, 3.11.1989, coll. B. RICHER DE FORGES: 1 ♀ 39.0 mm (MNHN). — Nr Nouméa, stn 58, 22°09'S, 166°13'E, 22 m, coll. B. RICHER DE FORGES: 1 ♀ 37.2 mm (MNHN). — St. Vincent Bay, stn 163, 22°12'S, 166°07'E, 15 m, coll. B. RICHER DE FORGES: 1 ♀ 34.0 mm (MNHN). — St. Vincent Bay, stn 179, 22°01'S, 166°04'E, 12 m, coll. B. RICHER DE FORGES: 1 ♂ 37.8 mm (MNHN).

DESCRIPTION. — Carapace convex, 1.3 wide as long, surface minutely granulate. Hepatic region depressed, gastro-cardial region delimited by deep longitudinal grooves. Branchial region and clypeiform process anteriorly with large mammilate tubercles. Cardiac and metabranchial regions with beaded tubercles. Front projecting, anteriorly bidentate. Basal antennal article granulate, anterior margin slightly concave, peduncle emerging from distal angle. Endostomial septum visible with first maxillipeds closed, with convex anterior margin. Distal margin of first maxillipeds deeply scooped, anterointernal angle acute. Anterolateral margin arcuate, carinate, anteriorly unevenly granulate, posteriorly with mammilate tubercles. Posterolateral margin setose, with six marginally beaded triangular teeth, three posterior teeth with median beaded ridges. Posterior margin sinuous, closely beaded. Merus of cheliped distally with quadrilobate lamina. External surface of chela minutely granulate, horizontally traversed by rounded tubercles, largest near upper crest. Crest of larger chela cut into seven foliate teeth increasing in size distally, proximalmost flattened. Lower margin with two beaded files. First male pleopod stout, slightly curved, tapering apically, distally spinulate; second pleopod slender, straight, with subdistal denticulate flange and digitate tip.

Color. — Carapace orange-red, red markings on branchial regions, interior surface of chela with red reticulation. Color photographs in TAKEDA & KOYAMA (1974), TAKEDA (1982).

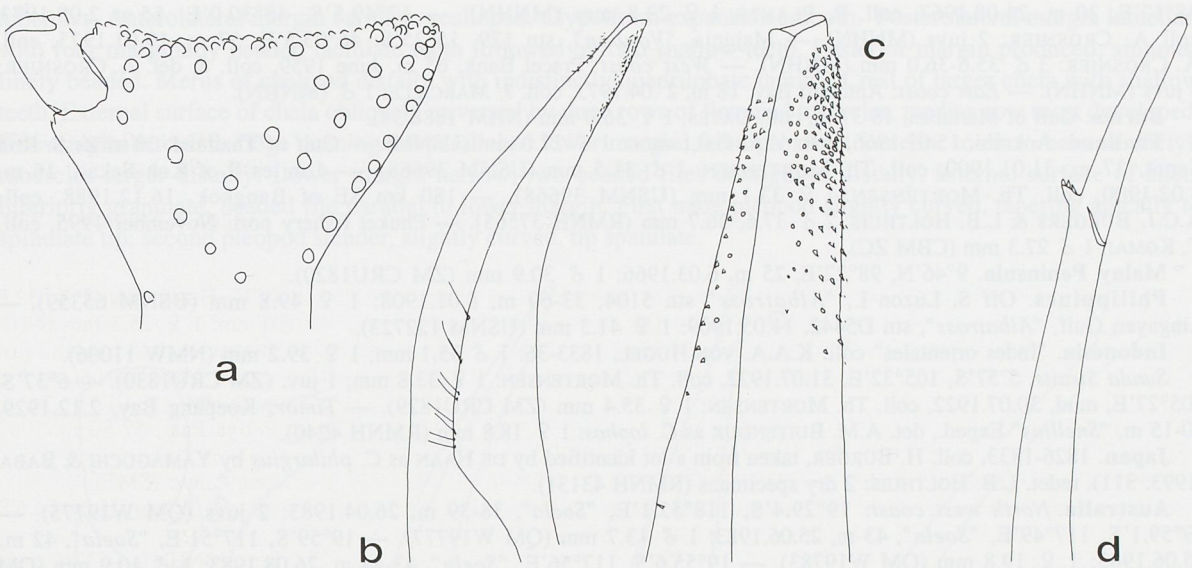


FIG. 5. — *Calappa capellonis* (Laurie, 1906), ♂ 36.6 mm, Seychelles, "REVES 2", stn 25, 4°54.6'S, 55°20.5'E, 60 m (MNHN): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

REMARKS. — LAURIE (1906) describing *C. gallus* divided his material into "two morphological series" and named his series (B) var. *capellonis*. RATHBUN (1937) submerged *capellonis* within *C. gallus* claiming the differences are but intraspecific variations (see above), but TAKEDA & KOYAMA (1974) recognized it as a distinct species. *C. capellonis* differs from *C. gallus* in having front emarginate rather than thickly truncate, tubercles on branchial region, clypeiform processes and outer surface of chelae more prominent and closely-set, and hepatic regions less markedly depressed.

DISTRIBUTION (fig. 29). — Seychelles and Madagascar to South China Sea, Japan and New Caledonia; on sand, pebbles, rocky bottoms; 9-80 m.

Calappa clypeata (Borradaile, 1903)

Fig. 1 d, 4 d, 6, 34, 35 d

Calappa pustulosa var. *clypeata* Borradaile, 1903: 436.

Calappa terraereginae Ward, 1936: 11, pl. 3 figs 9-11. — SAKAI, 1937: 92, pl. 18 fig. 1, text-figs 6b, 7; 1956: 8; 1976: 130, text-figs 72a-b. — TYNDALE-BISCOE & GEORGE, 1962: 70, pl. 1 fig. 2, pl. 2 fig. 2. — SERÈNE, 1968: 41 (list). — KIM, 1970: 11. — MIYAKE, 1983: 199. — DAI *et al.*, 1986: 92, fig. 50, pl. 11 fig. 5. — TAKEDA & SHIKATANI, 1990: 483. — DAI & YANG, 1991: 103, fig. 50, pl. 11 fig. 5. — CHEN, 1993: 682, fig. 4a. — YAMAGUCHI & BABA, 1993: 311, fig. 95.

Calappa lophos - BUITENDIJK, 1939: 231 (part). [Non Herbst, 1782].

MATERIAL EXAMINED. — **Maldive Is**. Haddumati Atoll, 1900, coll. J.S. GARDINER: 1 juv. (UMZC), syntype of *C. pustulosa* var. *clypeata* Borradaile, 1903. — Mulaku Atoll, 1900, coll. J.S. GARDINER: 1 juv. (UMZC), syntype of *C. pustulosa* var. *clypeata* Borradaile, 1903.

Seychelles. REVES 2 (coll. E. MARCHAL): stn 3, 5°13.7'S, 56°41.4'E, 50 m, 2.09.1980: 1 juv. (MNHN). — Stn 36, 4°40.7'S, 55°03.0'E, 55-62 m, 10.09.1980: 1 ♀ 23.2 mm (MNHN). — Stn 68, 60-65 m, 21.09.1980: 1 ♀ 24.2 mm (MNHN).

Zanzibar. 7-9 m, coll. I. GORDON: 1 ♂ 18.0 mm (NHM 1964.7.1.120).

Madagascar. *North west coast*: Nosy Be, 6-8 m, May 1957, coll. & det. P. FOURMANOIR: 3 ♂ 33.9, 37.1, 37.7 mm; 6 ♀ 32.7-40.5 mm (MMHN). — Nr Nosy-Iranja, 18.11.1969, coll. R. PLANTE: 1 ♀ 30.8 mm (MNHN). — 13°27'S,

48°12'E, 30 m, 24.08.1967, coll. R. PLANTE: 1 ♀ 23.8 mm (MNHN). — 12°49.5'S, 48°30.0'E, 55 m, 2.08.1973, coll. A. CROSNIER: 2 juvs (MNHN). — Majunja, *"Vauban"*, stn 129, 15°25'S, 46°03.5'E, 57 m, 19.01.1975, coll. A. CROSNIER: 3 ♂ 35.6-36.0 mm (MNHN). — *West coast*: Pracel Bank, 65 m, June 1959, coll. & det. A. CROSNIER: 3 juvs (MNHN). — *East coast*: Antongil Bay, 18 m, 2 .04.1973, coll. J. MARCILLE: 1 ♂ (MNHN).

Burma. Gulf of Martaban, 18-37 m, coll. OATES: 1 ♀ 36.0 mm (NHM 1888.34).

Thailand. Aokrabi, 15.02.1966, coll. V.A. GALLARDO: 1 ♂ 27.0 mm (USNM). — Gulf of Thailand. 20 miles S. Koh Samit, 37 m, 31.01.1900, coll. Th. MORTENSEN: 1 ♂ 31.5 mm (USNM 39668). — 4 miles S of Koh Sakait, 16 m, 3.02.1900, coll. Th. MORTENSEN: 1 ♀ 33.1 mm (USNM 39668). — 180 km SE of Bangkok, 16.12.1988, colls A.C.J. BÜRGERS & L.B. HOLTHUIS: 2 ♂ 37.6, 36.7 mm (RMNH 37565). — Phuket fishery port, November 1995, coll. T. KOMAI: 1 ♂ 27.3 mm (CBM ZC).

Malay Peninsula. 9°46'N, 98°22'E, 25 m, 6.03.1966: 1 ♂ 30.9 mm (ZM CRU1820).

Philippines. Off S. Luzon I., *"Albatross"* stn 5104, 33-60 m, 8.01.1908: 1 ♀ 49.8 mm (USNM 65359). — Lingayen Gulf, *"Albatross"*, stn D5442, 11.05.1909: 1 ♀ 41.3 mm (USNM 122723).

Indonesia. "Indes orientales" coll. K.A.A. VON HUGEL, 1833-36: 1 ♂ 35.1 mm; 1 ♀ 39.2 mm (NMW 11006).

Sunda Straits, 5°57'S, 105°32'E, 31.07.1922, coll. Th. MORTENSEN: 1 ♀ 33.8 mm; 1 juv. (ZM CRU1830). — 6°37'S, 105°27'E, mud, 30.07.1922, coll. Th. MORTENSEN: 1 ♀ 35.4 mm (ZM CRU1829). — *Timor*, Koepang Bay, 2.12.1929, 10-15 m, *"Snellius"* Exped., det. A.M. BUITENDIJK as *C. lophos*: 1 ♀ 18.8 mm (RMNH 4240).

Japan. 1826-1833, coll. H. BÜRGER, taken from a lot identified by DE HAAN as *C. philargius* by YAMAGUCHI & BABA (1993: 311), redet. L.B. HOLTHUIS: 2 dry specimens (RMNH 43131).

Australia. *North west coast*: 19°29.4'S, 118°52.1'E, *"Soela"*, 38-39 m, 26.04.1983: 2 juvs (QM W19775). — 19°59.1'S, 117°49'E, *"Soela"*, 43 m, 25.06.1983: 1 ♂ 13.7 mm (QM W19777). — 19°59'S, 117°51'E, *"Soela"*, 42 m, 25.06.1983: 1 ♀ 19.8 mm (QM W19783). — 19°55.6'S, 117°56'E, *"Soela"*, 43-44 m, 26.08.1983: 1 ♂ 10.9 mm (QM W19778). — *North coast*: Gulf of Carpentaria, 1965; 1 ♀ 29.8 mm (QM W2403). — Gulf of Carpentaria, 14°27.5'S, 138°42'E, *"Southern Surveyor"*, 52 m, 12.12.1991: 1 ♂ 29.6 mm; 2 ♀ 19.6, 17.8 mm (QM W17345). — Torres Straits, 10°12'S, 143°12'E, *"Kulasi"*, 27 m, 27.09.1988: 1 ♀ 27.7 mm (QM W16095). — *East coast*: Cairns, 17°00'S, 146°07'E, 35 m, 25.04.1982: 1 ♂ 40.7 mm; 1 ♀ 38.8 mm (QM W9966). — 12°34.5'S, 143°48.6'E, 16 m, September 1979: 1 ♀ 25.2 mm (QM W9889). — Darnley I., coll. Dr. TOSH: 1 ♂ 22.5 mm (QM W12267). — Bowen, coll. E.H. RAINFORD: 1 ♂ 20.2 mm (QM W216). — Nr Layoak I., 9°48'S, 143°18'E, *"Kulasi"*, 33 m, 26.09.1988: 1 ♂ 27.5 mm (QM W16096).

New Caledonia. LAGON (coll. B. RICHER DE FORGES): stn 7, 22°24'S, 166°19.7'E, 14 m, 21.05.1984: 5 ♂ 26.3-30.8 mm; 5 ♀ 24.4-35.8 mm (MNHN). — Stn 12, 22°17'S, 166°23'E, 23 m, 21.05.1984: 1 ♀ 38.1 mm (MNHN). — Stn 512, 19°24'S, 163°35'E, 59 m, 5.03.1985: 1 ♂ 34.4 mm; 1 ♀ 37.8 mm (MNHN). — Stn 513, 19°20'S, 163°35'E, 55 m, 5.03.1985: 3 ♀ 28.4, 39.5, 41.5 mm (MNHN). — Stn 527, 19°22'S, 163°34'E, 59 m, 5.03.1985: 1 ♂ 18.5 mm; 1 ♀ 20.6 mm(MNHN). — Stn 988, 20°17.1'S, 163°58.7'E, 19-20 m, 30.04.1988: 1 ♂ 25.9 mm (MNHN). — Stn 1066, 19°5' S, 163°52.2'E, 20 m, 23.10.1989: 1 ♀ (MNHN). — Stn 1067, 19°55.8'S, 163°52.8'E, 28 m, 23 .10.1989: 1 ♂ 20.8 mm; 6 ♀ 18.3-27.0 mm; 7 juv. (MNHN). — Stn 1068, 19°57.3'S, 163°52.8'E, 26 m, 23.10.1989: 1 ♂ 19.9 mm; 1 ♀ 19.1 mm; 5 juvs (MNHN). — Stn 1069, 19°59.1'S, 163°52.5'E, 30 m, 23.10.1989: 1 ♀ 24.9 mm (MNHN). — Stn 1076, 19°52.3'S, 163°54.9'E, 31 m, 23.10.1989: 1 ♀ 12.8 mm (MNHN). — Stn 1109, 19°43.8'S, 163°44.2'E, 38 m, 25.11.1989: 1 ♂ 35.4 mm (MNHN). — Stn 1194, 19°29.5'S, 163°22.9'E, 57 m, 1.11.1989: 1 juv. (MNHN). — Stn 1199, 19°37.8'S, 163°27.9'E, 43 m, 2.11.1989: 1 ♀ (MNHN). — Stn 1214, 19°49.9'S, 163°36.6'E, 29 m, 3.11.1989: 2 juvs (MNHN).

North Lagoon (M. KULBICKI coll.): stn 2, 19°54.3'S, 163°50' E, 30-33 m, 13.06.1985: 2 ♀ 31.4, 33.7 mm (MNHN). — Stn 6, 19°46.5'S, 163°47.2'E, 37 m, 14.06.1985: 1 ♂ 24.5 mm; 1 ♀ 24.4 mm (MNHN). — Stn 8, 19°54.8'S, 163°45.10'E, 33-36 m, 14.06.1985: 3 ♂ 19.6-30.0 mm; 5 ♀ 17.3-37.6 mm (MNHN). — Stn 9, 19°54.1'S, 163°42.9'E, 33 m, 14.06.1985: 3 ♀ 34.0- 37.4 mm (MNHN). — Stn 13, 19°40.2'S, 163°47.2'E, 42 m, 15.06.1985: 2 ♂ 29.2, 29.5 mm (MNHN). — Stn 20, 19°19.5'S, 163°36.0'E, 55-58 m, 18.06.1985: 1 ♂ 31.5 mm; 1 ♀ 40.5 mm (MNHN). — Stn 21, 19.41.8'S, 163.31.2'E, 40 m, 19.06.1985: 3 ♀ 33.6-38.8 mm (MNHN). — Stn 30, 19°36.5'S, 163°39.5'E, 40 m, 20.06.1985: 1 ♂ 29.9 mm; 1 ♀ 36.6 mm (MNHN). — Stn 34, 19°18.2'S, 163°40.3'E, 50-54 m, 18.06.1985: 1 ♂ 32.7 mm (MNHN). — Stn 36, 19°14.1'S, 163°21.2'E, 60-62 m, 21.06.1985: 1 ♀ 25.3 mm (MNHN). — Stn 39, 19°29.0'S, 163°25.4'E, 52-56 m, 22.06.1985: 3 ♂ 31.9-33.7 mm; 2 ♀ 26.7, 29.1 mm (MNHN). — Stn 43, 19°32.8'S, 163°40.6'E, 45-50 m, 23.06.1985: 2 ♂ 31.9, 33.7 mm; 2 ♀ 26.7, 29.1 mm (MNHN). — Stn 44, 19°46.5'S, 163°47.4'E, 38 m, 23.06.1985: 6 ♂ 26.4-33.9 mm; 2 ♀ 21.4, 24.2 mm (MNHN).

St Vincent Bay (M. KULBICKI coll.): 22°04.19'S, 166°00.5'E, 13-20 m, 29.04.1985: 1 ♂ (MNHN). — 22°05.5'S, 166°05.5'E, 15 m, 20.08.1985: 1 ♂ 29.0 mm (MNHN).

DESCRIPTION. — Carapace convex, 1.4 wide as long, surface finely punctate. Front only slightly projecting, with two rounded teeth separated by triangular sulcus. Basal antennal article with anterior proximal angle produced, peduncle emerging medially. Afferent branchial canal ending below orbit in rounded process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. First maxillipeds with small triangular notch on anterior margin. Branchial ridges prominent in young, barely distinguished, anteriorly with flattened

tubercles. Anterolateral margin carinate, scalloped. Clypeiform expansion smooth. Posterolateral margin lamellar, with four marginally beaded laciniate teeth followed by two shallow teeth. Posterior margin produced, sinuous, finely beaded. Merus of cheliped distally with indistinctly quadrilobate lamina. Crest of larger chela with shallow teeth. External surface of chela obliquely traversed by three rows of flattened tubercles, median row most developed. Unevenly tuberculate ridge running subparallel to lower margin, from proximal lamellar tooth to base of dactyl, tubercles larger distally. Lower margin narrow, two beaded files contiguous distally. Internal surface of chela inferiorly granulate, beaded file parallel to lower margin. First male pleopod slightly curved, tapering apically to spinulate tip; second pleopod slender, slightly curved, tip spatulate.

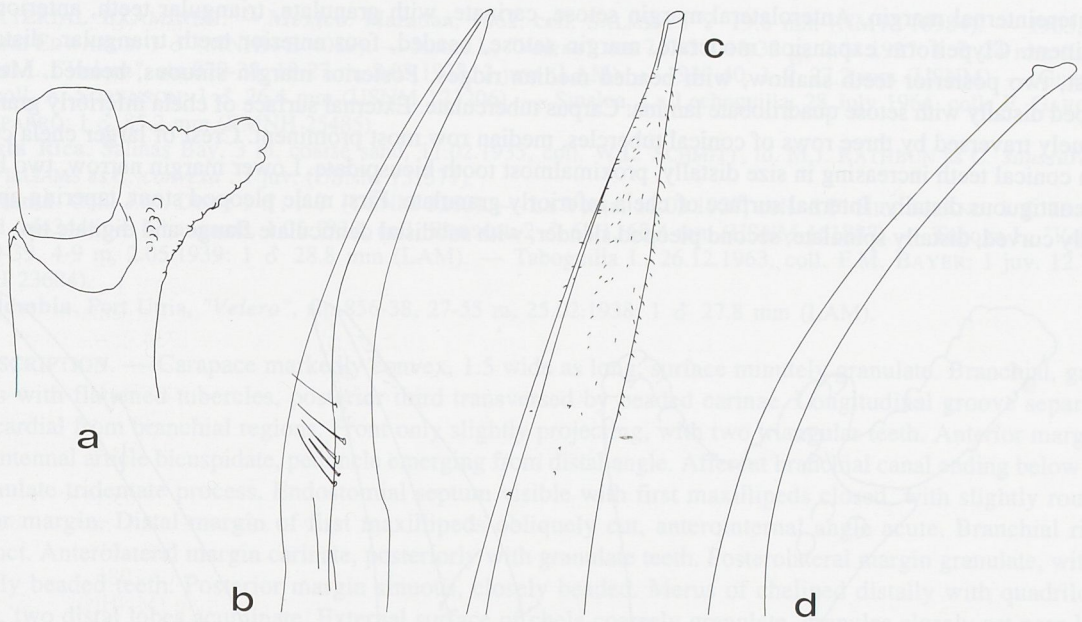


FIG. 6. — *Calappa clypeata* (Borradaile, 1903), ♂ 36.0 mm, Madagascar, Majunja, *"Vauban"* stn 129, 15°25'S, 46°03.5'E, 57 m (MNHN): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

Color (in alcohol). — "Pale grey-pink on carapace, inside of the palm marked with orange" (TYNDALE-BISCOE & GEORGE, 1962).

REMARKS. — BORRADAILE (1903) distinguished var. *clypeata* from the typical *C. pustulosa* as having the clypeiform expansions similar to those of *C. depressa* and denticulate anterolateral margins. Indeed, its carapace is as smooth and glabrous as that of *C. pustulosa*, but it differs from that species in having clypeiform expansions; it is easily distinguished from *C. depressa* by its smooth, convex carapace.

As *clypeata* Borradaile, 1903 is older than *terraereginae* Ward, 1936, it has priority. The fact that *clypeata* was proposed conditionally does not make it unavailable, as this was done before 1961 (International Code of Zoological Nomenclature, Articles 11(d)(i) and 15).

DISTRIBUTION (fig. 34). — From east African coast to Japan, the Philippines and New Caledonia, at 6-160 m.

Calappa conifera sp. nov.

Fig. 1 e, 4 e, 7

MATERIAL EXAMINED. — **South Africa**. *" Pieter Faure"*: Off Port Shepstone, 43 m: 1 ♂ 18.6 mm (SAM A43141); 1 ♀ 18.8 mm (SAM A43142). — Tongaat River, 65 m: 2 ♂ 10.5 and 10.9 mm, 1 broken specimen (SAM A463).

TYPE MATERIAL. — The male collected off Port Shepstone is the holotype. The other specimens are paratypes.

DESCRIPTION. — Carapace markedly convex, 1.2-1.3 wide as long, deep longitudinal groove separating gastrocardial from inflated branchial regions, hepatic region markedly depressed. Surface prominently tuberculate anteriorly, branchial tubercles largest, conical, intestinal region with granulate tubercles. Front projecting, with two triangular teeth separated by sulcus. Basal antennal article distally granulate, anterior margin bidentate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in tridentate process. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. First maxillipeds with triangular notch on anterointernal margin. Anterolateral margin setose, carinate, with granulate, triangular teeth, anterior tooth prominent. Clypeiform expansion moderate, margin setose, beaded, four anterior teeth triangular, distalmost largest, two posterior teeth shallow, with beaded median ridges. Posterior margin sinuous, beaded. Merus of cheliped distally with setose quadrilobate lamina. Carpus tuberculate. External surface of chela inferiorly granulose, obliquely traversed by three rows of conical tubercles, median row most prominent. Crest of larger chela cut into seven conical teeth increasing in size distally, proximalmost tooth bicuspidate. Lower margin narrow, two beaded files contiguous distally. Internal surface of chela inferiorly granulate. First male pleopod stout, tapering apically, slightly curved, distally spinulate; second pleopod slender, with subdistal denticulate flange and digitate tip.

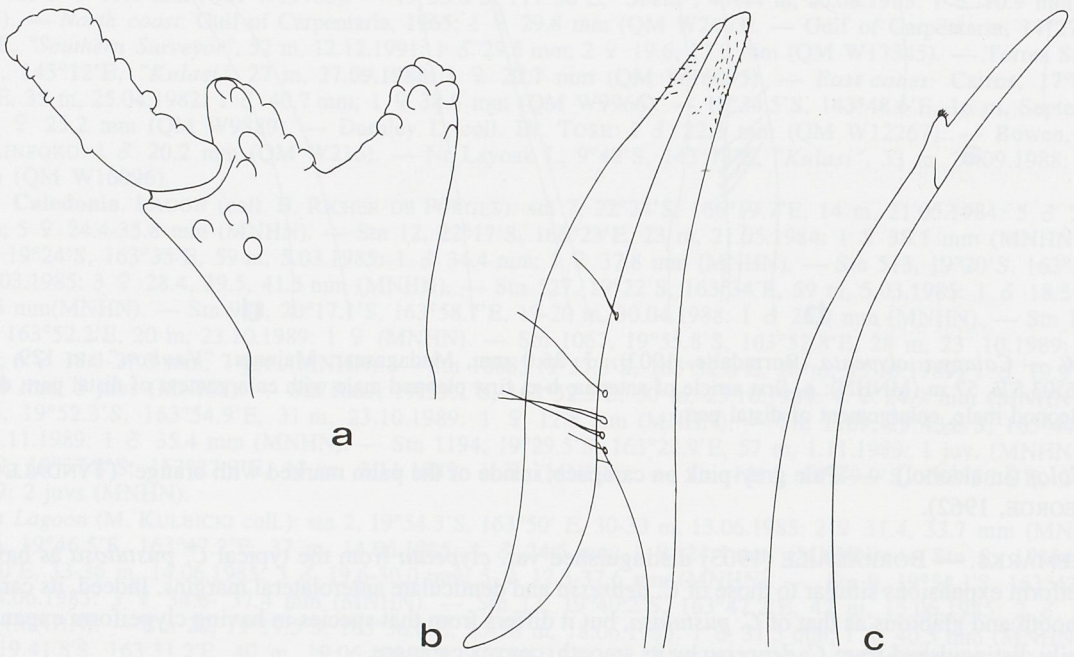


FIG. 7. — *Calappa conifera* sp. nov., ♂ cl 18.6 mm, South Africa, holotype (SAM A463) : **a**, first article of antenna; **b**, first pleopod male; **c**, second pleopod male, enlargement of distal part.

ETYMOLOGY. — From the Latin, *conus*, cone, after the conical tubercles on carapace and chelae, and the verb *fero*, bear.

REMARKS. — The deep longitudinal grooves separating the gastrocardial from inflated branchial regions and the markedly depressed hepatic region of *C. conifera* are similar to those of *C. gallus*. However, *C. conifera* is easily distinguished from the latter by its bidentate front, bidentate basal antennal article, prominently dentate anterolateral margin, moderate clypeiform expansion and conical tubercles on chelae.

DISTRIBUTION. — Known only from the type locality, South Africa, at 43-65 m.

Calappa convexa Saussure, 1853

Fig. 1 f, 4 f, 8

Calappa convexa Saussure, 1853: 362, pl. 13 fig. 3. — Stimpson, 1889: 470. — Nobili, 1901: 29. — Rathbun, 1907: 74; 1910b: 593; 1924a: 159; 1937: 206, pl. 62 figs 1-3. — Boone, 1927: 280, fig. 99. — Garth, 1946a: 360, pl. 62 fig. 6; 1946b: 620 (list); 1948: 19; 1960: 121 (list); 1966: 12. — Prahl & Sanchez, 1986: 23. — Lemaitre & Alvarez-Leon, 1992: 50 (list). — Hendrickx, 1992: 9 (list); 1993a: 8 (list); 1993b: 311 (list); 1994: 576.
Calappa xanthusiana Stimpson, 1860: 237.

Material examined. — **Mexico**. Mazatlan, 1862, coll. Salmin: 1 ♀ 19.6 mm (NMW 10984). — 1903, coll. A. Milne Edwards: 1 ♂ (MNHN-B 4089). — Isabel I., *"Velero"*, stn 747-37, 18-33 m, 2.04.1937: 1 ♀ 24 mm (LAM). — Isabel I., *"Velero"*, stn 870-38, 18-27 m, 8.03.1938: 3 juvs (LAM). — 1939-40: 1 ♀ 27.2 mm (USNM). — Guaymas, 1946, coll. A. Sorenson: 1 ♂ 26.4 mm (USNM 173206). — Sinaloa, La Lechoguilla, 28 July 1964, colls F. Garcia & E. Chaparro: 1 ♂ 85.2 mm (RMNH 25485).

Costa Rica. Salinas Bay, 3 m, coarse sand, 11.02.1935, coll. W.L. Schmitt, id. M.J. Rathbun as *C. saussurei,* id. A.B. Williams as *C. convexa* : 1 juv. (USNM 131571).

Panama. Coll. J.M. Dow: 1 ♂, 1 ♀ (USNM 3263). — La Venta, 11.03.1937, coll. S.F. Hildebrand: 1 ♂ 78.6 mm (USNM 144344). — Changame, 1.05.1938, coll. Robson: 2 ♂ 68.1, 68.4 mm (USNM 161887). — Taboga I., *"Velero"*, stn 960-39, 4-9 m, 2.05.1939: 1 ♂ 28.8 mm (LAM). — Taboguilla I., 26.12.1963, coll. F.M. Bayer: 1 juv. 12.7 mm (RMNH 23684).

Colombia. Port Utria, *"Velero"*, stn 856-38, 27-55 m, 25.02.1938: 1 ♂ 27.8 mm (LAM).

Description. — Carapace markedly convex, 1.5 wide as long, surface minutely granulate. Branchial, gastric regions with flattened tubercles, posterior third transversed by beaded carinae. Longitudinal groove separating gastrocardial from branchial regions. Front only slightly projecting, with two triangular teeth. Anterior margin of basal antennal article bicuspidate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. Distal margin of first maxillipeds obliquely cut, anterointernal angle acute. Branchial ridges indistinct. Anterolateral margin carinate, posteriorly with granulate teeth. Posterolateral margin granulate, with six medially beaded teeth. Posterior margin sinuous, closely beaded. Merus of cheliped distally with quadrilobate lamina, two distal lobes acuminate. External surface of chela coarsely granulate, granules closely set near lower margin; obliquely traversed by three flattened tubercles, similar tubercles distally above dactyl. Uneven tubercles running subparallel to lower margin, from proximal keel-like tooth to base of fixed finger, tubercles larger distally. Crest of larger chela cut into six teeth increasing in size distally, proximalmost lowest. Lower margin narrow, two beaded files contiguous distally. First male pleopod sinuous, distally spinulate; second pleopod slender, sickle-shaped distally.

Color. — *C. convexa* was named "Grey Box Crab" by Rathbun (1924), who then (1937) proceeded to describe a splendid specimen with "carapace dull red with fine dots of pale yellow; granulated ridges also yellow. On the carpus and distal end of merus of chelipeds the yellow spots are larger; on the upper half of the manus the ground is red with irregular splotches of yellow, on the lower half the ground is yellow with little red. Carpus and propodus of legs red with white spots; on the merus the white predominates". Boone (1927) called it "Purple Box Crab" with carapace "an exquisite shade of lilac-lavender. The ambulatory legs are banded alternately with light rose and lavender on the three distal joints". According to Garth (1946a) "Carapace hazel... Eugenia red patch on anterolateral area... but almost covered with small patterns of ochraceous orange and russet. Marginal teeth ochraceous orange. Eyestalks tawny; eye pale blue. Chelipeds same as carapace with a large Eugenia red spot across distal end of hand and base of movable finger. Fingers tawny olive shading to very light tips". Crane in Garth (1966) saw it as "Lavender spotted finely with white. Inside of cheliped orange. Ambulatories and chelipeds spotted with yellow and mottled with white and lavender".

Remarks. — Nobili (1901) remarked: "Questa specie [*C. convexa*] che rappresenta sulla costa occidentale dell'America la *C. flammea*, e a questa molto affine, ma e facile distinguerla". Rathbun (1937) too found it "Allied to *C. flammea* in its little protruded front and in the character of the surface. It is, however, more convex

than that species, and the triangular teeth of the posterolateral margins are more strongly carinated along the middle above; also there are numerous short transverse crenulated carinae on the posterior third of the carapace". GARTH (1946a) considered *C. convexa* "nearly related [to] *C. saussurei* Rathbun". However, the latter belongs altogether to a separate genus (see later).

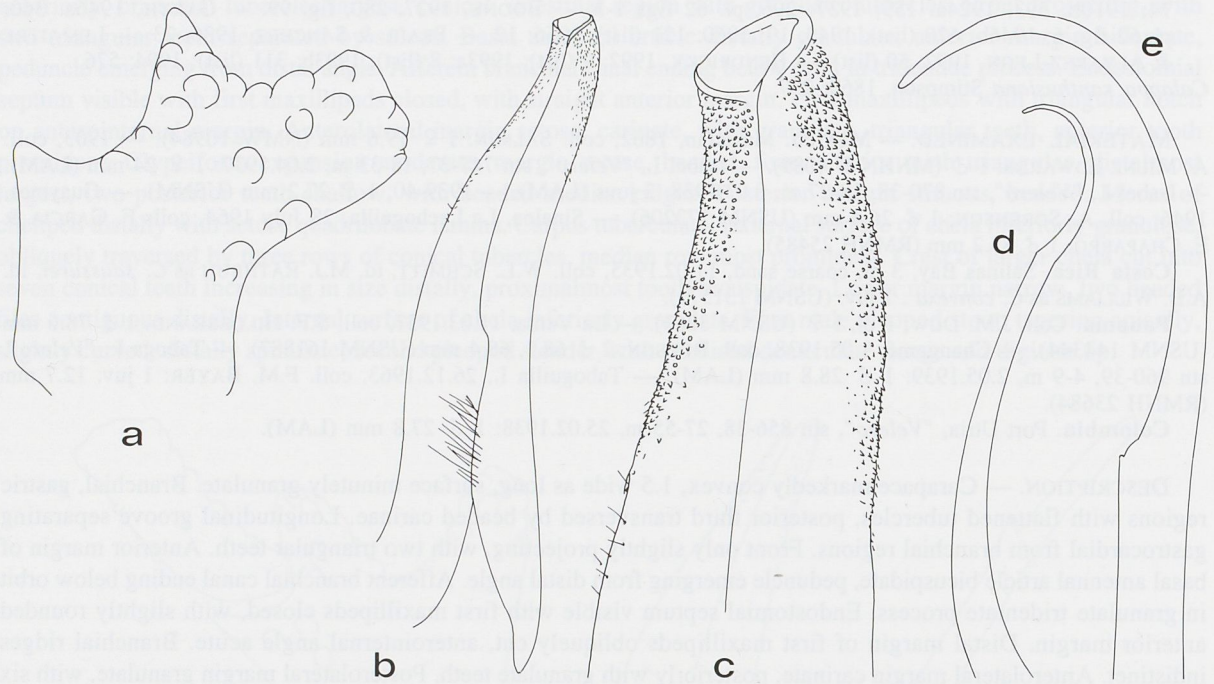


FIG. 8. — *Calappa convexa* Saussure, 1853, ♂ 68.1 mm, Panama (USNM 144344): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d-e**, second pleopod male with enlargement of distal part.

DISTRIBUTION. — Lower California, Mexico, to Ecuador and Galapagos; intertidal to 60 m; on gravelly sand, crushed shell, dead coral, rocks, sand and algae.

Calappa depressa Miers, 1886

Fig. 9, 10 a, 11, 13 a, 30, 35 e-f

Calappa depressa Miers, 1886: 287, pl. 23 fig. 2. — BORRADAILE, 1903: 436. — HALE, 1927: 190, fig. 191. — TYNDALE-BISCOE & GEORGE, 1962: 70. — SERÈNE, 1968: 41 (list).
Calappa woodmasoni Alcock, 1896: 148, pl. 6 fig. 2. — ALCOCK & ANDERSON, 1897, pl. 28 figs 2, 2a. — IHLE, 1918: 181. — SERÈNE, 1968: 41(list).
Calappa alata Rathbun, 1911: 198, pl. 15 fig. 2. — SERÈNE, 1968: 41 (list).
Calappa depressus Chopra, 1933: 31.
Calappa elata - GUINOT, 1967: 25 (list) [erroneous spelling].

MATERIAL EXAMINED. — **Australia**. *South coast*: 4-18 m, April 1874: 1 ♀ holotype, 18.0 mm (NHM 1884.31). — *North-west shelf*: 19°56.8'S, 117°53.4'E, 42 m, 22.04.1983, coll. *"Soela"*: 2 ♀ 20.5, 14.0 mm (QM W19779). — 19°29.4'S, 118°51.5'E, 40 m, 25.10.1983, coll. *"Soela"*: 1 ♂ 13.6 mm (QM W19776). — 19°30.9'S, 118°49.2'E, 38-39 m, 25.10.1983, coll. *"Soela"*: 1 ♂ 14.4 mm (QM W19779). — 19°29.4'S, 118°52.4'E, 38 m, 25.10.1983, coll. *"Soela"*: 3 juvs (QM W19780).
Somalia. 1 ♂ 24.1 mm (NHM 1950.8.8.37).
Seychelles. Amirante I., *"Sealark"*, stn E9, 62 m, 9.10.1905: 1 ♂ 17.9 mm (USNM 41057), holotype of *C. alata*.

REVES 2 (coll. E. MARCHAL): stn 22, 5°16.3'S, 55°58.42'E, 60 m, 6.09.1980: 2 ♀ 14.7, 16.7 mm (MNHN). — Stn 25, 4°54.6'S, 55°20.5'E, 60 m, 8.09.1980: 2 ♂ 22.0, 19.8 mm; 1 ♀ 17.7 mm (MNHN). — Stn 29, 4°44.0'S, 54°38.3'E, 56 m, 9.09.1980: 1 ♂ 13.4 mm (MNHN). — Stn 30, 4°42.4'S, 54°24.9'E, 50-55 m, 9.09.1980: 1 ♀ ovig. 18.0 mm (MNHN). — Stn 31, 4°37.4'S, 54°20.7'E, 50 m, 9.09.1980: 1 ♂ 13.0 mm (MNHN). — Stn 54, 3°53.2'S, 55°09.1'E, 50 m, 17.09.1980: 1 ♀ 18.6 mm (MNHN). — Stn 55, 3°48.0'S, 55.°6.2'E, 50-55 m, 17.09.1980: 1 ♂ 19.2 mm (MNHN). — Stn 60, 4°11.2'S, 55°12.6'E, 40-50 m, 19.09.1980: 1 ♀ ovig. 18.2 mm (MNHN).

W. of Poivre Atoll, 5°46'S, 53°11'E, 57 m, 1.01.1993, coll. *"Tyro"* Exped.: 1 ♀ 16.1 mm (RMNH). — SW of La Digue I., 4°23'S, 55°51'E, 25 m, 23.12.1992, coll. *"Tyro"* Exped.: 1 juv. 8.8 mm (RMNH).

Comoro Is. Mayotte lagoon, August 1959, coll. A. CROSNIER (as *C. alata*): 1 ♂ 19.9 mm (MNHN). — 50 m, September 1959, coll. A. CROSNIER (as *C. alata*): 1 ♂ 12.5 mm; 1 ♀ 11.2 mm (MNHN).

Madagascar. *North-west coast*: S. of Nosy Iranja, 20 m, 19.09.1960, colls HUMES & FOSTER: 1 ♂ 18.4 mm, 1 ♀ 20.3 mm (MNHN). — *West coast*: Tuléar, 8 m: 1 ♀ ovig. 13.0 mm (MNHN).

New Caledonia. LAGON (coll. B. RICHER DE FORGES): stn 4, 22°22.5'S, 166°20.7'E, 9 m, 21.05.1984: 1 ♀ 23.3 mm (MNHN). — Stn 10, 22°19.9'S, 166°20.4'E, 15 m, 21.05.1984: 1 ♀ (MNHN). — Stn 45, 22°11.9'S, 166°19.2'E, 14 m, 25.05.1984: 1 ♂ 20.5 mm (MNHN). — Stn 376, 22°33.6'S, 167°06.2'E, 75-76 m, 21.01.1985: 1 ♂ 17.2 mm (MNHN). — Stn 403, 22°34.5'S, 167°17.5'E, 45 m, 23.01.1985: 1 ♀ 17.3 mm (MNHN). — Stn 405, 22°37.5'S, 167°19.5'E, 27 m, 23.01.1985: 1 ♂ 19.9 mm (MNHN). — Stn 444, 18°15.3'S, 162°58.8'E, 300-350 m, 28.02.1985: 1 ♂ 18.9 mm (MNHN). — Stn 519, 19°02.5'S, 163°34.0'E, 5.03.1985: 3 ♂ 13.4-17.2 mm (MNHN). — Stn 581, 22°41.5'S, 167°26.1'E, 24 m, 18.07.1985: 1 ♀ 18.4 mm (MNHN). — Stn 911, 20°56.8'S, 164°34.8'E, 13-19 m, 26.04.1988: 1 juv (MNHN). — Stn 934, 20°43.0'S, 164°16.8'E, 10 m, 27.04.1988: 1 ♀ ovig. 20.1 mm (MNHN). — Stn 940, 20°38.1'S, 164°15.5'E, 10 m, 27.04.1988: 1 ♂ 16.7 mm (MNHN). — Stn 949, 20°33.1'S, 164°10.6'E, 12 m, 28.04.1988: 1 ♂ 19.0 mm (MNHN). — Stn 1015, 20°10.1'S, 163°51.6'E, 12 m, 3.04.1988: 1 ♂ 12.4 mm (MNHN). — Stn 730, 21°17.2'S, 165°54.5'E, 40-43 m, 12.08.1986: 1 ♀ ovig. 10.1 mm (MNHN). — Stn 771, 21°09.0'S, 165°42.45'E, 34 m, 8.01.1987: 1 ♀ 16.3 mm MNHN). — Stn 865, 20°38.7'S, 165°04.4'E, 24 m, 13.01.1987: 2 ♂ 15.5, 15.5 mm; 2 ♀ 12.0, 13.9 mm (MNHN). — Stn 888, 20°22.0'S, 164°37.9'E, 20 m, 14.01.1987: 1 ♂ 12.1 mm (MNHN). — Stn 1071, 19°54.7'S, 163°59.0'E, 26 m, 23.10.1989: 1 ♂ 11.8 mm (MNHN). — Stn 1072, 19°56.0'S, 164°02.4'E, 20 m, 23.10.1989: 2 ♀ 11.9, 12.9 mm (MNHN). — Stn 1075, 19°52.0'S, 163°58.4'E, 28 m, 23.10.1989: 2 ♂ 16.7, 17.0 mm (MNHN). — Stn 1078, 19°48.3'S, 163°59.5'E, 24 m, 24.10.1989: 1 juv. (MNHN). — Stn 1094, 19°54.4'S, 163°41.2'E, 26 m, 24.10.1989: 1 ♀ 18.4 mm (MNHN). — Stn 1105, 19°40.0'S, 163°57.8'E, 25 m, 25.10.1989: 2 ♀ 11.9, 15.2 mm (MNHN). — Stn 1129, 19°29.2'S, 163°48.8'E, 40 m, 26.10.1989: 2 ♀ 12.2, 17.2 mm (MNHN). — Stn 1158, 19°10.0'S, 163°06.5'E, 48 m, 30.10.1989: 2 juvs (MNHN). — Stn 1174, 19°21.2'S, 163°13.7'E, 53 m, 31.10.1989: 2 ♀ ovig. 12.6, 15.8 mm (MNHN). — Stn 1196, 19°32.5'S, 163°21'E, 30 m, 1.11.1989: 2 juvs (MNHN). — Stn 1205, 19°41.6'S, 163°25.6'E, 38 m, 2.11.1989: 1 ♂ 17.6 mm (MNHN). — Stn 1214, 19°49.9'S, 163°36.6'E, 29 m, 3.11.1989: 1 ♂ 15.1 mm (MNHN).

St. Vincent Bay, 7-8 m, 7.12.1961, coll. Mission Singer-Polignac: 2 ♂ 19.0, 20.8 mm; 1 ♀ 16.7 mm (MNHN).

Lagoon (coll. P. LABOUTE): 22°18.35'S, 166°25.06'E, 14 m, 11.02.1985: 1 ♀ 18.5 mm (MNHN). — 20°01.8'S, 161°33.1'E, 2.12.1986: 1 ♂ 24.8 mm (MNHN).

DESCRIPTION. — Carapace flattened, 1.4 wide as long. Surface anteriorly granulate, with granulate tubercles on gastrocardial, hepatic and branchial regions; posteriorly granules set in transverse, setiferous rows, rows increasing in length laterally. Front only slightly projecting, with two obliquely triangular teeth separated by triangular sulcus. Basal antennal article anteriorly spatulate, peduncle emerging medially. Afferent branchial canal ending below orbit in rounded process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. First maxillipeds with triangular notch on anterointernal margin. Anterolateral margin carinate, scalloped, setose. Posterolateral margin lamellar, setose, beaded, with five triangular teeth followed by two shallow indentations. Posterior margin slightly convex, beaded, setose. Merus of cheliped distally with indistinctly quadrilobate lamina, distalmost lobe acuminate, ram-like. External surface of carpus tuberculate. Crest of larger chela with seven teeth, proximalmost bicuspidate. External surface of chela unevenly granulate, obliquely traversed by two parallel granulate rows. Lower margin narrow, with two contiguous beaded rows. Internal surface of chela unevenly granulate. First male pleopod slightly curved, tapering apically to narrow spinulate tip; second pleopod slender, nearly straight, tip spatulate.

Color (in alcohol). — "Light yellow-brown; the lateral expansions of the carapace, outer surface of the chelipeds, and the ambulatory legs of a pinker hue; the inner surface of the palms are brownish-pink upon a yellowish ground; the coloration being disposed, in places, in wavy lines" (MIERS, 1886). "Pale brown mottled with pink; some sharp pink markings on palm of chelipeds" (TYNDALE-BISCOE & GEORGE, 1962).

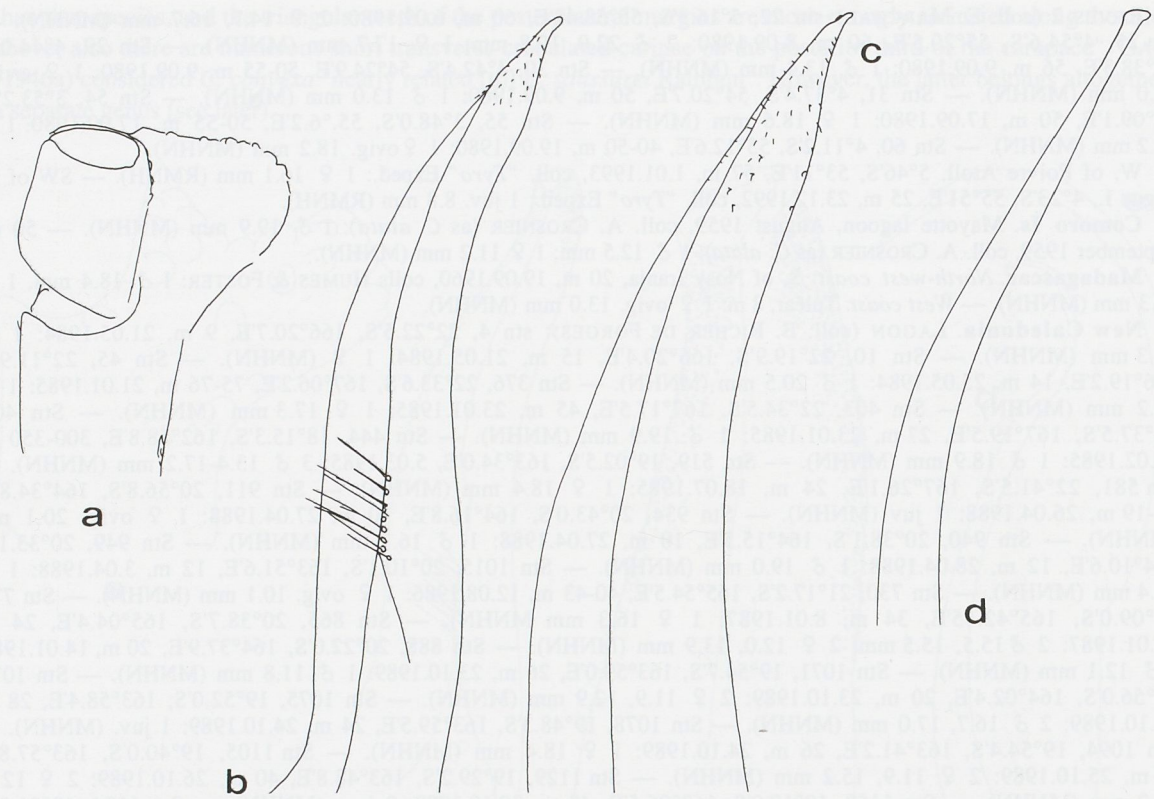


FIG. 9. — *Calappa depressa* Miers, 1886, ♂ 24.8 mm, New Caledonia, 20°01.8'S, 161°33.1'E (MNHN): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

REMARKS. — ALCOCK (1896) described *C. woodmasoni* as "Very closely allied to *C. depressa*". His drawings and description depict most likely a juvenile specimen of *C. depressa*. RATHBUN (1911) distinguished *C. depressa* Miers from *C. alata* "in its relatively narrower and more triangular carapace, the wings following the antero-lateral outline; obscure antero-lateral teeth; nearly transverse frontal lobes; in having two regular lines of granules on lower half of outer surface of palm." This comparison must have been based solely on MIERS' drawing. Examination of both MIERS' and RATHBUN's type specimens revealed they are one and the same species.

DISTRIBUTION (fig. 30). — Somalia, Comoro Is., Seychelles, Madagascar, Maldives Is (Suvadiva Atoll), Australia, New Caledonia, 2-350 m.

Calappa dumortieri Guinot, 1962

Fig. 10 b, 11, 13 b, 30, 35 b

Calappa cristata - H. Milne Edwards, 1837: 105; 1840: 17, pl. 20 fig. 1 [Non Fabricius, 1798].
Calappa philargius - NOBILI, 1906: 148. — HOLTHUIS, 1958a: 45 [Non Linnaeus, 1758].
Calappa dumortieri Guinot, 1962: 21, figs 7-10, 16, 19a-b, 20, pl. 1 fig. 2, pl. 2 fig. 2; 1967: 245 (list). — SERÈNE, 1968: 41 (list).

MATERIAL EXAMINED. — **"Mers d'Asie"**, det. H. MILNE EDWARDS as *C. cristata*: 1 ♂ 48.6 mm (MNHN B.3985), Paratype.

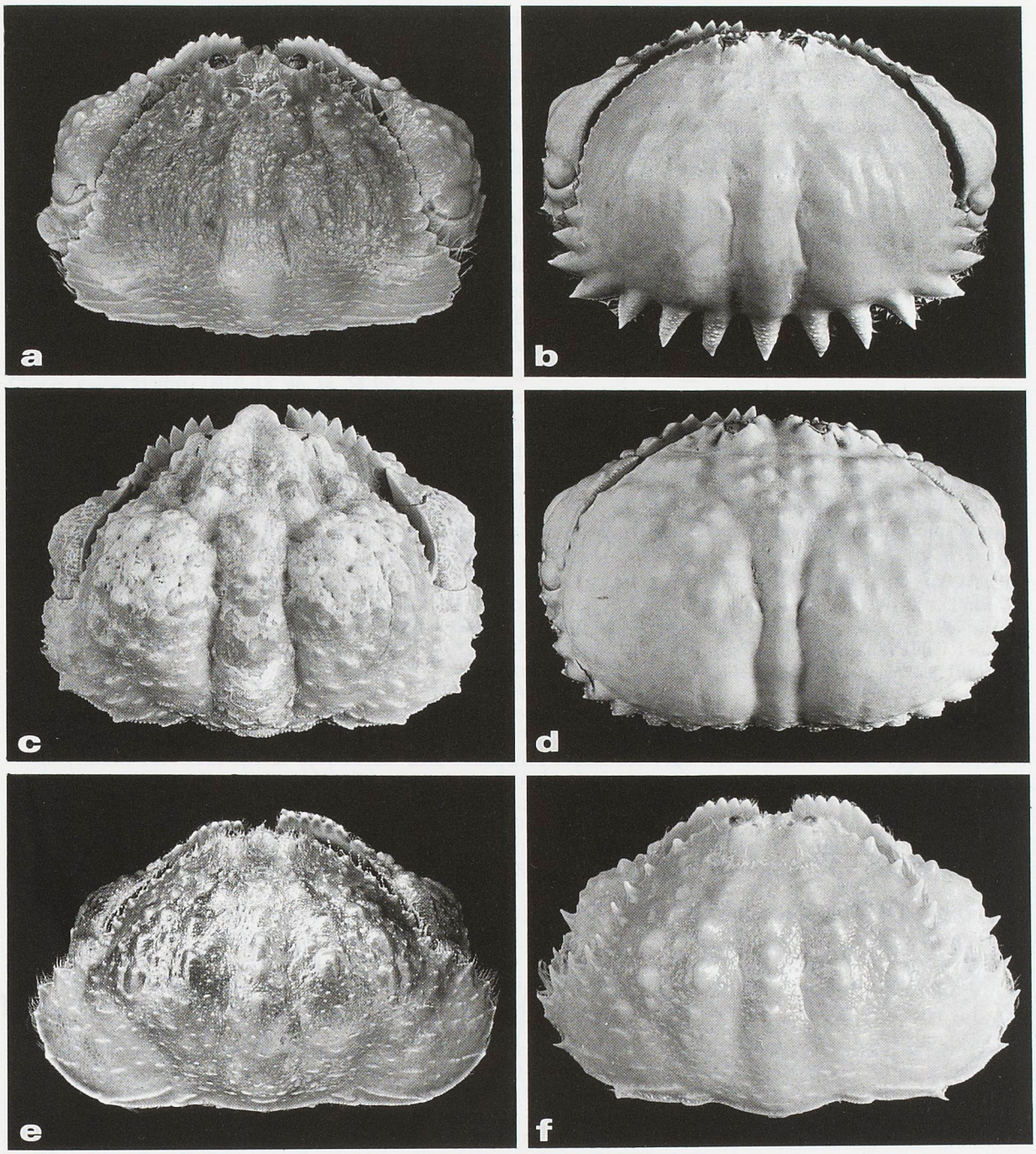


FIG. 10. — Whole crab, dorsal view: **a**, *Calappa depressa* Miers, 1886, ♂ 24.8 mm, New Caledonia, 20°01.8'S, 161°33.1'E (MNHN). — **b**, *Calappa dumortieri* Guinot, 1962, ♀ 67.1 mm, Assab (MF 1512). — **c**, *Calappa gallus* (Herbst, 1803), ♀ 53.3 mm, South Africa (SAM 462). — **d**, *Calappa japonica* Ortmann, 1892, ♂ 58.4 mm, Bay of Bengal, syntype of *C. exhamentosa* (NHM 1896.9.8.8). — **e**, *Calappa hepatica* (Linnaeus, 1758), ♂ 46.2 mm, New Caledonia, Platier de Touaourou (MNHN); **f**, *idem*, ♀ 32.8 mm, Aldabra, Île Picard (USNM 268809).

Red Sea. 1897, coll. F.P. JOUSSEAUME, det. G. NOBILI: 1 ♂ damaged (MNHN-B 13465). — 1957-58, coll. A. BEN TUVIA: 1 ♂ 42.9 mm (RMNH 25609). — Eilat: 1 ♀ 55 mm (TAU E58/86); 2 juv (TAU E58/86). — 5 m, October 1994, coll. N. POPPER: 1 ♀ 61.0 mm (TAU). — Eritrea, North Massawa Channel, 9.12.1957, coll. A. BEN TUVIA: 1 ♂ 48.5 mm, paratype (RMNH 16900). — S. Red Sea, 1957-58, coll. A. BEN TUVIA: 1 ♂ 62.0 mm, paratype (RMNH 16901). — Assab, 1880-1882, coll. RAGAZZINI: 1 ♀ 67.1 mm (MF 1512). — 1884, coll. SCAROMUCCI: 1 ♀ 64.4 mm (MF 783). — 16.01.1966, coll. B. DE WILDE: 1 ♂ 64.2 mm (RMNH 25570).

Gulf of Aden. 12°03.9'N, 44°47.7'E, 76 m, *"Meteor"*, stn 283, 16.03.1987: 1 ♂ damaged (SMF). — nr Djibouti, 12°21.2'N, 43°27.1'E, 35-45 m, *"Meteor"*, stn 236, 6.03.1987: 1 ♀ 80.6 mm (SMF).

DESCRIPTION. — Carapace convex, 1.4 wide as long, frontal and epigastric regions minutely granulate. Front with two triangular teeth. Anterior margin of basal antennal article concave, proximal lobe dilated, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with convex anterior margin. Distal margin of first maxillipeds obliquely cut, anterointernal angle acute. Branchial ridges indistinct, anteriorly with few flattened tubercles. Anterolateral margin carinate, unevenly granulate. Posterolateral margins setose, with four marginally beaded laciniate teeth, distalmost largest, and three elongate, granulate, conical teeth. Posterior margin with long, conical, granulate median tooth. Merus of cheliped distally with quadrilobate lamina, two distalmost acuminate. External surface of chela minutely granulate, vertically traversed by three nearly flattened tubercles. Crest of larger chela cut into seven teeth increasing in size distally, proximalmost bicuspidate. Granulate, tuberculate ridge running subparallel to beaded lower margin, from proximal keel-like tooth to base of pollex. Lower margin narrow, two beaded files contiguous distally. First male pleopod markedly curved distad, tapering apically to narrow spinulate tip, second pleopod slender, slightly curved, tip short, digitate.

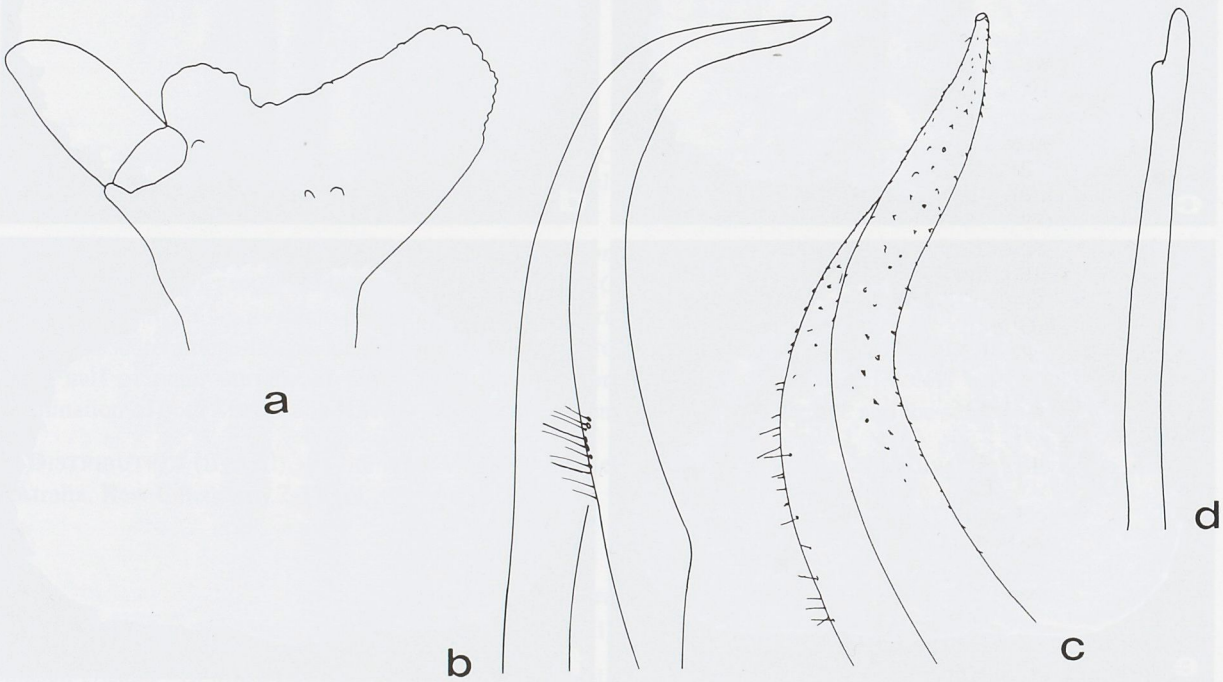


FIG. 11. — *Calappa dumortieri* Guinot, 1962, ♂ 64.2 mm, Red Sea (RMNH 25570): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

Color. — Carapace and chelae densely covered with numerous rich brown spots on pale background, leaving clear thin wavy lines, spots larger near posterolateral margins; posterolateral teeth pale yellow, wide brown lines on grooves separating teeth; brown reticulation on inner surface of chela.

REMARKS. — H. MILNE EDWARDS' drawing of *C. cristata* (1840, pl. 20 fig. 1) is quite accurate, but for the color scheme. According to GUINOT (1962), *C. dumortieri* is distinguished from the closely related *C. philargius* in having longer spiniform teeth on posterior margin, spinose interior angle anteriorly on first maxilliped endopod rather than obliquely truncate anterior margin, lesser pubescence on third maxilliped, and granulate tubercles on ridge running parallel to larger chela lower margin. *C. dumortieri* lacks the conspicuous maroon crescents near eyes and large maroon spots on chelipeds characteristic of *C. philargius*, rather its carapace and chelae are covered with numerous brown dots, posterolateral teeth yellow.

DISTRIBUTION (fig. 30). — Red Sea and Somalia, 5-76 m.

Calappa gallus (Herbst, 1803)

Fig. 10 c, 12, 13 c, 31

Cancer gallus Herbst, 1803: 18, 46, pl. 58 fig. 1.
Cancer (Calappa) gallus - LATREILLE, 1817: 24.
Gallus gallus - DE HAAN, 1837: 70.
Calappa gallus - H. MILNE EDWARDS, 1837: 105. — WHITE, 1847: 45. — DANA, 1853: 393. — A. MILNE EDWARDS, 1862: 10; 1874: 55. — BRITO CAPELLO, 1871: 133, pl. 2 figs 4, 14. — HOFFMANN, 1874: 26. — RICHTERS, 1880: 157. — MULLER, 1887: 473. — DE MAN, 1888a: 388; 1888b: 197. — ORTMANN, 1892: 567. — HENDERSON, 1893: 395. — ALCOCK, 1896: 146. — NOBILI, 1899: 249; 1906:148. — THURSTON, 1890: 82. — DOFLEIN, 1900: 137. — BORRADAILE, 1903: 436. — LENZ, 1905: 346. — KLUNZINGER, 1906: 61, pl. 2 fig. 14. — LAURIE, 1906: 354; 1915: 409 (list). — RATHBUN, 1906: 887; 1911: 197. — IHLE, 1918: 181. — SAKAI, 1936: 47, text-fig. 10; 1937: 94, pl. 17 fig. 2; 1965: 55, pl. 2 fig 3; 1976: 131, pl. 39 fig. 2. — ESTAMPADOR, 1937: 515. — STEPHENSEN, 1945: 65. — SOKOLOWSKY, 1945: 65, pl. 1 figs 4-6. — BARNARD, 1947: 372; 1950: 350, figs 66e-i (part). — LIN, 1949: 13 (list). — DAWYDOFF, 1952: 139. — UTINOMI, 1956: 70, pl. 35 fig. 6. — MICHEL, 1964: 36. — GUINOT, 1967a: 245. — SERÈNE, 1968: 41 (list). — ZARENKOV, 1971: 170. — TAKEDA, 1982: 106, fig. 311. — MIYAKE, 1983: 19, 199, pl. 7 fig. 2. — DAI *et al.*, 1986: 94, text-fig. 51. — TAKEDA & SHIKATANI, 1990: 478. — TIRMIZI & KAZMI, 1991: 54, fig. 16. — DAI & YANG, 1991: 105, text-fig. 51. — CHEN, 1993: 683, fig. 5.
Calappa lophos - BUITENDIJK, 1939: 231 pl. 8 fig. 5 (part). [Non Herbst, 1782].
Not *Calappa gallus* - MIERS, 1886: 286. — OSORIO, 1887a: 227; 1887b: 188; 1889: 135; 1890: 47; 1898: 193. — RATHBUN, 1897: 36; 1898a: 609; 1898b: 290; 1900: 297; 1902a: 85; 1920: 15; 1921: 66; 1936: 388; 1937: 214, pl. 65 figs 2-3. — BOUVIER, 1907: 496; 1922: 57. — BALSS, 1921: 50. — MONOD, 1927: 606; 1928: 116, figs 2b, 3, 9d; 1956: 100, figs 115-116; 1967: 178. — ROSSIGNOL, 1957: 76, 127 (key), fig. 1; 1962: 114. — LONGHURST, 1958: 87. — GAULD, 1960: 68. — GUINOT & RIBEIRO, 1962: 26. — RIBEIRO, 1964: 4; 1973: 5. — CHACE, 1966: 636. — FOREST & GUINOT, 1966: 51. — FILHO, 1967: 41 (list). — COELHO, 1971: 234 (list). — COELHO & RAMOS, 1972: 180. — MANNING & HOLTHUIS, 1981: 51 (= *C. galloides* Stimpson, 1859 *vide* MANNING & CHACE, 1990: 45).

MATERIAL EXAMINED. — **Red Sea**. Sharm el Naga, 33 kms S Hurgada, 28-31.08.1988, colls J. GOUD & W. VAN DONGEN, det. L.B. HOLTHUIS: 1 ♀ (RMNH 38534).

Gulf of Aden. nr Djibouti, 12°21.2'N, 43°27.1'E, 35-45 m, *"Meteor"*, stn 236, 6.03.1987: 1 ♀ 80.6 mm (SMF).

Seychelles. S.W. La Digue I., 4°23'S, 55°49'E, 30 m, 23.12.1992, coll. *"Tyro"* Exped.: 1 ♂ 22.9 mm (RMNH).

Mozambique Channel. Europa I., coll. P. FOURMANOIR: 2 ♀ 21.9, 37.5 mm (MNHN).

South Africa. Port Shepstone: 1 ♀ 53.3 mm (SAM 462).

Madagascar. *North-west coast*: Nosy Be, intertidal, coll. M. CHAVANE: 1 ♂ (broken) (MNHN). — Nosy Be, intertidal, December 1958, coll. A. CROSNIER: 3 ♀ 13.1-27.7 mm (MNHN). — 13°17.5'S, 48°07'E, 30 m, 24.08.1967, coll. R. PLANTE: 1 ♂ 44.9 mm; 1 ♀ 22.8 mm (MNHN). — *West coast*: Tuléar, 1976, coll. P. GALENON: 1 ♀ 35.8 mm (MNHN).

Glorieuses Is. Intertidal, 30.01.1971, coll. A. CROSNIER: 1 ♀ 24.6 mm (MNHN).

Mauritius. Det. HERKLOTS as *C. (Gallus) gallus*: 1 dry specimen (RMNH 43071).

Indonesia. *Moluccas*, Ambon, 9 m, 4.07.1956: 1 ♂ 43.7 mm (MNHN-B 13461). — *Timor*, nr Koepang, 4.12.1929, coll. & det. A.M. BUITENDIJK as *C. lophos*: 1 juv. (RMNH 4238). — *Irian Jaya*, Manokwari, 1962, coll. D. SMITS: 1 ♀ 28.8 mm (RMNH 17739).

Japan. Shikoku I., E. of Cape Muroto, 21.10.1973, coll. K. MATSUZAWA, det. K. SAKAI: 1 ♀ 43.0 mm (SMF).

New Caledonia. Coll. A. MILNE EDWARDS, det. E.L. BOUVIER: 2 ♂ 22.4, 32.3 mm (MNHN 48); 1 juv. (MNHN 47).

Tonga Is. Nukualofa, 6 m, January 1956: 1 ♀ damaged (ZM CRU1816).

Hawaii. *"Albatross"* stn 4061: 1 ♂ 40.1 mm (USNM 29892). — Honolulu, 1915, coll. Th. MORTENSEN: 1 ♂ 39.6 mm; 1 ♀ 44.5 mm (ZM CRU1812).

DESCRIPTION. — Carapace convex, 1.3 wide as long, surface rugose. Hepatic region markedly depressed. Gastric, cardial regions delimited by deep longitudinal grooves. Branchial, gastric regions with flattened tubercles, posteriorly transversed by beaded carinae. Front projecting, truncate. Basal antennal article closely granulate, anterior margin concave, peduncle emerging from distal angle. Endostomial septum visible with first maxillipeds closed, with convex anterior margin. Distal margin of first maxillipeds obliquely cut, anterointernal angle acute. Anterolateral margin sinuous, carinate, unevenly granulate. Posterolateral margin setose, with three small, marginally granulate teeth anteriorly, and three shallow, medially beaded teeth posteriorly. Posterior margin marginally beaded, sinuous. Merus of cheliped distally with quadrilobate lamina. External surface of chela minutely granulate, obliquely traversed by rounded tubercles, largest near upper crest. Crest of larger chela cut into seven teeth increasing in size distally, proximalmost flattened. Lower margin with two beaded files. First male pleopod stout, slightly curved, tapering apically, distally spinulate; second pleopod slender, curved, with subdistal denticulate flange and digitate tip.

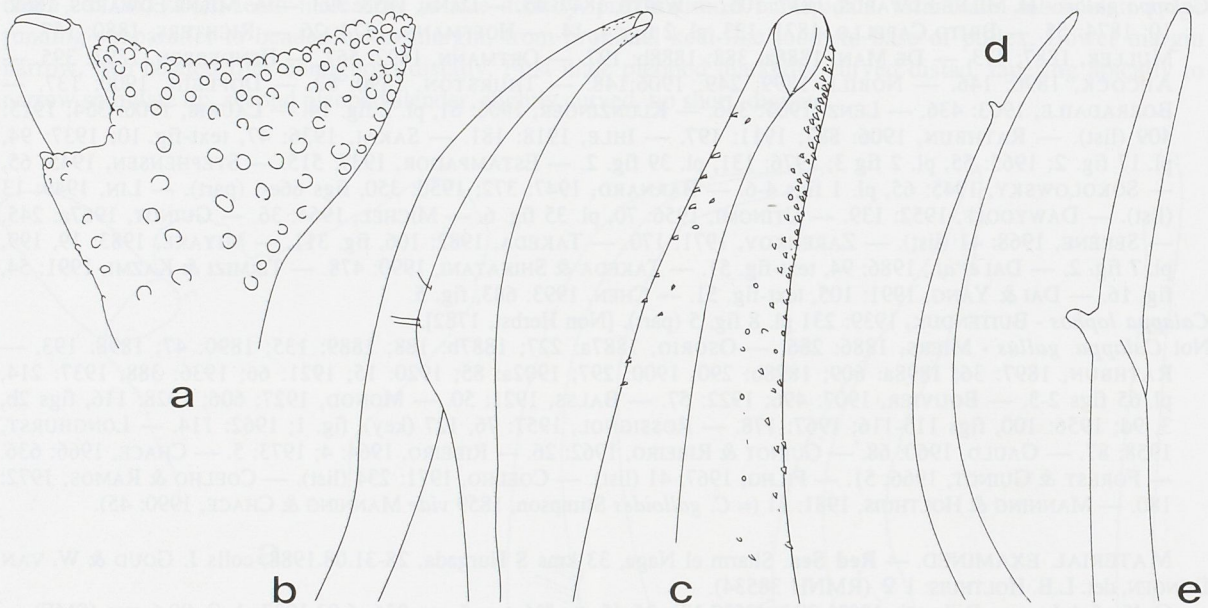


FIG. 12. — *Calappa gallus* (Herbst, 1803), ♂ 44.9 mm, Madagascar, 30 m (MNHN): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d-e**, second pleopod male with enlargement of distal part.

Color. — Legs yellow, chelipeds and carapace mottled yellowish-reddish and greyish-brown; undersurface mottled yellow and white. Color photographs in TAKEDA (1982, fig. 311), MIYAKE (1983, pl. 7 fig. 2).

REMARKS. — HERBST (1803) described *C. gallus* as differing from its congeners in its markedly beveled anterior carapace, thick, truncate front, and black fingers. However, the presence of an Atlantic species - *C. galloides* Stimpson, 1859 - which shares these characters, gave rise to confusion. Since both HERBST's and STIMPSON's types were lost, many authors presumed, like RATHBUN (1937), that *C. gallus* is a widely distributed species in which the "carapace varies in relative length and breadth due to the greater or less convexity; in size and prominence of dorsal tubercles; and in distinctness of rostral teeth, some having four teeth, others having no median sinus, or the lateral teeth slightly developed", and that "The variations do not correspond with geographical regions".

DANA (1853) erroneously cited RUPPELL's Krabben des rothen Meeres (1830: 18, pl. 4 fig. 5) in his list of synonymies and RICHTERS obviously copied it without checking.

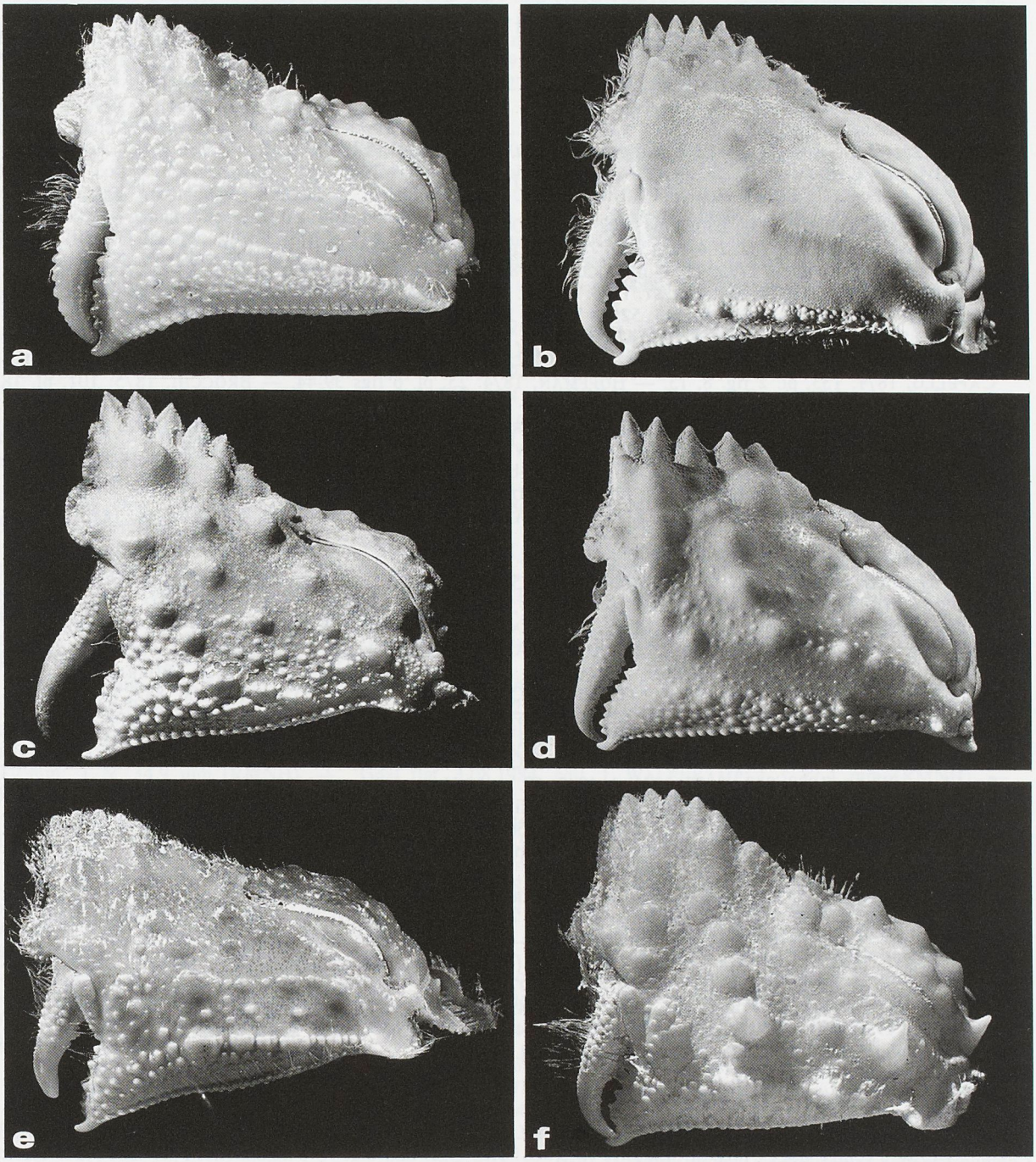


FIG. 13. — Cheliped, external view: **a**, *Calappa depressa* Miers, 1886, ♂ 24.8 mm, New Caledonia, 20°01.8'S, 161°33.1'E (MNHN). — **b**, *Calappa dumortieri* Guinot, 1962, ♀ 67.1 mm, Assab (MF 1512). — **c**, *Calappa gallus* (Herbst, 1803), ♀ 53.3 mm, South Africa (SAM 462). — **d**, *Calappa japonica* Ortmann, 1892, ♂ 58.4 mm, Bay of Bengal, syntype of *C. exhamentosa* (NHM 1896.9.8.8). — **e**, *Calappa hepatica* (Linnaeus, 1758), ♂ 46.2 mm, New Caledonia, Platier de Touaourou (MNHN); **f**, *idem*, ♀ 32.8 mm, Aldabra, Ile Picard (USNM 268809).

Of BUITENDIJK's (1939) material from Timor identified as *C. lophos*, the specimen that appears in pl. 8 fig. 5 was redetermined as *C. gallus*.

DISTRIBUTION (fig. 31). — Red Sea, Seychelles and Madagascar, to New Caledonia and Hawaii. On sandy, muddy, shelly bottoms, coral reefs, intertidal - 160 m.

Calappa hepatica (Linnaeus, 1758)

Fig. 10 e-f, 13 e-f, 14, 31

Cancer hepaticus Linnaeus, 1758: 630; 1764: 448; 1767: 1048.
Cancer tuberculatus Herbst, 1785: 204, pl. 13 fig. 78. — FABRICIUS, 1793: 454. — BOSC, 1802: 183.
Calappa tuberculata - WEBER, 1795: 92. — FABRICIUS, 1798: 345. — BOSC, 1802: 183; 1830: 213. — LATREILLE, 1803: 392; 1806: 28; 1829: 139. — DESMAREST, 1825: 109, pl. 10 fig. 1. — H. MILNE EDWARDS, 1837: 106. — EYDOUX & SOULEYET, 1842: 245. — KRAUSS, 1843: 52. — WHITE, 1847: 45. — GIBBES, 1850: 183. — HERKLOTS, 1851: 24. — DANA, 1853: 393. — STIMPSON, 1859a: 162; 1907: 165. — HELLER, 1861b: 372; 1865: 69. — HESS, 1865: 157. — MARTENS, 1866: 381. — A. MILNE EDWARDS, 1868: 72; 1874: 55. — HILGENDORF, 1869: 92; 1878: 809. — BRITO CAPELLO, 1871: 133, pl. 2 fig. 8, 13. — HOFFMAN, 1874: 25, pl. 6 figs 39-44. — BROCCHI, 1875: 101, pl. 18 figs 160-161. — PAULSON, 1875: 74, 75, pl. 9 fig. 5. — KOSSMANN, 1877: 63. — STREETS, 1877: 116. — DE MAN, 1880: 184; 1888a: 388. — NAUCK, 1880: 46. — RICHTERS, 1880: 157. — LENZ & RICHTERS, 1881: 425. — MÜLLER, 1887: 473. — SERÈNE, 1937: 78; 1968: 41 (list). — DAWYDOFF, 1952: 139. — ZIMSEN, 1964: 647.
Calappa tuberculosa Guérin Méneville, 1829, pl. 12 figs 2a-b.
Calappa (Calappa) hepatica - DE HAAN, 1837: 70. — HERKLOTS, 1861: 25.
Calappa spinosissima H. Milne Edwards, 1837: 106. — A. MILNE EDWARDS, 1847: 55. — RICHTERS, 1880: 157. — ALCOCK, 1896: 144.
Calappe sandwichien Eydoux & Souleyet, 1842, pl. 3 figs 9-10.
Calappa hepatica - WHITE, 1847: 44. — MIERS, 1876: 55; 1877: 238; 1879: 491; 1884: 257, 550; 1886: 285. — HILGENDORF, 1879: 809. — HASWELL, 1882: 136. — FILHOL, 1886: 406. — CANO, 1889a: 94; 1889b: 249. — WHITELEGGE, 1889: 231. — THURSTON, 1890: 82. — THALLWITZ, 1891: 52. — ORTMANN, 1892: 568. — HENDERSON, 1893: 395. — ALCOCK & ANDERSON, 1895: 203. — ALCOCK, 1896: 142. — DE MAN, 1896: 360; 1902: 687. — NOBILI, 1899: 249; 1900: 496; 1906: 148. — CALMAN, 1900: 25. — SCHENKEL, 1902: 574. — BORRADAILE, 1903: 436, pl. 22 fig. 6. — LENZ, 1905: 346. — GRANT &McCULLOCH, 1906: 24. — RATHBUN, 1906: 887; 1911: 197. — KLUNZINGER, 1906: 60. — STEBBING, 1910: 333. — PESTA, 1911: 37. — PARISI, 1914: 285. — BOUVIER, 1915: 215. — LAURIE, 1915: 409, 427. — BALSS, 1915: 15; 1922: 123; 1938: 8. — IHLE, 1918: 183, fig. 80. — GRAVIER, 1920: 379. — McNEILL, 1926: 306. — URITA, 1926: 36. — GRAVELY, 1927: 142, pl. 22 fig. 27. — MONOD, 1928: 124, fig. 13a. — WARD, 1928: 243, pl. 27; 1941: 1; 1942: 69. — McNEILL & WARD, 1930: 373. — ANDRÉ, 1931: 639. — STEPHENSON *et al.*, 1931: 44, 52. — BOONE, 1934: 32, figs 8-10; 1938: 212. — GORDON, 1934: 73. — SAKAI, 1934: 284; 1936: 44, text-fig. 7; 1937: 89, pl. 12 fig. 2; 1956: 8; 1960: 33, pl. 16 fig. 4; 1965: 55; 1976: 128, pl. 38 figs 1, 3. — MIYAKE, 1936: 507; 1939: 198; 1983: 20, pl. 7 fig. 6. — MONOD, 1935: 96. — CHOPRA & DAS, 1937: 382. — SERÈNE, 1937: 78. — ESTAMPADOR, 1937: 515. — BUITENDIJK, 1939: 230. — SOKOLOWSKY, 1945: 62. — STEPHENSEN, 1945: 65. — LIN, 1949: 13 (list). — BARNARD, 1950: 348, figs 66a-d. — TWEEDIE, 1950: 106. — DAWYDOFF, 1952: 139. — HOLTHUIS, 1953: 3; 1958a: 45. — STELLA, 1953: 58. — FOREST & GUINOT, 1961: 11, figs 1a-b, 2. — TYNDALE-BISCOE & GEORGE, 1962: 69. — SANKARANKUTTY, 1961: 135; 1962: 152. — MICHEL, 1964: 37. — GARTH, 1965: 7, figs 9-10. — GUINOT, 1967: 245 (list). — ROMIMOHTARTO, 1967: 4. — McNEILL, 1968: 43. — KIM, 1970: 11. — ZARENKOV, 1971: 170. — TAKEDA, 1973: 83; 1982: 105, fig. 307. — TAKEDA & NUNOMURA, 1976: 65. — SHIRAI, 1980: 415. — DAI *et al.*, 1986: 91, fig. 49, pl. 11 fig. 3. — NOMURA *et al.*, 1988: 18. — TAKEDA & SHIKATANI, 1990: 478. — DAI & YANG, 1991: 102, fig. 49, pl. 11 fig. 3. — CHEN, 1993: 677.
Caloppa uberculata - HELLER, 1861a: 20 [erroneous spelling].
Calappa spinosissimus - STEBBING, 1917: 19.
Cancer alata - CURTISS, 1938: 170. [Non Rathbun, 1911].
Calappa hepatica var. spinosissima - BUITENDIJK, 1939: 231.
Calappa hepatica hepatica - SERÈNE, 1968: 41 (list).
Calappa hepatica spinosissima - SERÈNE, 1968: 41 (list).

MATERIAL EXAMINED. — **Red Sea**. det. HERKLOTS as *C. (Calappa) Hepatica*: 1 dry specimen (RMNH 43098). — 1846-1854, coll. L.W. RUYSSENAERS, det. L.B. HOLTHUIS: 3 dry specimens (RMNH 43094). — 1880, coll. R. KOSSMANN: 1 ♂ (RMNH 3113). — Gulf of Eilat, November 1956: 1 ♂ 31.8 mm (TAU NS21299). — Eilat, 8.07.1969, coll.

D. POPPER: 3 ♂ 19.1-19.4 mm; 4 ♀ 23.6-34.6 mm; 2 parazitised (TAU NS7288). — 20.06.1986: 2 ♂ 29.6, 32.0 mm (TAU). — Coll. L. FISHELSON: 1 ♂ 27.0 mm (TAU NS21294). — Ras Burqa, 28.04.1973, coll. L.B. HOLTHUIS: 1 ♂ 27.3 mm (RMNH 29231). — Nabeq, 9.06.1975: 1 ♂ 32.4 mm (TAU NS21298). — 3 km S Nabeq, sand, 0-0.5 m, 8.11.1981, colls L.B. HOLTHUIS & Ch. LEWINSOHN: 7 ♂ 17.3-35.9 mm; 3 ♀ 22.1-32.9 mm; 2 juvs (TAU NS21292). — Mersa Mukabeila, July 1977, coll. N. GUNDERMAN: 1 ♂ 30.1 mm (TAU NS21297). — Shurat el Manqata, intertidal flat, 25.04.1976, colls L.B. HOLTHUIS & Ch. LEWINSOHN: 1 ♂ 39.7 mm (TAU NS21290). — Abu Zabad, 1.01.1957, coll. H. STEINITZ: 1 ♂ 34.6 mm (RMNH 12135). — Dahab, 26-27.04.1973, coll. & det. L.B. HOLTHUIS: 4 dry specimens (RMNH 43099). — Tiran I., 23.09.1981, coll. A. KELLER: 1 ♀ 26.9 mm (TAU). — Mingar, 5 km off Hurgada, rocky platform, 25.08.1988, colls J. GOUD & W. VAN DONGEN, det. L.B. HOLTHUIS: 1 ♂ (RMNH 38558). — Sudanese Red Sea. October 1904 - May 1905, coll. C. CROSSLAND: 2 ♂ 22.0, 21.0 mm (NHM 1934.1.17.4-6). — Mersa Makdah, 16.02.1905, coll. C. CROSSLAND: 2 juvs (NHM). — WE Shubuk, 16.02.1905, coll. C. CROSSLAND: 2 juvs (NHM). — Eritrea. Dahlak Archipelago, Entedebir I., Landing Bay, 0-2 m, 20.10.1965, coll. ISRSE: 1 ♀ 29.5 mm (TAU ISRSE1509). — Umm Aabak, 23.03.1962, coll. ISRSE: 1 ♀ 27.3 mm (RMNH 24860). — Harmil, coll. STEEN: 1 ♂ 27.3 mm (RMNH 25998). — Coll. ISRSE: 2 ♂ 15.1 and 15.8 mm; 3 juvs (RMNH).

Djibouti. Obock, 1897, coll. F.P. JOUSSEAUME, det. A. MILNE EDWARDS: 15 ♂ 15.0-32.5 mm; 3 ♀ 24.8-28.1 mm; 3 juvs (MNHN-B 16287). — Coll. *"Calypso"*: 1 ♂ 23.4 mm (MNHN-B 19560). — Nr Djibouti, 12°21.2'N, 43°27.1'E, 35-45 m, *"Meteor"*, stn 236, 6.03.1987: 9 juvs (SMF).

Socotra I. N. coast, 22-27 m, coll. H.M.S. *"Weston"*: 1 ♀ 16.7 mm; 1 juv. (NHM).

Persian Gulf. Janah I., 11.10.1956, coll. C.E. DAWSON: 1 ♀ 22.2 mm (RMNH 16649).

Kenya. Tiwi Beach, 10 km S. of Mombasa, November 1969, coll. & det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43104). — Mombasa, 1973, coll. J.O. YOUNG: 2 ♂ 39.2, 36.4 mm (NHM). — Bamburi Beach, 12 km N. of Mombasa, 10-15.12.1974, coll. & det. L.B. HOLTHUIS: 2 ♂ 38.2, 30.1 mm; 1 ♀ 25.5 mm (RMNH 29911). — 4 dry specimens (RMNH 43095). — Between Bamburi and Nyali, 10 km N. of Mombasa, 12.12.1974, coll. & det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43096).

Tanzania. Bagamoyo, coll. H.W.P. VAN BARNEVELD, det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43101).

Zanzibar. Don. SALMIN, 1864: 1 juv. (NMW10983). — 1864: 1 juv. (NMW 10983). — 7-9 m, coll. I. GORDON: 1 ♂ 15.1 mm (NHM 1964.7.1.119).

Seychelles. Coll. E. WRIGHT: 2 ♂ 34.9, 36.0 mm (NHM 1875.20). — St Joseph Atoll, 5°24'S, 53°20'E, reef flat, 27.12.1992, coll. *"Tyro"* Exped.: 1 ♂ 24.7 mm (RMNH). — Mahe, Beau Vallon, 4°37'S, 55°26'E, sandy shore with beachrock, 12.12.1992, coll. *"Tyro"* Exped.: 1 ♂ 26.3 mm (RMNH). — Mahe, Terang, coll. N. POLUNIN: 2 ♂ 38.2, 34.0 mm (NHM 1974.557). — Aldabra I., coll. J.D. TAYLOR: 1 juv. (NHM 1977.77). — Passe Gronnet, coll. J.D. TAYLOR: 1 juv. (NHM 1977.71). —Île Picard, lagoon, 09°22.40'S, 46°14.40'E, 0-1 m, 3.12.1964, coll. *"Anton Bruun"*, stn HA-16: 1 ♀ 32.8 mm (USNM 268809).

Mozambique. 3 ♂ 34.1-39.6 mm; 3 ♀ 23.4-32.2 mm (SAM 2212). — Coll. O.S. TATTERSAL: 2 ♂ 33.4, 34.1 mm; 1 ♀ 33.3 mm (NHM 1951.9.13.1-2). — Inhaca I., 22.02.1982, coll. J. WALENKAMP: 3 ♂ 25.9-35.2 mm (RMNH). — Ponta Punduini, 27.07.1982, coll. J. WALENKAMP: 1 ♀ (RMNH). — W coast, 11.01.1983: 1 ♂; 1 ♀ (RMNH). — Punta Rana, 1.08.1984, coll. J. WALENKAMP: 1 ♂ 32.4 mm (RMNH). — Tidal flat, 2.08.1984, coll. J. WALENKAMP: 1 ♂ 30.2 mm; 1 ♀ 34.9 mm (RMNH). — Tidal flat, 3.08.1984, coll. J. WALENKAMP: 1 ♂ 27.4 mm (RMNH). — 13.08.1984, coll. J. WALENKAMP: 1 ♀ (RMNH). — 8.01.1986: 1 ♂ 22.9 mm (RMNH).

South Africa. Durban, coll. & det. STEBBING as *C. spinosissimus*: 1 ♀ 16.9 mm (NHM 1928.12.1.209). — 1 ♂ 41.4 mm (NHM 1928.12.1.208). — Natal: 1 ♂ 35.2 mm; 2 ♀ 32.8, 25.2 mm (NHM 1896.9.30.1-3).

Madagascar. 1903, det. H. BALSS: 1 ♂, 1 specimen damaged (MNHN-B 16317). — 1871, coll. M. LANTZ, det. H. BALSS: 6 ♂ 25.7-44.9 mm (MNHN-B 16306). — 2 ♂ 29.8, 33.9 mm (MNHN). — *East coast*: Diégo Suarez, 1919, coll. Lt R. DECARY: 5 ♂ 19.0-35.7 mm; 1 ♀ 39.3 mm (MNHN-B 56). — Ivongo, det. A. CROSNIER: 1 ♀ 42.0 mm (MNHN). — Ile Sainte Marie, intertidal, coll. A. CROSNIER: 1 ♂ 39.6 mm (MNHN). — *North-west coast*: Nosy Be, 16.08.1958, coll. & det. A. CROSNIER: 5 ♂ 11.5-27.1 mm; 3 ♀ 18.2-21.4 mm (MNHN). — Nosy Be, intertidal, coll. A. CROSNIER: 1 ♂ 28.5 mm (MNHN). — Nosy Be, intertidal, coll. A. CROSNIER: 1 ♂ 28.3 mm; 1 ♀ 24.2 mm (MNHN). — East of Nosy Be, 8 m, May 1958, coll. & det. A. CROSNIER: 3 ♀ 26.1-37.0 mm (MNHN). — *West coast*: Morombe, coll. B. KOECHLIN: 1 specimen (MNHN-B 16314). — Tuléar, intertidal, October 1958, coll. & det. A. CROSNIER: 2 ♂ 19.6, 41.0 mm (MNHN).

Glorieuses Is. Grande Glorieuse, 30.01.1971, intertidal, coll. A. CROSNIER: 1 ♂ 22.8 mm (MNHN).

Mauritius. coll. de BELLOQUET: 4 specimens (MNHN-B 4078); 4 ♂ 40.8-46.6 mm (MNHN-B 70). — coll. REGNARD: 1 ♂ 44.3 mm; 1 ♀ 40.6 mm (ZM CRU1810). — Grand Bay, 4 m, sand, 4.10.1929, coll. Th. MORTENSEN: 12 juvs (ZM CRU1833). — October 1929, coll. Th. MORTENSEN: 2 ♂ 6.2, 43.9 mm; 1 juv. (ZM CRU1813). — Cannonius Pt., sand, October 1929, coll. Th. MORTENSEN: 1 ♂ 42.8 mm (ZM CRU1834). — Tourneau I., 20.10.1960, coll. C. MICHEL: 1 ♀ 37.6 mm (RMNH 17538). — Flic en Flac, 1-15.05.1995, coll. B. GALIL: 2 ♂ 40.1, 42.7 mm; 1 ♀ 48.4 mm; 1 juv. (NHM).

Maldive Is. 15.01.1957, sand, coll. W.W. PHILIPS: 2 ♂ 41.7, 40.8 mm (NHM 1957.6.21).

Chagos Arch. Diego Garcia, coll. J.D. TAYLOR: 1 ♂ 33.5 mm (NHM 1969.1170.1).

India. Palk Str., Pamban, coll. E. THURSTON: 2 ♀ 46.1, 47.9 mm (NHM 1890.10.20).

Sri Lanka. 1 ♂ 32.3 mm (NHM 1894.8.1.14). — Krusadai, 12-16.10.1951, coll. H. LEMCHE: 1 ♂ 51.3 mm (ZM CRU1801).

Thailand. N.W. corner of Koh Lon I., 24.02.1966, 5th Thai-Danish Exped.: 1 ♂ 39.6 mm (ZM CRU1805).

Cocos-Keeling Is. Coll. J. GRANT: 1 ♂ 41.4 mm; 1 ♀ 35.4 mm (NHM 1926.8.24.1-2).

Malaysia. Borneo, Sabah, Bohaydolong, coll. D. GEORGE: 1 ♂ 39.1 mm (NHM 1985:17). — 1 ♂ 39.5 mm; 1 ♀ 30.9 mm (NHM 1985:19).

Indonesia. 23 dry specimens (RMNH 43091). — 18 m, *"Challenger"*: 1 ♀ 36.5 mm (NHM 1884:31). — April 1915, coll. P. BUITENDIJK: 1 ♂; 2 ♀ (RMNH 3112). — 1915, coll. P. BUITENDIJK: 1 ♂ 35.3 mm (RMNH 3109). — Natuna Is., coll. SHELFORD: 1 ♀ 36.3 mm (NHM 1900.12.1.25). — February 1922, coll. Th. MORTENSEN: 1 ♂ 34.8 mm (ZM CRU1823).

Sumatra. Poeloe Weh, October 1923, coll. P. BUITENDIJK: 1 ♀ (RMNH 3111).

Java: 1816-1822, coll. C.G.C. REINWARDT, det. HERKLOTS as *C. (Calappa) Hepatica*, redet. L.B. HOLTHUIS: 12 + 1 *spinossisima* dry specimens (RMNH 43090).

Komodo I.: Slawi Bay, 8°34.5'S, 119°31.3'E, sublittoral, 17.09.1984: 1 ♂ 19.0 mm (RMNH).

Moluccas. Ambon, coll. E.W.A. LUDEKING: 1 ♀ 28.0 mm (RMNH 3107). — Wahai, coll. E.W.A. LUDEKING: 1 ♀ (RMNH 779).— Banda Is., Lontor, 6.06.1922, on beach at low tide, coll. Th. MORTENSEN: 2 ♂ 23.7 and 29.0 mm; 1 ♀ 39.5 mm (ZM CRU1827). — 7.06.1922, coll. Th. MORTENSEN: 3 ♂ 30.0-34.4 mm; 4 ♀ 19.8-35.1 mm (ZM CRU1826).

Timor. Kisar I., N.E. of Timor, 1898, coll. K. SCHADLER, det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43100).

Irian Jaya. Sekroe, 1897, coll. K. SCHADLER, det. L.B. HOLTHUIS: 2 dry specimens (RMNH 43089). — Padaido I., Mios Woendi, 1/2 m. SE Oeriv I., 7-10 m, 28.01.1956, det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43097). — Fakfak, 1952-55, coll. S. WOLF: 1 ♀ 38.2 mm (RMNH 25997). — Kampong Saba, S.E. Biak, 30.03.1952, coll. G. VAN DEN HOEK: 1 ♀ 34.8 mm (RMNH 13002).

"Snellius" EXPED.: Sulawesi, Paleleh, 22.08.1929: 1 ♀ 29.2 mm (RMNH 4215). — Kafal, Misool grp., 3-5.10.1929: 1 ♂ 22.0 mm (RMNH 4218). — Kera, nr Timor, 11-16.11.1929: 1 ♀ 31.8 mm (RMNH 4221); 1 ♀ 30.8 mm (RMNH 4236). — 22-23.11.1929: 2 ♂ 26.3, 18.0 mm; 1 ♀ 28.8 mm (RMNH 4222). — Timor, Koepang, 2.12.1929: 1 ♂ 19.1 mm (RMNH 4224).

RUMPHIUS EXPED. *Moluccas*: Ambon, Batumerah, littoral, 9.11.1990: 1 ♂ 29.9 mm (RMNH). — Pombo, 15.11.1990, coll. C. VAN EGMOND: 1 ♀ 23.4 mm (RMNH). — Littoral, 21.11.1990: 3 ♀ 24.1-18.8 mm (RMNH). — Ambon, littoral, 2.12.1990: 1 ♂ 31.6 mm; 2 ♀ 36.9, 41.8 mm (RMNH). — Rumahtiga, littoral, 3.12.1990: 2 ♂ 37.5, 35.3 mm (RMNH).

SULAWESI EXPED.: Bay of Tanjungnanas, 1°28'N, 125°13'E, muddy bay with algae, stones and coral patches, littoral, 12,13,19.10.1994: 2 ♂ 23.3, 26.8 mm (RMNH); — 1°30'N, 125°16'E, sandy bay, 0-5 m, 22.10.1994: 1 ♀ 20.7 mm (RMNH). — Bay S of Pulau Putus, 1°31'N, 125°16'E, rocky shore and sandy beach, 14-27.10.1994: 1 ♀ 21.1 mm (RMNH). — Selat Lembeh, Pulau Lembeh, 1°29'N, 125°15'E, sandy bay, 5-10 m, 21.10.1994: 1 ♂ 15.9 mm (RMNH). — Bay of Tanjung, 1°26'N, 125°11'E, sandy and muddy bay littoral, 23.10.1994: 1 ♂ 13.3 mm (RMNH). — 1°28'N, 125°14'E, sandy beach, 5 m, 31.10.1994: 1 ♂ 34.6 mm (RMNH).

Papua New Guinea. Bismarck Is., Manus I., Ndrilo, 15.06.1962, coll. T. WOLFF: 1 ♂ 38.5 mm (ZM CRU1836).

Philippines. Mindoro, Puerto Galera, shore, 2.02.1929, coll. Th. MORTENSEN: 2 ♂ 19.5, 30.6 mm; 1 ♀ 23.9 mm (ZM CRU1835). — 20-21.06.1936, coll. G.R. OESCH: 1 ♂ 29.9 mm (AMNH 7722). — Gulf of Davao, Padada Beach, June 1939, coll. G.R. OESCH: 1 ♂ 36.1 mm (AMNH 10385). — July 1940, coll. G.R. OESCH: 1 ♂ 38.2 mm (AMNH 12877); 2 ♂ 27.8, 35.4 mm (AMNH). — Cebu, 1978, coll. V. STORCH, det. L.B. HOLTHUIS: 1 dry specimen (RMNH 43103).

Caroline Is. Coll. F.W. CHRISTIAN: 6 ♂ 27.0-40.3 mm; 4 ♀ 20.7-26.6 mm (NHM 1898.11.1.6-11).

Mariana Is. Saipan, Garapan, 12.08.1990, coll. A. ALLSPACH: 1 ♂ 47.5 mm (SMF 19499).

Bonin Is. 16.06.1913, coll. C.B. CLAUSEN: 2 ♂ 42.3, 45.1 mm (ZM CRU1799).

Japan. Kii Peninsula, coll. T. SAKAI: 1 ♂ 35.2 mm (SMF 7632).

Australia. Off Clairmont I., coral reef, H.M.S. *"Alert"*: 1 ♂ 38.4 mm (NHM 1882:7). — N.W. Cape, 3.04.1961, coll. R.W. GEORGE: 1 ♀ (RMNH 17383).

East coast, Queensland: Thursday I., Torres Str. 15.08.1938, coll. J. MCNULTY: 1 ♀ 49.6 mm (QM W12272). — Torres Str., coll. A.C. HADDON: 2 ♀ 39.3, 29.2 mm (NHM 1954.9.14.173-175). — Torres Str. sand bank, 29.07.1974: 2 ♂ 43.1, 43.5 mm (QM W12535). — Pandora Reef, Brooke I., October 1923, coll. H. LONGMAN: 1 ♂ 46.2 mm (QM W12270). — Double I., Reef, off Cairns, coral sand, 27.08.1961, coll. J.H. BARNES: 1 ♂ 39.6 mm; 1 ♀ 36.6 mm (QM W2214). — Barron Beach, Cairns, 19.11.1940, coll. A.A. READ: 1 ♂ 41.4 mm (QM W1170). — Palm I., coll. MACKERRAS: 1 ♀ 40.4 mm (QM W12276). — Garden I., off N. Hinchinbrook I., sandy shore, 16.07.1981, coll. J. JOHNSON: 1 ♀ 37.3 mm (QM W9715). — Hannibal I., coll. A. WATSON: 1 ♂ 46.0 mm; 1 ♀ 31.2 mm (QM W12275). — Magnetic I.: 1 ♀ 44.4 mm (QM W1720). — Cockle Bay, 28.07.1944: 1 ♂ 43.0 mm (QM W12273). — Heron I., lagoon, 15.07.1975: 1 ♀ 22.8 mm (QM W4905). — Tin Can Bay, nr Gympie, 13.02.1952: 1 ♀ 41.1 mm (QM W1834). — Stradbroke I., January 1922: 1 ♀ 44.1 mm (QM W12269). — Myora, N. Stradbroke I., 22-23.04.1969: 1 ♂ 46.4 mm (QM W15934).

New Zealand. August 1917, coll. REISCHEK: 1 ♂ 41.2 mm (NMW 10985).

New Caledonia. 1 dry specimen (RMNH 43093). — Goro, April 1984: 1 ♂ 43.0 mm (MNHN). — Bourake, 2.09.1985, 1 ♂. — 8.11.1986, intertidal: 1 ♂ 26.9 mm (MNHN). — Coll. B. RICHER DE FORGES: 2 ♀ 27.5, 40.8 mm (MNHN). — Platier de Touaourou, 25.10.1988, coll. P. LABOUTE: 1 ♂ 46.2 mm; 1 ♀ 18.5 mm (MNHN). — Platier de Yate: 1 ♂ 42.8 mm (MNHN).

Fiji Is. Suva, Viti Levu, 29.05.1934, *"Monsunen"*: 1 ♂ 39.9 mm (ZM CRU1831). — 12 km E of Mbau I., SE Viti Levu, 4.05.1965, coll. T. WOLFF: 1 ♂ 34.0 mm (ZM CRU1837). — Viti I., coll. E. GRAEFFE: 1 juv. (NMW10982).

Tonga Is. Tongatapu, reef, H.M.S. *"Challenger"*: 1 ♂ 34.3 mm (NHM 1884.31). — Nukualofa, January 1956, tidal zone, coll. S. MIELCHE: 1 ♂ 25.7 mm (ZM CRU1847).

Samoa Is. 1 ♂ 48.8 mm (NHM 1875.5). — Upolu, coll. S.J. WHITNEE: 1 ♀ 17.3 mm (NHM 1874.54). — Apia, coll. BURTON & HOPKINS: 1 ♀ 27.9 mm (NHM 1931.5.26.22). — Viti I., coll. E. GRAEFFE: 1 juv. (NMW 10982).

French Polynesia. *Society Is*: Tahiti, July-September 1909, coll. H.E. CRAMPTON: 2 ♀ 35.1, 38.6 mm (AMNH 3411). — Tahiti, 17°40'S, 149°20'W, February-March 1994, coll. & det. J. POUPIN: 1 ♂ 26.7 mm (MNHN). — Tahaa, Tapuamu Bay, 14.09.1994, coll. & det. J. POUPIN: 1 ♂ 31.8 mm (MNHN). — *Tuamotu Is*: Takaroa I., coral reef, 16.03.1934, *"Monsunen"*: 1 ♂ 41.7 mm; 2 ♀ 41.5, 44.4 mm (ZM CRU1815). — South Marutea, 9.11.1965: 1 ♂ 20.0 mm (MNHN). — Gambier Is, coll. Y. PLESSIS, det. J. POUPIN: 2 ♂ 35.0, 39.0 mm (MNHN). — Mururoa, 1966: 1 ♂ 31.9 mm (MNHN). — Mururoa, 1993, coll. BABLET, det. J. POUPIN: 1 ♂ 41.8 mm (MNHN). — *Marquesas Is*: Nuku Hiva, 8°48.8'S, 140°05'W, 52 m, 24.01.1991, coll. J. POUPIN: 1 ♂ 27.3 mm (MNHN).

Line Is. Tabuaeran atoll, Fanning I., Inner Lagoon, 16.12.1913, coll. F. BAKER: 1 ♂ 28.4 mm (USNM 50513).

Hawaii. Ohau I., 1925, coll. A.E. VERRILL: 2 ♂ (post moult) (AMNH 5744). — 5 ♂ (USNM 2307). — Honolulu, *"Challenger"*: 1 ♀ 43.5 mm (NHM 1884.31). — 1 ♀ 42.4 mm (NHM 1883.22). — Hilo, rockpool, 7.04.1915, coll. Th. MORTENSEN: 1 ♂ 43.8 mm (ZM CRU1832). — Honolulu, 1915, coll. Th. MORTENSEN: 4 ♀ 39.7-40.1 mm (ZM CRU1812).

Clipperton I. 1966, coll. CHUITON: 1 ♂ 28.9 mm (MNHN-B 16319).

DESCRIPTION. — Carapace convex, 1.6-1.7 wide as long. Surface with rounded granulate tubercles on gastro-cardial, hepatic and branchial regions; posteriorly granules set in transverse, setiferous rows, rows increasing in length laterally. Front small, triangulate, apically emarginate. Basal antennal article spatulate, anterior margin slightly concave, peduncle emerging from median process. Afferent branchial canal ending below orbit in rounded process. Endostomial septum visible with first maxillipeds closed, with rounded anterior margin. First maxillipeds with triangular notch on anterior margin. Anterolateral margin crenulate, irregularly dentate, setose. Clypeiform expansions markedly developed. Posterolateral margin setose, with four marginally beaded triangular teeth followed by three denticles. Posterior margin slightly convex, beaded, setose. Merus of cheliped distally with quadrilobate lamina, two distal lobes acuminate. Crest of larger chela with seven teeth, proximalmost bicuspidate. External surface of chela unevenly granulate, obliquely traversed medially by three tubercles. Two unevenly granulate rows running subparallel to lower margin from proximal ram-like tooth to base of pollex. External beaded row on lower margin running entire length of chela, internal row only distal half. Internal surface of chela unevenly granulate inferiorly, with beaded file parallel to lower margin. First male pleopod stout, curved distad, tapering apically to narrow spinulate tip; second pleopod slender, slightly curved, tip spatulate.

Color. — "Hellgrau oder gelb bis olivengrun, mit violetten Flecken, Strichen und Punkten. Der hintere Teil des Ruckenschildes und die aussere Flache der Scherenfusse rot genetzt. Fusse und Unterflache des Korpers mehr violett" (KLUNZINGER, 1906). "Varies from very pale olive green, almost white, to a full olive grey or olive yellow"(TWEEDIE, 1950). A color photograph provided by MIYAKE (1983, pl. 7 fig. 3).

REMARKS. — LINNAEUS' (1758: 630) preliminary account of *Cancer hepaticus* was unduly brief: "thorace verrucoso gibbo semiorbiculato: margine serrato". This was rectified (LINNAEUS, 1764: 448), and as HERBST's (1785) description of *Cancer tuberculatus* included a fine drawing (pl. 13 fig. 78), many authors were inclined to follow him.

H. MILNE EDWARDS (1837) described *C. spinosissima* as resembling *C. tuberculata* [*C. hepatica*] but "armée sur les bords d'une série de dents spiniformes très pointues et relevées... Trois épines semblables et très aiguës sur la face externe des mains.". HILGENDORF (1869) remarked that though *C. tuberculata* [*C. hepatica*] "variirt sie nur wenig. Eine geringe Verschiedenheit zeigte sich in der Ausbildung der Zähne des vorderen Theiles des Seitenrandes". HOFFMANN (1874) noted: "En comparant les extrêmes on pourrait être tenté de les considérer comme deux espèces, mais nous avons devant nous tous les degrés intermédiaires". BUITENDIJK (1939: 231) too, found intermediate specimens with some spiniform teeth indistinct or missing. ALCOCK (1896) concluded that "it is

impossible to express any opinion as to whether this species [*C. spinosissima*] is... a variety of *C. hepatica*, or not". An examination of series of specimens covering the whole distributional range of *C. hepatica* revealed it to be but one species.

DISTRIBUTION (fig. 31). — From the Red Sea to Clipperton Island; on sandy, muddy or gravelly bottoms, intertidal to 100 m.

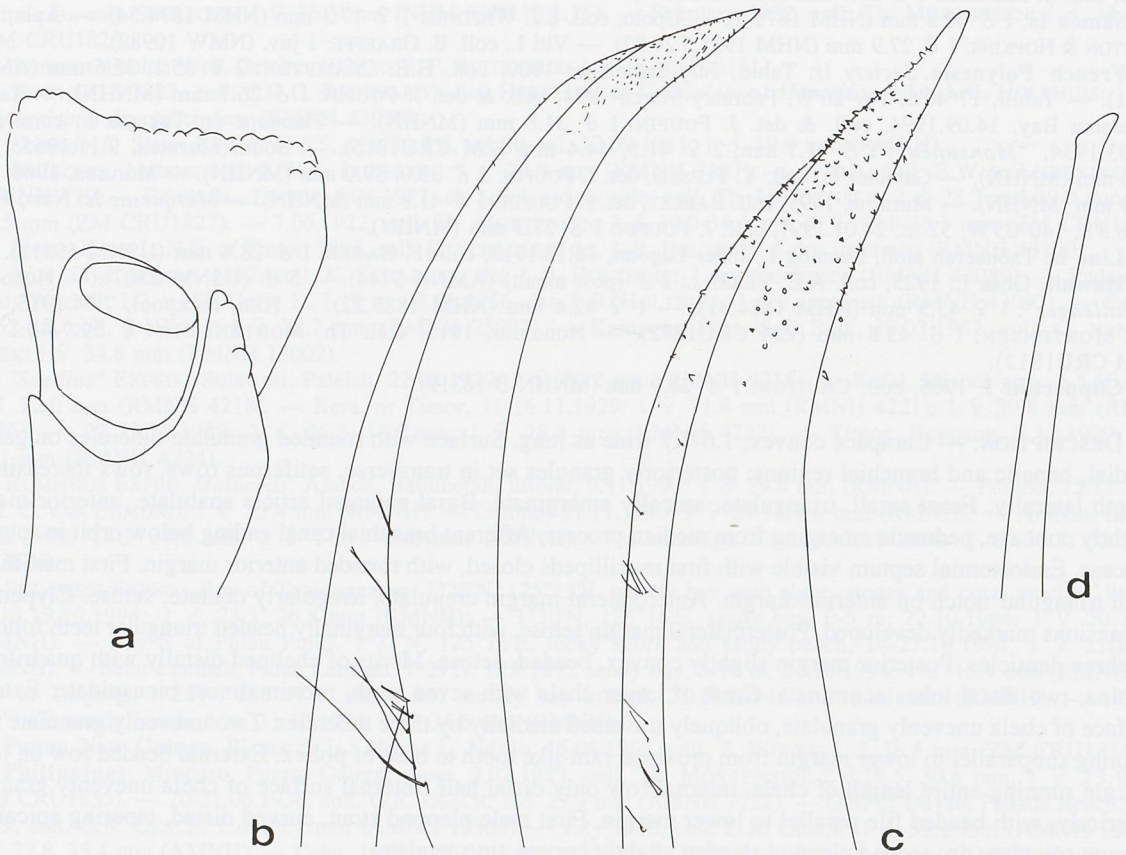


FIG. 14. — *Calappa hepatica* (Linnaeus, 1758), ♂ 39.6 mm, Madagascar, Île Sainte Marie, intertidal (MNHN): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

Calappa japonica Ortmann, 1892

Fig. 10 d, 13 d, 15, 32

Calappa japonica Ortmann, 1892: 566, pl. 26 fig. 8. — PARISI, 1914: 287, pl. 11. — IHLE, 1918: 301, 308 (list). — BALSS, 1922: 123. — SAKAI, 1936: 46, text-fig. 9; 1937: 96, pl. 18 fig. 4; 1956: 8; 1965: 57, pl. 23 fig. 1; 1976: 133, pl. 40 fig. 2. — BARNARD, 1947: 372; 1950: 352, figs 66n-p. — UCHIDA, 1949: 723, fig. 2093. — UTINOMI, 1956: 71, pl. 36 fig. 1. — GRINDLEY, 1961: 132. — GUINOT, 1967: 245 (list). — SERÈNE, 1968: 40 (list). — CAMPBELL, 1971: 31. — SANKARANKUTTY & SUBRAMANIAN, 1976: 21. — MATSUZAWA, 1977, pl. 91 fig. 3. — SHIRAI, 1980: 415. — TAKEDA, 1982: 107, fig. 313. — MIYAKE, 1983: 20, pl. 7 fig. 5. — YAMAGUCHI & HOLTHUIS, 1993: 664, figs 76-78.

Calappa exanthematosa Alcock & Anderson, 1894: 177; 1895 pl. 15 figs 1, 1a. — ALCOCK, 1896: 146; 1899: 21. — SERÈNE, 1968: 41 (list).

Calappa granulata - DE HAAN, 1837: 70. [Non Linnaeus, 1758].

Calappa flammea - BARNARD, 1926: 120. [Non Herbst, 1794].
Calappa frammea - LIN, 1949: 13 (list) [erroneous spelling]. [Non Herbst, 1794].
Calappa cf. *pustulosa* - TÜRKAY, 1986: 150, pl. 1 fig. 4-5.

MATERIAL EXAMINED. — **Indian Ocean**. Bay of Bengal, 1 ♂ 58.4 mm (NHM 1896.9.8.8), syntype of *Calappa exanthematosa*.

Red Sea. Ras el Aswad-Jeddah, *"Valdivia"*, stn 238, 21°22'N, 39°04'E, 383-363 m, 17.04.1979: 3 juvs (SMF 13592).

Kenya. Mombasa, 1974, coll. A.J. BRUCE: 1 ♂ 84.2 mm (RMNH 30335).

South Africa. Algoa Bay, between Bushman river & Bird I., 1905: 1 ♀ 83.2 mm (SAM 724). — Kentani coast, February 1952: 1 ♂ 77.1 mm (SAM 8495).

Pakistan. Mekran, 24°50'N, 61°52'E, mud, 135-148 m, 27.10.1963, coll. P. HANSEN: 1 ♂ 40.1 mm (ZM CRU1846).

Australia. Off Cape Moreton, March 1966, 128 m, coll. B. BEUTEL: 1 ♂ 102.8 mm (QM W2414).

Japan. Nagasaki, May 1909, coll. J. JORDAN: 1 ♂ 93.9 mm (ZM CRU1797). — Misaki, May 1914, coll. Th. MORTENSEN: 1 ♀ 10.7 mm (ZM CRU1794).

DESCRIPTION. — Carapace oval, 1.35 wide as long, markedly convex, inflated branchial region separated by furrow from gastrocardial region. Surface minutely granulate, branchial ridges indistinct, anteriorly with large flattened tubercles, granules above posterior margin. Front only slightly projecting, with two rounded teeth separated by wide sulcus. Anterior margin of basal antennal article bicuspidate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum invisible with first maxillipeds closed, with straight anterior margin. Distal margin of first maxillipeds nearly straight, with acute anterointernal angle. Anterolateral margin cristate, unevenly tuberculate, tubercles larger posteriorly. Clypeiform expansion with eight granulate, laciniate teeth. Posterior margin beaded. Merus of cheliped distally with quadridentate crest. Crest of larger chela cut into seven teeth increasing in size distally. External surface of chela minutely granulate, obliquely traversed by row of flattened tubercles; closely beaded inferiorly. Tooth proximally near lower margin small, tuberculate. Lower margin wide, with several unevenly granulate rows. First male pleopod stout, slightly curved, tapering, distally spinulate; second pleopod curved, distally crook-like.

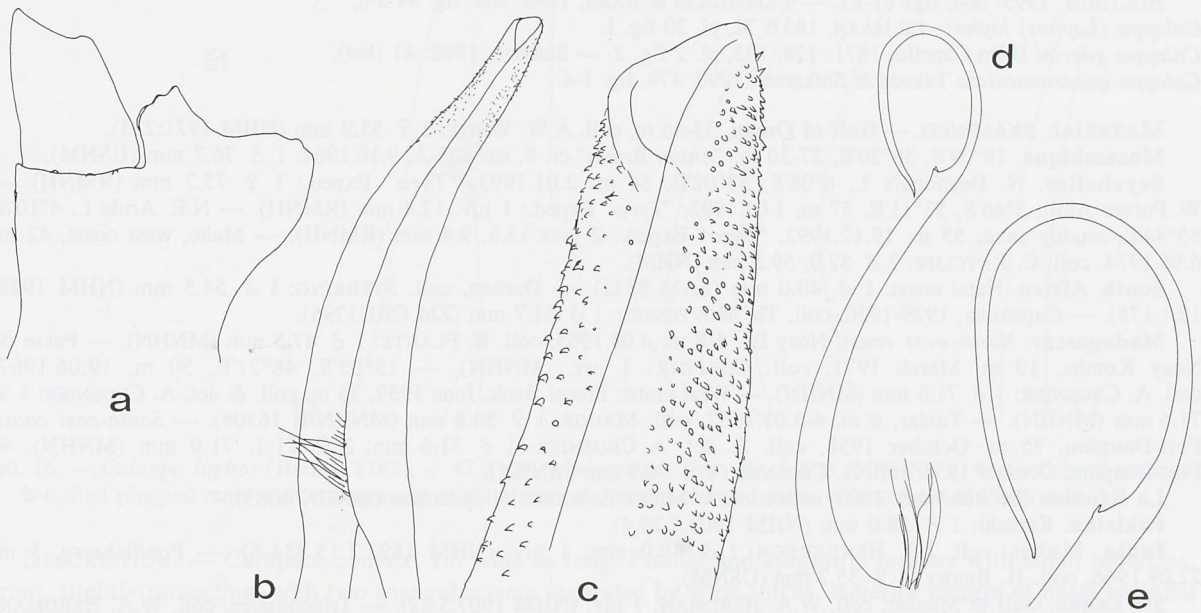


FIG. 15. — *Calappa japonica* Ortmann, 1892, ♂ 58.4 mm, Bay of Bengal, syntype of *C. exhamentosa* (NHM 1896.9.8.8): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d-e**, second pleopod male with enlargement of distal part.

Color. — "Anterior half [of carapace] is covered with numerous large smooth tubercles, which by their colouration (red base and shining yellow apex) exactly resemble ripe small-pox postules" (ALCOCK & ANDERSON, 1894). Color photographs in MATSUZAWA (1977), MIYAKE (1983).

REMARKS. — *C. japonica* was compared by ORTMANN (1892) and PARISI (1914) to *C. granulata* and *C. flammea*. PARISI (1914) found it "facilmente distinguibile da tutte e due". *C. japonica* is notable for its carapace size and coloration.

DISTRIBUTION (fig. 32). — East Africa to Japan and New Caledonia. On sandy or shelly bottom, 30-380 m.

Calappa lophos (Herbst, 1782)

Fig. 16, 17 a, 20 a, 32, 35 c

Cancer lophos Herbst, 1782: 201, pl.13, fig. 77.
Calappa lophos - FABRICIUS, 1798: 346. — BOSC, 1802: 184; 1830: 214. — LATREILLE, 1803: 393; 1829: 139. — H. MILNE EDWARDS, 1837: 104. — WHITE, 1847: 45. — GIBBES, 1850: 183. — HERKLOTS, 1861: 25. — HELLER, 1865: 69. — MIERS, 1880: 315; 1886: 286. — NAUCK, 1880: 46. — DE MAN, 1888a: 389. — WALKER, 1887: 111. — WHITELEGGE, 1889: 231. — ORTMANN, 1892: 565 (key). — HENDERSON, 1893: 395. — ALCOCK & ANDERSON, 1895: 203. — ALCOCK, 1896: 144. — DOFLEIN, 1902: 654; 1904: 35. — LAURIE, 1906: 353. — RATHBUN, 1910: 15; 1923: 137. — PARISI, 1914: 283. — IHLE, 1918: 182. — BALSS, 1922: 123; 1935: 116. — MONOD, 1928: 124, fig. 13a. — ANDRÉ, 1931: 640. — CHOPRA, 1933: 28. — SAKAI, 1934: 284; 1936: 44, text-fig. 6a; 1937: 90, pl. 12 fig. 1; 1956: 8; 1960: 33, pl. 16 fig. 5; 1965: 56, pl. 22 figs 2-3; 1976: 129, pl. 37 fig. 1, pl. 38 fig. 2. — SHEN, 1936: 64. — SERÈNE, 1937: 78; 1968: 41 (list). — BUITENDIJK, 1939: 231, (part). — STEPHENSEN, 1945: 65, figs 5a-b. — BARNARD, 1947: 372; 1950: 351, fig. 66 j-m. — SUVATTI, 1947: 56. — LIN, 1949: 13. — PILLAI, 1951: 8. — DAWYDOFF, 1952: 139. — UTINOMI, 1956: 70, pl. 35 fig. 5. — CHHAPGAR, 1957: 404, pl. 1. — TYNDALE-BISCOE & GEORGE, 1962: 70. — GUINOT, 1967: 245 (list). — KENSLEY, 1969: 151 (list). — KIM, 1970: 11. — HOLTHUIS & SAKAI, 1970: 117, pl. 9. — GRIFFIN, 1972: 64. — MATSUZAWA, 1977, pl. 91 fig.2. — SHIRAI, 1980: 415. — TAKEDA, 1982: 105, fig. 309. — MIYAKE, 1983: 19, pl. 7 fig. 3. — DAI *et al.*, 1986: 91, fig. 49, pl. 11 fig. 4. — DAI & YANG, 1991: 103, fig. 49, pl. 11 fig. 4. — TIRMIZI & KASMI, 1991: 54, fig. 16. — CHEN, 1993: 680, fig. 3. — YAMAGUCHI & HOLTHUIS, 1993: 664, figs 81-82. — YAMAGUCHI & BABA, 1993: 309, fig. 94 a-b.
Calappa (Lophos) lophos - DE HAAN, 1837: 72, pl. 20 fig. 1.
Calappa guerini Brito Capello, 1871: 128, 133, pl. 2 fig. 2. — SERÈNE, 1968: 41 (list).
Calappa quadrimaculata Takeda & Shikatani, 1990: 479, fig. 1-4.

MATERIAL EXAMINED. — **Gulf of Oman**. 33-46 m, coll. A.W. WHITE: 1 ♀ 55.9 mm (NHM 1971:223).
Mozambique. 19°09'S, 36°20'E, 27-30 m, *"Anton Bruun"* cr. 8, stn 403-A, 9.10.1964: 1 ♂ 76.7 mm (USNM).
Seychelles. N. Desnoeufs I., 6°08'S, 53°02'E, 54 m, 2.01.1993, *"Tyro"* Exped.: 1 ♀ 75.7 mm (RMNH). — W. Poivre Atoll, 5°46'S, 53°11'E, 57 m, 1.01.1993, *"Tyro"* Exped.: 1 juv. 12.4 mm (RMNH). — N.E. Aride I., 4°10'S, 55°44'E, muddy sand, 55 m, 19.12.1992, *"Tyro"* Exped.: 2 juvs 15.6, 9.4 mm (RMNH). — Mahe, west coast, 42 m, 6.06.1974, coll. C. RATCLIFF: 2 ♂ 57.0, 59.5 mm (NHM).
South Africa. Natal coast: 1 ♂ 40.0 mm (SAM 8332). — Durban, coll. STEBBING: 1 ♂ 54.5 mm (NHM 1928. 12.1.175). — Capetown, 1929-1930, coll. Th. MORTENSEN: 1 ♂ 61.7 mm (ZM CRU1796).
Madagascar. *North-west coast*: Nosy Be, 6-8 m, 4.08.1965, coll. R. PLANTE: 1 ♂ 47.3 mm (MNHN). — Passe de Nosy Komba, 10 m, March 1971, coll. CORFDIR: 1 juv. (MNHN). — 13°05'S, 48°21'E, 50 m, 19.06.1967, coll. A. CROSNIER: 1 ♂ 71.6 mm (MNHN). — *West coast*: Pracel Bank, June 1959, 35 m, coll. & det. A. CROSNIER: 1 ♀ 71.6 mm (MNHN). — Tuléar, 8 m, 4-5.01.1967, coll. MAUGÉ: 1 ♀ 34.8 mm (MNHN-B 16308). — *South-east coast*: Fort-Dauphin, 75 m, October 1958, coll. & det. A. CROSNIER: 1 ♂ 31.6 mm; 2 ♀ 71.1, 71.9 mm (MNHN). — Fort-Dauphin, October 1958, coll. A. CROSNIER: 1 ♀ 90.9 mm (MNHN).
La Réunion (Ile Bourbon). 1903, collection A. MILNE EDWARDS: 1 specimen (MNHN 4085).
Pakistan. Karachi: 1 ♂ 38.0 mm (NHM 1903.7.29.4).
India. Madras, coll. J.R. HENDERSON: 1 ♂ 49.0 mm; 1 juv. (NHM 1892.7.15.334-6). — Pondicherry, 5 m, 22.09.1966, coll. H. BERRY: 1 ♀ 35.7 mm (USNM).
Sri Lanka. Gulf of Manaar, coll. W.A. HERDMAN: 1 juv. (NHM 1907.5.22). — Trincomalee, coll. W.A. HERDMAN: 1 juv. (NHM 1934.1.16.9).
"Archipel Indien". 1 ♂ 42.2 mm; 1 ♀ 49.7 mm (MNHN-B 58).
"Mer des Indes". 1 ♀ 86.1 mm (MNHN-B 59).
Coast of China. Det. HERKLOTS as *C. (Lophos) Lophos*: 1 dry specimen (RMNH 43111).

Japan. 1 ♂ 77.3 mm (NHM 1894.7.8.9). — 1824-1834, colls P.F. VON SIEBOLD & H. BURGER, det. P.F VON SIEBOLD: 6 dry specimens (RMNH 43107). — 1824-1829, coll. & det. P.F VON SIEBOLD: 7 dry specimens (RMNH 43108). — 1826-1833, coll. H. BURGER, det. HERKLOTS as *C. (Lophos) Lophos*: 1 dry specimen (RMNH 43109). — 1823-1835, colls P.F. VON SIEBOLD & H. BURGER: 1 ♂ 65 mm; 84 juvs (RMNH 768). — Nagasaki, 1.07.1911, coll. J. JORDAN: 5 ♀ 31.8-61.7 mm (ZM CRU1798). — Shikoku I., Misaki, May 1914, coll. Th. MORTENSEN: 1 ♂ 46.9 mm (ZM CRU1795). — 1930, id. M.J. RATHBUN: 1 ♂ 35.9 mm; 1 ♀ 31.5 mm (USNM 63678). — Sagami Bay, coll. SAKAI: 1 ♂ 31.6 mm (NHM 1961.6.5.27). — Shikoku I., Kochi, 17.05.1979, colls H. SUZUKI & L.B. HOLTHUIS: 4 ♂ 22.3-42.1 mm; 1 ♀ 55.1 mm (RMNH 32772). — Saga, 10-20 m, 29.10.1979: 3 juvs (SMF).

Taiwan. Taichi, NE Taiwan, 3-4.08.1996, coll. P.K.L. NG: 1 juv; 29.0 mm; 1 ♂ 32.4 mm (NUS).

Indonesia. *Sumatra*: Poeloe Weh, January 1929, coll. P. BUITENDIJK: 1 ♀ 24.3 mm (RMNH 3116). — Poeloe Weh, 1930, coll. P. BUITENDIJK: 1 ♀ 18.1 mm (RMNH 3117). — Belawan, 1926, coll. P. BUITENDIJK: 1 ♂ 22.2 mm (RMNH 3203). — *Java*: 1839, coll. S. MULLER: 1 ♀ (RMNH 767). — *Timor*: Koepang Bay, 6-15 m, 4.12.1929, coll. P. BUITENDIJK: 1 juv. (RMNH 4239). — *Sulawesi*: Macassar, 1 ♂ 31.0 mm (NHM 1880.6). — *Moluccas*: 1821-1822, coll. C.G.C. REINWARDT, det. HERKLOTS as *C. (Lophos) Lophos*: 1 dry specimen (RMNH 43114). — Amboina, 1864, coll. E.W.A. LUDEKING: 1 ♀ ovig. 37.1 mm (RMNH 766).

Australia. Mission Beach, NE Qld. 17°53.7'S, 146°51.2'E, *"Solea"*, 140-142 m, 20.01.1986: 2 ♂ 35.0 and 31.5 mm; 1 juv. (QM W16980).

Chesterfield Is. CORAIL 2: stn 53, 19°17.19'S, 158°36.26'E, 67-68 m, 24.08.1988, coll. B. RICHER DE FORGES: 1 ♀ 91.8 mm (MNHN).

New Caledonia. LAGON: stn 745, 22°13.6'S, 167°02.8'E, 78-80 m, 13.08.1986, coll. B. RICHER DE FORGES: 1 juv. (MNHN). — Stn 241, 22°22'S, 167°02'E, 35 m, Ouen I., Prony Bay, coll. B. RICHER DE FORGES: 1 ♀ 31.6 mm (MNHN).

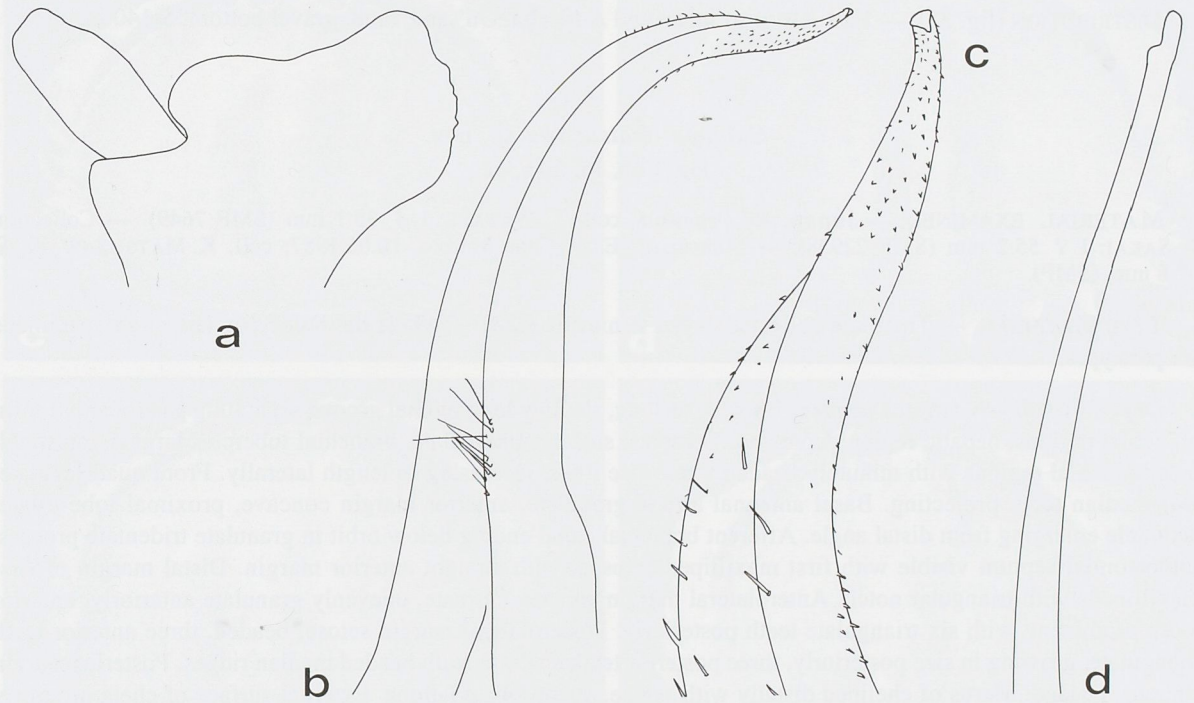


FIG. 16. — *Calappa lophos* (Herbst, 1782), ♂ 47.3 mm, Madagascar, Nosy Be, 6-8 m (MNHN): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

DESCRIPTION. — Carapace convex, 1.6 wide as long. Frontal and epigastric regions with small tubercles. Front, slightly projecting, with two triangular teeth separated by wide sulcus. Anterior margin of basal antennal article concave, proximal lobe dilate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. Distal margin of first maxillipeds straight. Branchial ridges, prominent in young, indistinct, anteriorly with flattened tubercles. Anterolateral margin carinate, unevenly granulate. Posterolateral margin

with four marginally beaded laciniate teeth, distalmost largest, and three granulate teeth. Posterior margin beaded. Merus of cheliped distally with quadrilobate lamina, two distalmost lobes acuminate. External surface of chela minutely granulate, few flattened tubercles below crest. Crest of larger chela cut into seven teeth increasing in size distally. Unevenly granulate ridge running subparallel to lower margin, from proximal ramlike tooth to base of fixed finger. Lower margin narrow, two beaded files contiguous distally. First male pleopod stout, markedly curved distad, tapering apically to narrow spinulate tip; second pleopod slender, slightly curved, tip short, digitate.

Color. — "In the juvenile form, the carapace is traversed by longitudinal stripes of reddish brown and also marked with a pair of large ocelli, one on each epibranchial region" (SAKAI, 1937). "*C. lophos* is a beautifully coloured species. The overall colour is pinkish with very small red specks; red ocelli arranged in curved lines are present along the anterolateral margin of the carapace scattered red ocelli are present in the middle of the carapace, wide transverse lines of red colour are found on the grooves separating the teeth of the clypeiform expansions and on the chelipeds. The fingers of chelipeds are yellowish." (TIRMIZI & KASMI, 1991). Color photographs in MATSUZAWA (1977), MIYAKE (1983).

REMARKS. — HERBST's (1782) description and drawing being very clear, there has never been any confusion over the identity of this handsome species. However when TAKEDA and SHIKATANI (1990) distinguished *C. quadrimaculata* from *C. lophos* "by the proportional difference of the carapace and the morphological difference of the posterior lobes of the carapace" they described features typical to young *C. lophos* specimens.

DISTRIBUTION (fig. 32). — East Africa to Japan and Australia. On sand, mud, gravel bottom, 5-140 m.

Calappa matsuzawa sp. nov.

Fig. 17 b, 18, 20 b, 32

MATERIAL EXAMINED. — **Japan**. Kii Peninsula, coll. T. WATABE: 1 ♂ 38.1 mm (SMF 7649). — Collection T. SAKAI: 1 ♀ 55.2 mm (SMF 22938). — Shikoku I., E. of Cape Muroto, 10.05.1987, coll. K. MATSUZAWA: 1 ♀ 57.6 mm (SMF).

TYPE MATERIAL. — The male collected at Kii Peninsula (SMF 7649) is the holotype. The other specimens are paratypes.

DESCRIPTION. — Carapace convex, 1.3 wide as long, shallow longitudinal groove separating gastrocardial from branchial regions, hepatic region depressed. Carapace surface tuberculate, branchial tubercles largest, intestinal, metabranchial regions with minutely beaded transverse lines, increasing in length laterally. Front quadridentate, two median teeth projecting. Basal antennal article granulate, anterior margin concave, proximal lobe dilate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. Distal margin of first maxillipeds with triangular notch. Anterolateral margin arcuate, carinate, unevenly granulate anteriorly, anterior tooth prominent, with six triangulate teeth posteriorly. Posterolateral margin setose, beaded, three anterior teeth triangulate, growing in size posteriorly, three posterior teeth shallow, with beaded median ridges. Posterior margin sinuous, beaded. Merus of cheliped distally with setose, quadrilobate lamina. External surface of chela inferiorly granulose, obliquely traversed by three rows of minutely granulate tubercles, largest tubercles just below crest. Crest of larger chela cut into seven teeth increasing in size distally, proximalmost bicuspidate. Lower margin closely beaded from proximal lamellar tooth to pollex.

ETYMOLOGY. — Celebrating the 70th birthday of Mr Keisuke MATSUZAWA, who kindly supplied me with one of the paratypes.

REMARKS. — *C. matsuzawa* is related to the *"gallus"* group, most closely to *C. undulata*. However, the two species are readily distinguished by the rugose carapace and quadridentate front in *C. matsuzawa* as compared with the smoother carapace and bidentate front of *C. undulata*.

DISTRIBUTION (fig. 32). — Known only from Japan. Depth unknown.

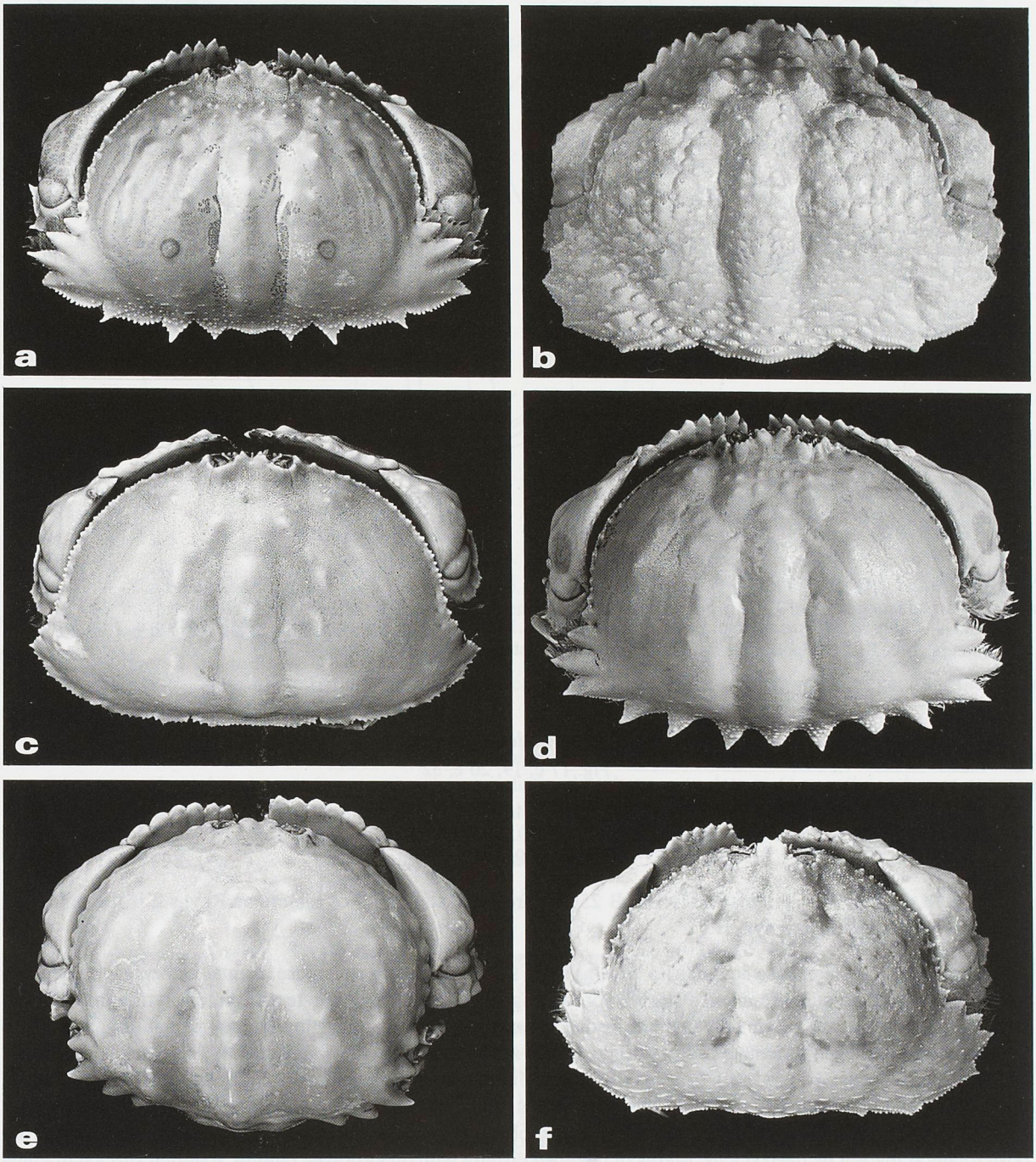


FIG. 17. — Whole crab, dorsal view: **a**, *Calappa lophos* (Herbst, 1782), ♂ 47.3 mm, Madagascar, Nosy Be, 6-8 m (MNHN). — **b**, *Calappa matsuzawa* sp. nov., ♂ paratype, 55.2 mm, Japan (SMF 22938). — **c**, *Calappa monilicanthus* sp. nov., ♂ holotype, 53.7 mm, Seychelles, "REVES 2" stn 45, 4°12.3'S, 55°59.6'E, 60-65 m (MNHN-B 25693). — **d**, *Calappa philargius* (Linnaeus, 1758), ♂ 55.5 mm, Australia, Cape Morton, 119 m (QM W3325). — **e**, *Calappa pustulosa* Alcock, 1896, ♀ 50.8 mm, Vietnam, Nha Trang Bay (MNHN-B 13464). — **f**, *Calappa sebastieni* sp. nov., ♂ holotype, 66.1 mm, Marquesas Is., stn 288, 9°20.5'S, 140°02'W, 120 m (MNHN-B 25690).

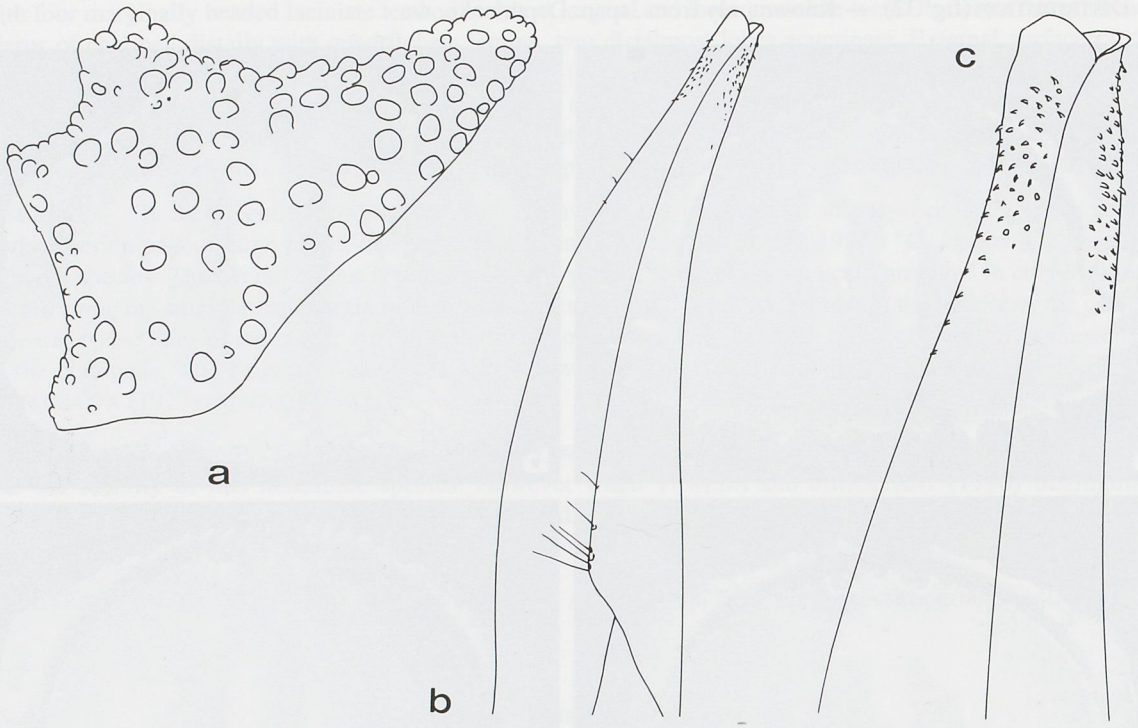


FIG. 18. — *Calappa matsuzawa* sp. nov., ♂ holotype, 38.1 mm, Japan, Kii peninsula (SMF 7649): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part.

Calappa monilicanthus sp. nov.

Fig. 17 c, 19, 20 c, 32

MATERIAL EXAMINED. — **Seychelles**. REVES 2 (E. MARCHAL coll.): stn 5, 5°04.4'S, 56°23.8'E, 33 m, 4.09.1980: 1 ♀ 61.7 mm (MNHN-B 25694). — Stn 45, 4°12.3'S, 55°59.6'E, 60-65 m, 14.09.1980: 1 ♂ 53.7 mm (MNHN-B 25693). — Stn 64, 50 m, 20.09.1980: 1 ♀ 61.2 mm (MNHN-B 25695).

TYPE MATERIAL. — The male (MNHN-B 25693) from the station 45 of the cruise REVES 2 is the holotype. The other specimens are paratypes.

DESCRIPTION. — Carapace convex, 1.5 wide as long, surface minutely squamose, frontal and epigastric regions more densely granulate. Front only slightly projecting, with two triangular teeth. Anterior margin of basal antennal article concave, proximal lobe dilate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. Distal margin of first maxillipeds obliquely cut, anterointerior angle acute. Branchial ridges indistinguished, anteriorly with few flattened lumps. Anterolateral margin carinate, unevenly granulate. Posterolateral margin lamellar, granulate, indistinctly lobate. Posterior margin sinuous, granular, separated from posterolateral margin by deep sulcus. Merus of cheliped distally with quadrilobate lamina. External surface of chela minutely granulate, few flattened tubercles below crest. Crest of larger chela cut into seven teeth increasing in size distally, proximalmost bicuspidate. Unevenly granulate ridge running subparallel to lower margin, from small proximal lamellar tooth to base of fixed finger. Lower margin narrow, two beaded files contiguous distally. First male pleopod curved distad, tapering apically to narrow spinulate tip; second pleopod slender, slightly curved, tip short, digitate.

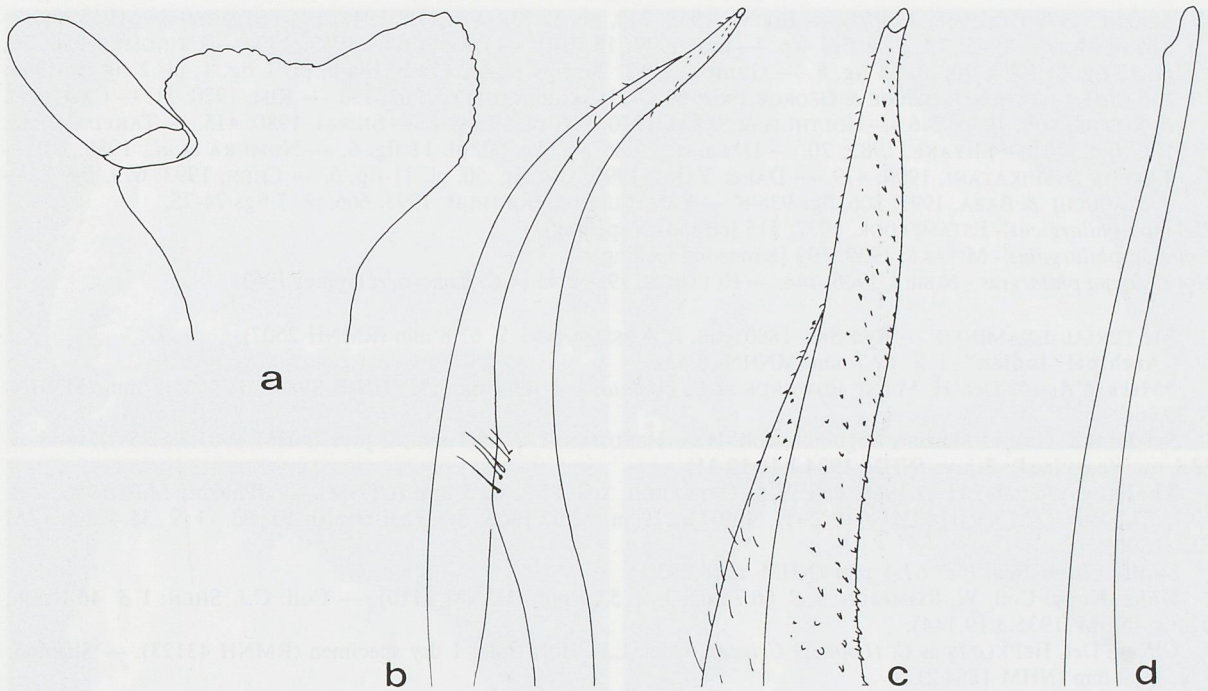


FIG. 19. — *Calappa monilicanthus* sp. nov., ♂ holotype, 53.7 mm, Seychelles, "REVES 2", stn 45, 4°12.3'S, 55°59.6'E, 60-65 m (MNHN-B 25693): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

ETYMOLOGY. — From the Latin, *monile* = necklace, string of beads and *canthus* = rim, edge; after the beaded margins.

REMARKS. — *C. monilicanthus* is related to *C. lophos*. However, the two are readily distinguished by the form of the posterolateral and posterior margins, being indistinctly lobate, granulate in *C. monilicanthus* as compared with the prominently laciniate margins of *C. lophos*.

DISTRIBUTION (fig. 32). — Known only from the Seychelles, at 33-65 m.

Calappa philargius (Linnaeus, 1758)

Fig. 17 d, 20 d, 21, 33

Cancer philargius Linnaeus, 1758: 626; 1764: 432; 1767: 1042.
Cancer philargus - HERBST, 1785: 203. — WHITE, 1847: 44.
Cancer inconspectus Herbst, 1794: 162, pl. 40 fig. 3; 1799: 22.
Calappa cristata Fabricius, 1798: 346. — LATREILLE, 1803: 393. — BERTHOLD, 1847: 20. — GIBBES, 1850: 183. — STIMPSON, 1858a: 162; 1907: 165. — WHITELEGGE, 1890: 231. — THALLWITZ, 1892: 52. — ORTMANN, 1892: 565. — DOFLEIN, 1902: 653. — SERÈNE, 1937: 78. — SOKOLOWSKY, 1945: 71, pl. 2 figs 1-3.
Calappa inconspecta - BOSC, 1801: 185; 1830: 215.
Calappa (Lophos) philargius - DE HAAN, 1837: 71, pl. 19 fig. 1.
Calappa philargius - HERKLOTS, 1861: 25. — NAUCK, 1880: 46. — DE MAN, 1888a: 388; 1888b: 196. — HENDERSON, 1893: 396. — ALCOCK, 1896: 145. — NOBILI, 1899: 249; 1900: 497; 1903: 23. — RATHBUN, 1902b: 30; 1924b: 27. — LAURIE, 1906: 353; 1915: 409 (list). — PARISI, 1914: 284. — IHLE, 1918: 183. — BALSS, 1922: 122. — MCNEILL & WARD, 1930: 372. — ANDRÉ, 1931: 640. — SHEN, 1931: 104, text-figs 10-11, pl. 8. — SAKAI, 1936: 45, pl. 8 fig. 2; 1937: 93, pl. 12 fig. 3; 1956: 8; 1960: 33, pl. 16 fig. 3; 1965: 56, pl. 22 fig. 1; 1976: 130, pl. 37 fig. 2. —

SERÈNE, 1937: 78; 1968: 41 (list). — BOONE, 1938: 210, pls 72-73. — WARD, 1941: 1. — STEPHENSEN, 1945: 66. — SOKOLOWSKY, 1945: 72, pl. 2 figs 4-6. — LIN, 1949: 13 (list). — DAWYDOFF, 1952: 139. — UTINOMI, 1956: 70, pl. 35 fig. 8; 1974: 70, pl. 35 fig. 8. — GUINOT, 1962: 26, figs 11-15, 17a-b, 18a-b, pl. 1 fig. 1, pl. 2 fig. 1; 1967: 245 (list). — TYNDALE-BISCOE & GEORGE 1962: 69. — SANKARANKUTTY, 1962: 153. — KIM, 1970: 11. — CAMPBELL & STEPHENSON, 1970: 246. — HOLTHUIS & SAKAI, 1970: 116, pl. 10 fig. 1. — SHIRAI, 1980: 415. — TAKEDA, 1982: 106, fig. 310. — MIYAKE, 1983: 20. — DAI *et al.*, 1986: 93, fig. 50, pl. 11 fig. 6. — NOMURA *et al.*, 1988: 63. — TAKEDA & SHIKATANI, 1990: 479. — DAI & YANG, 1991: 104, fig. 50, pl. 11 fig. 6. — CHEN, 1993: 679, fig. 2. — YAMAGUCHI & BABA, 1993: 306, figs 93a-b. — YAMAGUCHI & HOLTHUIS, 1993: 666, pl. 7 figs 74-75.

Calappa philargicus - ESTAMPADOR, 1937: 515 [erroneous spelling].

Calappa philarguius - MIYAKE, 1939: 199 [erroneous spelling].

Not *Calappa philargius* - NOBILI, 1906: 148. — HOLTHUIS, 1958a: 45 (= *C. dumortieri* Guinot 1963).

MATERIAL EXAMINED. — **Red Sea**. 1880, coll. R. KOSSMANN: 1 ♀ 62.8 mm (RMNH 2507).

"Archipel Indien". 1 ♀ 67.7 mm (MNHN- B 43).

"Mers d'Asie". Det. H. MILNE EDWARDS as *C. cristata*: 1 ♂ 43.4 mm (MNHN-B 3984); 1 ♂ 61.2 mm (MNHN-B 3986).

Sri Lanka. Gulf of Manaar, Negombo, coll. W.A. HERDMAN: 1 ♀ 29.5 mm; 2 juvs (NHM 1907.3.22.5-7). — 1 ♂ 38.1 mm (paratized); 3 juvs (NHM 1934.1.16.10-11).

Thailand. Aokrabi, 15.02.1966, coll. V.A. GALLARDO: 2 ♀ 57.7, 62.5 mm (USNM). — ?Phuket, 14.01.1966: 2 ♂ 59.7, 57.6 mm (ZM CRU1803). — 7°29'N, 99°07'E, 29 m, 12.02.1966, 5th Thai-Danish Exped.: 1 ♀ 35.4 mm (ZM CRU1806).

South China Sea. 1 ♂ 67.4 mm (NHM 1968.293.1).

Hong Kong. Coll. W. STIMPSON: 1 ♂ 66.7 mm; 1 ♀ 53.9 mm (USNM 2110). — Coll. C.J. SHEN: 1 ♂ 46.1 mm; 2 juvs (NHM 1935.3.19.144).

China. Det. HERKLOTS as *C. (Lophos) Cristata*, redet. L.B. HOLTHUIS: 1 dry specimen (RMNH 43123). — Shantou, 1 ♀ 67.9 mm (NHM 1884.2).

Taiwan. Tung Kang, S. Kaoshiung, SW Taiwan, 5.08.1996, coll. P.K.L. NG: 1 ♂ 44.1 mm; 1 ♀ 29.9 mm; 1 juv. 25.2 mm (NUS). — Taiwan Straits: 1 ♂ 67.0 mm; 1 ♀ 60.0 mm (ZM CRU1800).

Japan. 1824-1833, colls P.F. VON SIEBOLD & H. BURGER, det. J.A. HERKLOTS as *C. (Lophos) Philargius*, redet. L.B. HOLTHUIS: 8 dry specimens (RMNH 43122). — 1824-1829, coll. P.F. VON SIEBOLD, det. J.A. HERKLOTS as *C. (Lophos) Cristata*, redet. L.B. HOLTHUIS: 2 dry specimens (RMNH 43125). — 1826-1833, coll. H. BURGER, det. J.A. HERKLOTS as *C. (Lophos) Philargius*, redet. L.B. HOLTHUIS: 12 dry specimens (RMNH 43121). — 1826-1833, coll. H. BURGER, det. J.A. HERKLOTS as *C. (Lophos) Cristata*, redet. L.B. HOLTHUIS: 1 dry specimen (RMNH 43128). — Suzaki, coll. H.M. SMITH: 1 ♂ 55.7 mm (USNM 45853). — Nagasaki, June 1909, coll. J. JORDAN: 1 ♀ 44.8 mm (ZM CRU1797).

Philippines. Iloilo, Panay I., March-May 1929, coll. H.C. KELLER: 3 ♂ 27.7-55.8 mm; 2 ♀ 36.2 and 37.0 mm (USNM). — Gulf of Davao, Mouth of Padada River, 23-24.06.1936, coll. G.R. OESCH, det. M. WARD: 1 ♂ 36.5 mm; 1 ♀ 39.9 mm (AMNH 7892). — September 1937, coll. W.G. VAN NAME, det. M. WARD: 1 ♂ 49.9 mm (AMNH 8415). — SW Luzon, Sangay, 3.03.1981, coll. B. GINDELBERGER: 1 ♂ 37.0 mm (RMNH 35201).

Malaysia. N Borneo, Sandakan, 30.06.1929: 1 ♂ 60.2 mm (USNM 122953).

Indonesia. Java, ?det. J.A. HERKLOTS as *C. (Lophos) Cristata*, redet. L.B. HOLTHUIS: 2 dry specimens (RMNH 43129). — Balayan Bay, 27.08.1927: 2 ♂ 44.2, 45.8 mm (USNM). — Batavia Bay (= Bay of Jakarta), July 1904, coll. P. BUITENDIJK: 1 ♂ 48.9 mm (RMNH 2503). — Mollucas, April-September 1821, coll. C.G.C. REINWARDT, redet. L.B. HOLTHUIS: 1 dry specimen (RMNH 43124). — Amboina, coll. E.W.A. LUDEKING: 1 ♂ 71.1 mm (RMNH 1706).

New Guinea. Humboldt Bay, 25.06.1955: 1 ♀ (RMNH 12843).

Australia. *East coast, Queensland*: Sydney, February 1975, coll. V. CUSUMANO: 1 ♀ 44.1 mm (AMNH 16188). — SE Queensland, Bribie I.: 1 ♀ 76.9 mm (QM W1832). — 25.07.1958, coll. A. BEALE: 1 ♀ 75.7 mm (QM W1998). — Toorbul Pt, 29.04.1957: 1 ♂ 74.7 mm (QM W1977). — Maroochy River mouth, 7.03.1952: 1 ♀ 76.0 mm (QM W1800). — Moreton Bay, 7.05.1957, coll. J.T. WALKER: 1 ♂ 70.2 mm (QM W1979). — Nr Smoky Cape, 46-55 m, August 1962: 1 ♂ 29.3 mm (QM W2724). — Between Moreton I. and Stradbroke I.: 1 ♀ 74.5 mm (QM W2656). — Between Cape Moreton and Mooloolaba, 1970, coll. F . WALLACE: 1 ♀ (QM W3382). — Tin Can Bay: 1 ♂ 70.5 mm (QM W2073). — 19°04.9'S, 118°50.6'E, *"Soela"*, 81 m, 30.10.1983: 1 ♀ 40.3 mm (QM W19784). — Off Cape Moreton, 119 m, 1969, coll. P. HARRIS: 1 ♂ 55.5 mm (QM W3325).

North and north west coast: Weipa, July 1961, coll. G. WEBSTER: 1 ♂ 41.3 mm (QM W2218). — 19°28.4'S, 118°55.2'E, *"Soela"*, 39 m, 31.10.1983: 1 ♀ 18.7 mm (QM W19794). — Gulf of Carpentaria, *"Southern Surveyor"*, 1991: 1 ♂ 19.9 mm (QM W19798). — Yirrkala, August 1987: 2 ♀ 39.0, 68.4 mm (USNM 178294). — NW Australia, coll. B. GRAY: 1 ♂ 67.0 mm (NHM 1931.5.15.39).

New Caledonia. Coll. ROUGIER, det. E.L. BOUVIER as *C. cristata*: 1 ♀ 65.0 mm (MNHN 42). — North-west lagoon, stn CP 1061, 20°12.4'S, 164°12.4'E, 13-17 m, 5.05.1986, coll. B. RICHER DE FORGES: 1 juv. (MNHN). — St. Vincent Bay, stn 167, 22°07'S, 166°10'E, 11 m, coll. B. RICHER DE FORGES: 1 ♀ (broken) (MNHN).

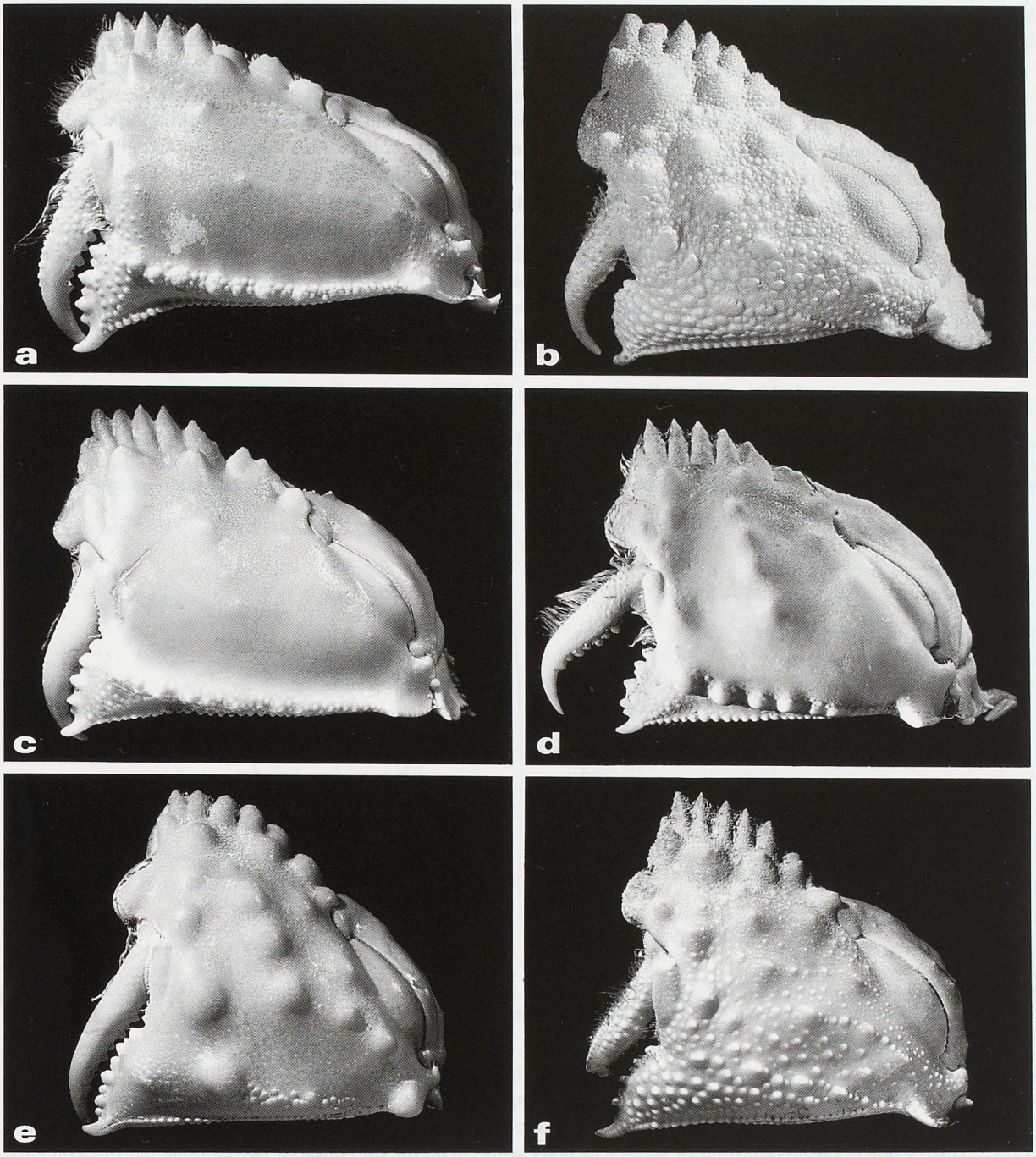


FIG. 20. — Cheliped, external view: **a**, *Calappa lophos* (Herbst, 1782), ♂ 47.3 mm, Madagascar, Nosy Be, 6-8 m (MNHN). — **b**, *Calappa matsuzawa* sp. nov., ♂ paratype, 55.2 mm, Japan (SMF 22938). — **c**, *Calappa monilicanthus* sp. nov., ♂ holotype, 53.7 mm, Seychelles, "REVES 2" stn 45, 4°12.3'S, 55°59.6'E, 60-65 m (MNHN-B 25693). — **d**, *Calappa philargius* (Linnaeus, 1758), ♂ 55.5 mm, Australia, Cape Morton, 119 m (QM W3325). — **e**, *Calappa pustulosa* Alcock, 1896, ♀ 50.8 mm, Vietnam, Nha Trang Bay (MNHN-B 13464). — **f**, *Calappa sebastieni* sp. nov., ♂ holotype, 66.1 mm, Marquesas Is., stn 288, 9°20.5'S, 140°02'W, 120 m (MNHN-B 25690).

DESCRIPTION. — Carapace convex, 1.5 wide as long, surface minutely granulate, frontal and epigastric regions more densely granulate. Front only slightly projecting, with two triangular teeth. Anterior margin of basal antennal article concave, proximal lobe dilate, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. Distal margin of first maxillipeds obliquely cut. Branchial ridges prominent in young, barely distinguished, anteriorly with flattened tubercles. Anterolateral margin carinate, unevenly granulate. Posterolateral margin with four marginally beaded laciniate teeth, distalmost largest, and three triangular, granulate teeth. Posterior margin with obtuse median tooth, shorter than adjacent teeth. Merus of cheliped distally with quadrilobate lamina, two distalmost acuminate. External surface of chela minutely granulate, vertically traversed by three flattened tubercles, similar tubercles distally above dactyl. Crest of larger chela cut into seven teeth increasing in size distally, proximalmost bicuspidate. Unevenly tuberculate ridge running subparallel to lower margin, from proximal keel-like tooth to base of fixed finger, tubercles larger distally. Lower margin narrow, two beaded files contiguous distally. First male pleopod markedly curved distad, tapering apically to narrow spinulate tip; second pleopod slender, slightly curved, tip short, digitate.

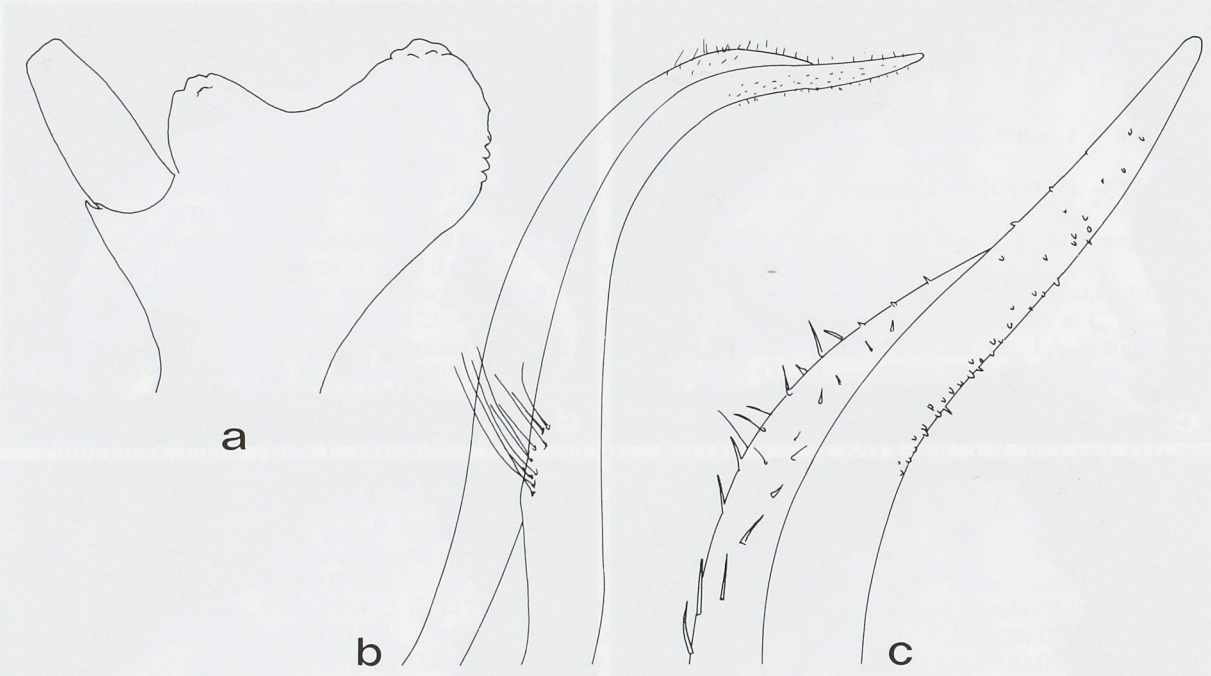


FIG. 21. — *Calappa philargius* (Linnaeus, 1758), ♂ 55.5 mm, Australia, Cape Morton, 119 m (QM W3325): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part.

Color. — "Pale brick-red above, the surface being covered with crowded punctae of that color. The eyes are longitudinally striped with black, the stripes or lines being about seven in number. A large, well-defined deep red spot on the carpus, and one on the front of the hand. Inner side of hand with red spots or blotches arranged in lines. Lower side of brachia deep red. Inferior surface of body white, with the exception of two oblique red lines on each cheek" (STIMPSON, 1907). "A pair of large maroon spots on either claw, and a maroon horse-shoe [marking] around each eye; the general colour fawn with a tinge of lavender centrally" (MCNEILL & WARD, 1930). Color photograph in TAKEDA (1982).

REMARKS. — LINNAEUS' (1758) description of *C. philargius*: "thorace laevi integerrimo convexo: postice quindecim-dentato" is accurate but exceedingly terse. HERBST's (1794, 1799) color description and drawing of *C. inconspectus* leave no doubt that the species depicted is indeed *C. philargius*. FABRICIUS' (1798) establishment

of *C. cristata* owes much to arithmetics: whereas LINNAEUS counted 15 teeth on the posterior margin (including posterolateral), FABRICIUS counted only seven (posterior proper). LATREILLE (1803) realized that *cristata* and *inconspecta* are one and the same, but it was DE HAAN (1837) who synonymized both with *C. philargius*.

DISTRIBUTION (fig. 33). — Indian Ocean to Japan, Australia and Samoa, 8-120 m.

Calappa pustulosa Alcock, 1896

Pl. 17 e, 20 e, 22, 33

Calappa pustulosa Alcock, 1896: 147, pl. 6 fig.1. — ALCOCK & ANDERSON, 1897, pl 28 figs 1-1a. — IHLE 1918: 306 (list). — ANDRÉ, 1931: 640. — CHOPRA, 1933: 29. — SERÈNE, 1937: 78; 1968: 41 (list). — SAKAI, 1937: 97, pl. 18 figs 2-3; 1956: 8; 1965: 57, pl. 23 fig. 2; 1976: 134, pl. 41 fig 1. — DAWYDOFF, 1952: 139. — MIYAKE, 1983: 199. — DAI *et al.*, 1986: 94, text-fig. 52, pl. 12 fig. 1. — DAI & YANG, 1991: 106, text-fig. 52, pl. 12 fig. 1. — CHEN, 1993: 686, fig. 4b.

Not *Calappa pustulosa* var. *clypeata* Borradaile, 1903: 436 [= *C. clypeata* (Borradaile, 1903)].

MATERIAL EXAMINED. — **Burma**. Gulf of Martaban: 1 ♂ 17.0 mm (NHM 1899.1.20.4).

Vietnam. Nha Trang Bay, 1930, coll. A. KREMPF: 2 ♀ 39.7, 50.8 mm (MNHN B.13464).

Philippines. Marinduque I., 2.03.1909, *"Albatross"*, stn 5376, 165 m, det. M. WARD: 2 ♀ 29.3, 30.9 mm (USNM 65429).

Taiwan. Kaoshiung, SW Taiwan, 24.11.1987, coll. LIN CHOON CHONG: 1 ♂ 62.3 mm (NUS).

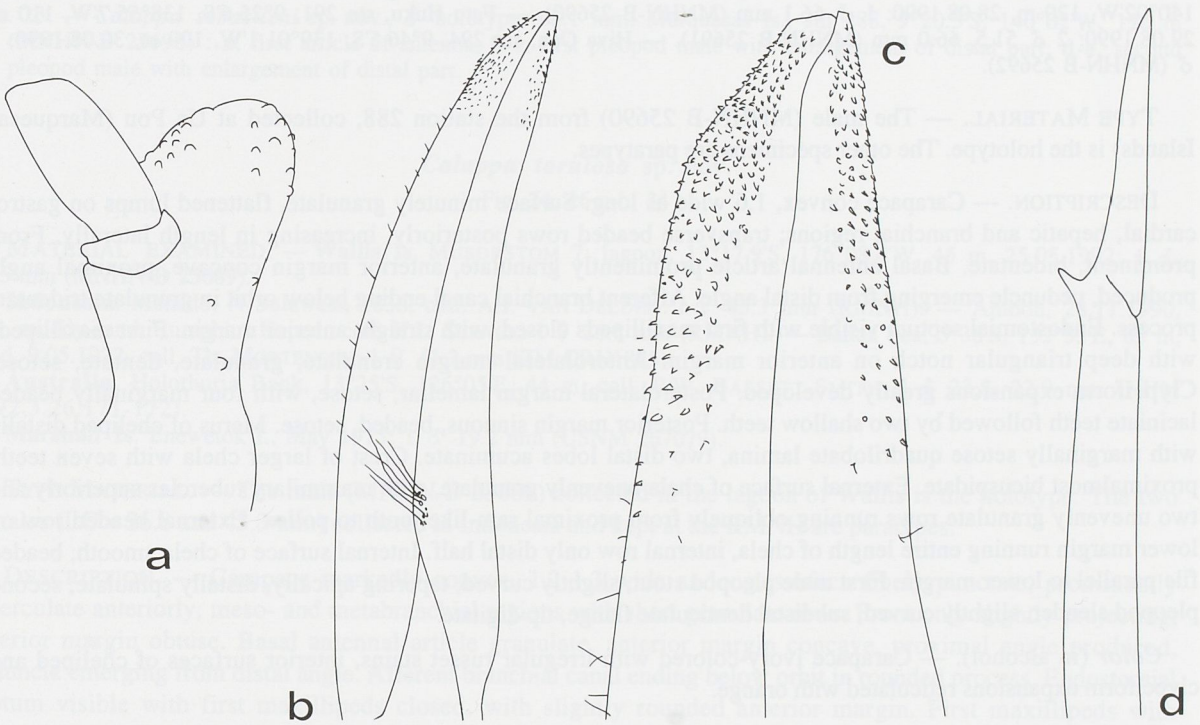


FIG. 22. — *Calappa pustulosa* Alcock, 1896, ♂ 62.3 mm, Taiwan, Kaoshiung (NUS 1995.605): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

DESCRIPTION. — Carapace prominently convex, subcircular, 1.1 wide as long, surface minutely granulate. Front only slightly projecting, with two low, rounded teeth. Basal antennal article not dilated anteriorly, peduncle

emerging from distal angle. Afferent branchial canal ending below orbit with medially-notched rounded process. Endostomial septum invisible with first maxillipeds closed, with straight anterior margin. First maxillipeds with triangular notch on anterointernal margin. Branchial ridges, prominent in young, indistinct, bullous. Anterolateral margin unevenly tuberculate. Clypeiform expansions moderate. Posterolateral margin with five triangular, granulate teeth, median longest. Posterior margin projecting, beaded. Merus of cheliped distally quadridentate, three proximal teeth rounded, distalmost tooth acuminate, ram-like. External surface of carpus with nearly obsolete tubercules. External surface of chela minutely granulate, obliquely traversed by three rows of tubercles, median row most prominent. Crest of larger chela cut into seven teeth, two proximalmost rounded. Unevenly granulate ridge running subparallel to lower margin, from proximal rounded tooth to base of pollex. Lower margin wide, two beaded files contiguous distally. Internal surface of chela inferiorly with beaded file subparallel to lower margin.

Color. — Carapace light brown, irregular reddish spots anteriorly (SAKAI, 1976, pl. 41 fig. 1).

REMARKS. — ALCOCK's (1896) description and drawings being accurate, the identity of *C. pustulosa* has never been in doubt. *C. pustulosa* differs from its congeners by its subcircular carapace lacking clypeiform expansions.

DISTRIBUTION (fig. 33). — India, Philippines, China, Japan. On sandy or muddy bottoms, 40-165 m.

Calappa sebastieni sp. nov.

Fig. 17 f, 20 f, 23, 33

MATERIAL EXAMINED. — **French Polynesia** (coll. J. POUPIN). *Marquesas Is*: Ua Pou, stn 288, 9°20.5'S, 140°02'W, 120 m, 28.08.1990: 1 ♂ 66.1 mm (MNHN-B 25690). — Fatu Huku, stn 291, 9°25.6'S, 138°55.7'W, 110 m, 29.08.1990: 2 ♂ 51.5, 66.0 mm (MNHN-B 25691). — Hiva Oau, stn 294, 9°46.5'S, 139°01.1'W, 100 m, 30.08.1990: 1 ♂ (MNHN-B 25692).

TYPE MATERIAL. — The male (MNHN-B 25690) from the station 288, collected at Ua Pou (Marquesas Islands) is the holotype. The other specimens are paratypes.

DESCRIPTION. — Carapace convex, 1.6 wide as long. Surface minutely granulate, flattened lumps on gastrocardial, hepatic and branchial regions; transverse beaded rows posteriorly, increasing in length laterally. Front prominent, bidentate. Basal antennal article prominently granulate, anterior margin concave, proximal angle produced, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in granulate tridentate process. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. First maxillipeds with deep triangular notch on anterior margin. Anterolateral margin crenulate, granulate, dentate, setose. Clypeiform expansions greatly developed. Posterolateral margin lamellar, setose, with four marginally beaded laciniate teeth followed by two shallow teeth. Posterior margin sinuous, beaded, setose. Merus of cheliped distally with marginally setose quadrilobate lamina, two distal lobes acuminate. Crest of larger chela with seven teeth, proximalmost bicuspidate. External surface of chela unevenly granulate, with mammilary tubercles superiorly and two unevenly granulate rows running obliquely from proximal ram-like tooth to pollex. External beaded row on lower margin running entire length of chela, internal row only distal half. Internal surface of chela smooth, beaded file parallel to lower margin. First male pleopod stout, slightly curved, tapering apically, distally spinulate; second pleopod slender, slightly curved, subdistal denticulate flange, tip digitate.

Color (in alcohol). — Carapace ivory-colored with irregular russet stains, interior surfaces of cheliped and clypeiform expansions reticulated with orange.

ETYMOLOGY. — Named after Sébastien, son of J. POUPIN, scientist of the SMSRB (Service mixte de surveillance radiologique et biologique des Armées) who collected all the specimens of this species studied here.

REMARKS. — *C. sebastieni* differs from the closely related *C. undulata* in its wider clypeiform expansion, form of laciniate teeth on posterolateral margin, lack of tubercles on branchial, gastric regions, bidentate front and color pattern.

DISTRIBUTION (fig. 33). — Known only from the Marquesas Islands, at 100-120 m.

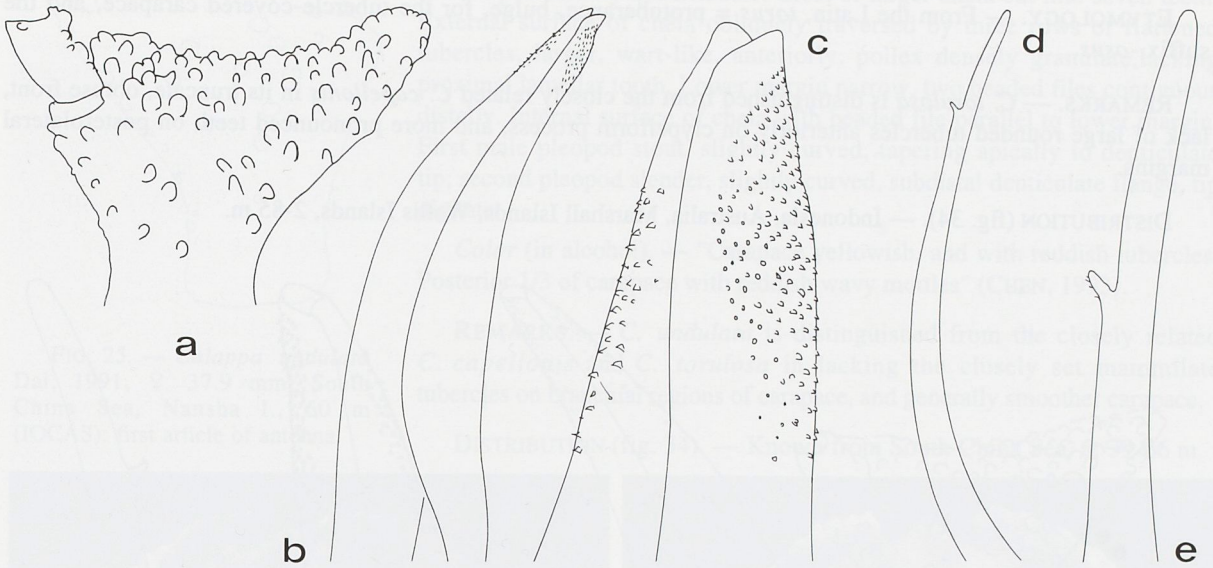


FIG. 23. — *Calappa sebastieni* sp. nov., ♂ holotype, 66.1 mm, Marquesas Is., stn 288, 9°20.5'S, 140°02'W, 120 m (MNHN-B 25690) : **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d-e**, second pleopod male with enlargement of distal part.

Calappa torulosa sp. nov.

Fig. 24, 26 a-b, 34

MATERIAL EXAMINED. — **Wallis Is**. MUSORSTOM 7: lagoon, 13°17.9'S, 176°08.4'W, 45 m, 25.05.1992: 1 ♂ 30.5 mm (MNHN-B 25689).

Indonesia. Menado, N Sulawesi, 1836, coll. A.J. VAN DELDEN: 1 ♀ 43.3 mm (RMNH). — Ambon, 28.11.1990, 2 m, muddy-sand, Rumphius Exped., coll. H.L. STRACK: 1 ♀ 26.8 mm (RMNH). — Banda Sea, 5°36'S, 132°55'E, 85 m, sand, 9.05.1922, coll. Th. MORTENSEN: 1 ♀ 41.2 mm (ZM CRU1825).

Australia. Holothuria Bank, 13°25'S, 126°05'E, 44 m, coll. P.W. BASSETT-SMITH: 2 ♂ 23.8, 22.9 mm (NHM 1892.3.26.171-172).

Marshall Is. Enewetok I., May 1975: 1 ♂ 19.2 mm (USNM 267079).

TYPE MATERIAL. — The male (MNHN-B 25689) collected in the lagoon of Wallis is the holotype. The two females (LC = 26.8 and 43.3 mm) collected in Indonesia and kept at the RMNH are paratypes.

DESCRIPTION. — Carapace markedly convex, 1.2-1.3 wide as long, surface finely punctate, prominently tuberculate anteriorly, meso- and metabranchial regions with short granulate rows. Front only slightly projecting, anterior margin obtuse. Basal antennal article granulate, anterior margin concave, proximal angle produced, peduncle emerging from distal angle. Afferent branchial canal ending below orbit in rounded process. Endostomial septum visible with first maxillipeds closed, with slightly rounded anterior margin. First maxillipeds with triangular notch on anterior margin. Anterolateral margin arcuate, carinate, scalloped. Posterolateral margin lamellar, with six marginally beaded triangular teeth, third and fourth teeth largest. Posterior margin produced, sinuous, closely beaded. Merus of cheliped distally with indistinctly quadrilobate lamina, anteriormost lobe keel-like. Crest of larger chela with six teeth. External surface of chela obliquely traversed by three rows of tubercles, median row most prominent, inferiorly granulate. Lower margin narrow, two beaded files contiguous distally. Internal surface of chela inferiorly minutely granulate, beaded file parallel to lower margin. First male pleopod

stout, slightly curved, tapering apically to spinulate tip; second pleopod slender, slightly curved, subdistal denticulate flange, tip digitate.

ETYMOLOGY. — From the Latin, *torus* = protuberance, bulge, for the tubercle-covered carapace, and the suffix *-osus*.

REMARKS. — *C. torulosa* is distinguished from the closely related *C. capellonis* in its truncate, obtuse front, lack of large rounded tubercles anteriorly on clypeiform process, and more pronounced teeth on posterolateral margins.

DISTRIBUTION (fig. 34). — Indonesia, Australia, Marshall Islands, Wallis Islands, 2-85 m.

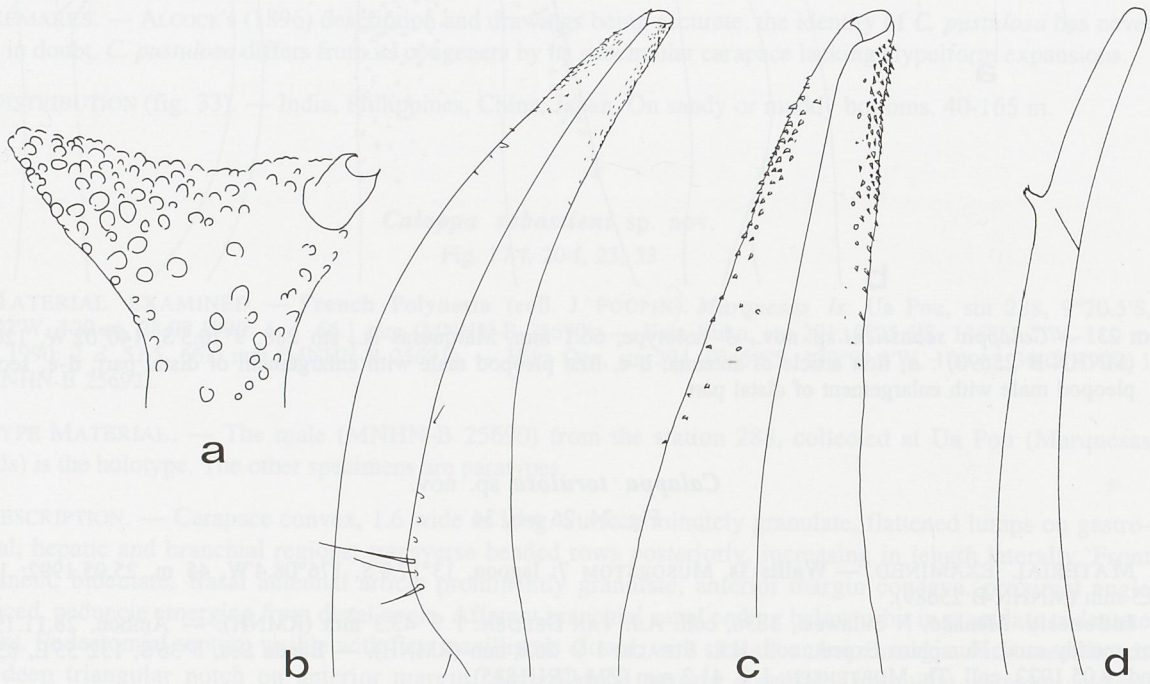


FIG. 24. — *Calappa torulosa* sp. nov., ♂ holotype, 30.5 mm, Wallis Is, "MUSORSTOM 7", 13°18'S, 176°08'W, 45 m (MNHN-B 25689): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d**, second pleopod male, enlargement of distal part.

Calappa undulata Dai, 1991

Fig. 25, 26 c-d, 34

Calappa undulata Dai, 1991: 101 (key). — CHEN, 1993: 686, fig 7a-h.

MATERIAL EXAMINED. — **South China Sea**. Nansha Islands, 60 m, 30.05.1993: 1 ♀ 37.9 mm (IOCAS).

DESCRIPTION. — Carapace convex, 1.3 wide as long, surface minutely granulate anteriorly. Front projecting, anterior margin with v-shaped notch, bidentate. Basal antennal article granulate, anterior margin concave, peduncle emerging from distal angle. Endostomial septum visible with first maxillipeds closed, with straight anterior margin. Hepatic region slightly depressed. Gastric, cardial regions delimited by shallow longitudinal grooves. Branchial, gastric regions with rounded tubercles, posteriorly traversed by few beaded tubercles. Anterolateral margin arcuate, anteriorly indistinctly dentate, posteriorly with six beaded denticles. Posterolateral margin setose,

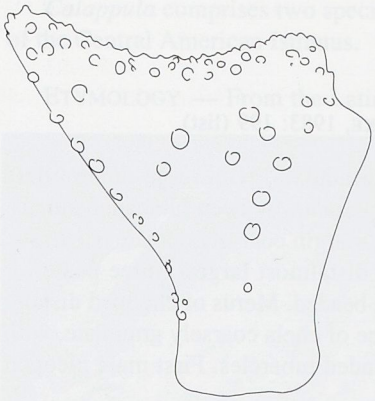


FIG. 25. — *Calappa undulata* Dai, 1991, ♀ 37.9 mm, South China Sea, Nansha I., 60 m (IOCAS): first article of antenna.

cut into six marginally beaded laciniate teeth, three posterior teeth medially beaded. Posterior margin somewhat produced, sinuous, finely beaded. Merus of cheliped distally quadrilobate. Crest of larger chela cut into seven teeth. External surface of chela obliquely traversed by three rows of flattened tubercles, larger, wart-like, anteriorly, pollex densely granulate,lacking proximal lamellar tooth. Lower margin narrow, two beaded files contiguous distally. Internal surface of chela with beaded file parallel to lower margin. First male pleopod stout, slightly curved, tapering apically to denticulate tip; second pleopod slender, slightly curved, subdistal denticulate flange, tip digitate.

Color (in alcohol). — "Carapace yellowish, and with reddish tubercles. Posterior 1/3 of carapace with reddish wavy mottles" (CHEN, 1993).

REMARKS. — *C. undulata* is distinguished from the closely related *C. capellonis* and *C. torulosa* in lacking the closely set mammilate tubercles on branchial regions of carapace, and generally smoother carapace.

DISTRIBUTION (fig. 34). — Known from South China Sea, at 39-66 m.

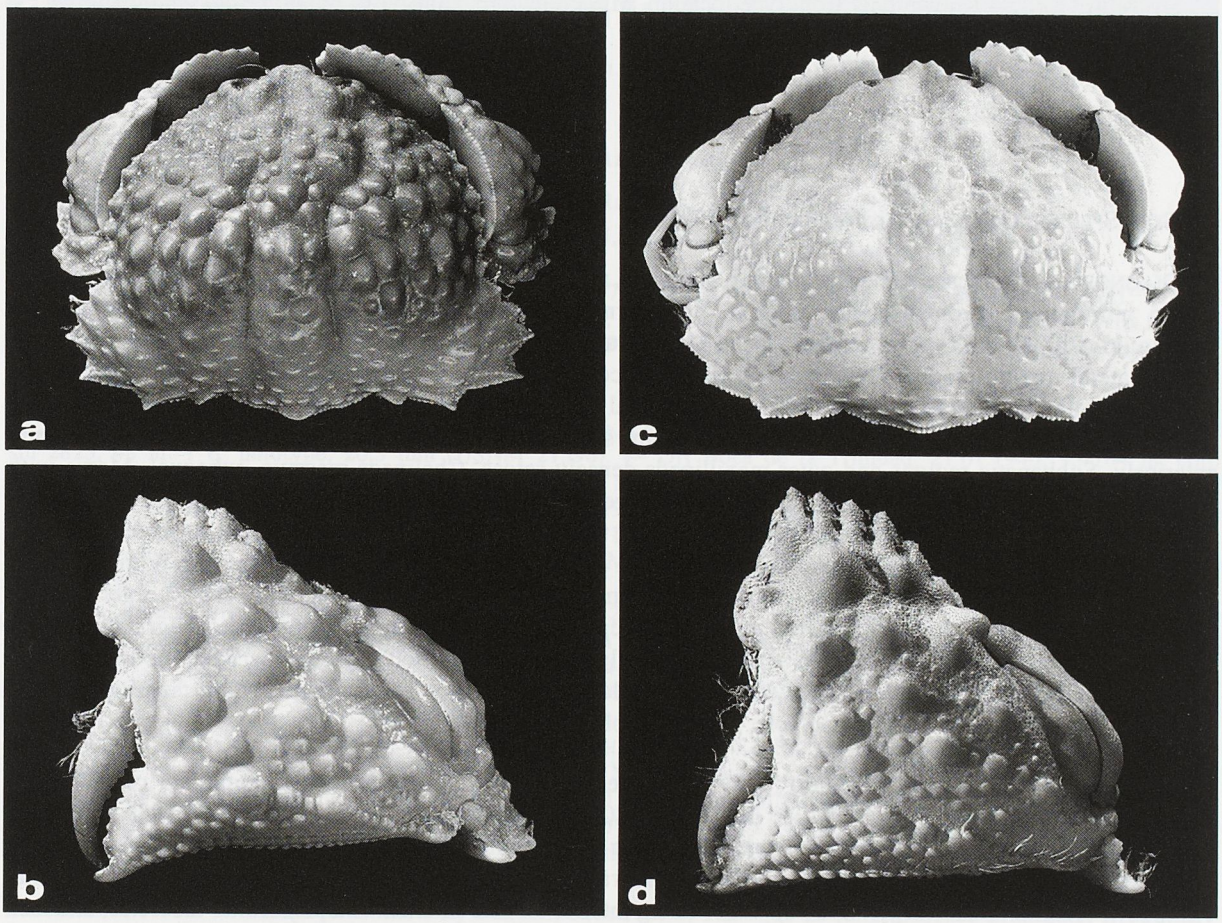


FIG. 26 a-b. — *Calappa torulosa* sp. nov., ♂ holotype, 30.5 mm, Wallis Is, "MUSORSTOM 7", 13°18'S, 176°08'W, 45 m (MNHN-B 25689): **a**, whole crab, dorsal view; **b**, cheliped, external view.

FIG. 26 c-d. — *Calappa undulata* Dai, 1991, ♀ 37.9 mm, South China Sea, Nansha I., 60 m (IOCAS): **c**, whole crab, dorsal view; **d**, cheliped, external view.

Calappa yamasitae Sakai, 1980

Fig. 34

Calappa yamasitae Sakai, 1980: 5, frontispiece fig. 2, text-figs 2a-b, 3a-c. — MIYAKE, 1983: 199 (list).

DESCRIPTION. — Carapace convex, 1.6 wide as long. Surface coarsely granulate, with large mammillate tubercles covering branchial region. Front projecting, with two obtuse teeth separated by deep U-shaped sulcus. Gastric, cardial regions delimited by shallow longitudinal grooves. Anterolateral margin coarsely dentate or serrate. Posterolateral margin setose, marginally beaded, six anterior teeth triangular, distalmost largest, three posterior teeth shallow, with prominent, beaded, median ridges. Posterior margin sinuous, beaded. Merus of cheliped distally quadrilobate. Crest of larger chela cut into 9-10 prominent teeth. External surface of chela coarsely granulate, with scattered tubercles, larger, wart-like, anteriorly. Lower margin narrow, with beaded tubercles. First male pleopod stout, slightly curved, tapering apically.

Color. — Carapace orange-red with tubercles somewhat darker (SAKAI, 1980, frontispiece fig. 2).

REMARKS. — The two known specimens of *C. yamasitae* were not available for study.

DISTRIBUTION. — Known only from type location, Mie Prefecture, Honshu I., Japan. Depth unknown.

Genus *CALAPPULA* nov.

TYPE SPECIES: *Calappa saussurei* Rathbun, 1898a.

DIAGNOSIS. — Carapace somewhat convex, granulate, tuberculate, regions undefined, furrows bordering cardiac region pronounced. Front as wide as orbit, downturned, trilobate, median lobe invisible in dorsal view. Antennules folding obliquely beneath front. Anterolateral margin arcuate, crenate, dentate or granulate. Posterolateral margin moderately expanded, laciniate, concealing flexed ambulatory legs beneath. Eyes filling orbits, eyestalk short, stocky, cornea large. Supraorbital margin swollen, unifissured. Basal article of antennae subquadrate, forming inner orbital margin, flagellum short. Buccal cavity elongate, lacking median septum anteriorly. Subhepatic regions and outer maxillipeds densely setose. Chelipeds massive, subequal. Merus with transverse dentate crest externally, distalmost tooth largest, keel-like. Carpus trigonal. External surface of chela swollen, upper margin crested, lobate; keel-like laminar tooth proximally near lower margin; lower margin with two parallel files of tubercles. Internal surface of chela densely setose along lower margin; finely milled ridge extending from mid crest to base of dactyl, preceded by smaller milled ridge on third tooth of crest. Larger dactylus proximally with crochet tooth fitting into molariform depression, dactylus' upper margin setose, granulate, with rounded tooth proximally. Pereiopods smooth, laterally compressed, dactyli styliform. Male abdomen five-segmented, second segment granulate, with prominent lateral lobes. First male pleopod stout, tapering, distally spinulose. Second male pleopod filamentose, distally crook-shaped.

REMARKS. — WILLIAMS & CHILD (1989), while establishing *Cyclozodion* to accomodate two Western Atlantic species - *C. angustum* (A. Milne Edwards, 1880) and *C. tuberatum* Williams & Child, 1989 - placed it between *Calappa* and *Paracyclois*. *Calappula*, combining features characteristic of both *Calappa* and *Cyclozodion*, is distinguished from the former by its unifissured supraorbital border, downturned trilobate front, stridulating organ consisting of milled ridge vertically transversing interior surface of chela and postorbital tubercles, and lack of median septum anteriorly in buccal cavity, features it shares in common with both *Cyclozodion* and *Paracyclois*. *Calappula* is distinguished from those in possessing expanded posterolateral margin large enough to conceal flexed ambulatory legs beneath, and keel-like tooth proximally on external surface of chela.

Calappula comprises two species - *C. saussurei* and *C. tortugae* (Rathbun, 1933) comb. nov., one on each side of the Central American Isthmus.

ETYMOLOGY. — From the Latin; *-ula* is a dimunitive suffix to denote the smaller-sized species.

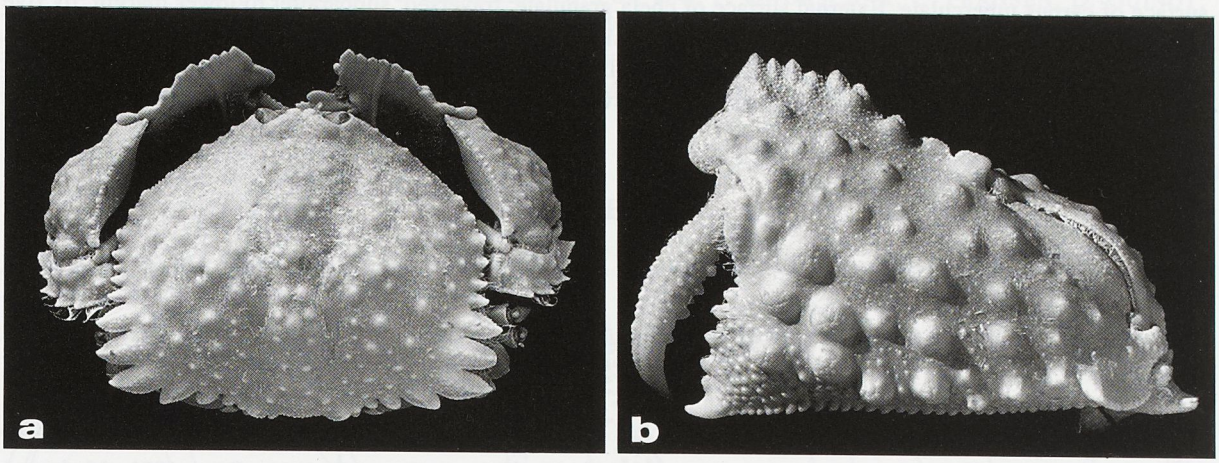


FIG. 27. — *Calappula saussurei* comb. nov., ♂ 31.5 mm, Ecuador (MNHN-B.17249) : **a**, whole crab, dorsal view; **b**, cheliped, external view.

Calappula saussurei (Rathbun, 1898) comb.nov.

Fig. 27, 28, 34

Calappa saussurei Rathbun, 1898a: 609, pl. 41 fig. 6; 1937: 206, fig. 43, pl. 63 figs 1-4. — FINNEGAN, 1931: 611. — CRANE, 1937: 98. — GARTH, 1948: 19; 1960: 121 (list); 1966: 12. — PRAHL & SANCHEZ, 1986: 24. — WILLIAMS & CHILD, 1989: 109. — LEMAITRE & ALVAREZ-LEON, 1992: 51 (list). — HENDRICKX, 1992: 9 (list); 1993a: 8 (list); 1993b: 311 (list); 1994: 577.

MATERIAL EXAMINED. — **Mexico**. Gulf of California. La Paz Bay, 24°18'N, 110°22'W, 30.04.1888, *"Albatross"*, stn 2823, 48 m: 1 ♂ holotype, 20.3 mm (USNM 21596). — Off Boca de la Trinidad, 21.01.1940, 93-104 m, coll. J.S. GARTH: 2 ♀ 25.2, 24.1 mm (LAM). — E. of Espiritu Santo, 95-106 m, 15.02.1940: 1 ♂ 18.6 mm; 1 ♀ 21.5 mm (LAM). — California. Farallon I., off San Ignacio, 1.04.1959, 91-119 m, coll. Scripps Exped.: 2 ♂ 13.5, 23.6 mm (LAM). — 60 mi. N. of Guaymas, 55-64 m, December 1963: 1 ♂ 24.0 mm; 3 juvs (USNM). — Gulf of California. Off Rio Fuente, 20.03.1985: 1 ♂ 25.7 mm; 1 ♀ ovig. 25.5 mm (MNHN-B 20867). — Banderas Bay, 13.02.1938, 46-73 m, coll. S.A. GLASSELL: 1 ♀ 23.0 mm (USNM 207834).

Costa Rica. April 1968, 80 m: 1 ♂ 34.1 mm (USNM 273953).

Panama. Isla de Joge, 28.06.1969, 73 m: 1 ♂ 26.9 mm (USNM 300691). — Bahia Honda, btn Medidor and Pacora I., 7°44.19'N, 8°35.23'W, 21.02.1934, *"Velero III"*, stn 244, 55-64 m, coll. W.L. SCHMITT, det. M.J. RATHBUN: 1 ♂ 18.5 mm (USNM 69227). — Secas I., 7°58.02'N, 82°00.30'W, 29.03.1939, *"Velero III"*, stn 945-39, 46-48 m: 3 juvs (LAM).

Colombia. Port Utria, 24.01.1935, 45 m, coll. W.L. SCHMITT, det. M.J. RATHBUN: 1 ♂ 37.5 mm (USNM 77161).

Ecuador. La Plata I., 10.02.1934, 82-101 m, coll. W.L. SCHMITT, det. M.J. RATHBUN: 1 ♂ 31.2 mm; 1 ♀ 24.4 mm (USNM 69228). — Off Guayaquil, 1979, coll. A. CROSNIER: 1 ♂ 31.5 mm (MNHN-B 17249).

Galapagos Is. Between Seymour and Daphne Is., 0°24.50'S, 90°21.40'W, 13.12.1934, *"Velero III"*, stn 345, 55 m, coll. W.L. SCHMITT, det. M.J. RATHBUN: 1 ♀ 17.3 mm (USNM 76671).

DESCRIPTION. — Carapace moderately convex, subcircular, 1.2 wide as long. Surface granulate, irregularly tuberculate, tubercles more prominent on midbranchial region. Distinct longitudinal groove separating gastro-cardial from branchial, hepatic regions. Front barely projecting, with two rounded teeth separated by shallow sulcus. Anterior margin of basal antennal article rounded, peduncle emerging distally. Afferent branchial canal

ending below orbit with rounded process. Anterior margin of first maxilliped concave. Anterolateral margin carinate, unevenly granulate anteriorly, prominently dentate posteriorly. Posterolateral margin beaded, with four granulate, laciniate teeth, penultimate largest, followed by two rounded teeth. Posterior margin produced, sinuous, irregularly beaded. Merus of cheliped distally with four granulate teeth, distalmost largest, bicuspidate. External surface of carpus tuberculate. External surface of chela granulate, traversed, subparallel to lower margin, by five irregular rows of granulate tubercles increasing in size inferiorly. Crest of larger chela with seven teeth, proximalmost bicuspidate. Inferior proximal tooth lamellar, ram-like. Lower margin with two contiguous beaded rows. First male pleopod stout, slightly curved, somewhat tapering, distally spinulate. Second male pleopod crook-shaped.

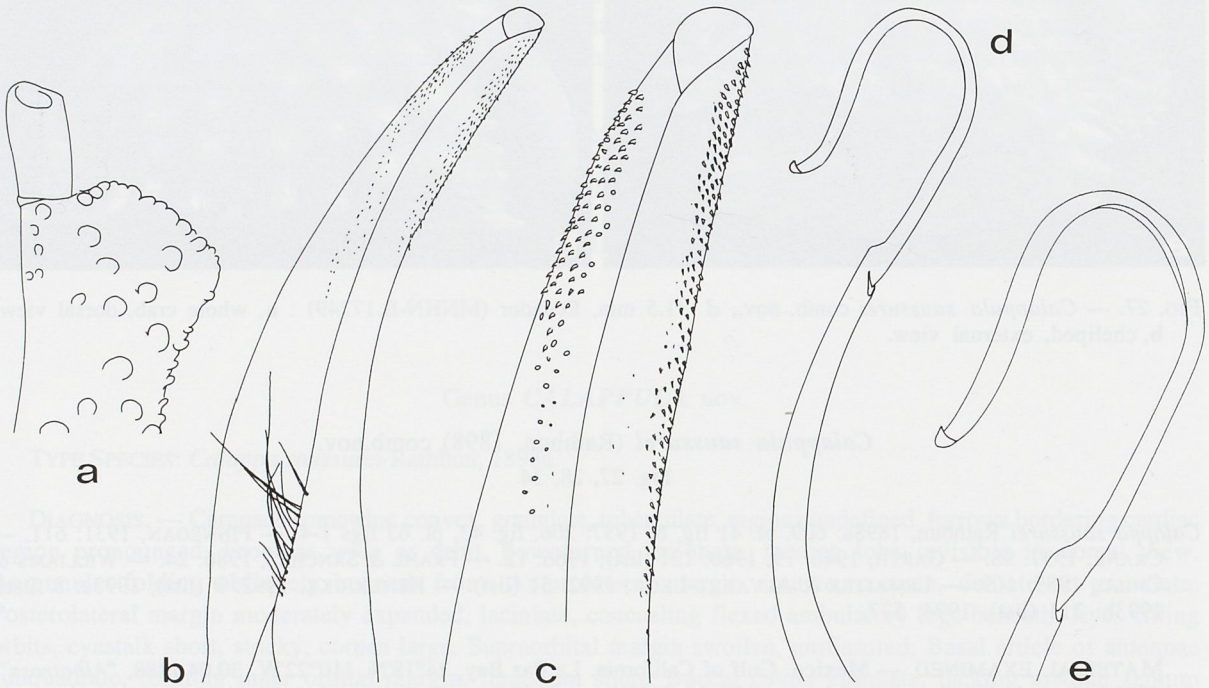


FIG. 28. — *Calappula saussurei* comb. nov., 1980, ♂ 31.5 mm, Ecuador (MNHN-B 17249): **a**, first article of antenna; **b-c**, first pleopod male with enlargement of distal part; **d-e**, second pleopod male with enlargement of distal part.

Color. — "Typical specimens from sandy bottoms were colored as follows: Carapace violet brown or tan anteriorly, fading posteriorly to white; all tubercles of carapace bright orange; chelipeds tan, the tubercles orange and white; ambulatories white banded at the joints with pale tan. Most of the specimens from muddy bottoms, on the other hand, had the entire carapace and sometimes the legs suffused with bright coral red or orange, while the tubercles were usually distinctly coral pink rather than orange... Eggs coral red to vermilion." (CRANE, 1937).

REMARKS. — RATHBUN (1898a), describing *C. saussurei*, recognized that "This species is analogous to *C. angusta* A. Milne Edwards of the West Indies". WILLIAMS & CHILD (1989), while clarifying the position of *C. tortugae* (Rathbun, 1933), concurred: "These two species of *Calappa* are similar enough to be regarded as a geminate pair from either side of the Central American land mass".

C. saussurei is distinguished from its close relative, *C. tortugae*, by the presence of five horizontal rows of granulate tubercles on external surface of chela.

DISTRIBUTION. — Gulf of California to Ecuador, Galapagos Is. Sand, mud, gravel, broken shell and coral bottoms, 1-300 m.

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GEOGRAPHICAL DISTRIBUTION MAPS

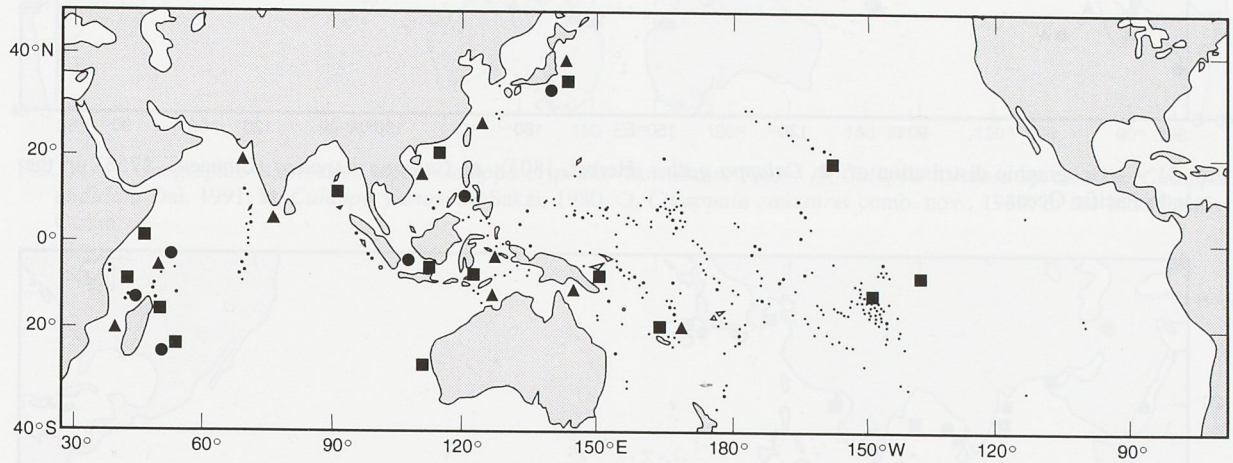


FIG. 29. — Geographic distribution of: ●, *Calappa bicornis* Miers, 1884; ■, *Calappa calappa* (Linnaeus, 1758); ▲, *Calappa capellonis* (Laurie, 1906), in the Indo-Pacific Ocean.

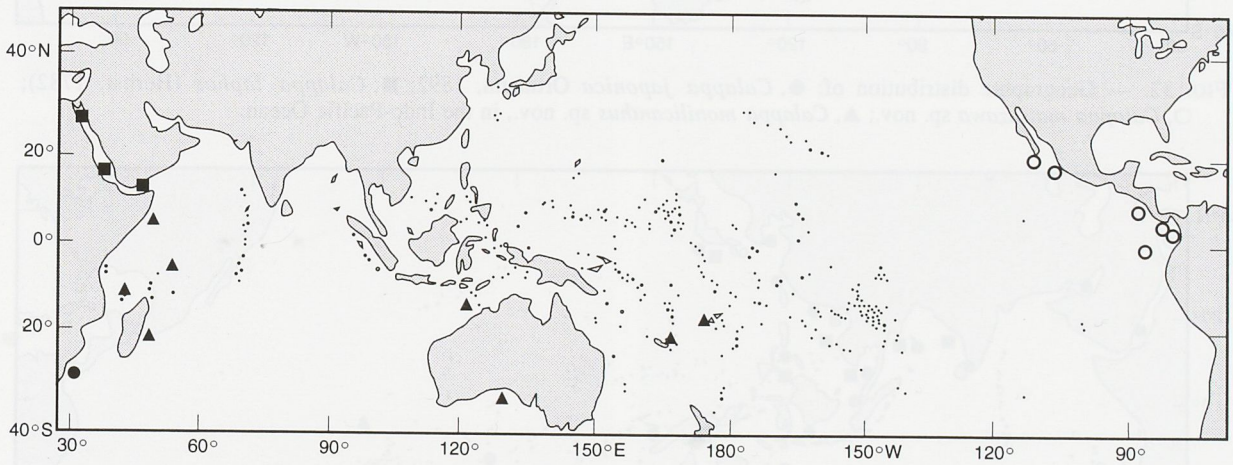


FIG. 30. — Geographic distribution of: ●, *Calappa conifera* sp. nov.; ○, *Calappa convexa* Saussure, 1853; ▲, *Calappa depressa* Miers, 1886; ■, *Calappa dumortieri* Guinot, 1962, in the Indo-Pacific Ocean.

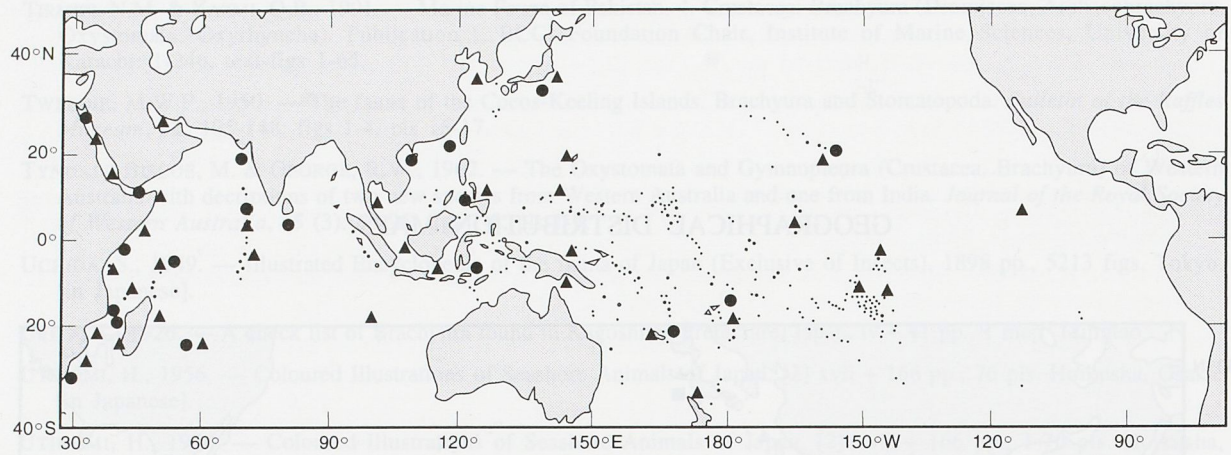


FIG. 31. — Geographic distribution of: ●, *Calappa gallus* (Herbst, 1803); ▲, *Calappa hepatica* (Linnaeus, 1758), in the Indo-Pacific Ocean.

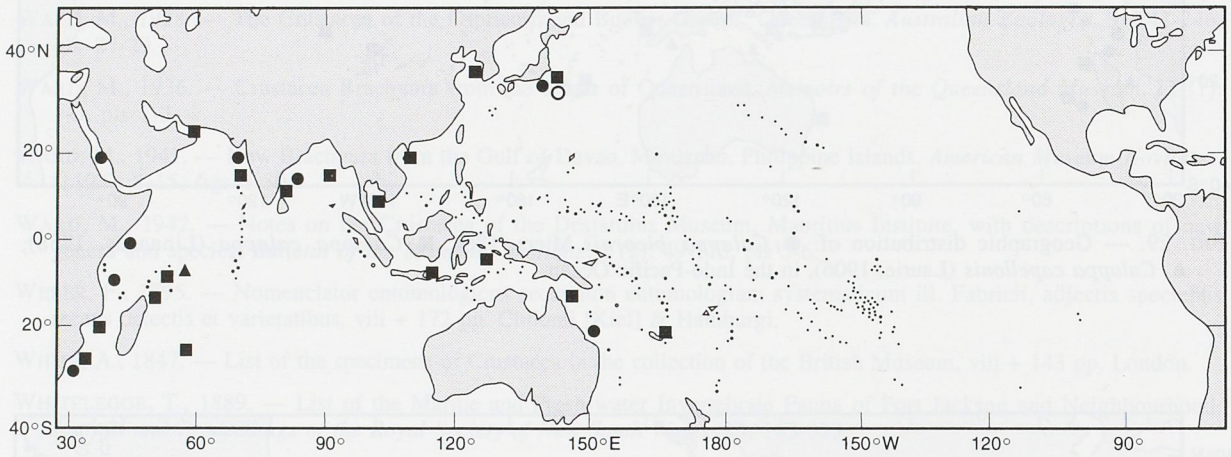


FIG. 32. — Geographic distribution of: ●, *Calappa japonica* Ortmann, 1892; ■, *Calappa lophos* (Herbst, 1782); ○, *Calappa matsuzawa* sp. nov.; ▲, *Calappa monilicanthus* sp. nov., in the Indo-Pacific Ocean.

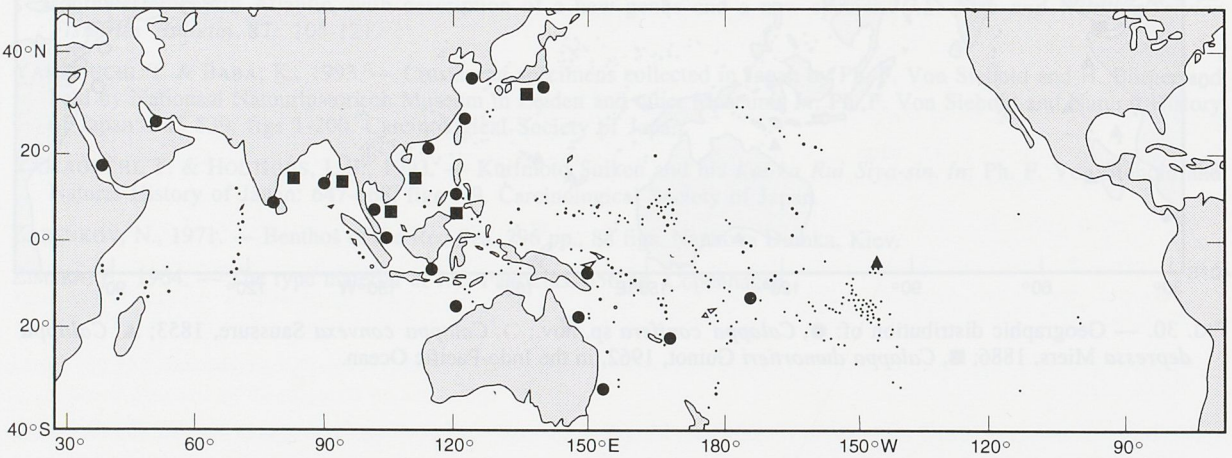


FIG. 33. — Geographic distribution of: ●, *Calappa philargius* (Linnaeus, 1758); ■, *Calappa pustulosa* Alcock, 1896; ▲, *Calappa sebastieni* sp. nov., in the Indo-Pacific Ocean.

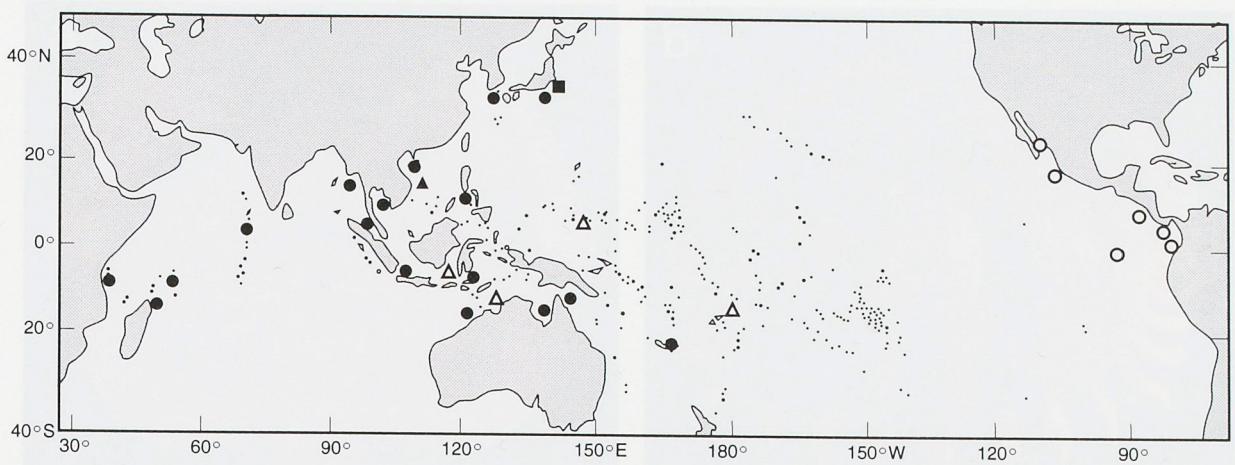


FIG. 34. — Geographic distribution of: ●, *Calappa clypeata* (Borradaile, 1903); △, *Calappa torulosa* sp. nov.; ▲, *Calappa undulata* Dai, 1991; ■, *Calappa yamasitae* Sakai, 1980; ○, *Calappula saussurei* comb. nov., 1980, in the Indo-Pacific Ocean.

FIGURES IN COLOUR

FIG. 35 a. — *Calappa capellonis* (Laurie, 1906). New Caledonia, north lagoon, 30 m.

FIG. 35 b. — *Calappa dumortieri* Guinot, 1962. Red Sea, Eilath.

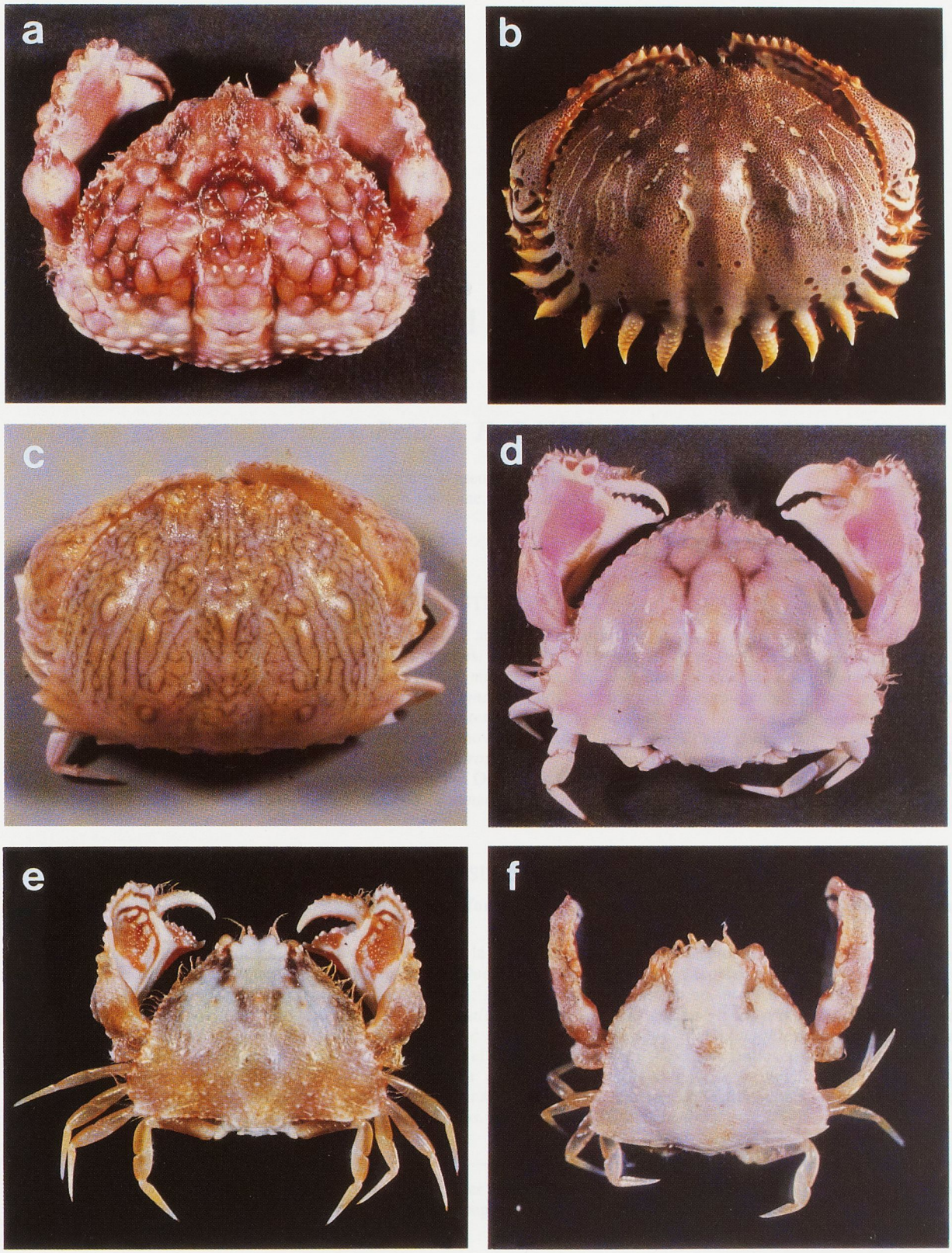
FIG. 35 c. — *Calappa lophos* (Herbst, 1782), young specimen. New Caledonia, east lagoon, 78-80 m.

FIG. 35 d. — *Calappa clypeata* (Borradaile, 1903). New Caledonia, north lagoon, 22-24 m.

FIG. 35 e. — *Calappa depressa* (Miers, 1886). New Caledonia, east lagoon, 20 m.

FIG. 35 f. — *Calappa depressa* (Miers, 1886), young specimen. New Caledonia, east lagoon, 42 m.

Photographs 35a, 35 b, 35 d by Pierre LABOUTE and 35 e, 35 f by Jean-Louis MENOU, both from ORSTOM.


a
b
c
d
e
f



10

Crustacea Decapoda: Deep water Xanthoidea from the South-Western Pacific and the Western Indian Ocean

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ABSTRACT

Twenty-two species of xanthoid crabs, living mostly at depths greater than 200 m, are recorded from waters off New Caledonia, and some other Southwest Pacific localities. Of these 13 species are new, and one new genus is defined. They include : *Gaillardiellus bathus* sp. nov.; *Meractaea multidentata* sp. nov.; *Rata chalcal* sp. nov.; *Alainodaeus alis* sp. nov.; *Alainodaeus nuku* sp. nov.; *Palatigum trichostoma* gen. nov., sp. nov.; *Medaeops gemini* sp. nov.; *Medaeops merodontos* sp. nov.; *Medaeus aztec* sp. nov.; *Paramedaeus megagomphios* sp. nov.; *Liomera nigrimanus* sp. nov.; *Euryxanthops latifrons* sp. nov.; and *Xanthias teres* sp. nov. Other species have had their geographic and bathymetric ranges increased. An additional species *Euryxanthops cepros* sp. nov. is described from the Seychelles Archipelago, and is the first species of this genus to be found in the Indian Ocean. Keys for identification are provided for the species of *Alainodaeus*, *Euryxanthops*, *Medaeops*, *Medaeus*, and *Paramedaeus*.

RÉSUMÉ

Crustacea Decapoda : Xanthoidea d'eau profonde du Sud-Ouest Pacifique et de l'océan Indien occidental.

Vingt-deux espèces de crabes Xanthoidea, vivant pour la plupart à plus de 200 m de profondeur, sont signalées de la Nouvelle-Calédonie et de quelques autres localités du Sud-Ouest Pacifique. Treize de ces espèces sont nouvelles et un genre nouveau est décrit, qui sont *Gaillardiellus bathus* nov.; *Meractaea multidentata* sp. nov.; *Rata chalcal* sp. nov.; *Alainodaeus alis* sp. nov.; *Alainodaeus nuku* sp. nov.; *Palatigum trichostoma* gen. nov., sp. nov.; *Medaeops gemini* sp. nov.; *Medaeops merodontos* sp. nov.; *Medaeus aztec* sp. nov.; *Paramedaeus megagomphios* sp. nov.; *Liomera nigrimanus* sp. nov.; *Euryxanthops latifrons* sp. nov.; et *Xanthias teres* sp. nov. Les autres espèces voient leurs répartitions géographique et bathymétrique étendues. Par ailleurs, *Euryxanthops cepros* sp. nov. est décrite des îles Seychelles et est la première espèce de ce genre trouvée dans l'océan Indien. Des clés d'identification sont proposées pour les espèces des genres *Alainodaeus*, *Euryxanthops*, *Medaeops*, *Medaeus*, and *Paramedaeus*.

DAVIE, P.J.F., 1997. — Crustacea Decapoda: Deep water Xanthoidea from the South-Western Pacific and the Western Indian Ocean. *In* : A. CROSNIER (ed.), Résultats des campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176** : 337-387. Paris ISBN : 2-85653-511-9.

INTRODUCTION

DAVIE (1993) described the deepwater of the central and southern Pacific Ocean as "a treasure-house of new taxa". In that paper he described 10 new species from French Polynesia, and four new genera to accommodate them. The present paper is mostly concerned with the New Caledonian region, including the Loyalty Islands, and southwards along the Norfolk Ridge. The investigation of the bathyal zone of this region has been quite extensive with many cruises having now been completed viz. CHALCAL 1 & 2, BIOCAL, MUSORSTOM 4-6, SMIB 1-8, BATHUS 1-3, VOLSMAR, AZTEQUE, GEMINI and BERYX 2 (for cruise reports see RICHER DE FORGES, 1990, 1993a; RICHER DE FORGES & CHEVILLON, 1995). RICHER DE FORGES (1993b) has provided an extensive bibliography of the research and reports that have been published on all aspects of the deepwaters of New Caledonia.

A small collection from French Polynesia, not previously seen by DAVIE (1993) has also been included. Cruise reports and more extensive collection details for these specimens are given by POUPIN (1991). Also, a collection made during the MUSORSTOM 7 cruise to Wallis and Futuna Islands (see RICHER DE FORGES & MENOU, 1993) has been studied.

The specimens entrusted from the Seychelles were caught in a trap set in deep water as part of a trapping program that was undertaken in 1987 by the CEPROS Cruise. One of the aims of this expedition was to investigate the potential for a deep water shrimp fishery in the waters of the Seychelles Plateau. A report detailing the methods, stations, and results has been published (INTÈS & BACH, 1989).

Measurements in millimeters (mm) are usually of carapace breadth (c.b.) (measured at the widest point) followed by length. Both measurements are given for all new taxa but for specimens belonging to an already described taxon, often only a single measurement of carapace breadth has been given, especially where there were many specimens.

Abbreviations used in the text are : AM, Australian Museum, Sydney; MNHN, Muséum national d'Histoire naturelle, Paris; QM, Queensland Museum, Brisbane; USNM, Smithsonian Institution, United States National Museum, Washington. Often the station numbers are prefixed by the following abbreviations : CAS = casier (trap); CH = chalut à panneaux (Otter trawl for fish); CP = chalut à perche (beam trawl); D = drague (dredge); DW = drague Waren (Waren dredge).

The abbreviated terminology used for carapace regions is that used by SERÈNE (1984) following DANA (1852). The classification used in this work follows that of SERÈNE (1984) with recent nomenclatural changes and additions incorporated, in particular I have followed HOLTHUIS (1993 : 619) in recognising the seniority of the Oziidae Dana, 1852, over the Menippidae Ortmann, 1893.

LIST OF SPECIES

Family OZIIDAE Dana, 1852

Subfamily Eriphiinae Alcock, 1898
Globopilumnus laciniatus (Sakai, 1980)

Family XANTHIDAE MacLeay, 1838

Subfamily Actaeinae Alcock, 1898
Gaillardiellus bathus sp. nov.
Meractaea multidentata sp. nov.
Rata chalcal sp. nov.

Subfamily Antrocarcininae Ng & Chia, 1994
Antrocarcinus petrosus Ng & Chia, 1994

Subfamily Euxanthinae Alcock, 1898
Alainodaeus alis sp. nov.
Alainodaeus nuku sp. nov.
Alainodaeus rimatara Davie, 1993
Palatigum trichostoma gen. nov., sp. nov.
Medaeops gemini sp. nov.
Medaeops merodontos sp. nov.
Medaeus aztec sp. nov.
Miersiella haswelli (Miers, 1886)
Paramedaeus globosus Serène & Vadon, 1981
Paramedaeus megagomphios sp. nov.
Paraxanthodes cumatodes (MacGilchrist, 1905)

Subfamily Liomerinae Sakai, 1976
Liomera nigrimanus sp. nov.

Subfamily Xanthinae MacLeay, 1838
Demania intermedia Guinot, 1969
Demania mortenseni (Odhner, 1925)
Demania wardi Garth & Ng, 1985
Euryxanthops latifrons sp. nov.
Euryxanthops cepros sp. nov.
Xanthias teres sp. nov.

SYSTEMATICS

XANTHOIDEA MacLeay, 1838

Family OZIIDAE Dana, 1852

Subfamily ERIPHIINAE Alcock, 1898

Genus ***GLOBOPILUMNUS*** Balss, 1933

Globopilumnus laciniatus (Sakai, 1980)

Pilumnus spongiosus - RATHBUN, 1923 : 111 [not *Pilumnus spongiosus* Nobili, 1905].
Planopilumnus spongiosus - BALSS, 1933 : 40.
Pilumnus laciniatus Sakai, 1980 : 76-77.
Globopilumnus multituberosus Garth & Kim, 1983 : 689-690, fig. 6. — NG & TAN, 1985 : 127-129, fig. 1.
Globopilumnus laciniatus - NG, 1992 : 221.

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 4 : stn 179, 18°56.6'S, 163°13.7'E, 475 m, 18.9.1985 : 1 ♀ 9.1 mm (MNHN-B 22739). — Stn 223, 22°57.0'S, 167°30.0'E, 545-560 m, 30.09.1985 : 1 ♂ 7.6 mm (MNHN-B 22740). — Stn 238, 22°13.0'S, 167°14.0'E, 500-510 m, 02.10.1985 : 1 ♂ 6.0 mm (MNHN-B 22738).
Loyalty Islands. MUSORSTOM 6 : stn DW 487, 21°23.3'S, 167°46.4'E, 500 m, 23.02.1989 : 1 ♀ 4.4 mm (MNHN-B 22741).
Norfolk Ridge. BATHUS 3 : stn CP 833, 23°03'S, 166°58'E, 442 m, 30.11.1993 : 1 ♂ 5.8 mm; 1 ♀ 6.5 mm (QM-W20585). — Stn CP 846, 23°03'S, 166°58'E, 500-514 m, 01.12.1993 : 2 ♂ 6.3, 6.7 mm; 4 ♀ 6.1, 6.4, 7.0, 7.9 mm (MNHN-B 22737).

REMARKS. — These specimens agree closely with the descriptions and figures of GARTH & KIM (1983) and NG & TAN (1985). The dorsal carapace is, in life, covered with a close tomentum that obscures the characteristic tuberculation, and makes the anterolateral teeth appear like broad blunt lobes. Only after careful cleaning does its identity become obvious.

DISTRIBUTION. — Philippines and Honshu Island, Japan (type series); New Caledonia; Norfolk Ridge; and Victoria, south-eastern Australia. Bathymetric range : 260-625 m.

Family XANTHIDAE MacLeay, 1838

Subfamily ACTAEINAE Alcock, 1898

Genus ***GAILLARDIELLUS*** Guinot, 1976

Gaillardiellus bathus sp. nov.

Figs 1, 15c

MATERIAL EXAMINED. — **New Caledonia**. SMIB 5 : stn DW 70, 23°40.6'S, 168°01.1'E, 270 m, 07.09.1989 : 1 ♀ 19.2 x 13.7 mm (MNHN-B 22772). — Stn DW 71, 23°41.3'S, 168°00.7'E, 265 m, 07.09.1989 : 1 ovig. ♀ 14.9 x

10.9 mm (USNM Unreg.). — Stn DW 75, 23°40.9'S, 168°00.8'E, 270 m, 07.09.1989 : 1 ♂ 18.7 x 14.3 mm (MNHN-B 22771).

BATHUS 3 : stn CP 806, 23°42'S, 168°01'E, 308-312 m, 27.11.1993 : 1 ♂ 13.8 x 10.3 mm (QM-W20581).

TYPE SPECIMENS. — The largest male (MNHN-B 22771) is the holotype, all other listed specimens are paratypes.

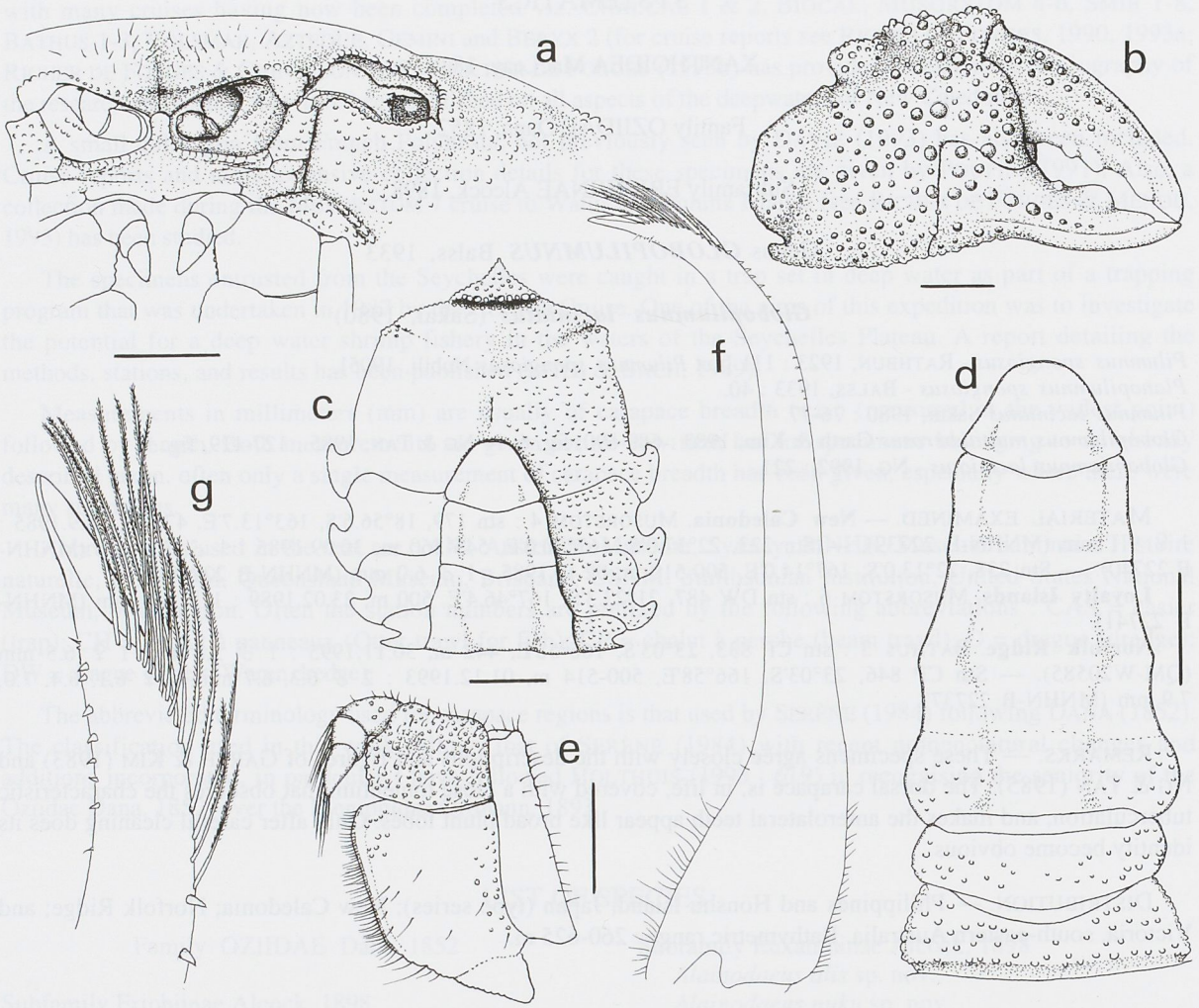


FIG. 1. — *Gaillardiellus bathus* sp. nov., holotype : **a,** frontal view; **b**, right chela; **c**, sternum; **d**, abdomen; **e**, third maxilliped; **f-g**, first gonopod and enlargement of tip. Scale line = 2 mm.

DESCRIPTION. — *Carapace*. Ovoid, *c.* 1.3-1.4 times broader than long; convex anteriorly, and moderately convex from side to side. Dorsal surface evenly covered in rounded granules except for smooth inter-regional furrows; minute, stiff, brown setae, about height of granules, over most of surface, less distinct in furrows; scattering of long, stiff, erect, brown setae. Regions distinct; separated by shallow furrows; 1F, 2F and 1M not distinctly separated from each other; 2M longitudinally divided, outer part longer and slightly wider; 3M entire, anterior projection narrow; 4M not distinct; 1P (cardiac) broad, well separated; 2P (intestinal) separated from cardiac by very broad smooth furrow; posterior margin not costate; postero-branchial regions mildly excavated.

Anterolateral margins regularly convex; consisting of 4 low, but distinct, evenly separated, granular lobes behind blunt exorbital angle. Front deflexed, *c.* 0.3 times carapace width; frontal margin granular; with broad, markedly projecting, median lobes; laterally concave; subacute lateral angles well separated from orbit. Upper orbital border evenly concave, median and lateral fissures closed, vestigial; lower orbital border concave medially, with large rounded inner lobe; narrow lateral fissure. Basal antennal segment touching front; granular; antennal flagellum short, reaching laterally to about proximal margin of cornea. Antennule with flagellum short, swollen, folding obliquely.

Third maxilliped. Length of merus *c.* 0.8 times width; *c.* 0.6 times length of ischium; surface finely granular, setiferous. Ischium rectangular, *c.* 1.2 times longer than wide; granular near interno-distal edge and along external lateral margin, otherwise smooth.

Chelipeds. Subequal, robust, moderately large; palm height *c.* 0.6 times length of palm including fixed finger. Merus short and broad; with posterior border coarsely granulate, bearing broad, blunt subdistal lobe, unarmed terminally. Carpus with inner angle not produced into a tooth, small granular prominence ventrally; upper surface of carpus covered with rounded granules; broad median longitudinal sulcus. Outer surface of palm coarsely granular; granules continuing in row over proximal half of fixed finger. Fixed finger with ventral submarginal groove; cutting margin with large rounded molar medially. Outer surface of palm covered, like carapace, in both short and long, stiff, simple setae. Inner surface of palm smooth behind gape, otherwise granular. Ventral border of chela concave at base of fixed finger. Dactylus with large granules proximally, diminishing distally. Fingers with tips cusp-like. Fingers dark-brown; colour extending only a little onto palm in females, but in large males colour of fixed finger rising up obliquely behind gape and extending backward for about one-third of length; similarly on inner face.

Walking legs. Relatively short, stout; first pair the longest. Merus of third leg *c.* 1.9 times longer than wide; carpus *c.* 1.5 times longer than wide; propodus *c.* 1.2 times longer than wide; dactylus longer than propodus. Dactyli curved, terminating in acute chitinous recurved tips. Superior margins and dorsal exposed faces of all segments coarsely granular, otherwise unarmed. Carpi with broad, smooth, sub-dorsal sulcus on upper surface. Setation as on carapace and chelipeds, but long setae more abundant.

Abdomen. Male abdomen relatively narrow; segments 3-5 fused. First segment about same width as third. Segments 3-5 sinuous, laterally angled at junction of segments 4/5. Segment six *c.* 1.7 times wider than long. Telson longer than sixth segment; *c.* 1.3 times wider than long; rounded. Female abdomen relatively narrow, not covering sternum. Females carrying large numbers of small eggs.

Gonopods. Male G1 long, curved, tapering; with long finely plumose setae on disto-dorsal margin (Fig. 1f-g).

Sternum. Relatively narrow, coarsely granular; telson reaching less than half length of fused sternites 3 and 4; suture between sternites 3/4 more-or-less distinct across whole width.

ETYMOLOGY. — Named in reference to the cruise on which one of the specimens was collected and also because this is the only species of *Gaillardiellus* known to live in the bathyal zone. It is used as a noun in apposition.

REMARKS. — This species is extremely similar to *Gaillardiellus rueppelli* (Krauss, 1843). It differs most obviously by the shape of the male abdomen with its short broad telson, and the sixth segment which is noticeably broader than long and not subquadrate as in *G. rueppelli*. Other differences are : the dorsal carapace areolation is lower and less strongly defined, with the grooves between the regions being shallower; the granulation is slightly finer; the transverse groove between sternites 3 and 4 is much less deeply marked; and the chelipeds have a strong bluntly rounded tooth medially on the cutting margin of the fixed finger. These differences apply equally to *G. orientalis* (Odhner, 1925), the other species close to *G. rueppelli*. Additionally *G. orientalis* has tufts of long, plumose setae symmetrically distributed on some regions, especially 2M and 1M.

The armature of the fixed finger of the chela of *G. bathus* is reminiscent of *Banareia*, and in fact there are strong superficial resemblances to *B. parvula* (Krauss, 1843), a very widespread Indo-West Pacific species that was long placed in the genus *Actaea*. GUINOT (1976) placed this species into *Banareia* with some reservations, but mainly because the shape of the male G1 is typical of *Banareia*, and the chelae are consistent with that genus. The G1 of *Gaillardiellus bathus* sp. nov. resembles those of *Gaillardiellus, Forestia*, and *Novactaea*, in being long, slender,

tapering towards a recurved tip, and with long setae subapically on the outer margin. The chelae of *Banareia* species have sharp cutting margins and the tips are pointed; in *Gaillardiellus* the margins are blunter and the fingers are more cusp-like.

Forestia abrolhensis (Montgomery, 1931), *Novactaea pulchella* (A. Milne Edwards, 1865) and *N. bella* Guinot, 1976, also look similar to *Gaillardiellus bathus* sp. nov., but they too can be separated using the differences in cheliped armature, male abdomen shape, and stronger carapace areolation. The sternal plate character that separates these three genera (see SERÈNE, 1984, figs 54, 55) is difficult to use with confidence, although NG & CLARK (1994) have found that larval characters appear to support the generic separation of at least *Novactaea* and *Gaillardiellus*.

DISTRIBUTION. — Only known from one sea-mount on the Norfolk Ridge, south of New Caledonia. Bathymetric range : 265-310 m.

Genus *MERACTEA* Serène, 1984

Meractaea multidentata sp. nov.

Figs 2, 15e, 18a

MATERIAL EXAMINED. — **New Caledonia**. CHALCAL 2 : stn DW 69, 24°43.7'S, 168°07.9'E, 260 m, 27.10.1986 : 1 ♀ 19.3 x 12.6 mm (MNHN-B 22759). — Stn DW 79, 23°40.5'S, 168°00.1'E, 243 m, 30.10.1986 : 1 ♂ 25.6 x 17.0 mm (MNHN-B 22760); 1 ovig. ♀ 14.1 x 9.4 mm (MNHN-B 22768). — Stn DW 80, 23°26.7'S, 168°01.8E, 160 m, 30.10.1986 : 1 ♂ 5.7 x 4.0 mm (MNHN-B 22769). — Stn DW 84, 23°23.8'S, 168°07.1'E, 170 m, 31.10.1986 : 1 ♂ 6.6 x 4.5 mm (MNHN-B 22770).

SMIB 4 : stn DW 43, 24°46.6'S, 168°08.8'E, 245 m, 08.03.1989 : 1 ♂ 8.8 x 5.8 mm (MNHN-B 22766). — Stn DW 53, 23°40.1'S, 167°59.9'E, 270 m, 09.03.1989 : 1 ♀ 20.1 x 14.0 mm (USNM Unreg.). — Stn DW 56, 23°20.6'S, 168°05.2'E, 260 m, 09.03.1989 : 1 ♂ 9.0 x 6.2 mm (MNHN-B 22763).

SMIB 5 : stn DW 70, 23°40.6'S, 168°01.1'E, 270 m, 07.09.1989 : 1 ♀ 14.5 x 9.6 mm, 1 damaged, sex undetermined 16.7 x 11.1 mm (MNHN-B 22762); 1 ♀ 13.0 x 8.9 mm (MNHN-B 22765). — Stn DW 71, 23°41.3'S, 168°00.7'E, 265 m, 07.09.1989 : ♀ 14.7 x 10.2 mm (MNHN-B 22761). — Stn DW 75, 23°40.9'S, 168°00.8'E, 270 m, 07.09.1989 : 1 ♂ 15.0 x 10.1 mm, 1 ♀ 14.7 x 10.1 mm (QM-W 20588). — Stn DW 77, 23°40.8'S, 168°01.1'E, 270 m, 07.09.1989 : 1 ♀ 18.8 x 12.6 mm (MNHN-B 22764). — Stn DW 79, 23°41.3'S, 168°01.1'E, 285 m, 7.09.1989 : 1 ♂ 20.3 x 13.6 mm (USNM Unreg.). — Stn DW 94, 22°19.6'S, 168°42.8'E, 275 m, 13.09.1989 : 1 ♂ 24.1 x 15.8 mm, 1 ♀ 16.3 x 10.7 mm (QM-W 20591).

SMIB 8 : stn DW 170, 23°40.5'S, 168°00.1'E, 243 m, 30.10.1986 : 1 ♀ 12.1 x 8.3 mm (MNHN-B 22767).

TYPE SPECIMENS. — The largest male (MNHN-B 22760) is the holotype; all other listed specimens are paratypes.

DESCRIPTION. — *Carapace*. Ovoid, *c.* 1.5 times broader than long (range 1.43-1.53); convex anteriorly, flat from side to side across postero-branchial regions. Regions all distinct and well separated by furrows, each region more-or-less sub-divided by large round tubercles of various sizes; 1F and 2F fused, rising abruptly from just behind frontal margin; 1M distinct; 2M longitudinally divided; 3M divided basally into three lobes, anterior lobe continuing as narrow anterior projection of 2-3 low blunt tubercles; 4M consisting of transverse row of 3 rounded tubercles, and fourth small one ventral to median tubercle; 1P divided longitudinally, with small rounded medial tubercles posteriorly; 2P with two strong transverse crests laterally projecting, the anterior one divided medially; postero-branchial regions with rounded tubercles. Anterolateral margins regularly convex; consisting of 4 evenly separated blunt teeth behind blunt exorbital tooth, each with two much smaller rounded tubercles in interspaces; minor tubercles placed on slightly ventral plane to main teeth, particularly anteriorly where first three minor tubercles form row in line with exorbital tooth but ventral to first major tooth; in smallest specimens (6-8 mm) minor tubercles almost non-existent. Front *c.* 0.3 times carapace width; frontal margin with narrow projecting medial and lateral lobes separated by broad convex margin; upper orbital border framed by 3-4 rounded lobes in

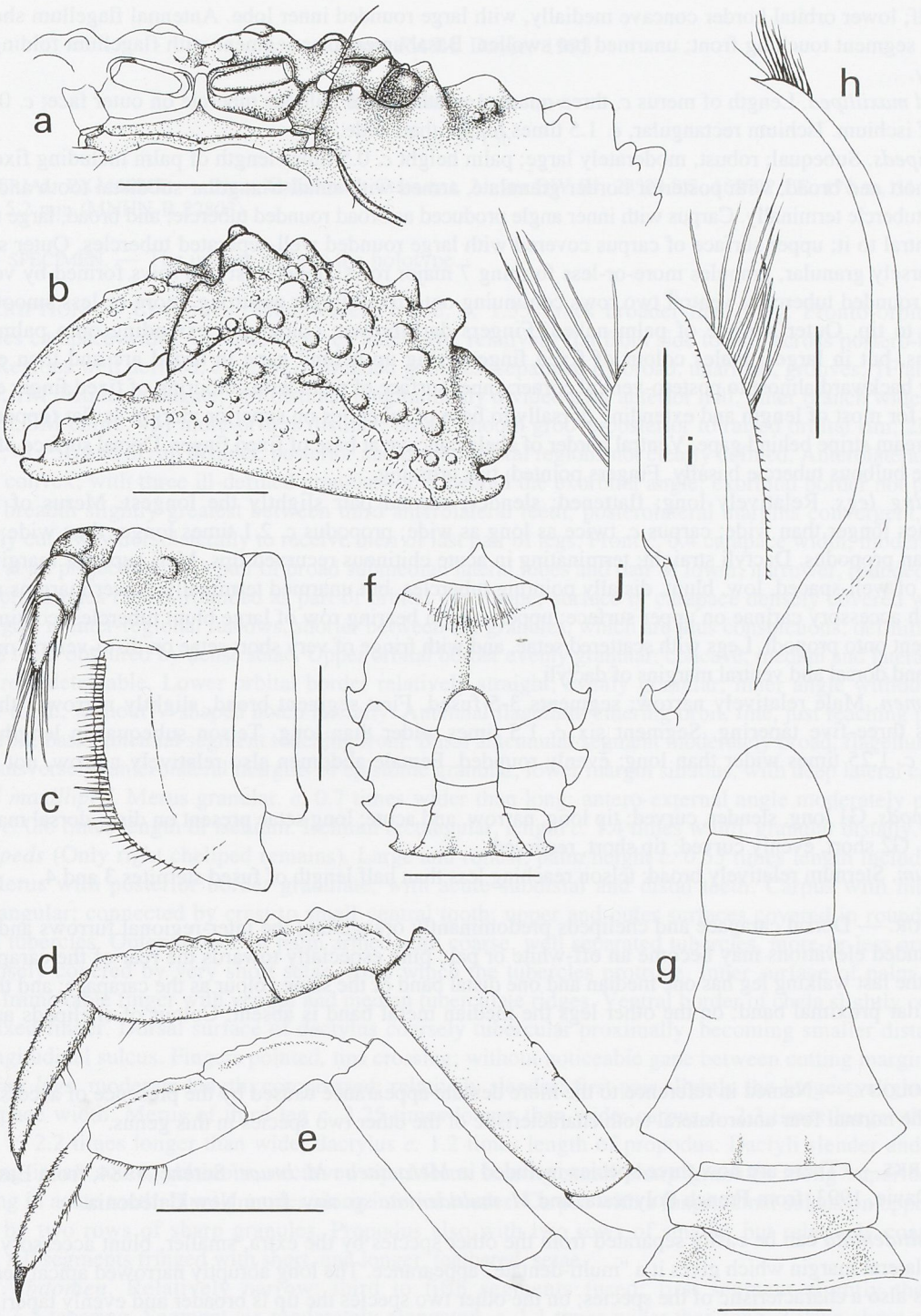


FIG. 2. — *Meractaea multidentata* sp. nov., a-e, h-j, holotype; f-g, paratype male : **a**, frontal view; **b**, left chela; **c**, third maxilliped; **d**, third walking leg; **e**, fourth walking leg; **f**, sternum; **g**, male abdomen; **h-i**, first gonopod and enlargement of tip; **j**, second male gonopod. Scale line a-b, d-f = 5 mm; c, g = 2 mm; h = 1 mm; i-j = 0.5 mm.

inner half; lower orbital border concave medially, with large rounded inner lobe. Antennal flagellum short. Basal antennal segment touching front; unarmed but swollen. Basal antennular segment with flagellum folding slightly obliquely.

Third maxilliped. Length of merus *c.* three-quarters width; single bulbous tubercle on outer face; *c.* 0.55 times length of ischium. Ischium rectangular, *c.* 1.5 times longer than wide.

Chelipeds. Subequal; robust, moderately large; palm height *c.* 0.5 times length of palm including fixed finger. Merus short and broad; with posterior border granulate, armed with small triangular subdistal tooth and rounded granular tubercle terminally. Carpus with inner angle produced as broad rounded tubercle; and broad, large triangular tooth ventral to it; upper surface of carpus covered with large rounded well-separated tubercles. Outer surface of palm coarsely granular, granules more-or-less forming 7 major rows; uppermost two rows formed by very large, swollen, rounded tubercles; ventral two rows continuing onto fixed finger as strong, more-or-less smooth ridges, reaching to tip. Outer surface of palm naked. Fingers dark-brown; colour not extending onto palm in most specimens, but in largest males colour of fixed finger rising up behind gape in broad arc and then extending obliquely backward almost to postero-ventral corner; inner surface of palm with colouring of fixed finger extending ventrally for most of length and extending dorsally to base of tubercles on superior margin as flat topped triangle leaving cream stripe behind gape. Ventral border of chela concave at base of fixed finger. Dorsal surface of dactylus with large bulbous tubercle basally. Fingers pointed; tips crossing.

Walking legs. Relatively long; flattened; slender; second pair slightly the longest. Merus of third leg *c.* 3.6 times longer than wide; carpus *c.* twice as long as wide; propodus *c.* 2.1 times longer than wide; dactylus longer than propodus. Dactyli straight; terminating in acute chitinous recurved tips. Meri superior margins armed with row of well-spaced, low, blunt, distally pointing tubercles, but unarmed terminally; lower margins unarmed. Carpi with accessory carinae on upper surface; upper margin bearing row of large blunt tubercles, continuing to a lesser extent onto propodi. Legs with scattered setae, and with fringe of very short setae on disto-ventral margins of propodi, and dorsal and ventral margins of dactyli.

Abdomen. Male relatively narrow; segments 3-5 fused. First segment broad, slightly narrower than third. Segments three-five tapering. Segment six *c.* 1.5 times wider than long. Telson subequal in length to sixth segment; *c.* 1.25 times wider than long; evenly rounded. Female abdomen also relatively narrow, not covering sternum.

Gonopods. G1 long, slender, curved; tip long, narrow, and acute; long setae present on disto-dorsal margin (see Fig. 2h-j). G2 short, evenly curved; tip short, recurved.

Sternum. Sternum relatively broad; telson reaching less than half length of fused sternites 3 and 4.

COLOUR. — Dorsal carapace and chelipeds predominantly orange/tan; the inter-regional furrows and the tops of the rounded elevations may become an off-white or pale pink especially towards the rear of the carapace. The merus of the last walking leg has one median and one distal band of the same colour as the carapace; and the carpus has a similar proximal band; on the other legs the median meral band is absent. Colour of chelipeds as already described.

ETYMOLOGY. — Named in reference to the more dentate appearance caused by the presence of accessory teeth between the normal four anterolateral teeth characteristic of the other two species in this genus.

REMARKS. — There are now three species included in *Meractaea* : *M. brucei* Serène, 1984, from East Africa; *M. tafai* Davie, 1993, from French Polynesia; and *M. multidentata* sp. nov. from New Caledonia.

M. multidentata can be easily separated from the other species by the extra, smaller, blunt accessory teeth on the anterolateral margin which gives it a "multi-dentate" appearance. The long abruptly narrowed apical beak on the male G1 is also a characteristic of the species; on the other two species the tip is broader and evenly tapering.

HABITAT. — Unrecorded.

DISTRIBUTION. — Found off New Caledonia, and south along the Norfolk Ridge. Bathymetric range : 160-285 m.

Genus *RATA* Davie, 1993

Rata chalcal sp. nov.

Figs 3, 15b

MATERIAL EXAMINED. — **New Caledonia**. CHALCAL 2 : stn DW 84, 23°23.8'S, 168°07.1'E, 170 m, 31.10.1986 : 1 ♂ 7.0 x 5.2 mm (MNHN-B 22803).

TYPE SPECIMEN. — The unique male is the holotype.

DESCRIPTION. — *Carapace*. Transversely ovoid, *c.* 1.35 times broader than long. Fronto-orbital width *c.* 0.7 times carapace width. Carapace convex anteriorly, relatively flat from side to side across postero-branchial regions. Regions well defined, covered in rounded granules; separated by broad, unarmed, grooves; 1F and 2F not separated; 1M distinct, elongate; 2M distinct, longitudinally divided over anterior half, outer branch wider than inner branch; 3M entire; 4M more-or-less distinct; broad smooth groove posterior to raised orbital rim; 2L and 3L confluent; 4L, 5L and 6L all distinct; posterior and posterolateral regions not clearly defined. Anterolateral margins regularly convex; with three ill-defined granular lobes behind the exorbital angle; exorbital border not produced; carapace breadth slightly greatest between third anterolateral teeth; posterolateral margins convergent, straight, moderately cut-away dorsolaterally to receive meri of last pair of legs. Front *c.* 0.4 carapace width; moderately sinuous; not at all projecting; with pair of broad submedian lateral lobes and pair of lower, narrower, rounded, median lobes; lateral angles raised, rounded as part of orbital rim. Upper surface of carapace densely covered with short setae, longest in inter-regional furrows, shorter between the granules, which are thus conspicuous; definition of anterolateral teeth obscured by dense setae. Upper orbital border evenly granular; concave; median and lateral fissures fused, barely detectable. Lower orbital border relatively straight; evenly granular; inner angle without marked triangular tooth; without V-shaped notch laterally. Antennal flagellum entering orbit, fine, just reaching past outer edge of orbit; basal antennal segment touching front. Basal antennular segment moderately broad, flagellum folding almost transversely; anterolateral margins of epistome granular, lower margin sinuous, with deep lateral clefts.

Third maxilliped. Merus granular, *c.* 0.7 times wider than long; antero-external angle moderately produced, rounded; *c.* 0.6 times length of ischium. Ischium rectangular, length *c.* 1.4 times width, granular distally.

Chelipeds (Only right cheliped remains). Large and robust; palm height *c.* 0.55 times length including fixed finger. Merus with posterior border granulate, with acute subdistal and distal teeth. Carpus with inner angle strongly angular; connected by crest to small ventral tooth; upper and outer surfaces covered in rounded, well-separated tubercles. Outer surface of palm armed with coarse, well separated tubercles, more-or-less arranged in rows; densely covered by very short setae, from which the tubercles protrude. Inner surface of palm minutely granular. Immovable finger with ventral and median tuberculate ridges. Ventral border of chela slightly concave at base of fixed finger. Dorsal surface of dactylus coarsely tubercular proximally, becoming smaller distally; subdorsal longitudinal sulcus. Fingers pointed, tips crossing; without noticeable gape between cutting margins.

Walking legs. moderate length; compressed; relatively slender; first pair slightly the longest; slightly longer than carapace width. Merus of third leg *c.* 3.25 times longer than wide; carpus *c.* 2.3 times longer than wide; propodus *c.* 2.2 times longer than wide; dactylus *c.* 1.2 times length of propodus. Dactyli slender and straight; terminating in an acute, chitinous, recurved tip. Merus bearing small sharp granules along superior border; terminating in acute tooth; blunt granules along inferior border. Carpus with a longitudinal sulcus on upper surface bordered by two rows of sharp granules. Propodus also with two rows of smaller but relatively coarse sharp tubercles. All segments fringed with short, and longer, feathered, setae.

Male abdomen. Relatively narrow; third to fifth segments fused; first segment slightly the widest. Segments 3-5 tapering. Segment six moderately elongated, *c.* 1.1 times wider than long. Telson about as long as wide; triangular, rounded apically.

Gonopods. G1 long, slender, curved; long setae on dorsal margin near tip; small, conical setae along dorsal margin over distal third, and on ventral margin near tip; tip hollowed so that gonopore subterminal; bluntly pointed (see Fig. 3h-i). G2 short, evenly curved; tip short, reflexed, pointed.

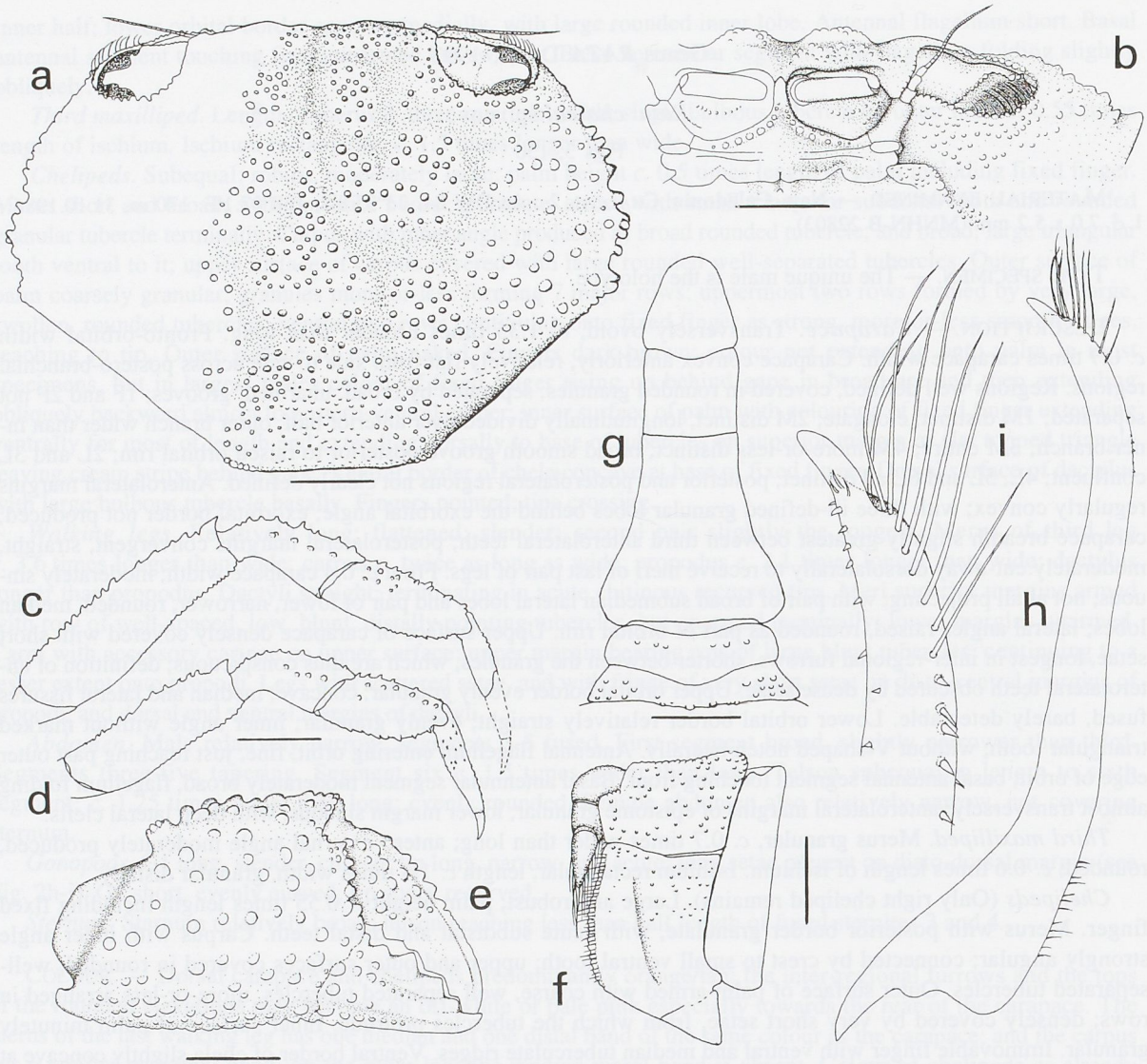


FIG. 3. — *Rata chalcal* sp. nov., holotype : **a**, dorsal carapace; **b**, frontal view; **c**, third walking leg; **d**, fourth walking leg; **e**, right chela; **f**, third maxilliped; **g**, male abdomen; **h-i**, first gonopod and enlargement of tip. Scale line a-e = 1mm; f-g = 0.5 mm.

ETYMOLOGY. — The name refers to the name of the cruise during which the holotype was collected; it is used as a noun in apposition.

REMARKS. — *Rata chalcal* sp. nov. differs from the only other member of the genus *R. tuamotense* Davie, 1993, by having the anterolateral teeth relatively poorly differentiated, and further obscured by dense, short setae; the dorsal carapace granulation is lower and less conspicuous; the lateral margins of segment 3 of the male abdomen are rounded, not angular; the antero-external angle of the third maxilliped is more broadly rounded; and the male G1 is slightly stouter.

DISTRIBUTION. — Only known from New Caledonia. Bathymetric range : 170 m.

Subfamily ANTROCARCININAE Ng & Chia, 1994

Genus *ANTROCARCINUS* Ng & Chia, 1994

Antrocarcinus petrosus Ng & Chia, 1994

Antrocarcinus petrosus Ng & Chia, 1994 : 707-714, figs 1-4, 10A.

MATERIAL EXAMINED. — **New Caledonia**. CHALCAL 2 : stn DW 79, 23°40.5'S, 168°00.1'E, 243 m, 30.10.1986 : 1 ♂ carapace damaged (MNHN-B 22792).

SMIB 4 : stn DW 49, 24°45.5'S, 168°08.5'E, 300 m, 8.03.1989 : 1 ♂ 16.1 x 12.0 mm (MNHN-B 22791). — Stn DW 50, 23°42.2'S, 168°00.8'E, 295 m, 9.03.1989 : 1 ♀ 9.2 x 6.8 mm (MNHN-B 22790). — Stn DW 51, 23°41.3'S, 168°00.6'E, 260 m, 9.03.1989 : 1 ♀ 13.3 x 9.9 mm (USNM).

SMIB 5 : stn DW 75, 23°40.9'S, 168°00.8'E, 270 m, 7.09.1989 : 2 ♂ 10.2 x 7.7, 11.5 x 8.8 mm, 1 ♀ 8.6 x 6.6 mm (QM-W 20589). — Stn DW76, 23°41.2'S, 168°00.5'E, 280 m, 7.09.1989 : 1 ♂ 10.3 x 7.8 mm, 1 ovig. ♀ 11.0 x 8.4 mm (USNM). — Stn DW 92, 22°19.9'S, 168°41.3'E, 280 m, 13.09.1989 : 1 ♂ 13.6 x 10.1 mm (QM-W 20590). — Stn DW 96, 23°00.0'S, 168°18.7'E, 245 m, 14.09.1989 : 1 ♀ 8.6 x 6.7 mm (MNHN-B 22788).

Loyalty Islands. MUSORSTOM 6 : stn DW 423, 20°25.85'S, 166°40.5'E, 280 m, 16.02.1989 : 1 ♂ 12.4 x 9.1 mm (MNHN-B 22789).

REMARKS. — *Antrocarcinus petrosus* was described from New Caledonia from depths of 235-244 m. The present large series of specimens agree well with the description and figures of NG & CHIA (1994). The largest specimen, a male, measured 16.1 mm c.b. which is slightly larger than the largest specimen in the type series (a female of 13.6 mm). The known range is extended slightly southwards and eastwards, and the depth range is increased.

DISTRIBUTION. — New Caledonia, Loyalty Islands, and the Norfolk Ridge. Bathymetric range : 235-300 m.

Subfamily EUXANTHINAE Alcock, 1898

Genus *ALAINODEUS* Davie, 1993

Alainodaeus Davie, 1993 : 515.

TYPE SPECIES. — *Alainodaeus akiaki* Davie, 1993, by original designation.

REMARKS. — DAVIE (1993) placed *Alainodaeus* closest to *Monodaeus* Guinot, 1967, and *Medaeops* Guinot, 1967. The male first gonopods of *Alainodaeus* are relatively unusual in form, although there is considerable variation in form amongst the euxanthine genera. The discovery of the two new species described in this paper has shown a significant degree of variation in the G1 within *Alainodaeus*, and it seems that it is possible that affinities outside the Euxanthinae as it is presently defined may be possible. *Alainodaeus nuku* sp. nov. looks very much like species now placed into *Nanocassiope* Guinot, 1967; and this suggests the two genera may be close. *Nanocassiope* however has a very characteristic male G1 that has the tip strongly recurved, and several strong, reflexed bristles subapically. Similarly the overall appearance and carapace shape are strongly reminiscent of panopeid genera such as *Micropanope* Stimpson, 1871, *Gonopanope* Guinot, 1967, and *Coralliope* Guinot, 1967, however this family has been precluded from containing possible relatives of *Alainodaeus* because its members typically have a characteristic male G1 with a highly flanged and twisted apex. *Micropanope* however has a relatively simpler G1, not so unlike that of *Alainodaeus*. More comparative work is needed to clarify the systematic position of *Alainodaeus*.

Key to the species of *Alainodaeus*

1. First anterolateral tooth clearly marked; inner face of palm of cheliped with a median and ventral row of spinules ..... *A. akiaki* Davie, 1993
— First anterolateral tooth almost obsolete, represented at most by a few raised granules; inner face of palm of cheliped without a median and ventral row of spinules **2**

2. Outer face of palm of major cheliped entirely granular, although granules larger dorsally; suture between abdominal segments 3 and 4 strongly marked across entire width; male G1 with extremely produced medial flange on inner face, tip fluted ..... *A. alis* sp. nov.
— Outer face of palm of major cheliped only granular dorsally, becoming smooth over ventral half; suture between abdominal segments 3 and 4 not strongly marked; male G1 with moderate medial flange on inner face, tip with slender tongue **3**

3. Palm of major cheliped without a row of spines on the inner superior margin, at most only granules; inner angle of the carpus with only a single broad tooth..... ..... *A. nuku* sp. nov.
— Palm of major cheliped armed with a row of spines on the inner superior margin; inner angle of the carpus with a spinous tooth, and also a conspicuous ventral spine .... *A. rimatara* Davie, 1993

Alainodaeus alis sp. nov.

Fig. 4

MATERIAL EXAMINED. — **New Caledonia**. CHALCAL 2 : stn DW 73, 24°39.9'S, 168°38.1'E, 573 m, 29.10.1986 : 1 ♂ 8.1 x 5.9 mm (MNHN-B 22809).

Wallis Island. MUSORSTOM 7 : stn DW 582, 13°10'S, 176°14'W, dredged, 360 m, 22.05.1992 : 1 ♂ 5.7 x 4.3 mm, 1 ♀ 7.8 x 5.5 mm (MNHN-B 22810).

TYPE SPECIMENS. — The largest ♂ (MNHN-B 22809) is the holotype, the other specimens are paratypes.

DESCRIPTION. — *Carapace*. Transversely ovoid, *c.* 1.33-1.42 (1.37 in holotype) times broader than long; granular over most of surface, coarser and sharper anteriorly; without conspicuous setae; convex anteriorly, slightly convex from side to side across postero-branchial regions. Regions clearly indicated, separated by smooth grooves; 1F separated from 2F by granular transverse ridge; 1M marked anteriorly by oblique row of coarse granules; 2M broad, more-or-less entire; 3M clearly defined; 4M more-or-less separated; lateral branchial regions indistinct; 1P and 2P clearly separated laterally. Anterolateral border of carapace divided into four granular teeth or lobes; exorbital angle not produced; first tooth merely indicated by a few raised granules; second tooth with long posterior margin; third tooth slightly more prominent, more evenly triangular; fourth tooth much smaller than third, placed just behind third on posterolateral margin. Greatest carapace width across third teeth. Posterolateral borders markedly convergent, straight or slightly convex, longer than anterolateral. Posterior border costate. Front divided into two broad convex lobes by distinct V-shaped median notch; laterally clearly separated from supra-orbital angles. Supra-orbital border granular; median and lateral fissures obvious, with posterior grooves. Infra-orbital border minutely granular, with broad, relatively low, triangular tooth at inner end, just visible dorsally; narrow V-shaped notch below exorbital angle. Eyestalk coarsely granular, tallest granules distally. Basal antennal segment relatively long, in contact with ventral prolongation of front; flagellum fine, reaching to about level of first anterolateral tooth. Basal segment of antennule with ridges on superior and lateral margins, flagellum folding nearly transversely.

Third maxilliped. Merus *c.* 0.5 times length of ischium, wider than long, anteroexternal angle slightly produced, rounded, surface granular; ischium *c.* 1.4 times longer than wide.

Chelipeds. Noticeably unequal, right largest and stoutest. Merus of right cheliped granular on outer face, upper border with row of prominent, well-spaced, spinous granules, without subterminal or terminal teeth. Carpus

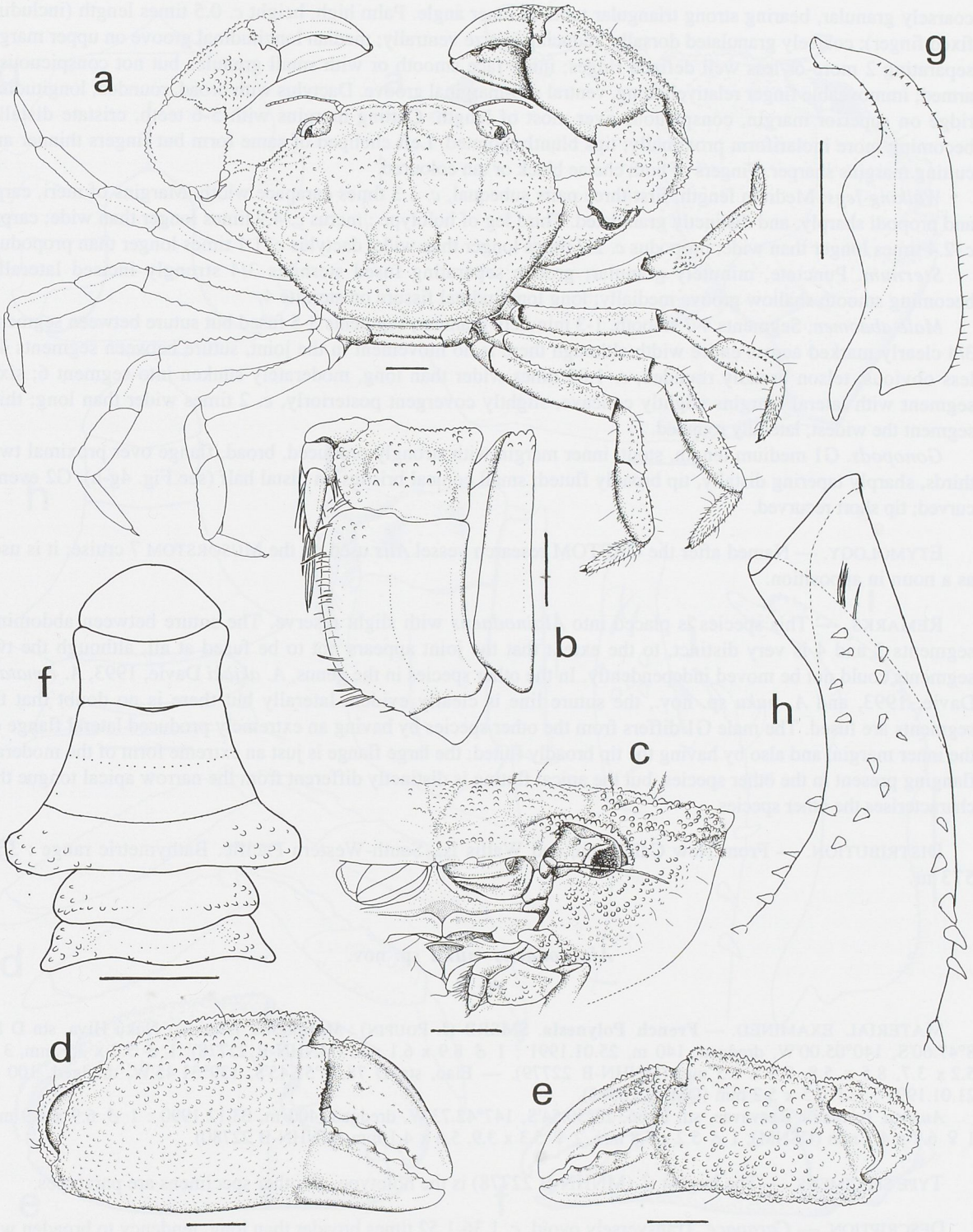


FIG. 4. — *Alainodaeus alis* sp. nov., holotype : **a**, dorsal view; **b**, third maxilliped; **c**, frontal view; **d**, right chela; **e**, left chela; **f**, abdomen; **g-h**, first gonopod and enlargement of tip. Scale line a, c-f = 1 mm; b, g = 0.5 mm.

coarsely granular, bearing strong triangular tooth at inner angle. Palm high, height *c.* 0.5 times length (including fixed finger); coarsely granulated dorsally, reducing in size ventrally; median longitudinal groove on upper margin separating 2 more-or-less well defined ridges; inner face smooth or with small granules but not conspicuously armed; immoveable finger relatively long, ventral sub-marginal groove. Dactylus with broad, rounded, longitudinal ridge on superior margin, conspicuous over most of length. Cutting margins with 5-6 teeth, cristate distally, becoming more molariform proximally; tips bluntly pointed. Left cheliped of same form but fingers thinner and cutting margins sharper. Fingers of both chelae black or tan coloured.

Walking legs. Medium length, first three pairs subequal, *c.* 1.3 times carapace width. Margins of meri, carpi, and propodi sharply, and distinctly granulated. Third leg of holotype : merus *c.* 4.9 times longer than wide; carpus *c.* 2.4 times longer than wide; propodus *c.* 2.7 times longer than wide; dactylus *c.* 1.1 times longer than propodus.

Sternum. Punctate, minutely granular; groove separating fused sternites 3/4 strongly incised laterally, becoming smooth shallow groove medially; long longitudinal fissure on sternite 4.

Male abdomen. Segments 4-7 smooth, 1-3 minutely granular; segments 3-5 fused but suture between segments 3/4 clearly marked across entire width although there is no movement in the joint, suture between segments 4/5 less obvious; telson broadly rounded, *c.* 1.85 times wider than long, moderately sunken into segment 6; sixth segment with lateral margins slightly concave, slightly covergent posteriorly, *c.* 2 times wider than long; third segment the widest, laterally rounded.

Gonopods. G1 medium length, stout, inner margin with strongly produced, broad, flange over proximal two-thirds, sharply tapering distally, tip broadly fluted; small conical bristles on distal half (see Fig. 4g-h). G2 evenly curved; tip short recurved.

ETYMOLOGY. — Named after the ORSTOM research vessel *Alis* used on the MUSORSTOM 7 cruise; it is used as a noun in apposition.

REMARKS. — This species is placed into *Alainodaeus* with slight reserve. The suture between abdominal segments 3 and 4 is very distinct, to the extent that the joint appears not to be fused at all, although the two segments could not be moved independently. In the other species in the genus, *A. akiaki* Davie, 1993, *A. rimatara* Davie, 1993, and *A. nuku* sp. nov., the suture line is clearly evident laterally but there is no doubt that the segments are fused. The male G1 differs from the other species by having an extremely produced lateral flange on the inner margin, and also by having the tip broadly fluted; the large flange is just an extreme form of the moderate flanging present in the other species, but the apical fluting is distinctly different from the narrow apical tongue that characterises the other species.

DISTRIBUTION. — From New Caledonia, and Wallis Is., South-Western Pacific. Bathymetric range : 360-573 m.

Alainodaeus nuku sp. nov.

Fig. 5

MATERIAL EXAMINED. — **French Polynesia**. SMSRB (J. POUPIN) : *Marquesas Islands* : Nuku Hiva, stn D 83, 8°47.60'S, 140°05.00'W, dredged, 140 m, 25.01.1991 : 1 ♂ 8.9 x 6.1 mm (MNHN-B 22778); 1 ♂ 5.2 x 3.7 mm, 3 ♀ 5.2 x 3.7, 8.5 x 5.8, 9.9 x 6.5 mm (MNHN-B 22779). — Eiao, stn D 78, 7°57.45'S, 139°31.45'W, dredged, 100 m, 21.01.1991 : 1 ♂ 7.5 x 5.2 mm (QM-W 20583).

Austral Islands : Raevavae, stn D 66, 23°50.54'S, 147°42.73'W, dredged, 400 m, 03.12.1990 : 1 ♂ 6.9 x 4.9 mm, 1 ♀ 6.7 x 4.7 mm (USNM); 1 ♂ 5.2 x 3.8 mm, 2 ♀ 5.3 x 3.9, 5.6 x 4.1 mm (MNHN-B 22780).

TYPE SPECIMENS. — The largest ♂ (MNHN-B 22778) is the holotype, all other specimens are paratypes.

DESCRIPTION. — *Carapace*. Transversely ovoid, *c.* 1.36-1.52 times broader than long, tendency to broaden with increasing size; granular over most of surface, less conspicuous on mesogastric and cardiac regions; without setae; convex anteriorly, slightly convex from side to side across postero-branchial regions. Regions clearly indicated, separated by smooth grooves; 1F and 2F confluent swollen, coarsely granular; 1M marked anteriorly by row of

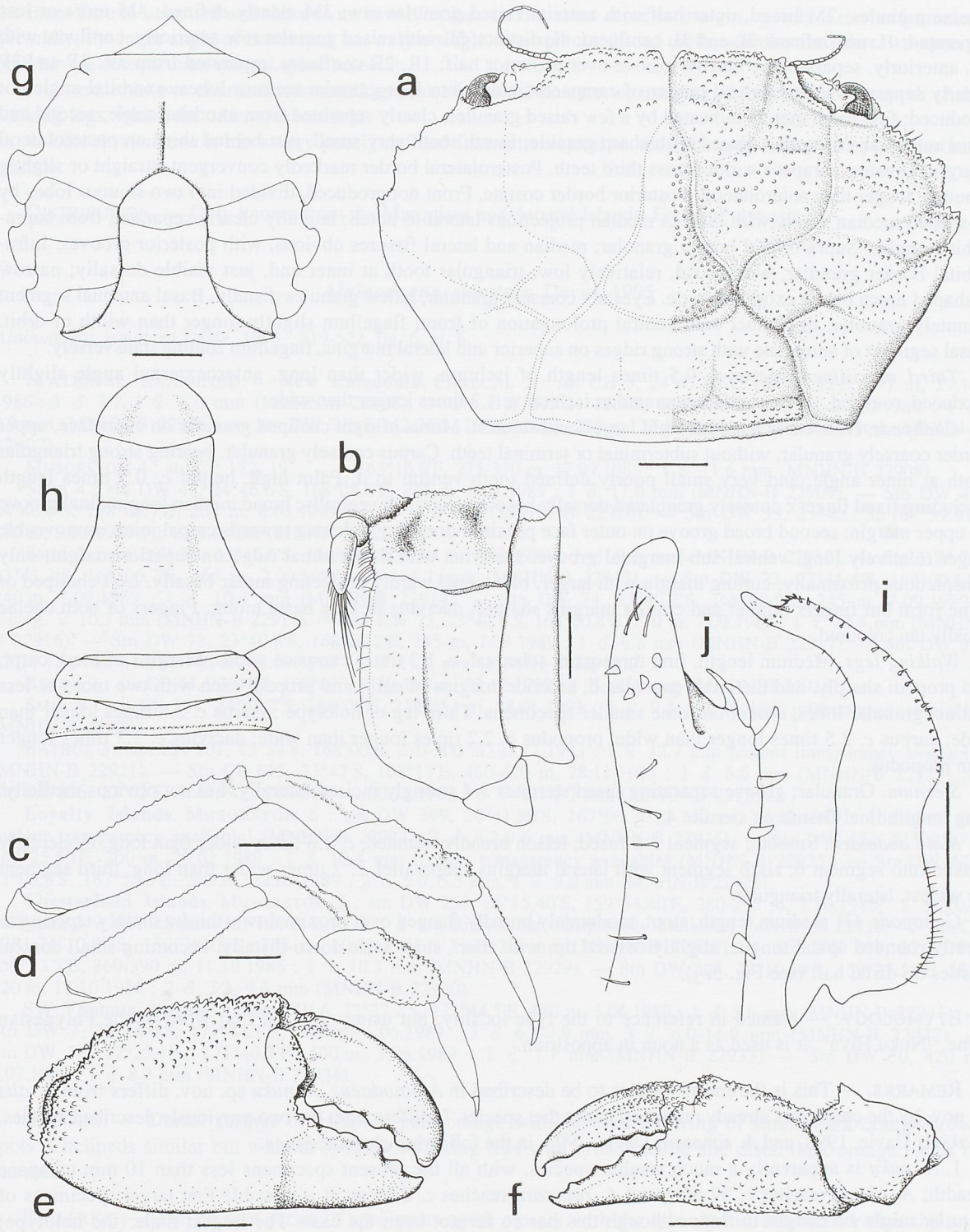


FIG. 5. — *Alainodaeus nuku* sp. nov., holotype : **a**, dorsal carapace; **b**, third maxilliped; **c**, third walking leg; **d**, fourth walking leg; **e**, right chela; **f**, left chela; **g**, sternum; **h**, abdomen; **i-j**, first gonopod and enlargement of tip. Scale line a, c-h = 1 mm; b, i = 0.5 mm.

coarse granules; 2M broad, outer half with anterior raised granular row; 3M clearly defined; 4M more-or-less separated; 1L not defined; 2L and 3L confluent; 4L distinct; 5L with raised granular row anteriorly, confluent with 6L anteriorly, separated by narrow groove over posterior half; 1R, 2R confluent, separated from 3R; 1P and 2P clearly separated. Anterolateral border of carapace divided into four granular teeth or lobes; exorbital angle not produced; first tooth merely indicated by a few raised granules, clearly separated from exorbital angle; second and third subequal, triangular, tipped with sharp granule; fourth tooth very small, just behind third on posterolateral margin. Greatest carapace width across third teeth. Posterolateral border markedly convergent, straight or slightly sinuous, longer than anterolateral. Posterior border costate. Front not produced, divided into two sinuous lobes by U-shaped median notch, with distinct median projections lateral to notch; laterally clearly separated from supra-orbital angles. Supra-orbital border granular; median and lateral fissures obvious, with posterior grooves. Infra-orbital border granular, with broad, relatively low, triangular tooth at inner end, just visible dorsally; narrow v-shaped notch below exorbital angle. Eyestalk coarsely granular, tallest granules distally. Basal antennal segment minutely granular, in contact with ventral prolongation of front; flagellum slightly longer than width of orbit. Basal segment of antennule with strong ridges on superior and lateral margins, flagellum folding transversely.

Third maxilliped. Merus *c.* 0.5 times length of ischium, wider than long, anteroexternal angle slightly produced, rounded, surface minutely granular; ischium *c.* 1.3 times longer than wide.

Chelipeds. Noticeably unequal, right largest and stoutest. Merus of right cheliped granular on outer face, upper border coarsely granular, without subterminal or terminal teeth. Carpus coarsely granular, bearing strong triangular tooth at inner angle, and very small poorly defined tooth ventral to it. Palm high, height *c.* 0.5 times length (including fixed finger); coarsely granulated dorsally becoming smooth ventrally; broad median longitudinal groove on upper margin; second broad groove on outer face proximo-dorsally, widening towards carpal joint; immoveable finger relatively long, ventral sub-marginal groove. Dactylus with longitudinal ridge on superior margin, only conspicuous proximally; cutting margin with larger, blunt, backwardly projecting molar basally. Left cheliped of same form but fingers thinner and cutting margins sharper; dactylus lacking basal molar. Fingers of both chelae usually tan coloured.

Walking legs. Medium length, first three pairs subequal, *c.* 1.3 times carapace width. Margins of meri, carpi, and propodi sharply, and distinctly granulated; anterior margins of carpi and propodi each with two more-or-less distinct granular lobes, absent on some smaller specimens. Third leg of holotype : merus *c.* 3.8 times longer than wide; carpus *c.* 2.5 times longer than wide; propodus *c.* 2.2 times longer than wide; dactylus *c.* 1.3 times longer than propodus.

Sternum. Granular; groove separating fused sternites 3/4 strongly incised laterally, but not obvious medially; long longitudinal fissure on sternite 4.

Male abdomen. Smooth; segment 3-5 fused; telson broadly rounded, *c.* 1.6 times wider than long, moderately sunken into segment 6; sixth segment with lateral margins subparallel, *c.* 2 times wider than long; third segment the widest, laterally triangular.

Gonopods. G1 medium length, stout, moderately broadly flanged over proximal two-thirds, sharply tapering to bluntly rounded apical tongue, slightly twisted tip; with short, stout setae dorso-distally, becoming small conical bristles on distal half (see Fig. 5i-j).

ETYMOLOGY. — Named in reference to the type locality, but using only the first word of the Polynesian name, "Nuku Hiva". It is used as a noun in apposition.

REMARKS. — This is the fourth species to be described in *Alainodaeus*. *A. nuku* sp. nov. differs from *A. alis* sp. nov. by the characters already remarked under that species. It differs from the two previously described species, *A. akiaki* Davie, 1993, and *A. rimatara* Davie, 1993, in the following characteristics.

1. *A. nuku* is apparently a much smaller species, with all the present specimens less than 10 mm carapace breadth; *A. akiaki* reaches *c.* 37 mm; and *A. rimatara* reaches *c.* 23 mm. It is possible that larger specimens of *A. nuku* might be caught in traps although this has so far not been the case. The largest male (the holotype) seems to have the right chela very robust and swollen which would seem characteristic of a fully mature crab.

2. *A. nuku* is most similar to *A. rimatara* in the armature of the major cheliped. Like that species the chela has granulation only over the outer dorsal surface, which becomes smooth ventrally. Unlike *A. rimatara* and *A. akiaki*

the inner face is unarmed and there is no row of spines on the inner superior margin, merely a row of granules. Secondly, the inner angle of the carpus has only a single, less spinous, broad tooth, whereas the other two species both have a conspicuous ventral spine below it.

3. *A. nuku* has two characteristic small, granular lobes on the anterior margins of the carpi and propodi of the walking legs, which the other species lack.

4. Like *A. rimatara* it has a very poorly defined first anterolateral tooth, often only indicated by a prominent granule.

DISTRIBUTION. — Only known from the Marquises and Austral Islands, French Polynesia.

Alainodaeus rimatara Davie, 1993

Alainodaeus rimatara Davie, 1993 : 519-522, fig. 6, pl. 6.

MATERIAL EXAMINED. — **New Caledonia**. CHALCAL 2 : stn CH 3, 24°47.88'S, 168°09.32'E, 257 m, 27.10.1986 : 1 ♂ 7.7, 1 ♀ 8.0 mm (MNHN-B 22905). — Stn DW 69, 24°43.7'S, 168°07.9'E, 260 m, 27.10.1986 : 1 ♂ 8.9 mm (MNHN-B 22906). — Stn DW 71, 24°42.26'S, 168°09.52'E, 230 m, 27.10.1986 : 5 ♂ 6.0-7.1 mm (MNHN-B 22907).

MUSORSTOM 4 : stn CP 172, 19°[illegible]2'S, 163°16.0'E, 275-330 m, 17.09.1985 : 1 ♂ 11.6 mm (MNHN-B 22908).

SMIB 4 : stn DW 43, 24°46.6'S, 168°08.8'E, 245 m, 8.03.1989 : 1 ♂ 11.0 mm (MNHN-B 22909). — Stn DW 45, 24°46.0'S, 168°08.7'E, 260 m, 8.03.1989 : 1 ♂ 11.6 mm (MNHN-B 22910). — Stn DW 53, 23°40.1'S, 167°59.9'E, 270 m, 9.03.1989 : 1 ♂ 8.4 mm (MNHN-B 22911).

SMIB 5 : stn DW 70, 23°40.6'S, 168°01.1'E, 270 m, 7.09.1989 : 1 ♂ 9.1 mm (MNHN-B 22912). — Stn DW 71, 23°41.3'S, 168°00.7'E, 265 m, 7.09.1989 : 1 ♂ 6.1 mm (MNHN-B 22913). — Stn DW 73, 23°41.4'S, 168°00.6'E, 240 m, 7.09.1989 : 1 ♂ 10.4 mm (MNHN-B 22914). — Stn DW 74, 23°40.2'S, 168°00.9'E, 245 m, 7.09.1989 : 1 ovig. ♀ 10.3 mm (MNHN-B 22915). — Stn DW 75, 23°40.9'S, 168°00.8'E, 270 m, 7.09.1989 : 1 ♀ 10.4 mm (MNHN-B 22916). — Stn DW 78, 23°40.8'S, 168°00.2'E, 245 m, 7.09.1989 : 1 ♂ 6.8 mm (MNHN-B 22917). — Stn DW 90, 22°19.1'S, 168°41.6'E, 340 m, 13.09.1989 : 1 ♂ 11.1 mm (MNHN-B 22918).

BERYX 2 : stn CP 44, 23°41'S, 168°01'E, 230-250 m, 20.10.1992 : 1 ♂ 10.0 mm (MNHN-B 22919).

SMIB 8 : stn CP 161, 24°46.7'S, 168°09'E, 232-251 m, 28.01.1993 : 1 ♀ 9.5 mm [colour transparency available] (MNHN-B 22920).

BATHUS 3 : stn CH 801, 23°39'S, 168°00'E, 270-300 m, 27.11.1993 : 1 ♀ 12.7 mm [colour transparency available] (MNHN-B 22921). — Stn CP 815, 23°47'S, 168°17'E, 460-470 m, 28.11.1993 : 1 ♂ 6.6 mm (MNHN-B 22922). — Stn DW836, 23°02'S, 166°59'E, 295-306 m, 30.11.1993 : 3 ♀ 6.1-6.7 mm (MNHN-B 22923).

Loyalty Islands. MUSORSTOM 6 : stn DW 399, 20°41.80'S, 167°00.20'E, 282 m, 14.02.1989 : 1 ♂ 13.4 mm [colour transparency available] (MNHN-B 22924); 3 ♂ 9.2-9.6 mm (MNHN-B 22935). — Stn DW 452, 21°00.30'S, 167°25.50'E, 300 m, 20.02.1989 : 1 ♂ 10.4 mm [colour transparency available] (MNHN-B 22925). — Stn DW 474, 21°08.8'S, 167°55.5'E, 260 m, 22.02.1989 : 2 ♂ 5.0, 5.5 mm, 1 ♀ 9.0 mm (MNHN-B 22926).

Chesterfield Islands. MUSORSTOM 5 : stn DW 255, 25°15.40'S, 159°54.80'E, 280-295 m, 7.10.1986 : 2 ♂ 10.6, 10.8 mm, 2 ♀ 4.9, 7.8 mm (MNHN-B 22927); 1 ♂ 6.7 mm [colour transparency available] (MNHN-B 22936). — Stn CP 278, 24°10.80'S, 159°38.10'E, 265 m, 10.10.1986 : 1 ♂ 7.4 mm (MNHN-B 22928). — Stn DW 299, 22°47.7'S, 159°23.7'E, 360-390 m, 11.10.1986 : 1 ♀ 10.3 mm (MNHN-B 22929). — Stn DW 304, 22°10.34'S, 159°25.51'E, 385-420 m, 12.10.1986 : 2 ♂ 7.3, 9.6 mm (MNHN-B 22930).

SW Vanuatu. VOLSMAR : stn DW 6, 22°27.2'S, 171°44.5'E, 480 m, 1.06.1989 : 1 ♂ 5.6 mm (MNHN-B 22931). — Stn DW 7, 22°26.0'S, 171°44.1'E, 400 m, 1.06.1989 : 3 ♂ 6.3-7.9 mm, 3 ♀ 6.0-11.9 mm (MNHN-B 22932). — Stn DW 16, 22°25.1'S, 171°40.7'E, 500 m, 3.06.1989 : 1 ♂ 7.7 mm (MNHN-B 22933). — Stn DW 50, 420 m, 4.07.1989 : 1 ♂ 8.3 mm (MNHN-B 22934).

COLOUR. — Dorsal surface of carapace pale orange with an even covering of small, dark-orange/brown spots. Chelipeds similar but without spotting. Walking legs with broad medial and distal dark-orange bands on the meri.

REMARKS. — The present series of specimens agree closely with the types. Most are smaller than the type series but this is attributed to the fact that the original specimens were caught by trap, and this technique would have been selective for only larger individuals. *Alainodaeus rimatara* is the most common deepwater xanthid represented in the collections from the New Caledonian region. Its congenor *A. alis* sp. nov. also occurs in

New Caledonia but is apparently rare. These records mark a significant westwards range extension for this recently described species.

DISTRIBUTION. — Southwestern Pacific : from Tuamotu Archipelago (type locality), and the Austral Islands, French Polynesia; and now westwards to New Caledonia, Loyalty Islands and the Norfolk Ridge. Bathymetric range : 90-500 m.

Genus *PALATIGUM* nov.

TYPE SPECIES. — *Palatigum trichostoma* sp. nov., here designated.

ETYMOLOGY. — Formed from the Greek *palatum* meaning the roof of the mouth, followed by a neuter form of a suffix *gum*, formed from *magnus* meaning large. The name refers to the large, projecting lower border of the epistome, an important character in separating this genus from its nearest allies. Gender is neuter.

DIAGNOSIS. — Carapace transversely ovoid; regions well defined, 1M and 2M confluent, 2M completely divided longitudinally, 4M separated from 3M, 2P with transverse, laterally angular, crest; posterior margin costate. Anterolateral margins with four, pointed, primary teeth behind the exorbital angle, with or without ancillary teeth. Anterior to first tooth is oblique granular row continuing towards anterolateral corner of buccal frame; greatest carapace width across third teeth. Antennal flagellum small, entering orbit. Basal antennal touching front. Basal antennular segment with palp folding slightly obliquely. Lower margin of epistome strongly projecting as thin rim; lateral margins strongly receding from centre, before meeting very large, broad, triangular lateral teeth. Third maxilliped, including exopod, completely and thickly covered in "fur" of feathered setae. Chelipeds unequal, robust, right cheliped the larger; minor cheliped of similar form but more slender; base of cutting margin of dactylus of larger chela with large, blunt, backwardly projecting molar. Walking legs of medium length.

Female abdomen relatively narrow, not covering entire sternum. Sternum with suture between segments 3/4 deeply incised laterally, continuing as deep transverse groove across entire width.

REMARKS. — *Palatigum* gen. nov. belongs in the Euxanthinae Alcock (*sensu* SERÈNE, 1984) because the anterolateral margin does not simply meet the exorbital angle but continues below the orbit across the sub-hepatic region towards the buccal frame. The lack of sub-hepatic cavities, the relatively long posterolateral borders that are not strongly hollowed out to receive the walking legs, and the strong carapace areolation with 4M clearly demarcated, together place *Palatigum* closest to *Medaeus* Dana, 1851, and the Atlantic and eastern Pacific genus, *Edwardsium* Guinot, 1967. Indeed, superficially *Palatigum trichostoma* sp. nov. looks most like *Edwardsium lobipes* Rathbun, 1898, and *E. crosslandi* Finnegan, 1931, both described from the Galapagos. Table 1 gives the most conspicuous differences separating *Palatigum* from these two genera.

	Medaeus and *Edwardsium*	*Palatigum*
1. Lower border of epistome	not strongly projecting, sloping down	strongly projecting, directed forwards
2. 1M and 2M fused	No	Yes
3. 2M divided	indistinctly	strongly
4. Third maxilliped	without unusual setal covering	completely and thickly covered in "fur" of feathered setae
5. Strongly differentiated basal tooth on major chela	No	Yes

TABLE 1. — Differences between *Palatigum* gen. nov. and *Medaeus* and *Edwardsium*.

The lower border of the epistome is quite different from *Medaeus* and *Edwardsium* not only by projecting forward so strongly, but also by having the lateral lobes unusually wide, and separated from the medial margin by a broad deep V.

The setation of the third maxilliped is a most remarkable feature of the type species, *Palatigum trichostoma* sp. nov. It is particularly unusual because this crab otherwise has relatively few setae, apart from patches distally on the propodi, and on the dactli of the walking legs. I believe that because this character is so unusual in the family, that it is of generic significance, but this will need to be assessed in the light of future species that may be assigned to this genus.

The strongly differentiated basal tooth on the dactylus of the major chela is a common character in several other euxanthine genera such as *Alainodaeus* Davie, 1993, *Cranaothus* Ng, 1993, *Paramedaeus* Guinot, 1967, *Paraxanthodes* Guinot, 1967, *Medaeops* Guinot, 1967, *Miersiella* Guinot, 1967, and *Monodaeus* Guinot, 1967. This character has not been mentioned before as having potential phylogenetic importance, but NG (1993) noted its presence in both *Cranaothus deforgesi* Ng, 1993, and *Paramedaeus noelensis* (Ward, 1934), and suggested that, as in *Calappa*, it may be used to "peel" open gastropods.

Palatigum trichostoma sp. nov.

Figs 6, 16a-b, e, 18c

MATERIAL EXAMINED. — **New Caledonia**. CHALCAL 2 : stn DW 79, 23°40.5'S, 168°00.1'E, 243 m, 30.10.1986 : 1 ♀ 13.8 x 9.8 mm (MNHN-B 22801).

SMIB 8 : stn DW 173, 23°40.5'S, 168°00.5'E, 234-242 m, 29.01.1993 : 1 ♀ 12.9 x 9.0 mm (MNHN-B 22802).

TYPE SPECIMENS. — The largest female (MNHN-B 22801) is the holotype, the other female a paratype.

DESCRIPTION. — *Carapace*. Transversely ovoid; *c.* 1.41-1.43 times broader than long. Carapace convex longitudinally over anterior third, more-or-less flat from side to side. Regions well defined, elevated, separated by strong furrows; 1F and 2F fused, slightly elevated; 1M and 2M confluent; 2M completely and deeply divided longitudinally; 3M slightly bilobed posteriorly; 4M elevated and separated from 3M; all anterolateral regions defined, 2L partially divided; posterolateral regions tubercular; 1P relatively distinct; 2P with transverse crest, strongly raised and angular laterally, barely distinguishable medially; posterior margin costate, with broad, minutely granular rim; posterolateral margins straight. Anterolateral margins regularly convex; with four, pointed, primary teeth behind the exorbital angle, rounded ancillary teeth on anterior and posterior slopes of second and third primary teeth; first tooth the smallest, well separated from orbit by broad granular lobe; anterior to first tooth is an irregular oblique granular row continuing on towards anterolateral corner of buccal frame; greatest carapace width across third teeth. Front *c.* 0.36 times carapace width; moderately projecting, minutely granular; narrow medial projections, and slightly broader, rounded submedian projections; laterally concave, with prominent blunt lateral projections; pre-orbital tooth bluntly pointed. Carapace surface tuberculate and granular except in smooth furrows separating regions; without setae. Upper orbital border concave, pair of shallow smooth furrows mark coalesced median and lateral fissures. Lower orbital border inner angle formed by triangular, minutely granular, bluntly pointed tooth; laterally with similar bluntly pointed, triangular tooth; with shallow V-shaped notch laterally; deep transverse sulcus below lower orbital teeth. Antennal flagellum small and entering orbit, fine, reaching to about end of cornea. Basal antennal touching front. Basal antennular segment with slightly raised rim across upper and lateral margins, palp folding slightly obliquely. Lower margin of epistome strongly projecting as thin rim; lateral margins strongly receding from centre, before meeting very large, broad, triangular lateral teeth.

Third maxilliped. Merus width *c.* 0.8 times length; antero-external angle slightly produced; *c.* 0.5 times length of ischium. Ischium tapering towards base, *c.* 1.5 times longer than wide. Third maxilliped, including exopod completely and thickly covered in "fur" of feathered setae.

Chelipeds. Unequal; robust, right cheliped the larger; minor cheliped of similar form but more slender. Merus with posterior border cristate, granular; granular subdistal tooth, and flat, triangular, distal tooth. Carpus with broad, triangular tooth at inner angle, and small blunt tooth ventral to it; upper and outer surfaces coarsely rugose

and granular. Outer surface of palm without setae; armed with 7 rows of tubercles; first row on inner dorsal margin in form of 4 large, slightly curved, triangular spines; dorsal-most rows with largest tubercles, size decreasing ventrally. Immovable finger of major chela with strong ventral and median ridges. Ventral border of chela slightly concave at base of fixed finger. Dorsal surface of dactylus with strong, blunt, median crest, bearing strong triangular tooth at base; two smaller lateral teeth one on inner, and one on outer surface, at bases of sub-median longitudinal crests. Fingers pointed, moderately recurved, tips crossing; base of cutting margin of dactylus of larger chela with large, blunt, backwardly projecting molar; fixed finger with row of five blunt molariform teeth, decreasing in size distally, basal tooth in form of broad plate opposing basal tooth of dactyl. Left cheliped of same form but fingers thinner and cutting margins sharper; dactylus lacking basal molar. Fingers of both chelae dark-brown to tan coloured.

Walking legs. Medium length, first pair slightly the longest, about equal to carapace width. Anterior margins of meri and carpi with lobulate crests, lobules largest on carpi taking form of 3-4 strong, triangular, bluntly pointed teeth. Third leg of paratype : merus *c.* 3.25 times longer than wide; carpus *c.* 1.8 times longer than wide; propodus *c.* 2.0 times longer than wide; dactylus *c.* 1.25 times longer than propodus. Few setae except for short "fur", interspersed with longer setae, entirely covering dactyli, and most of propodi except for bare area proximally.

Female abdomen and sternum. Abdomen relatively narrow, not covering entire sternum. Sternum minutely granular; suture between segments 3/4 deeply incised laterally, continuing as deep transverse groove across entire width; patch of long setae obscuring middle of transverse groove, otherwise sternum without conspicuous setation.

COLOUR. — Dorsal surface of carapace and chelipeds predominantly pinkish-mauve, overlayed with orange especially on the claws and over the posterior half of the carapace. Fingers of chelipeds black, colour not extending onto palm in the female types. Walking legs bluish-white with a small patch of orange subdistally on anterior margin of merus and on upper face of carpus.

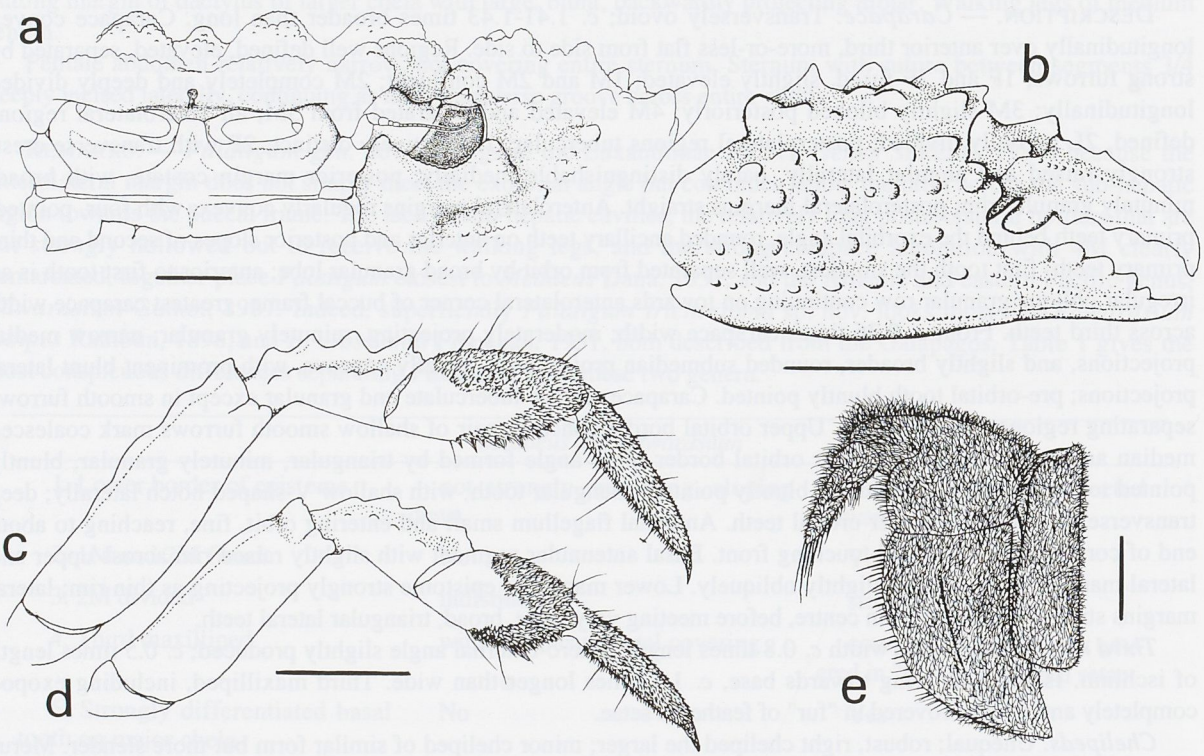


FIG. 6. — *Palatigum trichostoma* gen. nov., sp. nov., paratype female : **a**, frontal view; **b**, right chela; **c**, third walking leg; **d**, fourth walking leg; **e**, third maxilliped. Scale line a, e = 1mm; b-d = 2mm.

ETYMOLOGY. — From the Greek *trichos* (hair) and *stoma* (mouth). Named in reference to the extremely setose third maxillipeds.

REMARKS. — The thickly "furred" third maxillipeds are a singular feature of this new species; and a very unusual character for an otherwise little setose crab. The broader relationships have already been discussed under the generic remarks.

DISTRIBUTION. — Only known from the West Joumeau Bank, New Caledonia. Bathymetric range : 234-243 m.

Genus ***MEDAEOPS*** Guinot, 1967

Medaeops Guinot, 1967a : 366; 1971 : 1073. — SERÈNE, 1984 : 91.

REMARKS. — I find the characteristics which separate the genera *Medaeops* Guinot, 1967, and *Monodaeus* Guinot, 1967, to be not very clear. GUINOT (1967) relied on a number of characters in combination to split the two genera, and she did so only after careful deliberation. I believe however that with the description of recent species in *Monodaeus* (see GUINOT & MACPHERSON, 1988), and *Medaeops* (present work), new characters must be found in order to diagnose these two genera unequivocably. This will require a careful re-examination of all the species, and this is beyond the scope of the present work.

I have not placed the two new species described here into the genus *Monodaeus* because : 1) the meri of the walking legs are relatively shorter than those of most of the *Monodaeus* species (*Monodaeus tuberculidens* Rathbun, 1911, is very close in this respect); and 2) the fingers of the chelipeds are relatively short and sturdy, and not long, narrow, and incurved, which seems a constant feature of *Monodaeus* species.

The third maxillipeds of the new species have the anteroexternal angles produced, and while this has been considered a characteristic of *Monodaeus*, it seems variable (see GUINOT & MACPHERSON, 1988, c.f. figs 12-14). Generic characters given by GUINOT (1967) to separate *Monodaeus* and *Medaeops* that I have found to be quite variable include : differences in the prominence of the carapace regions; degree to which the sternum is swollen; size of the lacina of the third maxilla; arrangement and size of the segments of the antennules and antennae; and the shape of the male G1.

Medaeops is here considered to include the following five species : *M. granulosus* (Haswell, 1882), type species; *M. neglectus* (Balss, 1922); *M. edwardsi* Guinot, 1967; *M. gemini* sp. nov.; and *M. merodontos* sp. nov.

Key to the species of *Medaeops*

1. Anterolateral teeth prominent and broad **2**
— Anterolateral teeth low and little produced beyond an evenly convex anterolateral margin.. ..... *M. edwardsi* Guinot, 1967

2. Walking legs distinctly carinate along anterior margins .. *M. granulosus* (Haswell, 1882)
— Walking legs not distinctly carinate along anterior margins **3**

3. Carapace region 4M distinct; walking legs with row of spaced teeth along anterior margins of meri ..... *M. merodontos* sp. nov.
— Carapace region 4M not distinct; walking legs with anterior margins of meri smooth or with at most large granules **4**

4. Carapace regions with granules arranged into raised transverse striations; frontal lobes separated by a narrow slit; walking legs relatively short and stout; abdominal segment 6 with concave margins ..... *M. neglectus* (Balss, 1922)
— Carapace regions evenly granular; frontal lobes separated by a broad notch; relatively longer, narrower walking legs; abdominal segment 6 having straight margins .... *M. gemini* sp. nov.

Medaeops gemini sp. nov.

Figs 7, 16c-d, f

MATERIAL EXAMINED. — **New Caledonia**. VOLSMAR, *mont Gemini* : stn DW 60, 20°59.9'S, 170°16.6'E, 80-190 m, 6.07.1989 : 1 ♂ 20.1 x 13.6 mm (MNHN-B 22804); 1 ♂, 1 ♀ not measured because of carapace damage (MNHN-B 22805); 1 ♂ 9.8 x 7.0 mm (QM-W 20958); 1 ♂ 9.7 x 7.0 mm (USNM unreg.).

TYPE SPECIMENS. — The largest male (MNHN-B 22804) is the holotype; all other specimens are paratypes.

DESCRIPTION. — *Carapace*. Transversely ovoid; *c.* 1.5 times broader than long in holotype *c.* 1.4 in smaller paratypes. Carapace convex anteriorly, more-or-less flat from side-to-side across the posterobranchials. Regions well defined, elevated, separated by strong furrows; 1F and 2F confluent, sharply granular; 1M separated from 2M; 2M divided longitudinally over anterior two-thirds, outer lobe much broader; 4M not distinct; all anterolateral regions more-or-less defined; 1R and 2R not separated, divided from 3R by a broad oblique furrow; cardiac and intestinal regions distinct but not strongly marked; posterior margin costate, with a raised granular rim; posterolateral margins more-or-less straight. Anterolateral margins regularly convex; with six teeth behind the exorbital angle; margins granular, first and third teeth small, first well separated from orbit, and situated lateral to, and well below, level of orbit seen in frontal view; an ill-defined oblique granular ridge present anterior to first tooth and continuing on towards anterolateral corner of buccal frame; second and fourth to sixth teeth subequal, triangular, bluntly acute; greatest carapace width across last teeth. Front *c.* 0.3 times carapace width; not deflexed, bilobed, moderately projecting, granular; with prominent narrow lateral projections; pre-orbital sharply granular shoulder. Carapace surface with granular striations on anterior regions otherwise relatively smooth; with scattering of plumose setae. Upper orbital border concave, granular; median and lateral fissure vestigial, but noticeable. Lower orbital border inner angle formed by large triangular, bluntly pointed tooth; laterally with a second smaller blunt granular lobe; with V-shaped notch laterally. Antennal flagellum small and entering orbit, fine, reaching beyond orbit about level of first anterolateral tooth. Basal antennal segment touching front, rectangular, unarmed. Basal antennular segment with raised granular rim across upper and lateral margins, palp folding slightly obliquely.

Third maxilliped. Merus swollen medially, granular; *c.* 1.2 times wider than long; antero-external angle produced, blunt; *c.* 0.6 times length of ischium. Ischium sub-rectangular *c.* 1.5 times longer than wide.

Chelipeds. Unequal; large and robust; minor cheliped of similar form but with longer more slender fingers. Merus short and broad, posterior border granulate, with blunt subdistal shoulder and small distal tooth. Carpus with strong tooth at inner angle, without ventral tooth; upper and outer surfaces granular and rugose. Outer surface of palm covered in transverse granular striations, becoming more rugose dorso-proximally; with only scattered setae. Fixed finger with ventral ridge, and second longitudinal groove below cutting margin; length cutting edge *c.* 0.39 times length propodus. Ventral border of chela slightly concave at base of fixed finger. Dorsal surface of dactylus microscopically granular; dactylus broad, bearing 2 longitudinal grooves on outer face, running most of length. Fingers pointed, recurved; cutting margins of both fingers with molariform teeth; dactylus of major chela with slightly larger, blunt, backwardly projecting molar at base of cutting margin.

Walking legs. Medium length; compressed; relatively stout; first three pairs all of similar length, *c.* 1.1 times maximum carapace width. Merus of third leg of holotype *c.* 3.6 times longer than wide; carpus *c.* 2.5 times longer than wide; propodus *c.* 2.4 times longer than wide; dactylus *c.* 1.15 times length of propodus. Dactyli slender, straight, and flattened; terminating in an acute chitinous tip. Merus anterior margin terminating in a small, blunt lobe. Carpus with granular accessory carina on upper surface. All segments, except dactyli, more-or-less granular; short setae marginally, more-or-less completely covering dactyli; scattering of longer feathered setae.

Male abdomen. Relatively narrow; third to fifth segments fused; third segment the widest. Segments three-five tapering. Segment six *c.* 1.3 times wider than long. Telson longer and basally wider than segment 6, *c.* 1.3 times wider than long; evenly rounded.

Gonopods. G1 medium length, slender, curved, tip finely pointed; bearing single, long, plumose seta at base of aperture (see Figs 7g-h).

Sternum. Relatively broad, granular; deep, longitudinal, median cleft in front of telson; suture between segments 3/4 deeply incised laterally, shallow and indistinct medially.

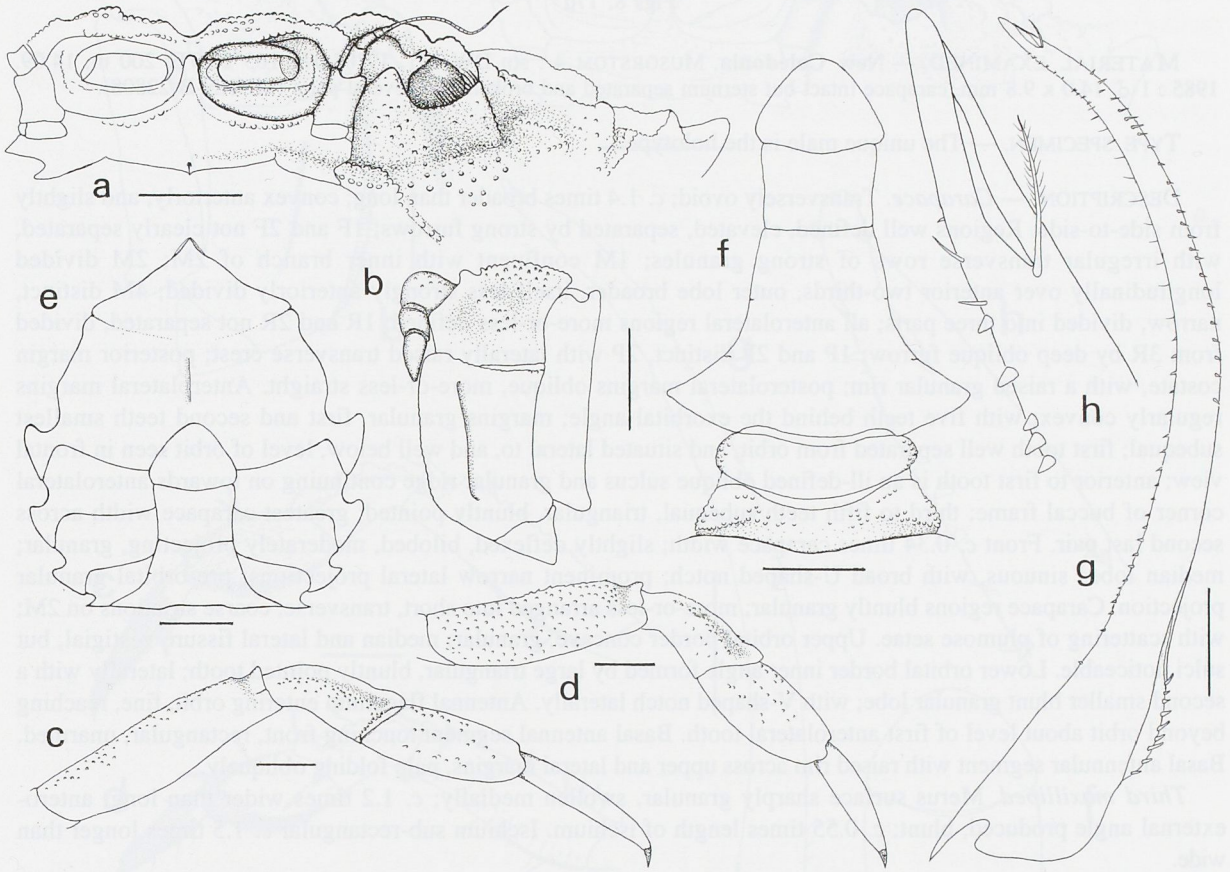


FIG. 7. — *Medaeops gemini* sp. nov., holotype : **a**, frontal view; **b**, third maxilliped (setae removed); **c**, third walking leg; **d**, fourth walking leg; **e**, sternum; **f**, abdomen; **g-h**, first gonopod and enlargement of tip. Scale line a-f = 2 mm; g = 0.5 mm.

ETYMOLOGY. — Named in reference to the locality where the species was collected, and used as a noun in apposition.

REMARKS. — *Medaeops granulosus* (Haswell, 1882) is clearly separated from *M. gemini* sp. nov. by having the walking legs distinctly carinate. *Medaeops edwardsi* Guinot, 1967, is also very different by having the anterolateral teeth very low, hardly interrupting the evenly convex anterolateral margins. Its nearest relative in appearance is *M. neglectus* (Balss, 1922) from which it differs by : having slightly more prominent and acute anterolateral teeth; carapace regions more-or-less evenly granular, not arranged into raised transverse striations; frontal lobes separated by a broad notch, not a narrow slit; longer, narrower walking legs; and abdominal segment 6 having straight, slightly divergent, not concave, margins. *Medaeops gemini* is also superficially similar to *Monodaeus pettersoni* Garth, 1985, from Easter Island, but in that species the carapace granulation is also arranged into striations, and the third maxilliped does not have its antero-external margin expanded.

DISTRIBUTION. — Only known from the type locality. Bathymetric range : 80-190 m.

Medaeops merodontos sp. nov.

Figs 8, 17d

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 4 : stn DW 151, 19°07.0'S, 163°22.0'E, 200 m, 14.09. 1985 : 1 ♂ 14.0 x 9.8 mm, carapace intact but sternum separated and broken into several parts (MNHN-B 22808).

TYPE SPECIMEN. — The unique male is the holotype.

DESCRIPTION. — *Carapace*. Transversely ovoid; *c.* 1.4 times broader than long; convex anteriorly, and slightly from side-to-side. Regions well defined, elevated, separated by strong furrows; 1F and 2F not clearly separated, with irregular transverse rows of strong granules; 1M confluent with inner branch of 2M; 2M divided longitudinally over anterior two-thirds, outer lobe broader, itself less strongly anteriorly divided; 4M distinct, narrow, divided into three parts; all anterolateral regions more-or-less defined; 1R and 2R not separated, divided from 3R by deep oblique furrow; 1P and 2P distinct, 2P with laterally raised transverse crest; posterior margin costate, with a raised granular rim; posterolateral margins oblique, more-or-less straight. Anterolateral margins regularly convex; with five teeth behind the exorbital angle; margins granular, first and second teeth smallest subequal; first tooth well separated from orbit, and situated lateral to, and well below, level of orbit seen in frontal view; anterior to first tooth is an ill-defined oblique sulcus and granular ridge continuing on towards anterolateral corner of buccal frame; third to fifth teeth subequal, triangular, bluntly pointed; greatest carapace width across second last pair. Front *c.* 0.34 times carapace width; slightly deflexed, bilobed, moderately projecting, granular; median lobes sinuous, with broad U-shaped notch; prominent narrow lateral projections; pre-orbital granular projection. Carapace regions bluntly granular; more-or-less arranged into short, transverse, coarse striations on 2M; with scattering of plumose setae. Upper orbital border concave, granular; median and lateral fissure vestigial, but sulci noticeable. Lower orbital border inner angle formed by large triangular, bluntly pointed tooth; laterally with a second smaller blunt granular lobe; with V-shaped notch laterally. Antennal flagellum entering orbit, fine, reaching beyond orbit about level of first anterolateral tooth. Basal antennal segment touching front, rectangular, unarmed. Basal antennular segment with raised rim across upper and lateral margins, palp folding obliquely.

Third maxilliped. Merus surface sharply granular, swollen medially; *c.* 1.2 times wider than long; antero-external angle produced, blunt; *c.* 0.55 times length of ischium. Ischium sub-rectangular *c.* 1.5 times longer than wide.

Chelipeds. Right slightly the larger; both large and robust; minor cheliped of similar form but with longer more slender fingers. Merus short and broad, posterior border granulate, with subdistal shoulder bearing several acute granules; small triangular distal tooth. Carpus with strong tooth at inner angle, and slightly smaller tooth ventral to it; upper and outer surfaces granular and rugose. Outer surface of palm coarsely granular, with several shallow longitudinal sulci more-or-less distinct; with scattered plumose setae. Fixed finger with ventral ridge, and second longitudinal groove below cutting margin; length cutting edge *c.* 0.39 times length propodus. Ventral border of chela slightly concave at base of fixed finger. Dorsal surface of dactylus granular proximally; dactylus broad, bearing 2 major longitudinal grooves on outer face, running most of length; and less distinct groove above cutting margin. Fingers pointed, recurved; cutting margins of both fingers with molariform teeth; dactylus of major chela with larger, blunt, backwardly projecting molar at base of cutting margin.

Walking legs. Medium length; compressed; relatively stout; second pair slightly the longest, *c.* 1.2 times carapace width. Merus of third leg of holotype *c.* 3.2 times longer than wide; carpus *c.* 1.95 times longer than wide; propodus *c.* 2.0 times longer than wide; dactylus *c.* 1.3 times length of propodus. Dactyli slender, straight, and flattened; terminating in an acute chitinous tip. Merus anterior margin terminating in more-or-less acute lobe; anterior margin armed with small acute teeth. Carpus with accessory carina on upper surface; anterior margin lobulate, largest distally. All segments, except dactyli, more-or-less granular; short setae marginally, more-or-less completely covering dactyli; and larger part of propodi; scattering of longer feathered setae.

Male abdomen. Relatively narrow; third to fifth segments fused; third segment the widest. Segments three-five tapering. Segment six *c.* 1.45 times wider than long. Telson subequal in length to segment 6, *c.* 1.4 times wider than long; evenly rounded.

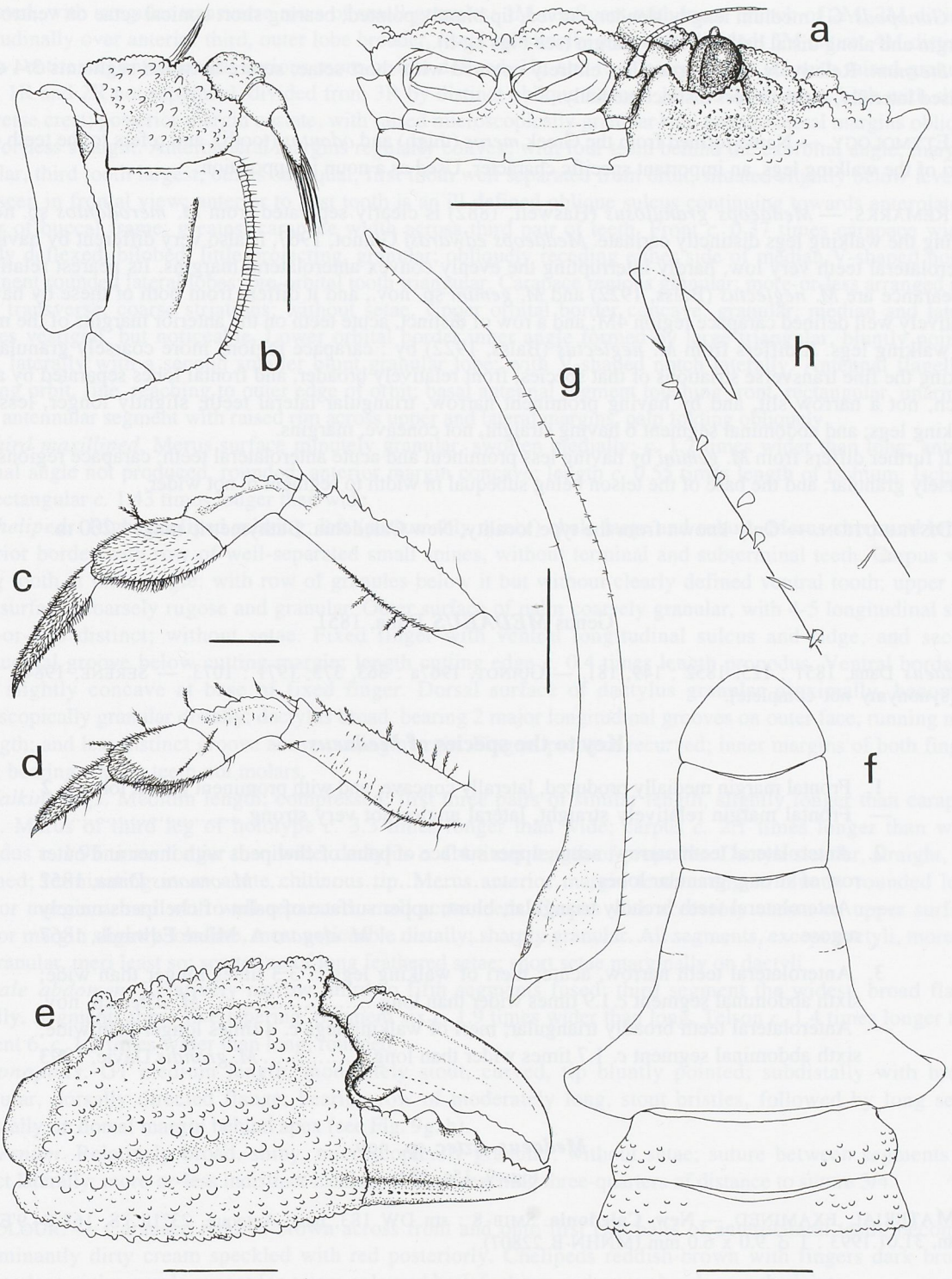


FIG. 8. — *Medaeops merodontos* sp. nov., holotype : **a**, frontal view; **b**, third maxilliped; **c**, third walking leg; **d**, fourth walking leg; **e**, right chela; **f**, abdomen; **g-h**, first gonopod and enlargement of tip. Scale line a, c-e = 2 mm; b, f, g = 1 mm.

Gonopods. G1 medium length, slender, curved, tip bluntly pointed; bearing short conical setae on ventro-distal margin and along distal half of dorsal margin (see Figs 8g-h).

Sternum. Relatively broad, granular; entirely covered with short setae; suture between segments 3/4 deeply incised laterally, more-or-less distinct medially.

ETYMOLOGY. — Name formed from the Greek *meros* (thigh) and *odontos* (tooth), and refers to the teeth on the meri of the walking legs, an important specific character. Used as a noun in apposition.

REMARKS. — *Medaeops granulosus* (Haswell, 1882) is clearly separated from *M. merodontos* sp. nov. by having the walking legs distinctly carinate. *Medaeops edwardsi* Guinot, 1967, is also very different by having the anterolateral teeth very low, hardly interrupting the evenly convex anterolateral margins. Its nearest relatives in appearance are *M. neglectus* (Balss, 1922) and *M. gemini* sp. nov., and it differs from both of these by having a relatively well defined carapace region 4M; and a row of distinct, acute teeth on the anterior margins of the meri of the walking legs. It differs from *M. neglectus* (Balss, 1922) by : carapace regions more coarsely granular, and lacking the fine transverse striations of that species; front relatively broader, and frontal lobes separated by a wide notch, not a narrow slit, and by having prominent narrow, triangular lateral teeth; slightly longer, less stout walking legs; and abdominal segment 6 having straight, not concave, margins.

It further differs from *M. gemini* by having less prominent and acute anterolateral teeth; carapace regions more coarsely granular; and the base of the telson being subequal in width to segment 6, not wider.

DISTRIBUTION. — Only known from the type locality, New Caledonia. Bathymetric range : 200 m.

Genus *MEDAEUS* Dana, 1851

Medaeus Dana, 1851 : 125; 1852 : 149, 181. — GUINOT, 1967a : 363, 373; 1971 : 1073. — SERÈNE, 1984 : 86-87. [synonymy not complete].

Key to the species of *Medaeus*

1. Frontal margin medially produced, laterally concave, and with prominent lateral lobes . **2**
— Frontal margin relatively straight, lateral angles not very strong **3**

2. Anterolateral teeth narrow, acute; upper surface of palm of chelipeds with inner and outer row of strong, granular lobes ..... *M. ornatus* Dana, 1852
— Anterolateral teeth broadly triangular, blunt; upper surface of palm of chelipeds merely rugose ..... *M. elegans* A. Milne Edwards, 1867

3. Anterolateral teeth narrow, acute; meri of walking legs *c.* 3.3 times longer than wide; sixth abdominal segment *c.*1.9 times wider than long ..... *M. aztec* sp. nov.
— Anterolateral teeth broadly triangular; meri of walking legs *c.* 4 times longer than wide; sixth abdominal segment *c.* 1.7 times wider than long ..... *M. grandis* Davie, 1993

Medaeus aztec sp. nov.

Figs 9, 15a, 18d

MATERIAL EXAMINED. — **New Caledonia**. SMIB 8 : stn DW 183, banc Azteque, 23°18.3'S, 168°04.9'E, 330-367 m, 31.01.1993 : 1 ♂ 9.0 x 6.0 mm (MNHN-B 22807).

TYPE SPECIMEN. — The unique male is the holotype.

DESCRIPTION. — *Carapace*. Transversely ovoid; *c.* 1.5 times broader than long; convex anteriorly, and slightly from side-to-side. Regions moderately defined, elevated, separated by smooth furrows; 1F and 2F not clearly

separated, with irregular transverse rows of small granules; 1M confluent with inner branch of 2M; 2M divided longitudinally over anterior third, outer lobe broader, itself indistinctly anteriorly divided; 3M entire; 4M distinct, narrow, entire; all anterolateral regions more-or-less defined, 1L, and to a lesser extent 3L, with raised granular tooth; 1R and 2R not separated, divided from 3R by distinct oblique furrow; 1P and 2P distinct, both with sharp transverse crest; posterior margin costate, with raised microscopically granular rim; posterolateral margins oblique, more-or-less straight. Anterolateral margins regularly convex; with four teeth behind the exorbital angle; margins granular, third tooth largest, others subequal; first tooth well separated from orbit, situated slightly below level of orbit seen in frontal view; anterior to first tooth is an ill-defined oblique sulcus continuing towards anterolateral corner of buccal frame; greatest carapace width across third pair of teeth. Front *c.* 0.37 times carapace width; slightly deflexed, bilobed, little projecting, granular; obliquely receding either side of median V-shaped notch; prominent rounded lateral lobes; pre-orbital tooth triangular. Carapace regions granular; more-or-less arranged into short, transverse, coarse striations; without setae. Upper orbital border concave, granular; median and lateral fissures vestigial, but noticeable. Lower orbital border inner angle formed by large triangular, bluntly pointed tooth; laterally with a second smaller blunt granular lobe; with V-shaped notch laterally. Antennal flagellum entering orbit, fine, reaching to outer edge of orbit; basal antennal segment touching front, rectangular, unarmed. Basal antennular segment with raised rim across upper and lateral margins, palp folding obliquely.

Third maxilliped. Merus surface minutely granular, swollen medially; *c.* 1.2 times wider than long; antero-external angle not produced, rounded; anterior margin concave; length *c.* 0.55 times length of ischium. Ischium sub-rectangular *c.* 1.43 times longer than wide.

Chelipeds. Right cheliped missing; left (presumably minor) chela large and robust. Merus short and broad, posterior border with row of well-separated small spines, without terminal and subterminal teeth. Carpus with strong tooth at inner angle; with row of granules below it but without clearly defined ventral tooth; upper and outer surfaces coarsely rugose and granular. Outer surface of palm coarsely granular, with 4-5 longitudinal sulci more-or-less distinct; without setae. Fixed finger with ventral longitudinal sulcus and ridge, and second longitudinal groove below cutting margin; length cutting edge *c.* 0.4 times length propodus. Ventral border of chela slightly concave at base of fixed finger. Dorsal surface of dactylus granular proximally, becoming microscopically granular distally; dactylus broad, bearing 2 major longitudinal grooves on outer face, running most of length; and less distinct groove above cutting margin. Fingers pointed, recurved; inner margins of both fingers sharp, bearing cutting teeth not molars.

Walking legs. Medium length; compressed; first three pairs of similar length, slightly longer than carapace width. Merus of third leg of holotype *c.* 3.3 times longer than wide; carpus *c.* 2.1 times longer than wide; propodus *c.* 1.95 times longer than wide; dactylus *c.* 1.4 times length of propodus. Dactyli slender, straight, and flattened; terminating in an acute chitinous tip. Merus anterior margin terminating in bluntly rounded lobe; anterior margin armed with well-separated small acute teeth. Carpus with accessory carina on upper surface; anterior margin slightly lobulate, most noticeable distally; sharply granular. All segments, except dactyli, more-or-less granular, meri least so; scattering of long feathered setae; short setae marginally on dactyli.

Male abdomen. Relatively narrow; third to fifth segments fused; third segment the widest, broad flange laterally. Segments three-five tapering. Segment six *c.* 1.9 times wider than long. Telson *c.* 1.4 times longer than segment 6, *c.* 1.3 times wider than long; rounded.

Gonopods. G1 medium length, moderately stout, curved, tip bluntly pointed; subdistally with broad, triangular, dorsally directed flange; bearing row of moderately long, stout bristles, followed by long setae, subdistally on dorsal margin behind apex (see Fig. 9g, h).

Sternum. Relatively broad, shiny, microscopically granular; without setae; suture between segments 3/4 distinct laterally, more-or-less indistinct medially; telson reaching three-quarters of distance to suture 3/4.

COLOUR. — Carapace reddish-brown across front and onto first two pairs of anterolateral teeth, becoming predominantly dirty cream speckled with red posteriorly. Chelipeds reddish-brown with fingers dark brown. Walking legs pinky-purple except for cream coloured basis/ischium and cream bands near the joints.

ETYMOLOGY. — Named in reference to the name of the cruise during which the specimen was collected; it is used as a noun in apposition.

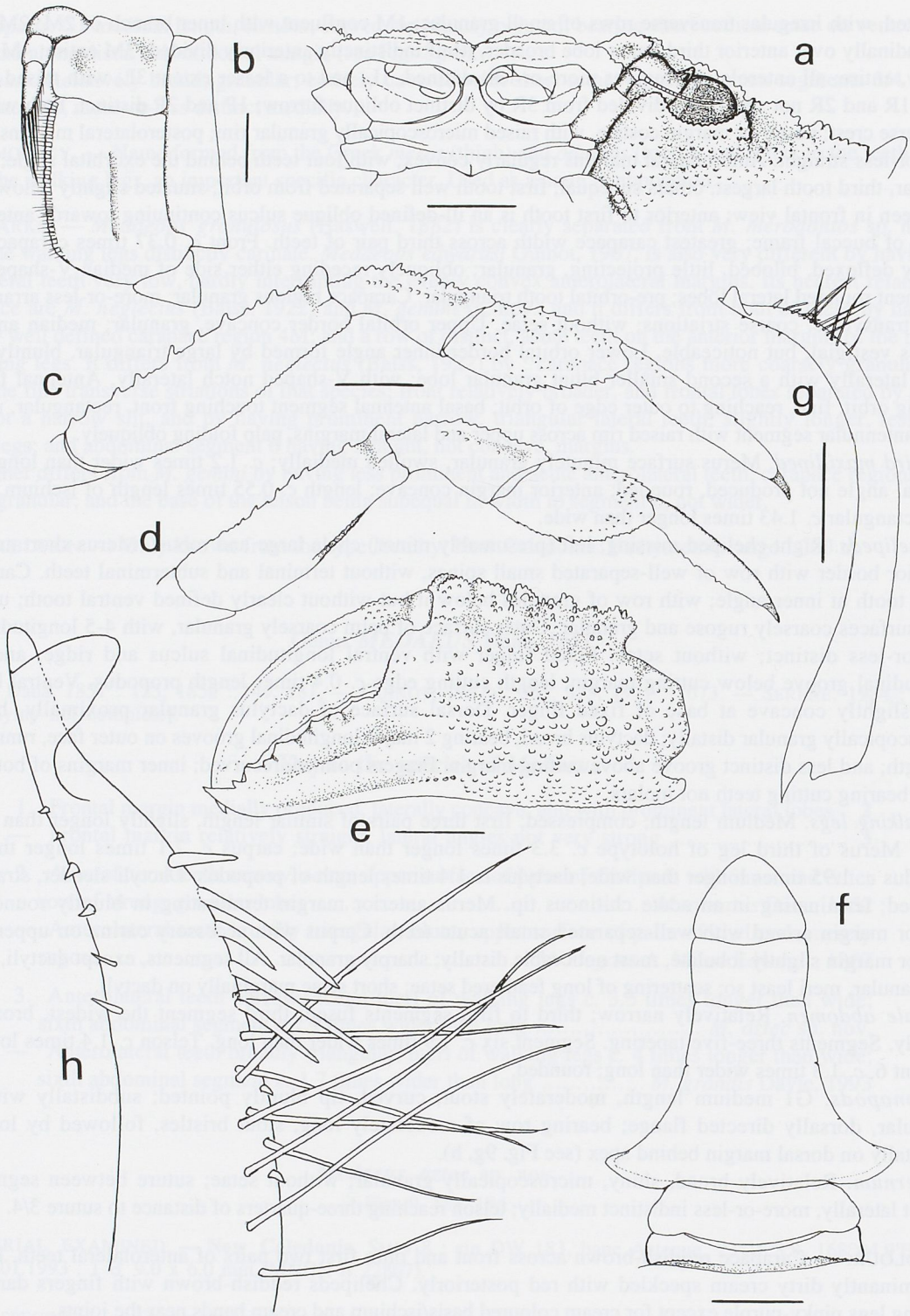


FIG. 9. — *Medaeus aztec* sp. nov., holotype : **a**, frontal view; **b**, third maxilliped; **c**, third walking leg; **d**, fourth walking leg; **e**, left chela; **f**, abdomen; **g-h**, first gonopod and enlargement of tip. Scale line a, c-f = 1 mm; b, g = 0.5 mm.

REMARKS. — *Medaeus aztec* sp. nov. is placed into *Medaeus* Dana, 1851, within the bounds of the current definition of the genus (GUINOT, 1967a). It has a relatively straight front, most like *Medaeus grandis* Davie, 1993, whereas the fronts of the two other species, *Medaeus ornatus* Dana, 1852, and *M.elegans* A. Milne Edwards, 1867, are more protruding. It differs from *M. grandis* by having sharper, narrower, anterolateral spines; less prominent carapace regions; shorter legs (merus of third leg 3.3 times longer than wide *versus c.* 4 times in *M. grandis*); and by having a wider sixth abdominal segment (breadth 1.9 times wider than long *versus* 1.7 in *M. grandis*). By the prominent, narrow, anterolateral spines it looks most like *M. ornatus*, but besides the strongly protuberant front, that species also has the chelipeds armed with strong granular lobes, which are absent in *M. aztec* sp. nov.

All four species share strong transverse carinae across both the cardiac and intestinal regions, and this separates them from the species in the genera *Monodaeus* and *Medaeops* which all seem to lack such carinae. This character has not been previously mentioned as being useful in defining the genus.

DISTRIBUTION. — Only known from the type locality in New Caledonia. Bathymetric range : 330-367 m.

Genus ***MIERSIELLA*** Guinot, 1967

Miersiella haswelli (Miers, 1886)

Medaeus haswelli Miers, 1886 : 117, pl. 11, fig. 2-2c. — MCNEILL, 1953 : 94, pl. 7, figs 3-4.
Xanthias haswelli - CALMAN, 1911 : 546-550, fig. 1.
Platypilumnus haswelli - BALSS, 1922 : 120.
Miersiella haswelli - GUINOT, 1967a : 359-362, figs 17-20.
Miersella haswelli - SERÈNE & VADON, 1981 : 122, 134, figs 2g-i, 3, pl. 3B.

MATERIAL EXAMINED. — **New Caledonia**. CHALCAL 2 : stn DW 72, 24°54.5'S, 168°22.3'E, 527 m, 28.10.1986 : 1 ♂ 6.1 mm (QM-W20586).
BATHUS 3 : stn CP 815, 23°47'S, 168°17'E, 460-470 m, 28.11.1993 : 1 ♂ 7.0 mm (MNHN-B 22742).
Loyalty Islands. MUSORSTOM 6 : stn DW 472, 21°08.6'S, 167°54.7'E, 300 m, 22.02.1989 : 1 ♂ 6.7 mm (MNHN-B 22800).
Waterwitch Bank, SW Pacific. MUSORSTOM 7 : stn DW 538, 12°31'S, 176°40'W, 275-295 m, 16.05.1992 : 1 ♂ 5.4 mm, 1 ♀ 6.5 mm (USNM unreg.).
Wallis Island. MUSORSTOM 7 : stn DW 610, 13°21'S, 176°09'W, 286 m, 26.05.1992 : 1 ♀ 6.1 x 4.5 mm (MNHN-B 22781).

DISTRIBUTION. — New South Wales, southeastern Australia (type locality); Christmas Island, northeastern Indian Ocean; Japan; Philippines; and now from New Caledonia, the Loyalty Islands, Norfolk Ridge, south of New Caledonia, and east to Wallis Island, and Waterwitch Bank. Bathymetric range : 80-527 m.

Genus ***PARAMEDAEUS*** Guinot, 1967

Paramedaeus Guinot, 1967 : 373. — SERÈNE, 1984 : 87.

REMARKS. — *Paramedaeus* Guinot, 1967, now contains five species : *P. simplex* (A. Milne Edwards, 1873) (type species), *P. noelensis* (Ward, 1942), *P. planifrons* (Sakai, 1965), *P. globosus* Serène & Vadon, 1981, and *P. megagomphios* sp. nov. described below.

Key to the species of *Paramedaeus*

1. Carapace relatively wide, *c.* 1.5 times or more wider than long **2**
— Carapace relatively more globular, distinctly less than 1.5 times wider than long **3**

2. Anterolateral teeth prominently projecting and armed with coarse accessory tubercles; carapace regions strongly projecting, rugose, with short, irregular, transverse rows of granules ..... *P. simplex* (A. Milne Edwards, 1873) (Madagascar; Mauritius; Somalia; Red Sea; Chagos Arch.; Ternate, Indonesia; Philippines; Upolu, Samoa; Hawaii).

— Anterolateral teeth not prominently projecting, more-or-less coelescent, with accessory granules; carapace regions not strongly projecting, evenly, and more finely, granular .... *P. noelensis* (Ward, 1942) (Japan, Philippines, Tahiti, Samoa, Christmas Is., Mauritius, Red Sea — NG (1993) considers these records may be polyspecific).

3. Frontal lobes remarkably salient, directed laterally, with a deep, wide, median V-shaped notch, and similar deep notches, visible dorsally, separating them from pre-orbital teeth; anterolateral teeth in the form of very prominent broad triangular spines; carapace surface conspicuously granular ..... *P. planifrons* (Sakai, 1965) (Japan).

— Frontal lobes prominent but not remarkably salient, with a deep, median notch, but no V-shaped lateral notches visible in dorsal view; anterolateral teeth relatively low; carapace surface mostly only minutely granular **4**

4. Larger chela with an enormous quadrangular molar occupying proximal half of dactyl; carapace regions relatively poorly separated, in particular 1M and 2M confluent, 2M only partially divided, 2L and 5L low and rounded; meri of walking legs armed with row of low, small sharp tubercles ..... *P. megagomphios* sp. nov. (Futuna Is., SW Pacific).

— Larger chela without unusual dentition on cutting margins of fingers; carapace regions relatively strongly separated, in particular 1M and 2M separated, 2M completely divided, 2L in the form of a prominent blunt spine, and 5L bulbous; meri of walking legs strongly serrated ..... *P. globosus* Serène & Vadon, 1981 (Philippines, New Caledonia, and the Norfolk Ridge).

Paramedaeus globosus Serène & Vadon, 1981

Paramedaeus planifrons globosus Serène & Vadon, 1981 : 130, pl. 3A.

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 4 : stn 149, 19°07.6'S, 163°22.7'E, 155 m, 14.09.1985 : 1 ovig. ♀ 7.2 mm (MNHN-B 22745); 1 ♂ 7.5 mm (QM-W 20587). — Stn 203, 22°35.8'S, 167°04.8'E, 105-110 m, 27.09.1985 : 1 ♀ 6.4 mm, 1 ♂ 7.1 mm (QM-W 20582). — Stn 204, 22°37.0'S, 167°05.7'E, 120 m, 27.09.1985 : 1 ♂ 8.7 mm (MNHN-B 22750).

CHALCAL 2 : stn DW 70, 24°46.0'S, 168°09.0'E, 232 m, 27.10.1986 : 1 ovig. ♀ 5.8 mm, 1 ♂ 6.4 mm (MNHN-B 22749). — Stn DW 71, 24°42.26'S, 168°09.52'E, 230 m, 27.10.1986 : 1 ovig. ♀ 6.5 mm (MNHN-B 22746). — Stn DW 80, 23°26.7'S, 168°01.8'E, 160 m, 30.10.1986 : 1 ♂ 9.1 mm (USNM Unreg.).

SMIB 5 : stn DW 82, 22°31.7'S, 167°32.4'E, 155 m, 09.09.1989 : 1 ♂ 6.1 mm (MNHN-B 22748).

Loyalty Islands. MUSORSTOM 6 : stn DW 440, 20°48.8'S, 167°17.25'E, 288 m, 19.02.1989 : 1 ♂ 5.8 mm (MNHN-B 22747).

REMARKS. — *Paramedaeus globosus* was originally described as a subspecies of *P. planifrons* (Sakai, 1965). Considering that the present specimens agree precisely with the figure and diagnosis of SERÈNE & VADON (1981), and that it has maintained this integrity over such a large geographic area, it seems valid to treat it as a full species.

Following SERÈNE & VADON (1981) it can be separated from *Paramedaeus planifrons* by : (1) the front is much less produced beyond the orbits, with the median fissure, as a consequence being not as deep, and the median and lateral angles less pointed; the lateral cleft before the inner orbital angle is also not as strongly oblique; (2) the

inner and outer orbital angles are rounded instead of being sharply pointed; (3) the last three anterolateral teeth are less prominent and less sharp; (4) the carapace regions are more smoothly rounded, and centrally relatively smooth, without obviously strong granulation; three distinct small tubercles are present as an almost vertical row posterolaterally on the region 3R. The G1 seems of little use in separating the two species.

DISTRIBUTION. — Philippines (type locality), and now from New Caledonia and the Norfolk Ridge. Bathymetric range : 96-288 m.

Paramedaeus megagomphios sp. nov.

Fig. 10

MATERIAL EXAMINED. — **Futuna Island, SW Pacific**. MUSORSTOM 7 : stn DW 498, 14°19'S, 178°03'W, dredged, 105-160 m, 10.05.1992 : 1 ♀ 7.3 x 5.5 mm (MNHN-B 22787).

TYPE SPECIMEN. — The unique female is the holotype.

DESCRIPTION. — *Carapace*. Transversely ovoid; *c.* 1.3 times broader than long; convex longitudinally over anterior third, but only slightly from side to side. Regions well defined, elevated, separated by strong furrows; 1F and 2F confluent slightly elevated; 1M confluent with inner branch of 2M; 2M partially divided longitudinally with outer lobe much broader; 3M with narrow anterior prolongation; 4M not defined; anterolateral and posterolateral regions not defined except for lateral grooves between 2L and 5L, and between 2R and 3R; cardiac and intestinal regions defined only by broad shallow depressions; posterior margin costate; posterolateral margins straight or slightly convex. Anterolateral margins with five teeth behind the exorbital angle; margins coarsely granular, first tooth the smallest, well separated from orbit, and situated lateral to, and well below, level of orbit seen in frontal view; second tooth relatively close to first tooth, slightly larger; third tooth largest; fifth and sixth reducing slightly in size; all teeth sub-triangular, relatively acute; greatest carapace width across fourth teeth. Front 0.37 times carapace width; strongly projecting, granular; two broad lobes separated by very deep, broad V-shaped notch; each lobe with strongly oblique margins, more-or-less straight, ending in a large, broad, rounded pre-orbital tooth. Posterior margin costate. Carapace surface finely granulate except in smooth furrows separating regions, but becoming more sharply and coarsely granulate towards anterolateral margins; without setae. Upper orbital border granular; median and lateral fissures indistinct. Lower orbital border inner and outer angles formed by triangular, granular, pointed teeth, clearly visible dorsally. Antennal flagellum entering orbit, fine, reaching about width of orbit. Basal antennal segment touching front, minutely granular. Basal antennular segment with raised crest across upper and lateral margins almost forming oblique z-shape laterally, palp folding slightly obliquely. Lower margin of epistome strongly sinuous, projecting as thin rim.

Third maxilliped. Merus *c.* 1.2 times wider than long; antero-external angle not produced; *c.* 0.5 times length of ischium. Ischium sub-rectangular *c.* 1.6 times longer than wide.

Chelipeds. Markedly unequal; right chela the largest, strong and robust. Merus granular and pitted, posterior border bearing row of acute triangular tubercules; small granular distal tooth. Carpus with strong, slightly upturned, blunt tooth at inner angle; small granular elevation ventral to it; dorsal face rugose, granular and pitted. Outer surface of palm finely granular, without setae; moderately pitted in broad subdorsal longitudinal groove. Fixed finger long, with indistinct ventral ridge. Dorsal surface of dactylus minutely granular; dactylus very broad, indistinct median longitudinal groove. Fingers pointed, recurved, tips crossing; cutting margins of dactylus with 3 triangular teeth in distal half, increasing in size proximally, distal half entirely occupied by single very large quadrangular molar; cutting margin of fixed finger with broad flat shelf opposing molar of dactyl. Minor cheliped with more slender fingers; cutting margins jagged and sharp, lacking molar of large chela; longitudinal grooves more pronounced; surfaces more coarsely granular and pitting obvious over outer face of palm.

Walking legs. Medium length; compressed; slender; first three pairs all of similar length. Third leg : merus *c.* 3.3 times longer than wide; carpus *c.* 1.9 times longer than wide; propodus *c.* 1.8 times longer than wide; dactylus *c.* 1.4 times length of propodus. Dactyli stout, terminating in an acute chitinous tip. Meri anterior margins armed

with row of short sharp tubercles, terminating in blunt tooth. Carpi with anterior margins bilobed; accessory carinae on upper surface. All segments with small sharp granules. Short feathered setae marginally on most segments, more-or-less covering dactyli.

Sternum. Relatively broad, smoothly and finely granular.

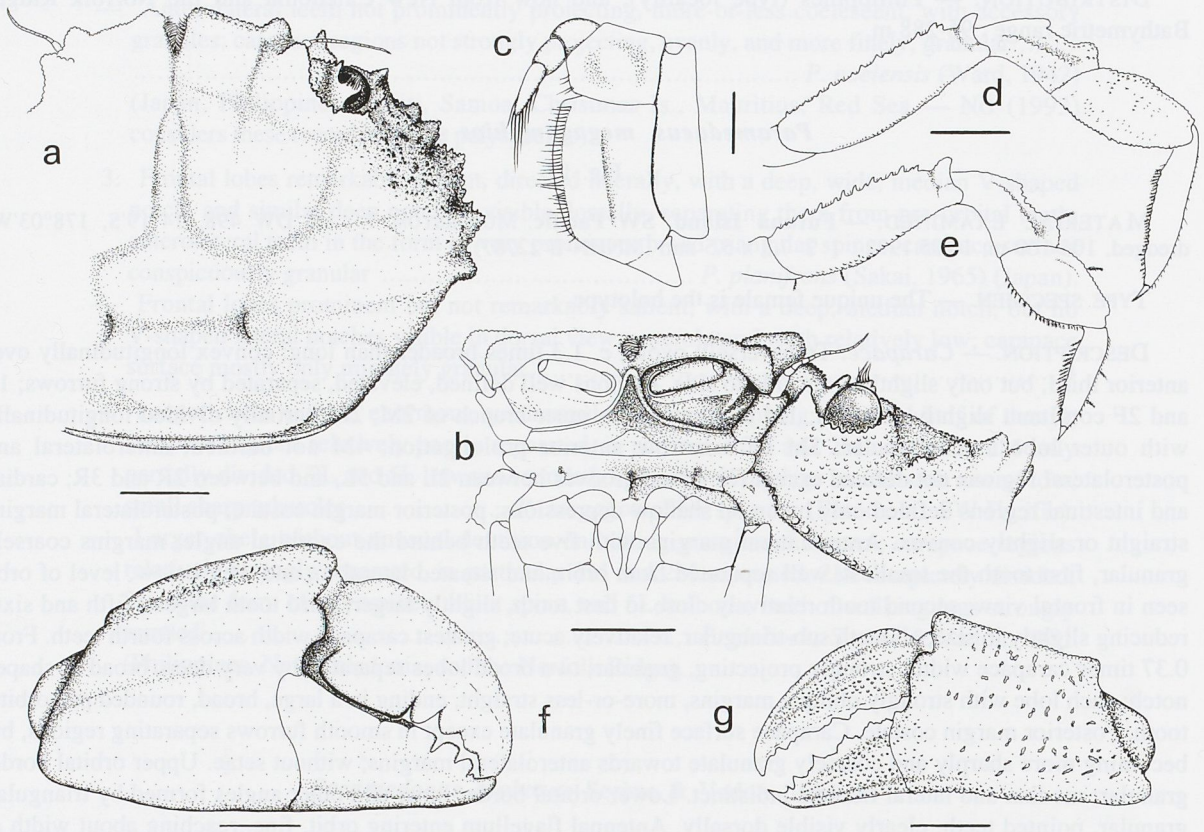


FIG. 10. — *Paramedaeus megagomphios* sp. nov., holotype : **a**, dorsal carapace; **b**, frontal view; **c**, third maxilliped; **d**, third walking leg; **e**, fourth walking leg; **f**, right chela; **g**, left chela. Scale line a, b, d-g = 1 mm; c = 0.5 mm.

ETYMOLOGY. — Formed from the Greek *mega* (large) and *gomphios* (molar). Named in reference to the enormous molariform tooth near the base of the dactylus of the cheliped. It is used as a noun in apposition.

REMARKS. — *Paramedaeus megagomphios* sp. nov. is easily separated from all other known species of *Paramedaeus* by the enormous molariform tooth on the dactylus of the larger cheliped. It is closest in appearance to *P. globosus* in the shape of the carapace and front, but differs from that species by having less strongly defined carapace regions, in particular 1M and 2M are confluent, 2M is only partially divided, and 2L and 5L are low and rounded. On *P. globosus* the carapace regions are relatively strongly separated, in particular 1M and 2M are distinct, 2M is completely divided, 2L is in the form of a prominent blunt spine, and 5L is bulbous. Also the meri of the walking legs are armed with a row of low, small sharp tubercles in *P. megagomphios*, but are strongly serrated in *P. globosus*.

DISTRIBUTION. — Only known from waters off Futuna Island, south-western Pacific. Bathymetric range : 105-160 m.

Genus *PARAXANTHODES* Guinot, 1968

Paraxanthodes cumatodes (MacGilchrist, 1905)

Xanthodes cumatodes MacGilchrist, 1905 : 258. — Alcock & Annandale, 1907, pl. 79, fig. 1. — Balss, 1929 : 24.
Xanthias cumatodes - Stephensen, 1945 : 148. — Guinot, 1967b : 269.
Paraxanthodes cumatodes - Guinot, 1968 : 723, fig. 60. — Serène, 1984 : 209, pl. 30C.

Material examined. — **New Caledonia**. Musorstom 4 : stn 149, 19°07.6'S, 163°22.7'E, 155 m, 14.09.1985 : 3 ♂ 4.7, 6.3, 8.2 mm, 1 imm. ♀ 4.3 mm (MNHN-B 22751); 1 ♂ 3.5 mm (MNHN-B 22752); 3 imm. 2.9, 3.3, 4.1 mm, 1 ♀ 6.0 mm (MNHN-B 22755). — Stn 151, 19°07.0'S, 163°22.0'E, 200 m, 14.09.1985 : 1 ♂ 12.0 mm, 1 ♀ 9.0 mm (USNM Unreg.). — Stn 187, 19°08.3'S, 163°29.3'E, 65-120 m, 19.09.1985 : 2 ♂ 6.9, 9.6 mm, 3 ♀ 5.7, 5.8, 5.8 mm (MNHN-B 22753); 3 ♀ 7.7, 8.0, 8.1 mm, 2 ♂ 6.9, 9.6 mm (MNHN-B 22753); 2 ♂ 9.3, 11.6 mm, 3 ♀ 7.7, 8.0, 8.1 mm (QM-W20584). — Stn 189, 19°07.5'S, 163°29.0'E, 210 m, 19.09.1985 : 1 ♂ 8.3 mm, 1 ovig. ♀ 9.5 mm (MNHN-B 22757). — Stn 205, 22°38.5'S, 167°06.8'E, 140-160 m, 27.09.1985 : 5 ♀ 5.7, 6.0, 6.8, 9.9, 10.0 mm (USNM Unreg.).

Chalcal 2 : stn DW 80, 23°26.7'S, 168°01.8'E, 160 m, 30.10.1986 : 1 ♀ 7.4 mm (MNHN-B 22754).

Smib 6 : stn DW 106, 19°08.1'S, 163°30.7'E, 165-195 m, 2.03.1990 : 2 ♂ 10.5, 10.1 mm (MNHN-B 22756).

Remarks. — The present series of specimens is only the third collection to be reported on, and the first from the Pacific Ocean. The earlier records of MacGilchrist (1905) and Balss (1929) were from the Persian Gulf and the Red Sea respectively.

The Pacific specimens differ in minor details from the female specimen of Balss (1929) which is now housed in the MNHN, Paris (MNHN-B 13054), but which now lacks claws and some legs. There is however some variation amongst the present Pacific specimens. In particular the first anterolateral tooth of the carapace varies from being obviously connected to the exorbital margin by a low carina, through to being clearly separated from it; and as a consequence the subhepatic tubercle is more-or-less obvious in the gap. In the Red Sea female the first anterolateral tooth is almost completely separate, and the subhepatic tubercle is very clearly seen in the gap. The shape of the front varies from being almost straight to being moderately prominent medially, and the median incision varies from very narrow to a relatively broad v-shaped notch. On the Red Sea female the carapace regions have rows of fine granules that do not seem to so obviously fuse into the characteristic "wavelets or ripples moving in a forward direction" described for the type material (MacGilchrist, 1905) and which is clearly represented on the Pacific material. Finally, the proportions of the meri of the walking legs seem to vary slightly, with the P5 of the Red Sea specimen having the merus slightly shorter than the figured syntype (Alcock & Annandale, 1907, pl. 79, fig. 1), and most of the present material, although in the present series there is a gradation between both states.

On the largest males the outer-face of the palm of the cheliped has the three parallel longitudinal furrows less obviously demarcated, and the granules lower and smoother such that it appears quite smooth, especially on the lower half.

It is clear to me that *Paraxanthodes* is most closely related to *Alainodaeus*, *Medaeus*, *Medaeops*, *Paramedaeus*, and *Monodaeus* than to *Xanthias* and *Paraxanthias* to which it has been allied in the past (Guinot, 1967a), and therefore it should be transfered to the Euxanthinae. The division that separates this group from the Xanthinae proper is very tenuous, however I believe these five genera at least form a monophyletic grouping. This conclusion is based on the general conformation of the carapace, sternum, male abdomen shape, and the euxanthine condition of having the first anterolateral tooth separated from the exorbital margin such that the anterolateral margin is continued towards the anterior buccal cavity. This last character is not as strong for this group of genera as it is for the central core of euxanthine genera (like *Carpoporus*, *Epistocavea*, *Euxanthus*, *Glyptoxanthus*, *Guinotellus*, *Hepatoporus*, and *Hypocolpus*) and can be difficult to appreciate on some species.

Distribution. — Persian Gulf (type locality); Red Sea; and now from New Caledonia in the south-western Pacific. Bathymetric range : 65-210 m.

Subfamily LIOMERINAE Sakai, 1976

Genus ***LIOMERA*** Dana, 1851

Liomera (Liomera) nigrimanus sp. nov.

Figs 11, 15d, 18e

Carpiloaes virgatus - RATHBUN, 1911 : 212. — ODHNER, 1925 : 16, pl. 1, fig. 8.
Liomera virgata - GUINOT, 1967b : 266. — SERÈNE, 1984 : 60, pl. 9 D-E.
Not *Carpilodes virgatus* Rathbun, 1906.

MATERIAL EXAMINED. — **New Caledonia**. SMIB 8 : Azteque Bank, stn DW 183, 23°18.3'S, 168°04.9'E, 330-367 m, 31.01.1993 : 1 ♂ 14.7 x 9.0 mm (MNHN-B 22758).

TYPE SPECIMEN. — The unique male is the holotype.

DESCRIPTION. — *Carapace*. Transversely ovoid; *c.* 1.63 times broader than long; anteriorly convex longitudinally, flat from side to side across postero-branchials. Regions strongly defined; 1F and 2F confluent, moderately swollen, not separated from frontal margin; 1M moderately swollen and separated by broad shallow groove from inner branch of 2M; 2M longitudinally divided over most of its length by deep groove, outer branch of 2M wider than inner branch; orbital margin swollen; 1L low, connected to lateral margin of orbit; 2L, 3L, 5L and 6L all distinct; 4L confluent with third anterolateral tooth; cardiac and intestinal regions defined by diffused grooves. Anterolateral margins regularly convex; four rounded lobes behind exorbital angle; margins rounded; first tooth slightly smaller, others subequal; carapace width slightly greatest between fourth teeth. Front *c.* 0.34 times carapace width, moderately projecting, bilobed; pre-orbital teeth in form of broad rounded lobe. Carapace surface smooth, finely punctate, without setae. Upper orbital border concave, smooth, low lobe dorsally behind cornea, median and lateral fissures absent. Lower orbital border with inner angle formed by blunt triangular lobe. Antennal flagellum small and entering orbit, not reaching beyond orbit. Basal antennal segment in broad contact with front. Basal antennular segment with palp folding slightly obliquely.

Third maxilliped. Merus wider than long, length *c.* 0.73 times breadth; *c.* 0.5 times length of ischium. Ischium rectangular, length *c.* 1.4 times breadth.

Chelipeds. Sub-equal; palm relatively slender, height *c.* 0.35 times length (including fixed finger). Merus with margins rounded, finely granulate. Carpus granulate at inner angle, but rounded and unarmed; outer margin and upper surface smooth, uneven, finely punctate. Outer surface of palm minutely granular, strong, short, vertical punctations; without setae; inner surface more coarsely granular. Fixed finger moderately long; ventral ridge poorly defined. Ventral border of chela concave at base of fixed finger. Dactylus with sub-supramarginal groove relatively well defined. Fingers spooned, with edges sharp; narrow gape between cutting margins.

Walking legs. Medium length, stout, rounded, unarmed, margins microscopically granular; first pair slightly the longest. Merus of third leg *c.* 2.9 times longer than wide; carpus *c.* 1.8 times longer than wide; propodus *c.* 1.7 times longer than wide; dactylus *c.* 1.2 times length of propodus. Dactyli straight, terminating in an acute chitinous tip. Carpi without accessory carinae on upper surface, but with slight distal depression.

Male abdomen. Third to fifth segments fused; first and third segments subequal in width. Segments three-five tapering, slightly sinuous. Segment six *c.* 1.4 times wider than long. Telson about as long as wide; *c.* 1.25 times longer than segment 6.

Gonopods. G1 long, moderately stout, sinuous; tip flanged, appearing papillate on inner abdominal margin. Long setae distally (see Fig. 11g-h). G2 evenly curved; tip short.

Sternum. Relatively broad, microscopically granular; base of telson adjacent to suture between segments 4 and 5.

COLOUR. — Dorsal carapace predominantly red but with some small narrow cream patches lateral to metagastric and cardiac regions, a median longitudinal cream band bisecting the intestinal region and continuing onto the abdomen, and some other sparse speckling. Chelipeds red, as on the carapace, but (at least in adult males)

with the black colour of the fixed finger extending backwards and forming a band completely encircling the palm and leaving only a narrow streak at each end. Walking legs also red except for cream coloured bands near the joints.

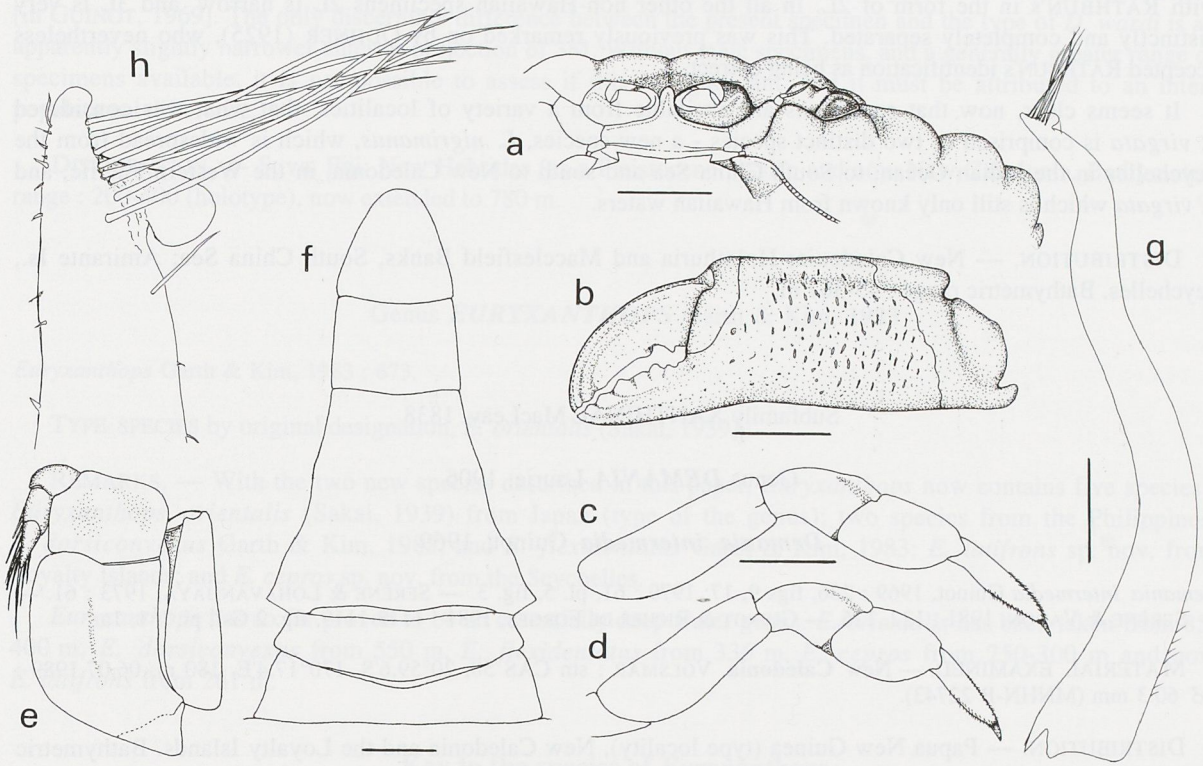


FIG. 11. — *Liomera nigrimanus* sp. nov., holotype : **a**, frontal view; **b**, left chela; **c**, third walking leg; **d**, fourth walking leg; **e**, third maxilliped; **f**, abdomen; **g-h**, first gonopod and enlargement of tip. Scale line a-d = 2 mm; e, f = 1 mm; g = 0.5 mm.

ETYMOLOGY. — Named in reference to the broad black band that encircles the palm of the cheliped.

REMARKS. — *Liomera nigrimanus* sp. nov. is most closely related to *L. virgata* (Rathbun, 1906) described from Hawaii. In particular the characteristic colouring is apparently very similar i.e. bright scarlet which persists in alcohol, and five or six bands of buff on the legs.

In all obvious characteristics the present specimen agrees precisely with the specimen figured by ODHNER (1925) from Macclesfield Bank, South China Sea, and the two specimens figured by SERÈNE (1984), one from Amirante Is., Seychelles, and the other from Holothuria Bank, South China Sea, the former being the same specimen that was identified by RATHBUN (1911) as *L. virgata*.

SERÈNE noted that the adult males of *Liomera virgata* were easily recognised by the black colour of the fixed finger extending backwards and forming a band completely encircling the palm, as it does on the present crab. Contrary to this, RATHBUN's (1906) type was a larger male than those available to SERÈNE, and apparently from her description the black band reached only two-thirds of the height of the palm and thus did not encircle it dorsally. Similarly EDMONDSON (1962) remarked only that the black of the fixed finger extended far back on the palm, and not that it encircled it. However ODHNER (1925), who also had an Hawaiian specimen at his disposal, said that it was the black bands on the male chela, that left only narrow streaks at each end, that confirmed the identity of *all* his specimens as being *L. virgata*. Nevertheless the colour of the male chela is not enough to use as a specific character when there is a much more significant morphological difference.

The present specimen and those of ODHNER (1925) and SERÈNE (1984) differ from RATHBUN's type in the shape of dorsal carapace region 2L, which RATHBUN describes as wider, and not dimpled; her figure shows that 2L and 3L are fused. EDMONDSON (1962) recorded several other specimens from Hawaii, and his figure is consistent with RATHBUN's in the form of 2L. In all the other non-Hawaiian specimens 2L is narrow, and 3L is very distinctly and completely separated. This was previously remarked on by ODHNER (1925), who nevertheless accepted RATHBUN's identification as being correct.

It seems clear, now that specimens are available from a variety of localities, that what was considered *L. virgata* is comprised of two distinct species - a new species, *L. nigrimanus*, which is widespread from the Seychelles in the Indian Ocean, to South China Sea and south to New Caledonia, in the Western Pacific; and *L. virgata* which is still only known from Hawaiian waters.

DISTRIBUTION. — New Caledonia; Holothuria and Macclesfield Banks, South China Sea; Amirante Is., Seychelles. Bathymetric range : 45-367 m.

Subfamily XANTHINAE MacLeay, 1838

Genus ***DEMANIA*** Laurie, 1906

Demania intermedia Guinot, 1969

Demania intermedia Guinot, 1969 : 236, figs 9, 17; 1979 : 61, pl. 5, fig. 3. — SERÈNE & LOHAVANIJAYA, 1973 : 61. — SERÈNE & VADON, 1981 : 122, 126. — GUINOT & RICHER DE FORGES, 1981 : 1118-1119, fig. 2 G-I, pl. I, 1, 1a.

MATERIAL EXAMINED. — **New Caledonia**. VOLSMAR : stn CAS 58, 20°59.6'S, 170°17.4'E, 180 m, 06.07.1989 : 1 ♂ 60.3 mm (MNHN-B 22743).

DISTRIBUTION. — Papua New Guinea (type locality), New Caledonia and the Loyalty Islands. Bathymetric range : 180-200 m.

Demania mortenseni (Odhner, 1925)

Actaea mortenseni Odhner, 1925 : 51-52, pl. 5, fig. 9.
[*Actaea*] *mortenseni* - GUINOT, 1976 : 204, pl. 19, fig. 4, 4a.
Demania mortenseni - DAVIE, 1993 : 508-511, fig. 3, pl. 3.

MATERIAL EXAMINED. — **Loyalty Islands**. MUSORSTOM 6 : stn DW 398, 20°47.19'S, 167°05.65'E, 370 m, 13.02.1989 : 1 ♀ 8.7 mm (MNHN-B 22744).

REMARKS. — DAVIE (1993) has described, figured, and discussed this species in detail. I considered that it was most closely related to some of the *Demania* species, although this genus is in need of revision.

DISTRIBUTION. — Kei Islands, Micronesia, (5°37'10"S, 132°23'W), type locality, east to Tuamotu Archipelago, French Polynesia (21°47'S, 138°52'W), and now from the Loyalty Islands, New Caledonia. Bathymetric range : 200-370 m.

Demania wardi Garth & Ng, 1985

Demania wardi Garth & Ng, 1985 : 294-296, figs 3 D-E, pls 2 C-D.

MATERIAL EXAMINED. — **New Caledonia**. HALIPRO 1 : stn CP 854, 21°45.37'S, 166°38.34'E, 650-780 m, 19.03.1994 : 1 ♀ 39.8 x 29.9 mm (MNHN-B 22806).

REMARKS. — This is only the second live specimen to be recorded of this species which is thus now known from two females and a fossil. The present specimen agrees very closely with the type description, and shows all the differences listed by GARTH & NG (1985) which separate it from its closest ally, *D. rotundata* (Serène, 1969) [in GUINOT, 1969]. The only discernible difference between the present specimen and the type of *D. wardi* is an apparently slightly narrower anterior projection of 3M. Without male specimens, and a generally greater range of specimens available, it is not possible to assess if this is significant, and it must be attributed to an inter-populational difference.

DISTRIBUTION. — Suva, Fiji; New Hebrides (as a Pleistocene fossil); and now New Caledonia. Bathymetric range : 200-400 (holotype), now extended to 780 m.

Genus ***EURYXANTHOPS*** Garth & Kim, 1983

Euryxanthops Garth & Kim, 1983 : 673.

TYPE SPECIES by original designation, *E. orientalis* (Sakai, 1939).

REMARKS. — With the two new species described in this paper, *Euryxanthops* now contains five species : *Euryxanthops orientalis* (Sakai, 1939) from Japan (type of the genus); two species from the Philippines, *E. dorsiconvexus* Garth & Kim, 1983, and *E. flexidentatus* Garth & Kim, 1983; *E. latifrons* sp. nov. from Loyalty Islands; and *E. cepros* sp. nov. from the Seychelles.

Euryxanthops has so far proved to be an essentially deep water genus. *E. orientalis* has been taken from 85-400 m, *E. dorsiconvexus* from 550 m, *E. flexidentatus* from 336 m, *E. cepros* from 250-300 m and now *E. latifrons* from 261 m.

Key to the species of *Euryxanthops*

1. Anterolateral lobes almost confluent, so as to form an almost evenly convex margin, and separated by only small notches ..... *E. cepros* sp. nov. (Seychelles).
— Anterolateral lobes well defined, more-or-less prominent, and all clearly and broadly separated **2**

2. Front markedly produced beyond the general carapace outline, a distinct median incision separating two lobes with their margins laterally sloping; 2M anteriorly divided..... ..... *E. orientalis* (Sakai, 1939) (Japan; Philippines).
— Front not markedly produced beyond the general carapace outline, composed of two more-or-less straight lobes, without a strong median incision; 2M entire **3**

3. Front relatively broad (*c.* 0.34 times carapace width); anterolateral margin behind exorbital angle markedly sloping backwards; legs relatively broad (merus of fourth walking leg *c.* 2.8 times longer than wide) .....*E. latifrons* sp. nov. (Loyalty Islands).
— Front narrower (< 0.3 times carapace width); anterolateral margin behind exorbital angle only moderately sloping backwards, nearly horizontal, or even projecting slightly forwards; legs narrower (merus of fourth walking leg > 3.5 times longer than wide) **4**

4. Anterolateral margin behind exorbital angle moderately sloping backwards such that apex of first anterolateral tooth is level with, or only slightly posterior to, rear margin of orbital cup ..... *E. dorsiconvexus* Garth & Kim, 1983 (Philippines).
— Anterolateral margin behind exorbital angle nearly horizontal, or even projecting slightly forwards, such that apex of first anterolateral tooth is level with, or slightly in advance of exorbital angle ..... *E. flexidentatus* Garth & Kim, 1983 (Philippines).

Euryxanthops latifrons sp. nov.

Figs 12, 17b, 18f

MATERIAL EXAMINED. — **Loyalty Islands**. MUSORSTOM 6 : stn CP 445, 20°54.29'S, 167°17.16'E, 261 m, 19.02.1989 : 1 ♀ 13.7 x 9.6 mm (MNHN-B 22785).

TYPE SPECIMEN. — The unique female specimen is the holotype.

DESCRIPTION. — *Carapace*. Transversely ovoid, *c*. 1.43 times broader than long; appearing smooth but microscopically granular; very short setae between anterolateral teeth otherwise bare; convex anteriorly, slightly convex from side to side across postero-branchial regions. Regions poorly indicated, mostly marked by broad shallow smooth grooves; 1F and 2F confluent; 1M barely indicated, 2M broad, entire; 3M well marked, anterior prolongation narrow, with slightly convex margins; moderately deep, well defined, lateral gastro-cardiac and cardio-intestinal depressed grooves; 4M slightly indicated; 1L-5L all more-or-less separated; 1R and 2R confluent, separated from 3R by distinct lateral groove. Anterolateral border of carapace crested, slightly upturned; divided into four broad teeth; first tooth with slightly longest margin, confluent with exorbital angle, most produced near junction with second tooth; second tooth broad with low, rounded, median prominence; third tooth slightly smaller, triangular, blunt; fourth tooth smallest but prominent. Greatest carapace width across third teeth. Posterolateral border straight, slightly longer than anterolateral. Posterior border costate. Front produced, straight divided into two lobes by small notch; 0.34 times carapace width; laterally separated from prominent supra-orbital eaves. Supra-orbital border minutely granular, with two lateral closed fissures; infra-orbital border minutely granular, sinuous, with large triangular tooth at inner end visible dorsally, and deep notch below exorbital angle. Eyestalk with small tubercles on antrero-distal margin behind cornea. Basal antennal segment with small sharp distal granules; touching front; flagellum fine, slightly wider than orbit. Basal segment of antennule with two strong lateral crests; flagellum folding obliquely.

Third maxilliped. Merus with surface covered in small sharp granules, especially distally; *c*. 0.6 length of ischium; wider than long; anteroexternal angle markedly produced, bluntly rounded. Ischium *c*. 1.4 times longer than wide.

Chelipeds. Noticeably unequal, right largest and stoutest; appearing smooth but microscopically granular. Merus of right cheliped short, not markedly projecting beyond edge of carapace, margins granular, upper border sharply crested, crest ending subterminally. Carpus swollen, smoothly rounded, bearing a strong triangular tooth at inner angle, and a smaller tooth below it. Palm high, height *c*. 0.5 times length (including fixed finger); evenly rounded except for broad shallow longitudinal depression before upper margin; immoveable finger relatively short and stout, ventral sub-marginal groove, cutting edge with largest teeth in proximal third. Dactylus longer, stout, rounded, with a broad, blunt longitudinal ridge defined proximally, indicated merely by row of punctuations distally; cutting margin with a few low rounded teeth distally and large, blunt, outwardly and backwardly projecting molar basally. Left cheliped of same form but fingers thinner and cutting margins sharper; dactylus lacking basal molar. Fingers of both chelae brown; colour of fixed finger not extending backwards beyond gape.

Walking legs. Medium length, first three pairs subequal, fourth pair slightly shorter. Margins of meri, carpi, and propodi sharply crested. Thick short setae on anterior margins of carpi and propodi, on posterior margins of propodi, and completely covering dactyli. Third leg of holotype with the following proportions : merus *c*. 2.7 times longer than wide; carpus *c*. 1.9 times longer than wide; propodus 1.8 times longer than wide (measured in mid-line); dactylus *c*. 1.3 times longer than propodus.

Sternum (of female holotype). With groove separating fused sternites 3/4 strongly incised laterally, and clearly marked across most of width; short deep longitudinal fissure on sternite 4.

COLOUR. — Dorsal carapace and chelipeds predominantly orange-brown lightly speckled with cream; legs generally less darkly coloured but darker towards distal end of meri and on carpi.

ETYMOLOGY. — The name is formed from the latin *latus* (broad) and *frons* (forehead, front), and refers to the relatively wider front of this species when compared with its congeners.

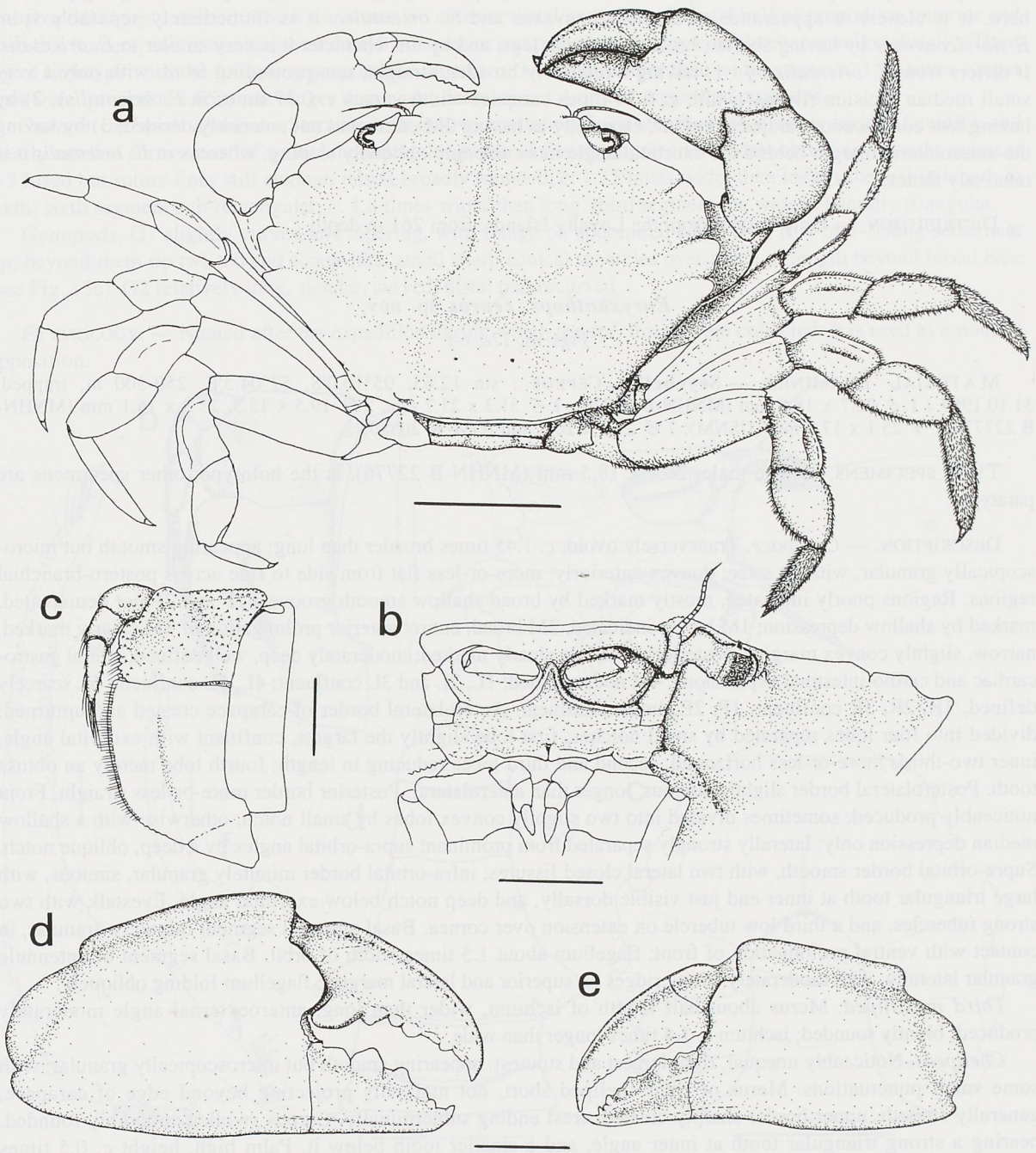


FIG. 12. — *Euryxanthops latifrons* sp. nov., holotype : **a**, dorsal view; **b**, frontal view; **c**, third maxilliped; **d**, right chela; **e**, left chela. Scale line a = 5 mm; b, d, e = 2 mm; c = 1 mm.

REMARKS. — *E. latifrons* sp. nov. fits perfectly the generic diagnosis of GARTH & KIM (1983) especially in the shape and cresting of the anterolateral margins, the crested walking legs, the relatively poorly defined carapace regions, and the unequal chelipeds. Unfortunately as the only available specimen is a female it is impossible to check the structure of the gonopods.

Euryxanthops latifrons can be separated from all other species using the characters given in the key provided here. It is closest in appearance to *E. dorsiconvexus* and *E. orientalis*. It is immediately separable from *E. dorsiconvexus* by having shorter, broader, walking legs, and by this character it is very similar to *E. orientalis*. It differs from *E. orientalis* by : 1) having a relatively broader, straight, non-protruding front, with only a very small median incision (frontal width *c.* 0.34 times carapace width versus *c.* 0.27 times in *E. orientalis*); 2) by having less conspicuous carapace regions, especially in having 2M entire and not anteriorly divided; 3) by having the anterolateral margin behind the exorbital angle more strongly obliquely sloping, whereas in *E. orientalis* it is relatively flatter.

DISTRIBUTION. — Only known from the Loyalty Islands, from 261 m depth.

Euryxanthops cepros sp. nov.

Figs 13, 17c, e-f

MATERIAL EXAMINED. — **Seychelles**. CEPROS : stn 12.63, 05°10.0'S, 57°04.3'E, 250-300 m, trapped, 31.10.1987 : 1 ♂ 26.7 x 18.5 mm (MNHN-B 22776); 1 ♂ 31.3 x 21.7 mm, 2 ♀ 19.5 x 13.5, 23.3 x 16.1 mm (MNHN-B 22777); 1 ♀ 25.1 x 17.3 mm (USNM); 1 ♂ 29.3 x 20.3 mm (QM-W 20580).

TYPE SPECIMENS. — The male, 26.7 x 18.5 mm (MNHN-B 22776), is the holotype; other specimens are paratypes.

DESCRIPTION. — *Carapace*. Transversely ovoid, *c.* 1.45 times broader than long; appearing smooth but microscopically granular, without setae; convex anteriorly, more-or-less flat from side to side across postero-branchial regions. Regions poorly indicated, mostly marked by broad shallow smooth grooves; 1F and 2F not demarcated, marked by shallow depression; 1M barely indicated, 2M broad, entire; anterior prolongation of 3M clearly marked, narrow, slightly convex margins, posteriorly 3M less clearly marked; moderately deep, well defined, lateral gastro-cardiac and cardio-intestinal depressions; 4M not separated; 1L, 2L and 3L confluent; 4L, 5L confluent; 6L scarcely defined; 1R, 2R, 3R confluent; 1P, 2P almost confluent. Anterolateral border of carapace crested and upturned; divided into four lobes separated by small notches; first lobe slightly the largest, confluent with exorbital angle, inner two-thirds more-or-less horizontal; second and third lobes reducing in length; fourth lobe merely an obtuse tooth. Posterolateral border slightly sinuous, longer than anterolateral. Posterior border more-or-less straight. Front noticeably produced, sometimes divided into two slightly convex lobes by small notch, otherwise with a shallow median depression only; laterally strongly separated from prominent supra-orbital angles by a deep, oblique notch. Supra-orbital border smooth, with two lateral closed fissures; infra-orbital border minutely granular, sinuous, with large triangular tooth at inner end just visible dorsally, and deep notch below exorbital angle. Eyestalk with two strong tubercles, and a third low tubercle on extension over cornea. Basal antennal segment minutely granular, in contact with ventral prolongation of front; flagellum about 1.5 times width of orbit. Basal segment of antennule granular laterally, with moderately strong ridges on superior and lateral margins, flagellum folding obliquely.

Third maxilliped. Merus about half length of ischium, wider than long, anteroexternal angle moderately produced, bluntly rounded; ischium *c.* 1.4 times longer than wide.

Chelipeds. Noticeably unequal, right largest and stoutest; appearing smooth but microscopically granular; with some small punctuations. Merus of right cheliped short, not markedly projecting beyond edge of carapace, generally smooth, upper border sharply crested, crest ending subterminally. Carpus swollen, smoothly rounded, bearing a strong triangular tooth at inner angle, and a smaller tooth below it. Palm high, height *c.* 0.5 times length (including fixed finger); evenly rounded except for broad shallow longitudinal depression before upper margin; immoveable finger relatively short and stout, ventral sub-marginal groove, cutting edge with small blunt teeth distally, but broad wide shallowly concave shelf over proximal two fifths. Dactylus longer, stout, rounded, with a broad, blunt longitudinal ridge defined proximally, indicated merely by row of punctuations distally; cutting margin with a few low rounded teeth distally and large, blunt, outwardly and backwardly projecting molar basally. Left cheliped of same form but fingers thinner and cutting margins sharper; dactylus lacking basal molar. Fingers of both chelae black; colour of fixed finger not extending backwards beyond gape.

Walking legs. Medium length, first three pairs subequal, fourth pair slightly shorter. Margins of meri, carpi, and propodi sharply crested. Thick tomentum on anterior distal end of carpi, distal half of propodi on anterior and posterior borders, and entire length of dactyli on anterior and posterior borders, completely encircling distally. Third leg of holotype with the following proportions : merus *c*. 3.0 times longer than wide; carpus *c*. 1.95 times longer than wide; propodus 1.65 times longer than wide; dactylus *c*. 1.4 times longer than propodus.

Sternum and male abdomen. Sternum with groove separating fused sternites 3/4 strongly incised laterally, and clearly marked across most of width; short deep longitudinal fissure on sternite 4. Male abdomen smooth; segment 3-5 fused but suture lines still evident; telson broadly rounded, *c*. 1.75 times wider than long, subequal in length to sixth; sixth segment sub-rectangular, *c*. 1.8 times wider than long; third segment the widest, laterally triangular.

Gonopods. G1 slightly curved and tapering, with flange on abdominal edge; with row of 7-8 long setae near tip; beyond them tip twisted and scoop-like; small sharp conical tubercles over much of length beyond broad base (see Fig. 13e). G2 relatively long, slender, curved, distal part recurved.

ETYMOLOGY. — Named after the expedition during which the specimens were collected. It is used as a noun in apposition.

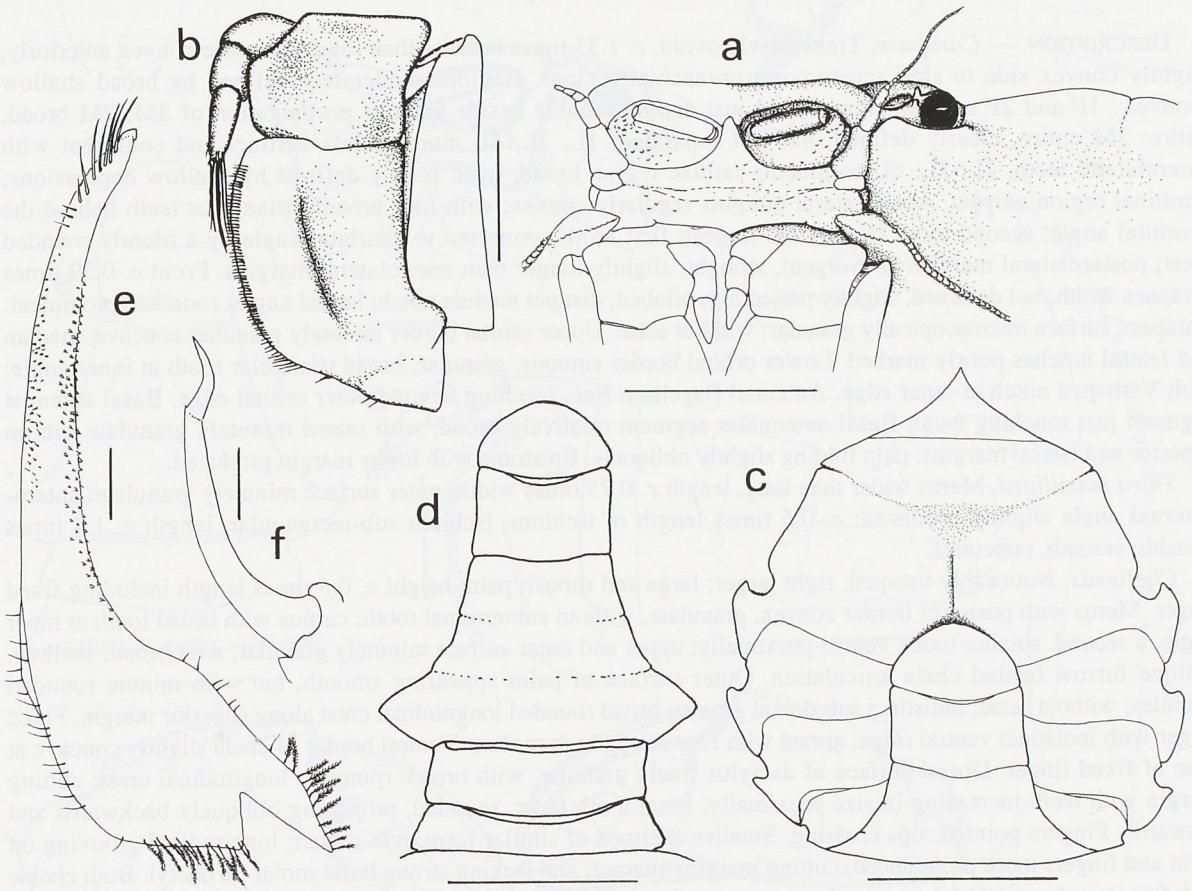


FIG. 13. — *Euryxanthops cepros* sp. nov., holotype : **a**, frontal view; **b**, third maxilliped; **c**, sternum; **d**, abdomen; **e**, first gonopod; **f**, second gonopod. Scale line a, c, d = 5 mm; b = 2 mm; e, f = 0.5 mm.

REMARKS. — This is the first species of this genus to be recognised from the Indian Ocean. *Euryxanthops cepros* sp. nov. perfectly fits the generic diagnosis of GARTH & KIM (1983) especially in the shape and cresting of the anterolateral margins, the crested walking legs, the relatively poorly defined carapace regions, the unequal chelipeds and the shape and armature of the gonopods.

Euryxanthops cepros differs from all known species by its poorly differentiated anterolateral lobes, which are almost confluent and separated by only small notches. Also it is somewhat broader than the two species from the Philippines, length/breadth ratio of holotypes : 1.44 in *E. cepros* versus 1.36 in *E. dorsiconvexus*, and 1.40 in *E. flexidentatus*. In this regard it agrees precisely with *E. orientalis* (also 1.44).

DISTRIBUTION. — Only known from the Seychelles. Bathymetric range : 250-300 m.

Xanthias teres sp. nov.

Fig. 14

MATERIAL EXAMINED. — **Loyalty Islands**. MUSORSTOM 6 : stn DW 399, 20°41.8'S, 167°00.2'E, 282 m, 14.02.1989 : 1 ♂ 8.0 x 6.0 mm (MNHN-B 22786).

TYPE SPECIMEN. — The unique male specimen is the holotype.

DESCRIPTION. — *Carapace*. Transversely ovoid, *c.* 1.33 times broader than long. Carapace convex anteriorly, slightly convex side to side across posterobranchial regions. Regions moderately defined by broad shallow grooves : 1F and 2F not demarcated; 1M just distinguishable beside anterior prolongation of 3M; 2M broad, entire; 3M entire, clearly defined; 4M not separated; 1L, 3L, 4L more or less distinct and confluent with anterolateral teeth, 2L, 5L, 6L confluent; cardiac region broad, oval, poorly defined by shallow depressions; intestinal region narrow. Anterolateral margins regularly convex; with four broadly triangular teeth behind the exorbital angle; second tooth slightly the largest; first tooth connected to exorbital angle by a bluntly rounded crest; posterolateral margins convergent, straight, slightly longer than anterolateral margins. Front *c.* 0.39 times carapace width; not deflexed, slightly projecting; bilobed; distinct median notch; lateral angles rounded, prominent. Carapace surface microscopically granular; without setae. Upper orbital border minutely granular; concave; median and lateral notches poorly marked. Lower orbital border sinuous, granular, broad triangular tooth at inner angle; with V-shaped notch at outer edge. Antennal flagellum fine, reaching beyond outer orbital edge. Basal antennal segment just touching front. Basal antennular segment relatively broad, with raised minutely granulate rim on superior and lateral margins; palp folding slightly obliquely. Epistome with lower margin produced.

Third maxilliped. Merus wider than long, length *c.* 0.75 times width; outer surface minutely granulate; antero-external angle slightly produced; *c.* 0.5 times length of ischium. Ischium sub-rectangular, length *c.* 1.4 times breadth; smooth, punctuate.

Chelipeds. Noticeably unequal, right larger; large and robust; palm height *c.* 0.5 times length including fixed finger. Merus with posterior border convex, granulate, without subterminal tooth; carpus with broad tooth at inner angle; a second, smaller tooth, ventro-proximally; upper and outer surface minutely granular, with broad, shallow, oblique furrow behind chela articulation. Outer surface of palm appearing smooth, but with minute rounded granules; without setae; indistinct sub-dorsal groove; broad rounded longitudinal crest along superior margin. Fixed finger with indistinct ventral ridge; armed with four strong high molars. Ventral border of chela slightly concave at base of fixed finger. Dorsal surface of dactylus finely granular, with broad, rounded, longitudinal crest; cutting margin with teeth increasing in size proximally, basal tooth large, rounded, projecting obliquely backwards and outwards. Fingers pointed, tips crossing. Smaller cheliped of similar form, less robust; longitudinal grooving on palm and fingers more pronounced; cutting margins sharper, and lacking strong basal molar on dactyl. Both chelae with fingers coloured dark brown; colour not extending backwards onto palm.

Walking legs. Medium length; compressed; first three pairs of similar length, *c.* 1.3 times maximum carapace width. Merus of third leg *c.* 3.6 times longer than wide; carpus *c.* 2.2 times longer than wide; propodus *c.* 1.9 times longer than wide; dactylus *c.* 1.6 times length of propodus. Dactyli slender, straight, terminating in an acute chitinous recurved tip; thick covering of short setae. Anterior margin of meri armed with small sharp granules. Carpi with an accessory carina on upper surface. Feathered setae on margins, mostly sparse, densest proximally.

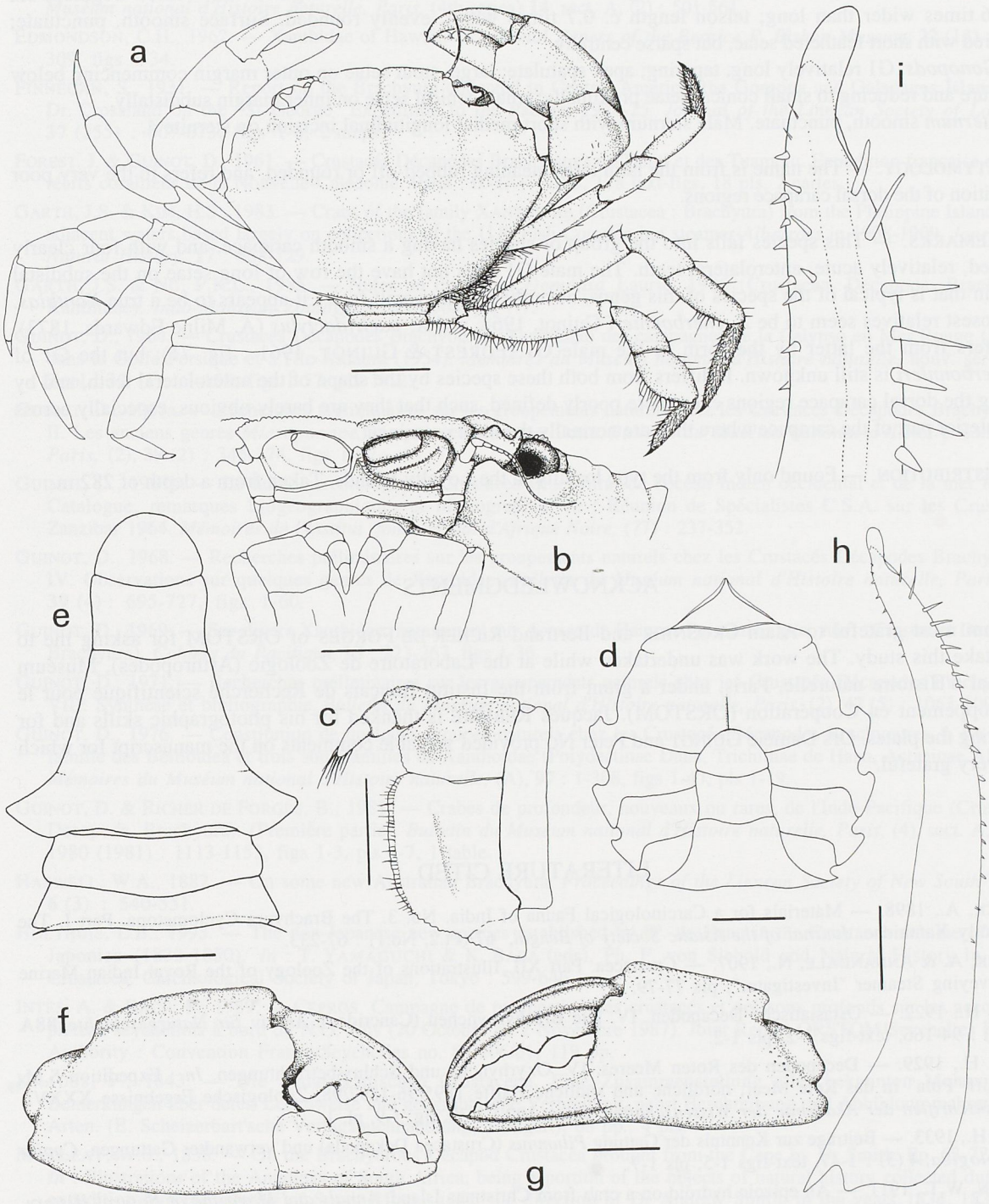


FIG. 14. — *Xanthias teres* sp. nov., holotype: **a**, dorsal view; **b**, frontal view; **c**, third maxilliped; **d**, sternum; **e**, abdomen; **f**, right chela; **g**, left chela; **h-i**, first gonopod and enlargement of tip. Scale line a = 2 mm; b-g = 1 mm; h = 0.5 mm.

Male abdomen. Relatively narrow; segments three to five fused; third segment the widest. Segment six *c*. 1.6 times wider than long; telson length *c*. 0.7 times width, evenly rounded. Surface smooth, punctuate; covered with short feathered setae, but sparse centrally.

Gonopods. G1 relatively long, tapering; apex spatulate; large, stout setae on outer margin commencing below aperture and reducing to small conical setae proximally; small conical setae on inner margin subdistally.

Sternum smooth, punctuate. Male sternum with short medial longitudinal incision on sternite 4.

ETYMOLOGY. — The name is from the latin teres meaning rubbed-off or rounded, and refers to the very poor definition of the dorsal carapace regions.

REMARKS. — This species falls into the group of species having a smooth carapace, and with four clearly defined, relatively acute, anterolateral teeth. The male G1 does not have the row of long setae on the subdistal margin that is typical of the species of this genus, nevertheless in overall facies it appears to be a true *Xanthias*. Its closest relatives seem to be *X. cherbonnieri* Guinot, 1964, and *X. pachydactylus* (A. Milne Edwards, 1873). It differs from the latter by the form of the male G1 (FOREST & GUINOT, 1961 : fig. 71); but the G1 of *X. cherbonnieri* is still unknown. It differs from both these species by the shape of the anterolateral teeth, and by having the dorsal carapace regions even more poorly defined, such that they are barely obvious, especially across the anterior part of the carapace where they are normally the most prominent.

DISTRIBUTION. — Found only from the type locality in the Loyalty Islands. Taken from a depth of 282 m.

ACKNOWLEDGMENTS

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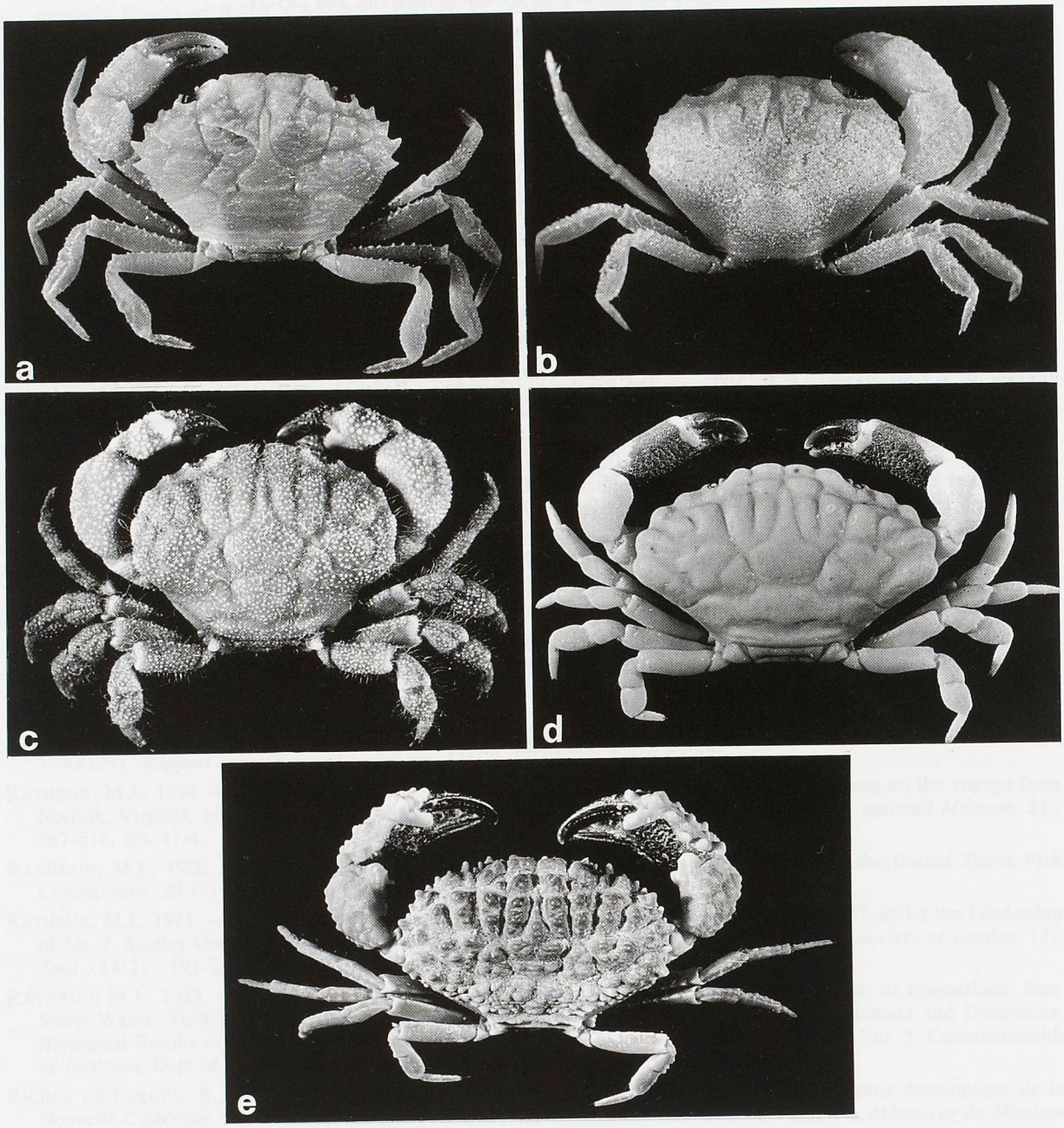


FIG. 15. — **a**, *Medaeus aztec* sp. nov., ♂ holotype (MNHN-B 22807); **b**, *Rata chalcal* sp. nov., ♂ holotype (MNHN-B 22803); **c**, *Gaillardiellus bathus* sp. nov., ♂ holotype (MNHN-B 22771); **d**, *Liomera nigrimanus* sp. nov., ♂ holotype (MNHN-B 22758) ; **e**, *Meractaea multidentata* sp. nov., ♂ holotype (MNHN-B 22760).

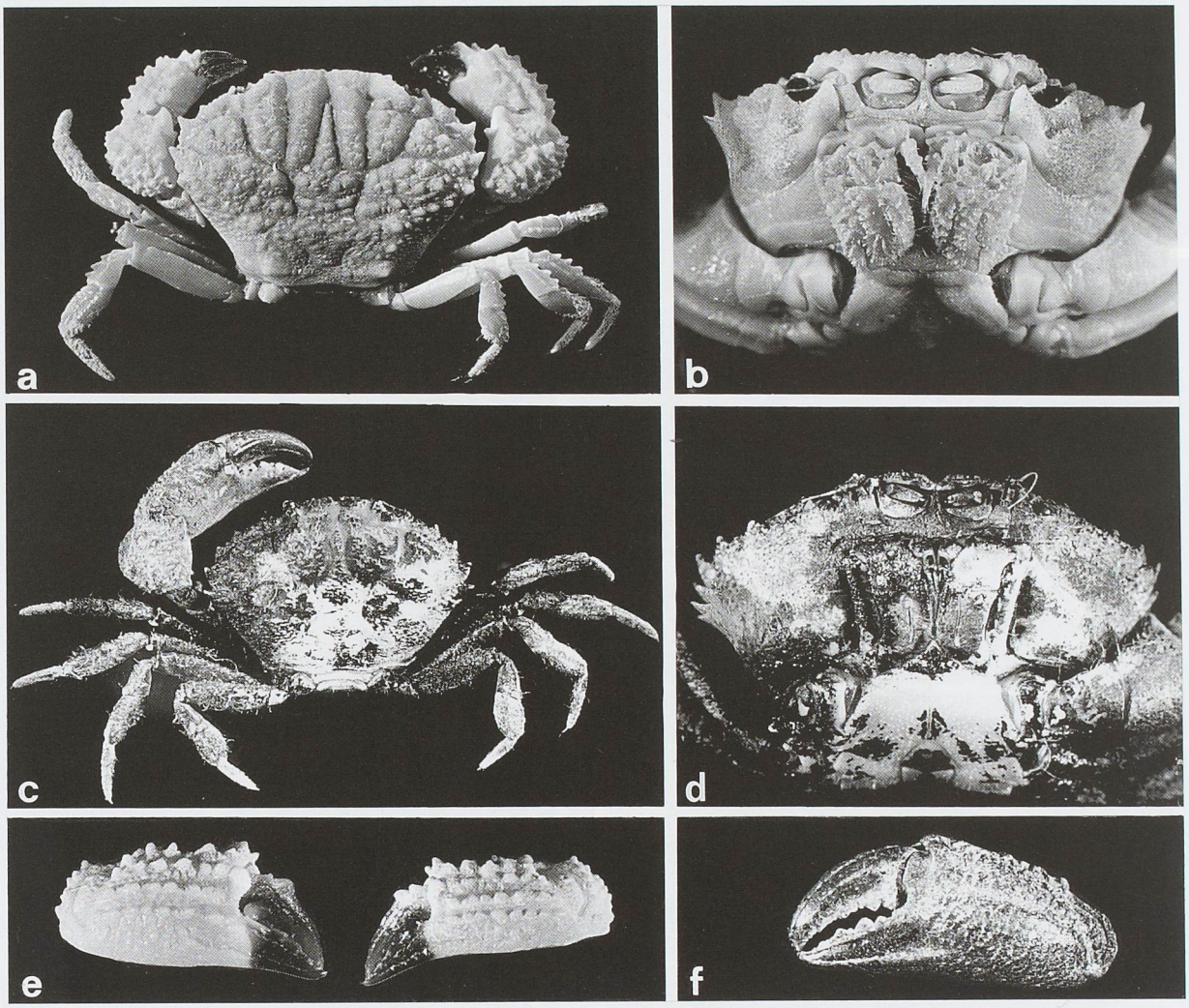


FIG. 16. — **a-b**, **e**, *Palatigum trichostoma* gen. nov., sp. nov., ♀ holotype (MNHN-B 22801); **c-d**, **f**, *Medaeops gemini* sp. nov., ♂ holotype (MNHN-B 22804).

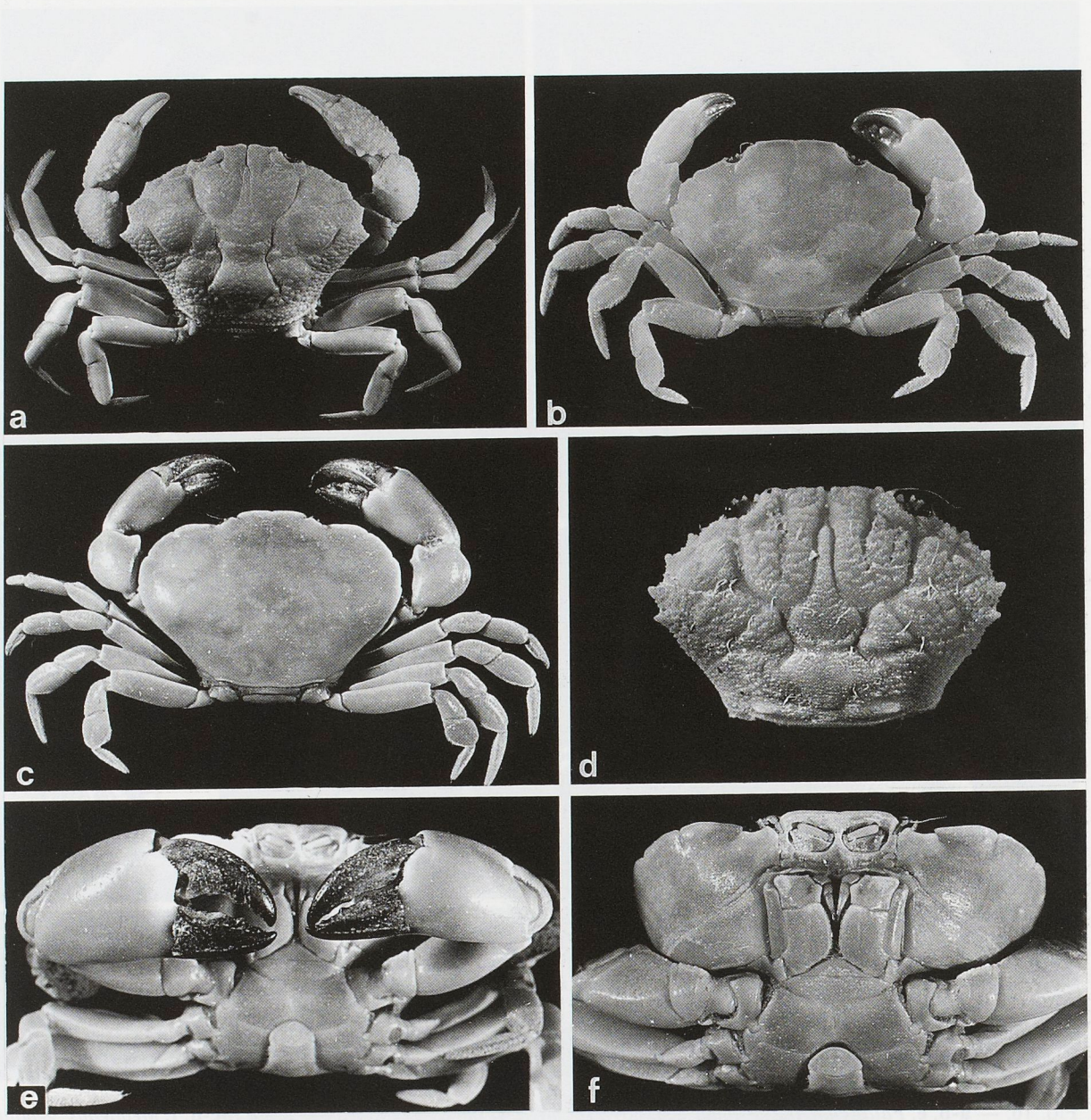


FIG. 17. — **a**, *Demania wardi* Garth & Ng, 1985 (MNHN-B 22806); **b**, *Euryxanthops latifrons* sp. nov., ♀ holotype (MNHN-B 22785);**c**, **e-f**, *Euryxanthops cepros* sp. nov., ♂ holotype (MNHN-B 22776); **d**, *Medaeops merodontos* sp. nov., ? holotype (MNHN-B 22808).

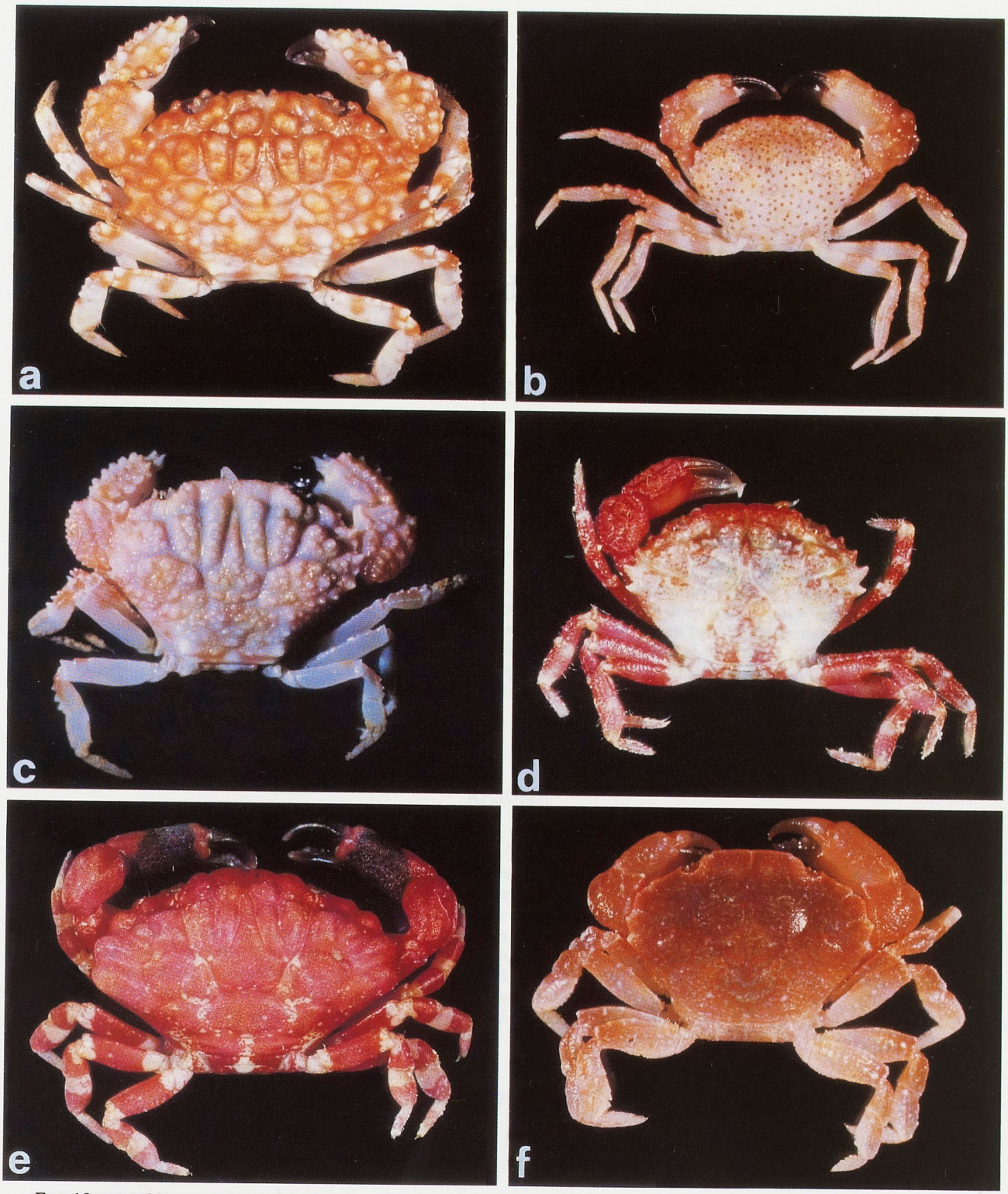


FIG. 18. — **a**, *Meractaea multidentata* sp. nov., ♀ paratype (MNHN-B 22767); **b**, *Alainodaeus rimatara* Davie, 1993, ♂ (MNHN-B 22924); **c**, *Palatigum trichostoma* gen. nov., sp. nov., ♀ (holotype) (MNHN-B 22801); **d**, *Medaeus aztec* sp. nov., ♂ holotype (MNHN-B 22807); **e**, *Liomera nigrimanus* sp. nov., ♂ holotype (MNHN-B 22758); **f**, *Euryxanthops latifrons* sp. nov., ♀ holotype (MNHN-B 22785).



11

Pycnogonida collected in recent years around New Caledonia and Vanuatu

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ABSTRACT

Twenty-eight species of Pycnogonida (plus one unidentifiable juvenile) are recorded from New Caledonia and Vanuatu (formerly the New Hebrides, some 400 km NE of New Caledonia), mostly from deep waters, but some in the littoral and infra-littoral zones. They belong to the families Ammotheidae (8 species, of which two, in the genera *Ascorhynchus* and *Cilunculus*, are new), Colossendeidae (7 species, of which one, in the genus *Colossendeis*, new), Nymphonidae (2 species in the genus *Nymphon*, both new), Callipallenidae (1 species), Phoxichilidiidae (10 species), and Pycnogonidae (1 species). In addition to the species new to Science, several others are new to the area and represent extensions of the previously known ranges.

A key to all known species of *Cilunculus* is presented.

RÉSUMÉ

Pycnogonides récoltés durant ces dernières années autour de la Nouvelle-Calédonie et du Vanuatu.

Vingt-huit espèces de Pycnogonides (sans compter un jeune non identifiable) sont signalées de la Nouvelle-Calédonie et du Vanuatu (autrefois les Nouvelles-Hébrides, à 400 km environ au N. E. de la Nouvelle-Calédonie). Les récoltes proviennent surtout des eaux profondes, mais quelques-unes du littoral et de l'infralittoral. Ces espèces appartiennent aux familles Ammotheidae (8 espèces, dont deux, dans les genres *Ascorhynchus* et *Cilunculus*, sont nouvelles), Colossendeidae (7 espèces, dont une, dans le genre *Colossendeis*, nouvelle), Nymphonidae (2 espèces de *Nymphon*, l'une et l'autre nouvelles), Callipallenidae (1 espèce), Phoxichilidiidae (10 espèces) et Pycnogonidae (1 espèce). Outre les espèces nouvelles pour la Science, plusieurs autres sont nouvelles pour la région.

Une clé d'identification de toutes les espèces du genre *Cilunculus* est proposée.

INTRODUCTION

After the completion of an earlier paper (STOCK, 1991b) on the Pycnogonida of New Caledonia and its surroundings, a number of new samples collected in the same area and off Vanuatu, were available. These

STOCK, J.H., 1997. — Pycnogonida collected in recent years around New Caledonia and Vanuatu. *In*: A. CROSNIER (ed.), Résultats des Campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176**: 389-409. Paris ISBN 2-85653-511-9.

collections partly containing the same species as previously recorded, yielded also a good many surprises. They form the subject of the present report.

I have to thank Bertrand RICHER DE FORGES, ORSTOM Nouméa, for collecting most of these new samples and Alain CROSNIER, ORSTOM Paris, for sorting and entrusting me the material. Almost the entire collection has been deposited in the Paris Museum (MNHN), but for some duplicates which have been retained for the Zoölogisch Museum, Amsterdam (ZMA).

The hierarchical arrangement of the families, genera and species is the same as in a previous publication (STOCK, 1994), *i.e.*, the families and genera are in phylogenetic order, the species in alphabetical sequence.

In the lists of Material examined, the names of the cruises are in capital letters. The names of vessels are in italic letters and quoted. Station numbers are preceded by two capital letters, denoting the gear used: DW means Warren dredge, CP beam trawl.

SYSTEMATIC ACCOUNT

The collection contains the following species from New Caledonia (NC) and Vanuatu (V):

Family Ammotheidae: *Ascorhynchus orthorhynchus* Hoek, 1881 (NC and V); *A. constrictus* sp. nov. (V); *A. seticauda* Stock, 1991 (NC); *Cilunculus scaurus* sp. nov. (NC); *Ammothella indica* Stock, 1954 (NC); *Achelia assimilis* (Haswell, 1885) (NC); *A. nana* (Loman, 1908) (NC); *A.* sp. juv. (NC).

Family Colossendeidae: *Colossendeis colossea* Wilson, 1881 (V); *C. leptorhynchus* Hoek, 1881 (NC and V); *C. macerrima* Wilson, 1881 (V); *C. pipetta* Stock, 1991 (NC); *C. sinuosa* sp. nov. (NC); *Rhopalorhynchus filipes* Stock, 1991 (NC); *Hedgpethia tibialis* Stock, 1991 (NC).

Family Nymphonidae: *Nymphon fortunatum* sp. nov. (NC); *N. spinifex* sp. nov. (NC).

Family Callipallenidae: *Callipallene fallax* Stock, 1994 (NC).

Family Phoxichilidiidae: *Pallenopsis (P.) angusta* Stock, 1991 (NC); *P. (P.) dentifera* Stock, 1983 (NC); *P. (P.) spinipes* Carpenter, 1907 (V); *P. (P.) virgata* Loman, 1908 (V); *Pallenopsis (Bathypallenopsis) juttingae* Stock, 1964 (NC); *P. (B.) longirostris* Wilson, 1881 (V); *P. (B.) mollissima* (Hoek, 1881) (V); *P. (B.) ?oculotuberculosis* Hilton, 1942 (V); *P. (B.) t. tydemani* Loman, 1908 (V and Indonesia); *Endeis mollis* (Carpenter, 1904) (NC).

Family Pycnogonidae: *Pycnogonum occa* Loman, 1908 (NC).

Family AMMOTHEIDAE

Genus *ASCORHYNCHUS* Sars, 1877

In agreement with the International Code of Zoological Nomenclature, art. 30(a)(iii), the generic name is treated here as masculine.

Ascorhynchus orthorhynchus Hoek, 1881

Fig. 1

Ascorhynchus orthorhynchus Hoek, 1881: 57-59, pl. 5 figs 11-13, pl. 6 figs 1-4, pl. 15 figs 14-15. — LOMAN, 1908: 31 (no new records). — STOCK, 1953b: 301.

MATERIAL EXAMINED. — **New Caledonia**. BATHUS 1: stn CP 702, 20°55.97'S, 165°34.67'E, 591-660 m, 18.03.1993: 1 ♀ (MNHN-Py 863).

BATHUS 4: stn CP 946, 20°33.81'S, 164°58.35'E, 386-430 m, 10.08.1994: 2 ♀ (MNHN-Py 864, ZMA Pa. 202.062).

Vanuatu. MUSORSTOM 8: stn DW 1019, 17°38.25'S, 168°33.91'E, 397-430 m, 28.09.1994: 1 ♀ (MNHN-Py 865). — Stn 1131, 15°38.41'S, 167°03.52'E, 140-175 m, 11.10.1994: 1 young ♀ (MNHN-Py 866).

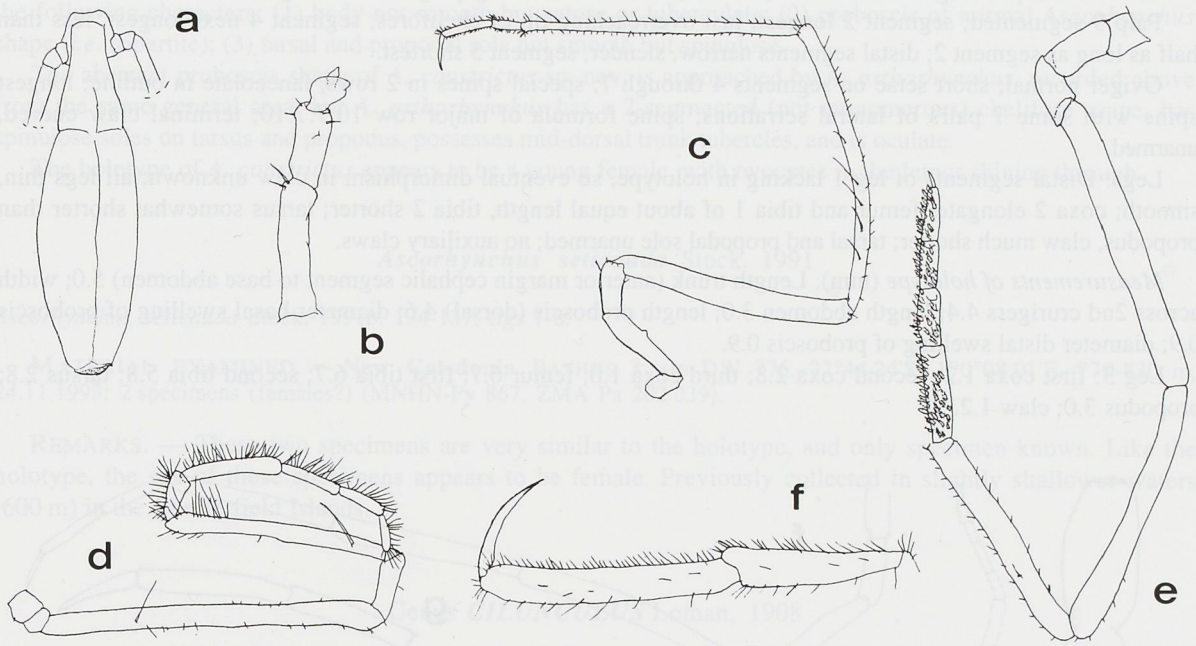


FIG. 1. — *Ascorhynchus orthorhynchus* Hoek, 1881 (♀, BATHUS 1, Stn CP 702): **a**, proboscis, ventral; **b**, chelifore; **c**, leg 4; **d**, palp; **e**, oviger; **f**, distal segments of leg 3.

REMARKS. — This species has been found only twice before, on *"Challenger"* Stn 219, 01°50'S, 146°42'E, 274 m (= N. of New Guinea), and on *"Albatross"* Stn 5577, 05°20'36"N, 119°58'51"E, 439 m (= N.E. of Borneo), thus the present specimens constitute a considerable range extension to New Caledonia and Melanesia. HOEK's description and figures suffice completely to recognize *A. orthorhynchus*, showing the spiniform processes on the mid-dorsal line of the trunk and crurigers, the long abdomen, the club-shaped proboscis, the 2-segmented chelifore scape (of which the distal segment is the longest), the relatively long tarsus, the dense spinulation of tarsus and propodus, the slender claw, etc.

The claw of leg 1 (lacking in HOEK's material) is slightly less elongate than that of the remaining legs, but it is not rudimentary or vestigial. The adult specimen from Vanuatu has somewhat longer setae on tibia 1 of the legs.

Some new drawings of the animal are presented in this paper, to complement HOEK's illustrations.

Ascorhynchus constrictus sp. nov.

Fig. 2

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn CP 1080, 15°57.30'S, 167°27.73'E, 799-850 m, 5.10.1994: 1 ♀ holotype (MNHN-Py 923).

DESCRIPTION. — Trunk completely segmented, smooth, without tubercles or spurs; articulation lines with cuff-like, overlapping rims. Abdomen vaguely articulated with 4th trunk segment. Crurigers longer than central trunk diameter; separated by intervals narrower than their own diameter. Neck with "crop" (i.e. anterior end wider than posterior end). Eye tubercle inconspicuous low swelling, with small tubercle left and right on top; no eyes; implanted slightly in front of oviger implantations. Proboscis with almost stalk-like, narrow basal part, gonflate next portion, then pinched markedly, and swollen distal portion; entire proboscis thus bipartite rather then the usual tripartite.

Chelifore scape 1-segmented, narrow, slender; chela small, with gaping, smooth fingers.

Palp 9-segmented; segment 2 longest, just overreaching tip of chelifores; segment 4 next longest, less than half as long as segment 2; distal segments narrow, slender, segment 5 shortest.

Oviger normal; short setae on segments 4 through 7; special spines in 2 rows, lanceolate in outline; longest spine with some 7 pairs of lateral serrations; spine formula of major row 10:7:7:10; terminal claw curved, unarmed.

Legs: Distal segments of leg 1 lacking in holotype, so eventual dimorphism in claw unknown; all legs thin, smooth; coxa 2 elongate; femur and tibia 1 of about equal length, tibia 2 shorter; tarsus somewhat shorter than propodus, claw much shorter; tarsal and propodal sole unarmed; no auxiliary claws.

Measurements of holotype (mm): Length trunk (anterior margin cephalic segment to base abdomen) 5.0; width across 2nd crurigers 4.4; length abdomen 3.0; length proboscis (dorsal) 4.6; diameter basal swelling of proboscis 0.9; diameter distal swelling of proboscis 0.9.

Leg 3: first coxa 1.2; second coxa 2.8; third coxa 1.0; femur 6.7; first tibia 6.7; second tibia 5.8; tarsus 2.8; propodus 3.0; claw 1.2.

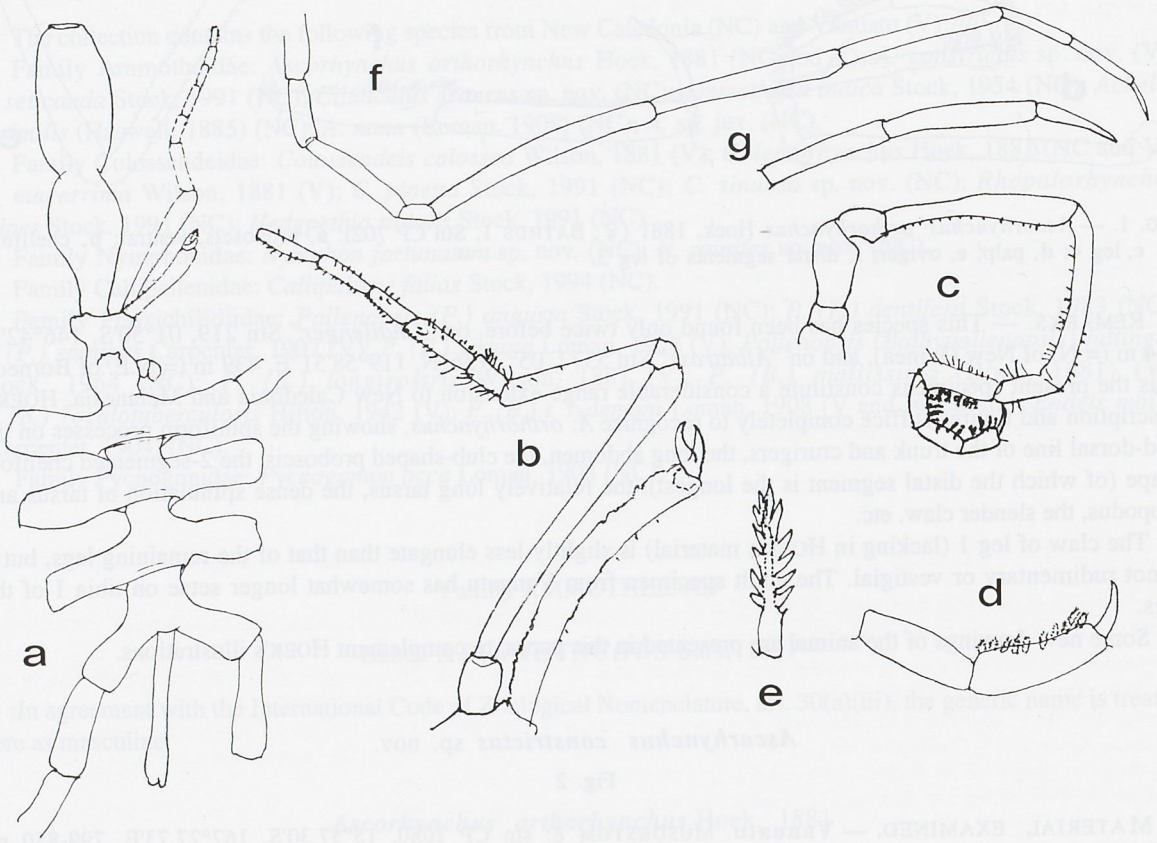


FIG. 2. — *Ascorhynchus constrictus* sp. nov. (♀ holotype): **a**, trunk, dorsal; **b**, chelifore and palp; **c**, oviger; **d**, distal oviger segments; **e**, third special spine of oviger segment 7; **f**, leg 3; **g**, distal segments of leg 3.

ETYMOLOGY. — The specific name, *constrictus*, alludes to the shape of the proboscis, with its narrow basal portion and central constriction.

REMARKS. — There are quite a few blind, longitarsal *Ascorhynchus* species (e.g. *A. bucerus* Turpaeva, 1971, *birsteini* Turpaeva, 1971, *breviscapus* Stock, 1968, *fragilis* Stock, 1991, *ovicoxa* Stock, 1975, *ios* Bamber &

Thurston, 1993, *levimani* Turpaeva, 1994). These species do not look like the present species, because of one of the following characters: (1) body not smooth but setose or tuberculate; (2) proboscis of normal *Ascorhynchus* shape (*i.e.* tripartite); (3) tarsal and propodal sole not smooth but spinulose.

The aberrant proboscis shape of *A. constrictus* sp. nov. is approached by *A. orthorhynchus,* recorded above from the same general area, but *A. orthorhynchus* has a 2-segmented (not monomerous) chelifore scape, has spinulose soles on tarsus and propodus, possesses mid-dorsal trunk tubercles, and is oculate.

The holotype of *A. constrictus* appears to be a young female, with ovocytes in the femur shining through.

Ascorhynchus seticauda Stock, 1991

Ascorhynchus seticauda Stock, 1991b: 134-137, figs 7-8.

MATERIAL EXAMINED. — **New Caledonia**. BATHUS 3: stn DW 776, 22°44.24'S, 170°08.01'E, 770-830 m, 24.11.1993: 2 specimens (females?) (MNHN-Py 867, ZMA Pa 202.039).

REMARKS. — These two specimens are very similar to the holotype, and only specimen known. Like the holotype, the sex of these specimens appears to be female. Previously collected in slightly shallower waters (600 m) in the Chesterfield Islands.

Genus *CILUNCULUS* Loman, 1908

Cilunculus scaurus sp. nov.

Fig. 3

MATERIAL EXAMINED. — **New Caledonia**. BATHUS 2: stn CP 823, 23°22.76'S, 167°51.60'E, 980-1000 m, 29.11.1993: 1 ♂, 1 ♀ (holo- and allotype, MNHN-Py 868) and 1 ♂ (paratype, ZMA Pa. 202.038).

DESCRIPTION. — Body completely segmented, segments 1 to 3 with slightly swollen posterior margin, overlapping the next body segment. Allotype with minute mid-dorsal tubercles, holotype without. Crurigers separated by narrow intervals, with several spiniferous tubercles in holotype, less spinous in allotype. Small, pointed tubercle ("horn") at each side of frontal margin of cephalic segment. Cephalic hood overlapping slightly scape segment 1. Ocular tubercle tapering, rounded, low; eyes well-pigmented. Proboscis oval, fat; carried on ventral side of body (not visible in dorsal view). Abdomen reaching to middle of coxa 1 of leg 4, armed with 2 long and some smaller setae.

Chelifore scape 2-segmented; first segment unarmed; second segment with low swelling and several spines. Chela ovate, fingers strongly reduced.

Palp 10-segmented; 2 short basal segments; segments 3 and 5 elongate; segment 5 with longitudinal spine row; segments 6 to 10 pubescent.

Oviger (♂) with elongate segments 2, 4, and 5; segments 6 to 10 with irregular setation; compound spines on segments 8 to 10, according to formula 3:2:3: no terminal claw. Largest compound spines lanceolate, with 4 or 5 pairs of marginal teeth.

Legs: Coxa 1 with spiniform tubercles; femur with some low tubercles; cement gland cone very large, pointed, on dorsal surface of femur; distal end of femur with several long setae; propodus (both sexes) of characteristic shape: convex (dorsal) margin with conspicuous hump in basal quarter; 2 or 3 heel spines (but no well-developed heel); 2 to 3 longer spines in central part of sole and several smaller spines in distal part; size and number of spines variable with specimens; claw about half as long as propodus; auxiliary claws less than one-third of main claw.

Measurements of holotype (mm): Length trunk (frontal margin cephalic segment to tip of abdomen) 10.8; width across second crurigers 4.0. Fourth leg: first coxa 1.0; second coxa 1.6; third coxa 1.0; femur 4.2; first tibia 5.0; second tibia 5.1; tarsus + propodus 2.6.

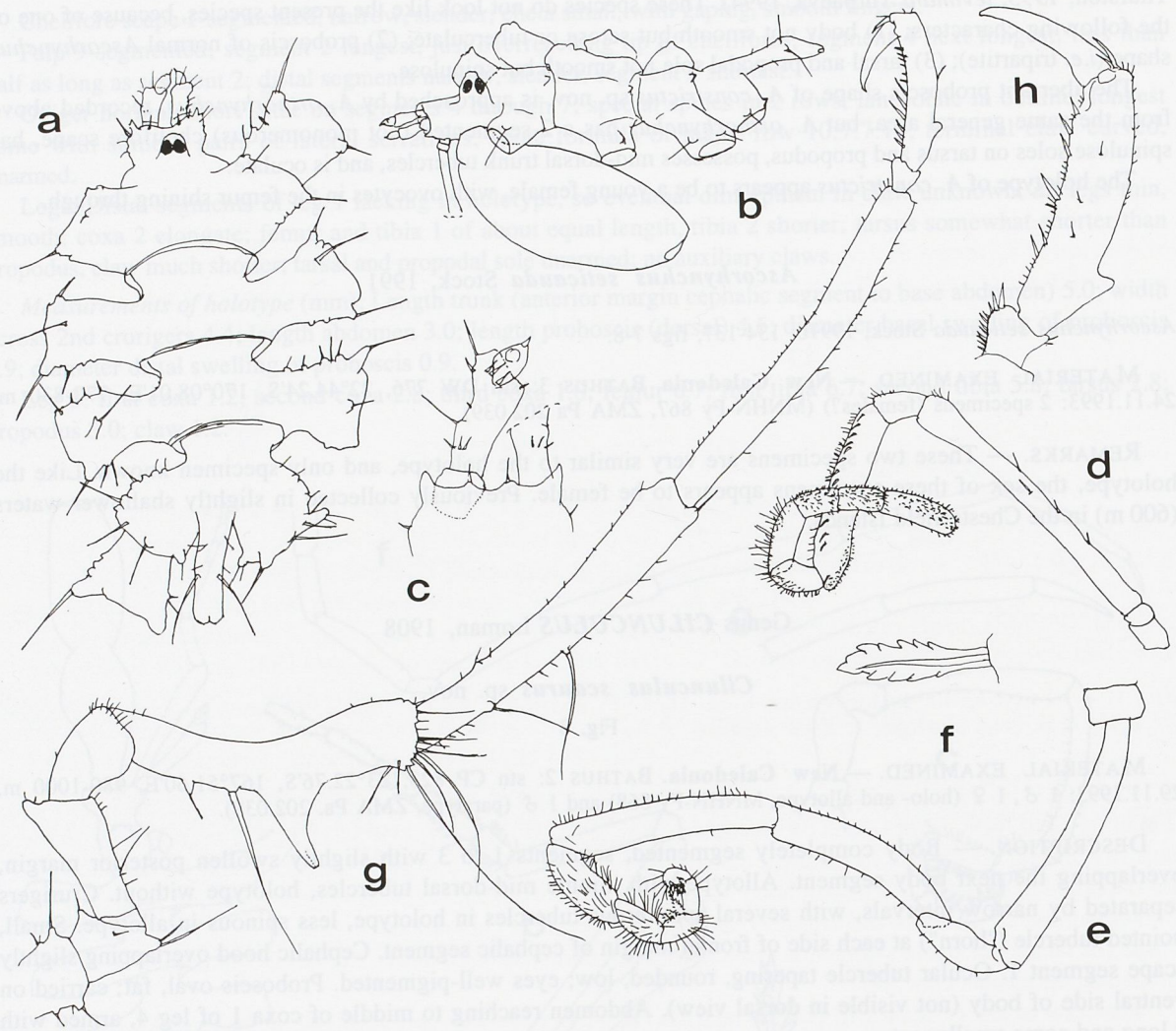


FIG. 3. — *Cilunculus scaurus* sp. nov. (♂ holotype, ♂ paratype, and ♀ allotype, BATHUS 3, Stn CP 823): **a**, trunk of holotype, dorsal; **b**, trunk of allotype, from the left; **c**, anterior end of cephalon with chelifore of paratype; **d**, palp of paratype; **e**, oviger of paratype; **f**, distal compound spine of oviger segment 8 of paratype; **g**, leg 3 of paratype (to same scale as fig. 3a); **h**, distal segments of leg 3.

ETYMOLOGY. — The hump on the foot (= propodus) has inspired the Latin name *scaurus*, meaning "club-foot" (Horatio).

REMARKS. — The new species, *C. scaurus*, shares superficially many characters with another New Caledonian species, *C. compactus* Stock, 1991. The latter has, however, many more, and stronger spiniform processes on crurigers and abdomen, much stronger mid-dorsal trunk tubercles, a much shorter male cement gland cone, slenderer distal palp segments, a more pronounced cephalic hood, etc. *C. scaurus* differs from all other *Cilunculus* species, and as point of fact from any other pycnogonid known, in the presence of a dorsal hump on the propodus.

In the last few years the number of species in this genus has greatly increased, from 5 (STOCK, 1955b), or 12 (STOCK, 1978a), to 28 (present situation). Therefore a new key to all species actually known is presented in this paper.

Artificial key to the species of *Ciluncul us*

1. Uniunguiculate **2**
— Auxiliary claws present **3**

2. Chelifore scape 2-segmented. Mid-dorsal line of trunk somites 1 to 3 with tubercle .....
..... ***C. acanthus*** Fry & Hedgpeth, 1969
— Chelifore scape 1-segmented. Mid-dorsal line without tubercles .....
..... ***C. kravcovi*** Pushkin, 1973

3. Auxiliary claws much less than half as long as main claw **4**
— Auxiliary claws at least half as long as main claw **11**

4. Scape 1-segmented **5**
— Scape 2-segmented **6**

5. Mid-line of trunk bald. Ocular tubercle absent .. ***C. battenae*** Bamber & Thurston, 1993
— Mid-line of trunk with long setae placed on pedestal. Ocular tubercle tall .....
..... ***C. frontosus*** Loman, 1908

6. Propodus with conspicuous hump on convex margin ..... ***C. scaurus*** sp. nov.
— Propodal margin evenly convex **7**

7. Crurigers widely separated ..... ***C. pedatus*** Stock, 1991
— Crurigers separated by ≤ own diameter **8**

8. Crurigers with strong processes on anterior and posterior margin. Frontal cephalic hood covering chelifores in dorsal view ..... ***C. compactus*** Stock, 1991
— Anterior and posterior margins of crurigers unadorned. Chelifore extending beyond hood ...
..... **9**

9. Pointed tubercles or rounded humps on mid-dorsal line of trunk. Suture lines of trunk clearly visible. Crurigers with some setae. Auxiliary claws weak (≤ 25% of main claw) ...
..... **10**
— Dorsum of trunk smooth. Suture lines obscure. Crurigers naked. Auxiliary claws about one-third of main claw ..... ***C. profundus*** (Hedgpeth, 1949)

10. Mid-dorsal trunk tubercles tall. Crurigers tuberculate, with short setae. Chela not hidden in distal excavation of scape. Cephalic segment tuberculate, but without anterior horns ....
..... ***C. sewelli*** Calman, 1938
— Mid-dorsal trunk tubercles low. Crurigers not tuberculate, with long distal seta. Chela partly hidden in distal excavation of scape. Anterior cephalic horns not well-developed .....
..... ***C. hirsutus*** Clark, 1963
— Posterior margin of trunk segments swollen, not forming well-defined tubercles. Anterior cephalic horns strongly developed ..... ***C. perspicax*** Loman, 1908

11. Scape 1-segmented **12**
— Scape 2-segmented **19**

12. Median line of trunk adorned with tubercles, spine row, or tubular spines **13**
— Median line of trunk unadorned **15**

13. Median line of trunk with transverse spine row. Anterior and posterior margins of crurigers with short spine ..... ***C. spinicristus*** Child, 1987
— Median line of trunk with tubercles, bearing tubular spine. Anterior and posterior margins of crurigers with some setae ..... ***C. galeritus*** Nakamura & Child, 1991

— Median line of trunk with unarmed tubercle. Anterior and posterior margins of crurigers with pointed processes **14**

14. Chelifore scape with long setae. Crurigers separated by more than their own diameter. Ocular tubercle vestigial ..... ***C. crinitus*** Stock, 1991
— Chelifore scape with some short setules. Crurigers closely together. No ocular tubercle .... ***C. achelioides*** Stock, 1991
— Chelifore scape with some minute setae. Crurigers closely together. Ocular tubercle tall ... . ***C. alcicornis*** Stock, 1978

15. Auxiliary claws at least two-thirds of length of main claw **16**
— Auxiliary claws half as long as main claw ..... ***C. haradai*** Nakamura & Child, 1983

16. Ocular tubercle bifurcate, without eyes **17**
— Ocular tubercle cylindrical, with eyes ..... ***C. sekiguchii*** Nakamura & Child, 1983
— Ocular tubercle vestigial, no eyes ..... ***C. europaeus*** Stock, 1978

17. Propodal sole with few (*ca.* 4) spinules. Second coxa 2-3 times as long as wide .... ***C. bifidus*** (Stock, 1968)
— Propodal sole with many (> 10) spines. Second coxa 5-6 times as long as wide **18**

18. Second tibia with many setae. Propodus feebly curved. Chelifore hardly extending beyond cephalic hood ..... ***C. tubicinis*** Child, 1982
— Second tibia poorly setose. Propodus strongly curved. Chelifore well extending beyond cephalic hood ..... ***C. antillensis*** Stock, 1955

19. No mid-dorsal trunk tubercles. No anterior "horns". Chelifores about two-thirds of length of proboscis ..... ***C. gracilis*** Nakamura & Child, 1991
— With mid-dorsal trunk tubercles, with anterior "horns". Chelifores short **20**

20. Long setae on dorsal tubercles and crurigers ..... ***C. cactoides*** Fry & Hedgpeth, 1969
— With short setae only **21**

21. Anterior "horns" smooth. Mid-dorsal tubercles low ..... ***C. armatus*** (Böhm, 1879)
— Anterior "horns" with setae. Mid-dorsal tubercles tall ..... ***C. australiensis*** Clark, 1963

Genus ***AMMOTHELLA*** Verrill, 1900

Ammothella indica Stock, 1954

Ammothella indica - STOCK, 1994: 27 (refs).

MATERIAL EXAMINED. — **New Caledonia**. Récif Senez, 7 m, 7.09.1992, coll. P. BOUCHET: 1 ♂ (MNHN-Py 869).

REMARK. — A widely distributed shallow-water species in the Indo-West Pacific.

Genus ***ACHELIA*** Hodge, 1864

Achelia assimilis (Haswell, 1885)

Achelia assimilis - STOCK, 1994: 32-33, fig. 9 (lit., syn.).

MATERIAL EXAMINED. — **New Caledonia**. SMIB 4: stn DW 55, Norfolk rise, 23°21.4'S, 168°04.5'E, 260 m, 9.03.1989: 1 ♂ (MNHN-Py 871).
Koumac, between the mainland and l'Infernet, 13 m, 4-9.10.1993, coll. B. RICHER DE FORGES: 1 ♀ (MNHN-Py 870).

REMARKS. — A variable and widely distributed species in tropical and cooler waters of the Southern Hemisphere, possibly a catch-all for an unresolved complex of sibling species.

Achelia nana (Loman, 1908)

Achelia nana - STOCK, 1991b: 161 (refs); 1992, fig. 6c; 1994: 35-36.

MATERIAL EXAMINED. — **New Caledonia**. Nouville, intertidal zone, 29.08.1992, coll. B. RICHER DE FORGES: 2 ♂, 5 ♀, 1 juv. (MNHN-Py 872). — Récif Senez, depth 7 m, 7.09.1992, coll. P. BOUCHET: 1 ♂ (MNHN-Py 873).

REMARK. — Frequently recorded from the Indo-West Pacific, in depths from 0 to 435 m.

Achelia sp.

MATERIAL EXAMINED. — **New Caledonia**. OPÉRATION MONTROUZIER: Touho, SCUBA-diving at sandy island, 7.09.1993, coll. B. RICHER DE FORGES: 1 juv. (MNHN-Py 874).

Family COLOSSENDEIDAE

Genus *COLOSSENDEIS* Jarzynsky, 1870

Colossendeis colossea Wilson, 1881

Colossendeis colossea - FRY & HEDGPETH, 1969: 53-54, figs 7-8 (refs).

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn CP 1075, 15°53.26' S, 167°27.21' E, 956-944 m, 4.10.1994, coll. B. RICHER DE FORGES: 1 spm (MNHN-Py 924). — Stn CP 1076, 15°53.81'S, 167°30.42'E, 1100-1191 m, 4.10.1994, coll. B. RICHER DE FORGES: 1 spm (MNHN-Py 925).

REMARK. — A widely distributed, large-sized, common deep-sea species.

Colossendeis leptorhynchus Hoek, 1881

Colossendeis leptorhynchus Hoek, 1881: 64, pl. 8 figs 3-7. — STOCK, 1978b: 401, 402, fig. 2*l* (redescr. types); 1981c: 454-455; 1983: 299-300; 1986b: 417. — AUSTIN, 1985: 429. — NAKAMURA & CHILD, 1990: 308-309. — CHILD, 1992: 42. — TURPAEVA, 1994: 95.
Colossendeis pennata Pushkin, 1970: 1490-1492, fig. 2.

MATERIAL EXAMINED. — **New Caledonia**. BATHUS 3: stn DW 794, 23°48.35'S, 169°49.10'E, 751-755 m, 26.11.1993, coll. B. RICHER DE FORGES: 1 spm (MNHN-Py 875).
Vanuatu. MUSORSTOM 8: stn CP 992, 18°52.34'S, 168°55.16'E, 775-758 m, 24.09.1994, coll. B. RICHER DE FORGES: 1 spm (MNHN-Py 876).

REMARKS. — Because of its confused synonymy, older records of *C. leptorhynchus* and its look-alike *C. macerrima* may not be reliable. TURPAEVA (1994) suspects that the two are identical.

Recent records from all over the Atlantic, and from the western and eastern Pacific show that *C. leptorhynchus* is a rare, but wide-spread species. Nearest to the New Caledonia are STOCK's (1983) and NAKAMURA & CHILD's (1990) records from the Indonesian/Philippine region.

Colossendeis macerrima Wilson, 1881

Colossendeis macerrima - STOCK, 1994: 39 (refs).

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn CP 990, 18°51.63'S, 168°50.98'E, 980-990 m, 24.09.1994: 1 spm (MNHN-Py 926). — Stn CP 1036, 18°01.00'S, 168°48.20'E, 920-950 m, 29.09.1994: 1 spm

(MNHN-Py 877). — Stn CP 1037, 18°03.70'S, 168°54.40'E, 1058-1086 m, 29.09.1994: 2 spms (MNHN-Py 878). — Stn 1075, 15°53.26'S, 167°27.31'E, 956-944 m, 4.10.1994: 1 spm (MNHN-Py 927). — Stn CP 1080 15°57.30'S, 167°27.73'E, 799-850 m, 5.10.1994: 1 spm (MNHN-Py 928). — Stn CP 1129, 16°00.73'S, 166°39.94'E, 1014-1050 m, 10.10.1994: 2 spms (MNHN-Py 879). — Stn CP 1131, 15°38.41'S, 167°03.52'E, 140-175 m, 11.10.1994: 1 spm (MNHN-Py 880).

REMARK. — Station CP 1131 is very shallow indeed for this bathyal species.

Colossendeis pipetta Stock, 1991

Colossendeis pipetta Stock, 1991b: 164-166, fig. 28.

MATERIAL EXAMINED. — **New Caledonia**. BERYX 11: stn CP 32, 23°38'S, 167°43'E, 420-460 m, 18.10.1992: 1 spm (MNHN-Py 881).

SMIB 8: stn DW 168, 23°37.7'S, 168°42.5'E, 433-450 m, 29.01.1993: 1 spm (MNHN-Py 882). — Stn DW 177, Banc Jumeau Ouest, 23°39'S, 168°00'E, 320-370 m, 29.01.1993: 1 spm (MNHN-Py 883). — Stn DW 178, Banc Jumeau Est, 23°45.1'S, 168°17'E, 400 m, 30.01.1993: 2 spms (MNHN-Py 884). — Stn DW 183, Banc Aztèque, 23°18.3'S, 168°04.9'E, 330-367 m, 31.01.1993: 1 spm (MNHN-Py 885). — Stn DW 186, Banc Aztèque, 23°24.9'S, 168°05.7'E, 57-59 m, 31.01.1993: 1 spm (MNHN-Py 886). — Stn DW 189, Banc Aztèque, 23°17.6'S, 168°05.5'E, 400-402 m, 31.01.1993: 1 spm (MNHN-Py 887). — Stn DW 198, Île des Pins, S.E. south reef, 22°51.6'S, 167°12.4'E, 410-330 m, 1.02.1993: 1 spm (MNHN-Py 888).

BATHUS 3: stn CP 805, 23°41.30'S, 168°01.08'E, 278-310 m, 27.11.1993: 4 spms (MNHN-Py 889). — Stn CP 806, 23°42.31'S, 168°00.52'E, 308-312 m, 27.11.1993: 2 spms (MNHN-Py 890). — Stn CP 811, 23°41'S, 168°15'E, 383-408 m, 28.11.1983: 7 spms (6 spms MNHN-Py 929, 1 spm. ZMA). — Stn CP 812, 23°43.38'S, 168°15.98'E, 391-440 m, 12.11.1993: 2 spms (MNHN-Py 891). — Stn DW 817, 23°42.38'S, 168°15.51'E, 405-410 m, 28.11.1993: 2 spms (MNHN-Py 892). — Stn DW 830, 29°19.75'S, 168°01.45'E, 361-365 m, 29.11.1993: 1 spm (MNHN-Py 893). — Stn CP 831, 23°04.47'S, 166°55.57'E, 650-658 m, 30.11.1993: 1 spm (MNHN-Py 894).

BATHUS 4: stn DW 925, 18°54.55'S, 163°23.75'E, 340-405 m, 7.08.1994: 1 spm (MNHN-Py 930).

REMARKS. — A frequently collected species around New Caledonia, in depths between 270 and 1475 m (upper slope). Station DW 186 (see above) forms an exception, the material coming only from 57-59 m (perhaps contamination of the net used at Stn DW 185?).

Colossendeis sinuosa sp. nov.

Fig. 4

MATERIAL EXAMINED. — **New Caledonia**. BATHUS 3: stn DW 809, 23°39.39'S, 167°58.94'E, 650-730 m, 27.11.1993: 1 holotype (MNHN-Py 895), 2 paratypes (MNHN-Py 896 and ZMA Pa. 202.037).

BERYX 11: stn DW 34, 23°33'S, 167°17'E, 560-570 m, 19.10.1992: 1 ♀ (fragmentary, lacking distal part of proboscis), possibly this species (MNHN-Py 897).

DESCRIPTION OF HOLOTYPE (sex uncertain). — Very similar to *C. pipetta* Stock, 1991b. Ocular tubercle rather tall, pointed; eyes well-pigmented. Proboscis of characteristic shape: in lateral view it is not regularly down-curved (as in *C. pipetta*), but more sinuous.

Palp segments 3, 5, 7, 8, and 9 less elongate than in *C. pipetta*. Tarsus much less elongate, *ca.* 1.5 times as long as propodus (in *C. pipetta* almost twice as long).

Measurements of holotype (mm): Body length (frontal margin cephalic segment to tip abdomen 6.2; width across second crurigers 2.0; length proboscis 7.1. First leg: first coxa 0.9; second coxa 0.9; third coxa 1.0; femur 11.7; first tibia 13.2; second tibia 18.0; tarsus 2.2; propodus 1.5; claw 0.6.

ETYMOLOGY. — The specific name *sinuosa* (Latin for sinuous) has been inspired by the proboscis shape.

REMARKS. — At first, it was thought that these animals were just damaged or regenerated, slightly aberrant specimens. But the presence of three specimens of similar morphology at the same station, plus 1 more specimen at another, but not at any of the numerous other stations, seems to rule this out. Therefore, a new species was

created for the form with the aberrant proboscis, and with slightly different slenderness of the palp segments and of the distal leg segments.

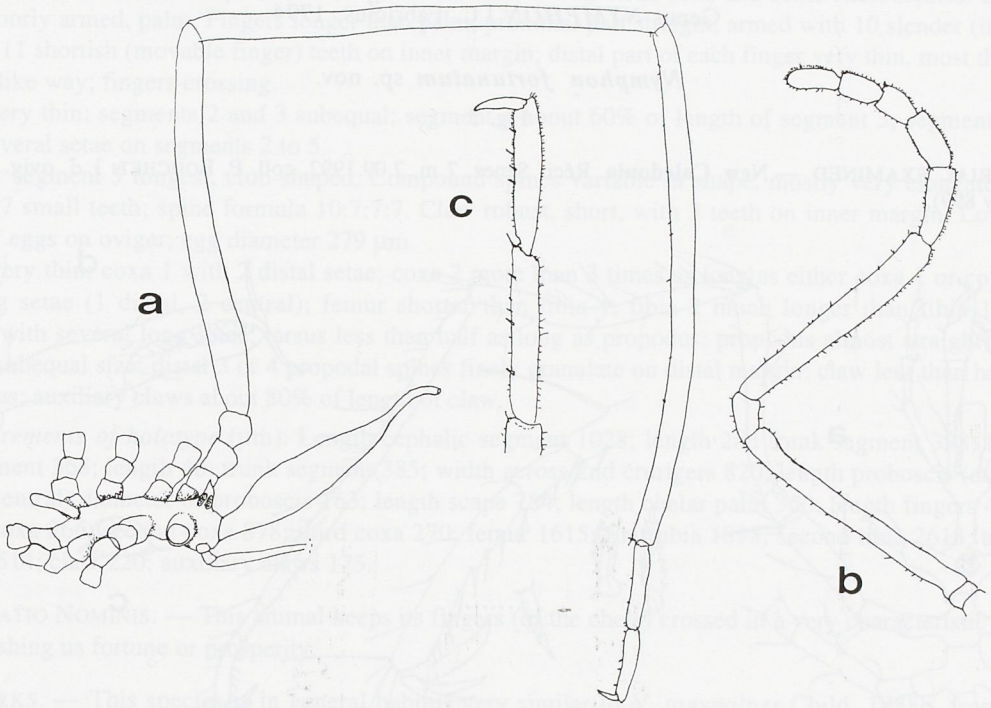


FIG. 4. — *Colossendeis sinuosa* sp. nov. (holotype, BATHUS 3, Stn DW 809): **a**, trunk and first leg, from the right; **b**, palp; **c**, distal segments of first leg.

Genus ***RHOPALORHYNCHUS*** Wood-Mason, 1873

Rhopalorhynchus filipes Stock, 1991

Rhopalorhynchus filipes Stock, 1991b: 161-163, fig. 27; 1994: 39.

MATERIAL EXAMINED. — **New Caledonia**. MUSORSTOM 5: stn CP 293, 23°09.35'S, 159°30.80'E, 280 m, 11.10.1986: 2 ♂, 2 ♀ (MNHN-Py 898).

REMARK. — Previously described from New Caledonia, and later recorded from Indonesia (Tiger Islands).

Genus ***HEDGPETHIA*** Turpaeva, 1973

Hedgpethia tibialis Stock, 1991

Hedgpethia tibialis Stock, 1991b: 166-168, figs 29-30. — TURPAEVA, 1993: 22 (text only).

MATERIAL EXAMINED. — **New Caledonia**. BATHUS 4: stn DW 931, 18°55.38'S, 163°24.36'E, 360-377 m, 4.08.1994: 1 spm (MNHN-Py 931).

REMARK. — Previous records were also from New Caledonia.

Family NYMPHONIDAE

Genus *NYMPHON* J.C. Fabricius, 1794

Nymphon fortunatum sp. nov.

Fig. 5

MATERIAL EXAMINED. — **New Caledonia**. Récif Senez, 7 m, 7.09.1992, coll. P. BOUCHET: 1 ♂ ovig. (holotype) (MNHN-Py 899).

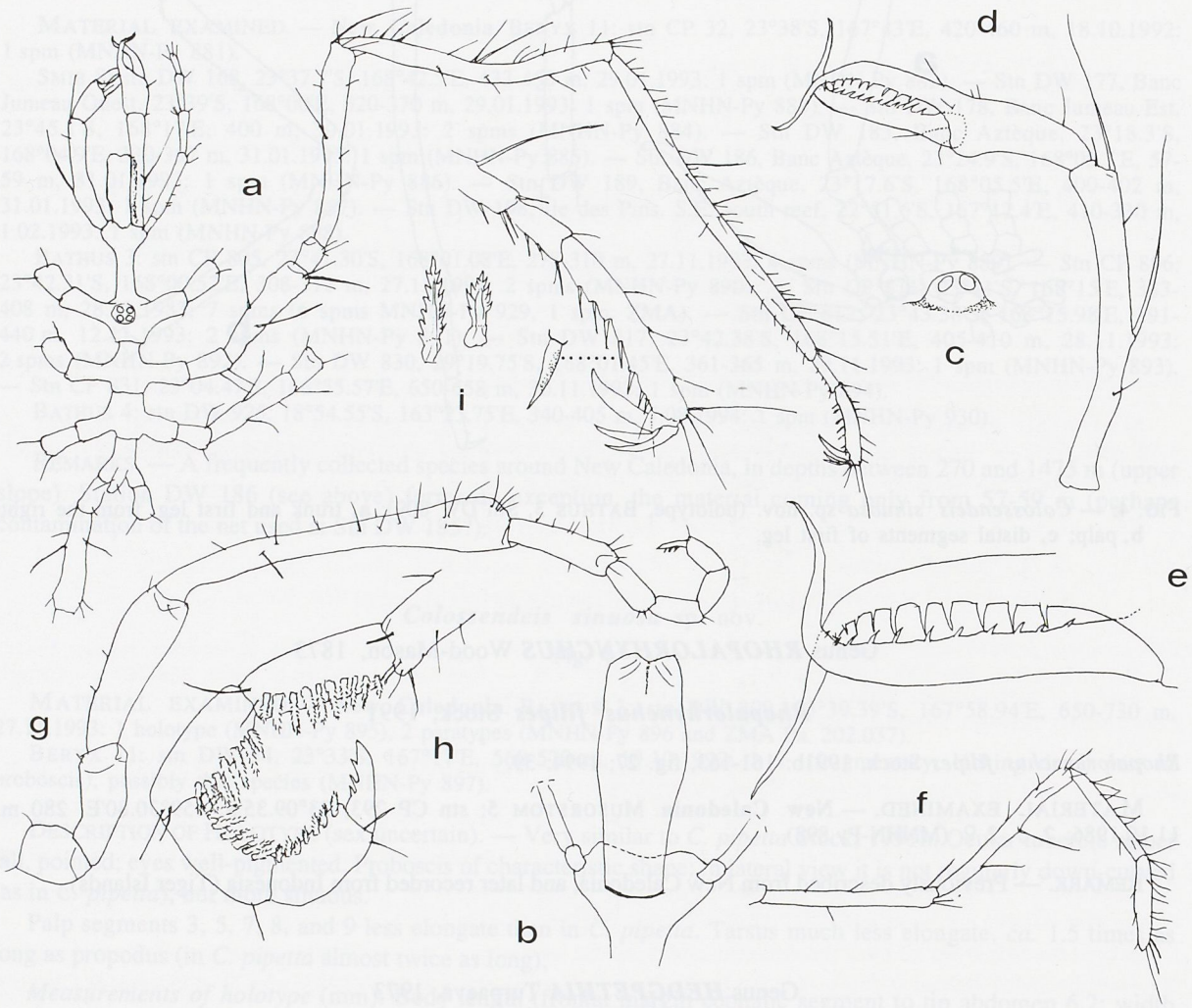


FIG. 5. — *Nymphon fortunatum* sp. nov. (♂ holotype, Récif Senez, New Caledonia): **a**, trunk and leg 2, dorsal; **b**, proboscis, ventral; **c**, ocular tubercle, from the right; **d**, chelifore; **e**, tip of chela; **f**, palp; **g**, oviger; **h**, distal part of oviger; **i**, compound spines of oviger segment 7.

DESCRIPTION. — Body and appendages thin and slender. Crurigers unarmed, longer than trunk diameter, separated by twice their own diameter. Neck slender, anterior part strongly widened; narrow part, in front of ocular

tubercle, parallel-sided; oviger implantation in contact with first cruriger. Ocular tubercle low, rounded; eyes present. Abdomen hardly overreaching 4th crurigers. Proboscis slightly swollen in central part.

Chelifore thin, slender. Scape with 1 long, central seta, 1 long distal seta, and some short setules. Chela with narrow, poorly armed, palm. Fingers longer than palm; proximal part straight, armed with 10 slender (immovable finger) or 11 shortish (movable finger) teeth on inner margin; distal part of each finger very thin, most thread-like, bent in S-like way; fingers crossing.

Palp very thin; segments 2 and 3 subequal; segment 4 about 60% of length of segment 3; segment 5 shorter than 4. Several setae on segments 2 to 5.

Oviger segment 5 longest, club-shaped. Compound spines variable in shape, mostly very elongate; margins with 5 to 7 small teeth; spine formula 10:7:7:7. Claw robust, short, with 3 teeth on inner margin. Low number (4 to 6) of eggs on oviger; egg diameter 279 µm.

Legs very thin; coxa 1 with 2 distal setae; coxa 2 more than 3 times as long as either coxa 1 or coxa 3, with some long setae (1 distal, 2 central); femur shorter than tibia 1, tibia 2 much longer than tibia 1; all long segments with several long setae; tarsus less than half as long as propodus; propodus almost straight; all 7 sole spines of subequal size; distal 3 or 4 propodal spines finely granulate on distal margin; claw less than half as long as propodus; auxiliary claws about 80% of length of claw.

Measurements of holotype (µm): Length cephalic segment 1028; length 2nd trunk segment 398; length 3rd trunk segment 368; length 4th trunk segment 385; width across 2nd crurigers 820; length proboscis (dorsal) 560; greatest (central) diameter of proboscis 163; length scape 784; length chelar palm 350; length fingers 493. Third leg: first coxa 266; second coxa 878; third coxa 270; femur 1615; first tibia 1895; second tibia 2613; tarsus 163; propodus 514; claw 220; auxiliary claws 175.

DERIVATIO NOMINIS. — This animal keeps its fingers (of the chela) crossed in a very characteristic way, as if it were wishing us fortune or prosperity.

REMARKS. — This species is in general habitus very similar to *N. tanypalpes* Child, 1988b, from Aldabra Atoll. Differences were only clear after dissection of the appendages, and pertain to: (1) number of teeth on chelar fingers (10-11 in *fortunatum*, 33-35 in *tanypalpes*); (2) shape of the fingers (S-shaped, strongly curved in *fortunatum*; only slightly curved in *tanypalpes*); (3) number of teeth on oviger claw (3 in *fortunatum*, 10 in *tanypalpes*); (4) relative lengths of palp segments (2 subequal to 3 in *fortunatus*, 2 more than twice as long as 3 in *tanypalpes*).

Nymphon spinifex sp. nov.

Fig. 6

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL: stn. CP 60, 24°01.45'S, 167°08.43'E, 1530 m, 2.09.1985: 1 ♂ (holotype) (MNHN-Py 900).

DESCRIPTION OF HOLOTYPE. — A very spinous and setose, blind *Nymphon*. Trunk completely segmented. Posterior rim of trunk segment 2 with 3 long, mid-dorsal setae, that of segment 3 with 2 such setae. Crurigers 1 and 4 with 1 long, terminal seta; crurigers 2 and 3 with 1 to 3 terminal setae. Oviger implantation in contact with first cruriger. Distance between crurigers slightly more than their own diameter. Frontal part of neck ("crop") enlarged, abruptly merging into narrow posterior part, with 2 minute tubercles on frontal margin. Ocular tubercle and eyes lacking, but 2 minute, pointed tubercles situated at place of ocular tubercle. Abdomen unarmed, somewhat overreaching 4th crurigers, carried horizontally. Proboscis almost perfectly cylindrical.

Chelifore scapes divergent, with several long setae. Chela with many long setae on hand and immovable finger. Fingers longer than hand, regularly curved, tips crossing; movable finger with 7 slender, slightly curved teeth, immovable finger with 8 shorter, slightly curved teeth.

Palp segments 2 and 3 elongate, 2 > 3; segments 4 and 5 short, 4 < 5; many setae on segments 2 through 5.

Oviger (♂): segment 4 club-shaped, with swelling in basal part and dilated at distal end; segment 5 very elongate and slender, distal end swollen; segment 6 setose; segments 7 to 10 small, armed with very low number

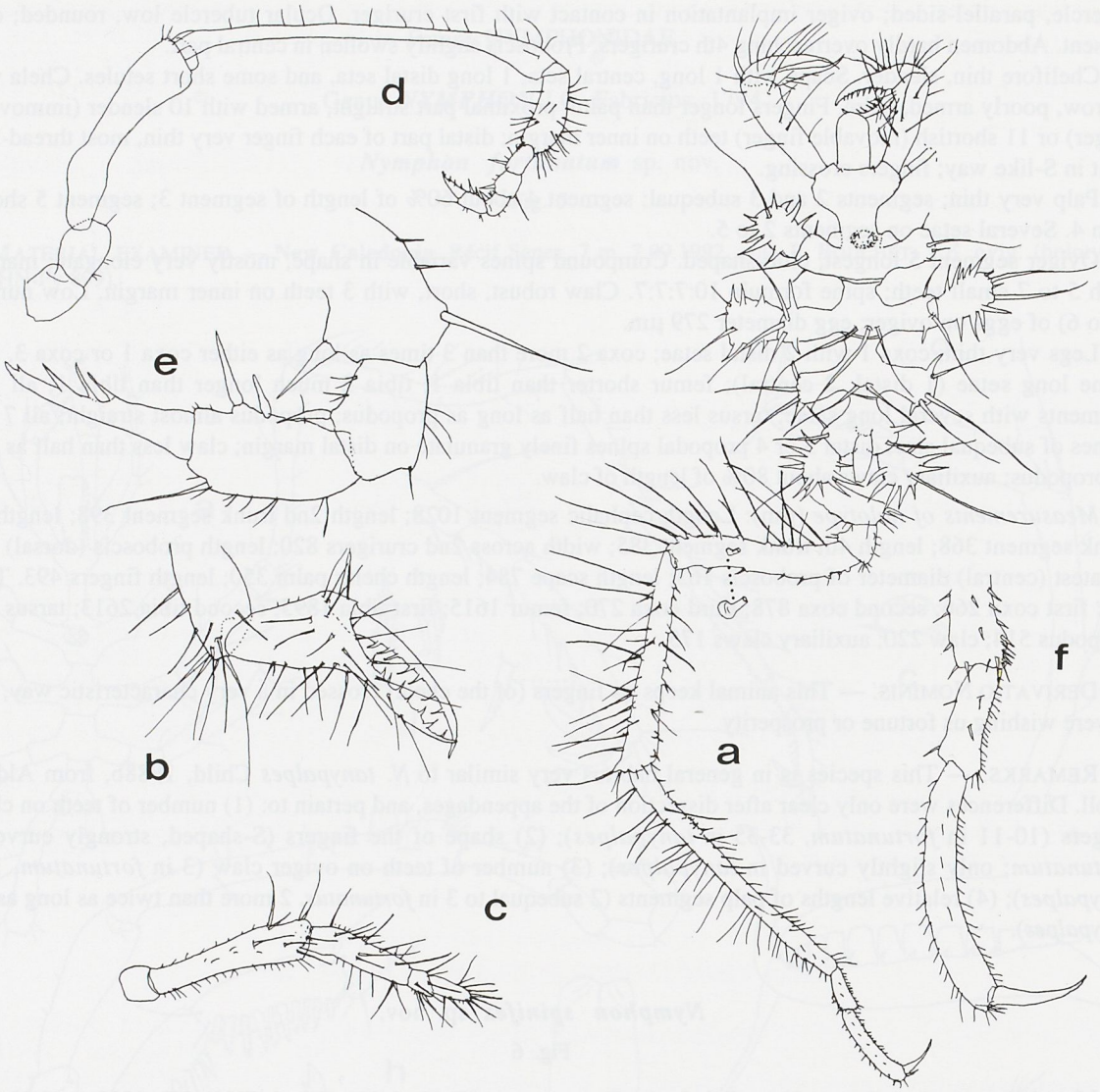


FIG. 6. — *Nymphon spinifex* sp. nov. (♂ holotype, BIOCAL Stn CP 80): **a**, trunk and leg 4, dorsal; **b**, chela; **c**, palp; **d**, oviger; **e**, distal part of oviger; **f**, distal segments of leg 4.

of "special spines" (which are simple, not denticulate), according to formula 1:1:1:2; terminal claw longer than segment 10, almost straight, with 3 larger and 1 smaller endal teeth.

Legs: Coxa 1 with 3 or 4 large spiniferous processes on anterior and posterior margins, and 1 or 2 smaller processes + 1 or 2 long setae on distal margin. Coxa 2 with rounded, low genital process at ventrodistal end. Femur < tibia 1 < tibia 2, with numerous very long setae on dorsal surface, and several spinules, often placed on top of low tubercle on ventral surface. Tarsus 37% of length of propodus. Propodal sole evenly concave, armed with numerous spinules of equal size. Claw less than half as long as propodus, thin. Auxiliary claws present, but very short. Cement gland discharging through one flask-shaped duct at about two-thirds of femur of all legs.

Measurements of holotype (μm): Length first trunk segment 1331; length second trunk segment 745; length third trunk segment 778; length fourth trunk segment (to tip lateral process) 713; width across 2nd lateral processes 2029; length abdomen 647; length proboscis (dorsal) 808; greatest diameter proboscis 454; length scape

1782; length chela 1337. Leg 4: first coxa 466; second coxa 731; third coxa 416; femur 2355; first tibia 2293; second tibia 3427; tarsus 422; propodus 1135; claw 490; auxiliary claws 101.

ETYMOLOGY. — The specific name, *spinifex*, is derived from the Latin words *spina* (= spine) and *ferre* (= to bear), and alludes to the thorny coxa 1 of this species.

REMARKS. — I do not know where to place this species in the large (235 species) genus *Nymphon.* Its setose body, chelifores and legs suggest relationship with the *australe*-group (see CHILD, 1995a) or with the Southern Hemisphere forms formerly united in the (now abandoned) genus *Chaetonymphon.* However, these forms have a male oviger of type II (GORDON, 1932: 27 and table III; 1944: 17), whereas the New Caledonian species has a type Ib.

There are several points of agreement between the new species and *N. adareanum* Hodgson, 1907, from the (Sub)Antarctic, especially in (1) the low number of special oviger spines (< 10), which are simple instead of foliate/denticulate; (2) the smallish oviger segments 7 to 10, and (3) the relative length of the palp segments. However, HODGSON's species has a type Ia (not Ib) male oviger, long auxiliary claws, and a non-setose trunk.

The resemblance to *N. chaetochir* Utinomi, 1971, from the Chatham Rise (E. of New Zealand) is rather superficial. It differs from *N. spinifex* in the possession of denticulate compound spines on the oviger, slenderer distal palp segments, a larger tarsus, and complete absence of auxiliary claws.

Nymphon spinifex is well-characterized by the numerous spiniform processes, in particular on coxa 1, which give it a superficial resemblance to members of the genus *Achelia.*

Another feature of *N. spinifex* is the absence of eyes and of an ocular tubercle. In this respect, it agrees with *N. australe* var. *caecum* Gordon, 1944 considered as a deep-water "subspecies" (1200-3204 m) of the circum-antarctic typical form (CHILD, 1995a: 11), but it was recently recorded by STIBOY-RISCH (1993: 261) from two *"Polarstern"* stations in 158-222 m. This "var. *caecum*" is apparently not closely related to *N. spinifex* (oviger with numerous teeth, coxae without spines, male oviger of type II, etc.).

Family CALLIPALLENIDAE

Genus ***CALLIPALLENE*** Flynn, 1929

Callipallene fallax Stock, 1994

Callipallene fallax Stock, 1994: 47-48, fig. 18.

MATERIAL EXAMINED. — **New Caledonia**. Nouville, intertidal zone, 29.08.1992: 2 ♂ ovig. (1 ♂ MNHN-Py 901, 1 ♂ ZMA Pa. 202.040).

REMARK. — Recently described from 2 females collected in Indonesia (Misoöl and Sangihe islands), between 1 and 18 m.

Family PHOXICHILIDIIDAE

Genus ***PALLENOPSIS*** (subgenus ***PALLENOPSIS*** *s. str.)* Wilson, 1881

Pallenopsis (Pallenopsis) angusta Stock, 1991

Pallenopsis (Pallenopsis) angusta Stock, 1991b: 195-197, figs 47-48; 1994: 49.

MATERIAL EXAMINED. — **New Caledonia**. SMIB 8: stn DW 180, Banc Jumeau Est, 23°47.7'S, 168°18.1'E, 460-525 m, 30.01.1993: 1 ♂ (MNHN-Py 902). — Stn DW 189, Banc Aztèque, 23°17.6'S, 168°05.5'E, 400-402 m,

31.01.1993: 1♂ (MNHN-Py 903). — Stn DW 198, 22°51.6'S, 167°12.4'E, 413-430 m, 1.02.1993: 1 ♂ (MNHN-Py 904).

BATHUS 1: stn CP 701, 20°57.54'S, 165°35.86'E, 302-335 m, 18.03.1993: 1♂ (MNHN-Py 905).

BATHUS 2: stn DW 717, 22°44.02'S, 167°16.58'E, 350-393 m, 11.05.1993: 1 ♂, 1 ♀ (MNHN-Py 906).

BATHUS 3: stn CP 805, 23°41.30'S, 168°01.08'E, 278-310 m, 27.11.1993: 1 ♂, 1 ♀ (MNHN-Py 907). — Stn CP 806, 23°42.31'S, 168°00.52'E, 308-312 m, 27.11.1993: 3 ♂ (MNHN-Py 908). — Stn DW 830, 23°19.75'S, 168°01.45'E, 361-365 m, 29.11.1993: 1♂ (MNHN-Py 809). — Stn CP 847, 23°02.53'S, 168°58.18'E, 405-411 m, 1.12.1993: 2 ♂, 1 ♀ (MNHN-Py 910).

BATHUS 4: stn CP 955, 21°45.71'S, 166°37.47'E, 242-250 m, 11.08.1994: 1 ♂ (MNHN-Py 911).

REMARK. — A large pycnogonid, common on the lower shelf and particularly on the upper slope around New Caledonia, and in Indonesia.

Pallenopsis (Pallenopsis) dentifera Stock, 1983

Pallenopsis (Pallenopsis) dentifera Stock, 1983: 300-304, figs 1-10. — CHILD, 1988a: 23.

MATERIAL EXAMINED. — **New Caledonia**. OPÉRATION MONTROUZIER: Passe de Touho, dredged in 100 m, 8.09.1993: 1 ♀ (MNHN-Py 912).

REMARKS. — The denticulation of the immovable finger of the chela resembles that of the female described by CHILD (1988a).

The species was previously recorded from the lower shelf (143-172 m) on two places in the Philippines. It is new to New Caledonia.

Pallenopsis (Pallenopsis) spinipes Carpenter, 1907

Pallenopsis (Pallenopsis) spinipes - STOCK, 1994: 49-51, fig. 19 (refs).

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn CP 1001, 18°48.97'S, 168°59.83'E, 150-250 m, 25.09.1994: 1 ♂, 1 ♀ (MNHN-Py 913).

REMARKS. — A widely distributed species of variable morphology, collected between 0 and 300 m in great parts of the Indo-West Pacific (STOCK, 1994).

Pallenopsis (Pallenopsis) virgata Loman, 1908

Pallenopsis (Pallenopsis) virgata - NAKAMURA & CHILD, 1991: 41 (refs). — STOCK, 1991b: 197; 1991c: 223-224.

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn CP 1084, 15°50.29'S, 167°17.48'E, 207-280 m, 5.10.1994: 1 young ♀ (MNHN-Py 914).

REMARKS. — Distributed from Japan, through the Philippines and Indonesia, to New Caledonia. The present record from Vanuatu constitutes an eastward extension of the known range. The species is restricted to the shelf and upper slope.

Genus *PALLENOPSIS* (subgen. *BATHYPALLENOPSIS* Stock, 1975)

Pallenopsis (Bathypallenopsis) juttingae Stock, 1964

Pallenopsis (Pallenopsodon) juttingae Stock, 1964: 46-51, fig. 2a-g. — ARNAUD, 1974: 148-149, figs 3.
Pallenopsis (Bathypallenopsis) juttingae - STOCK, 1975: 1032.
Pallenopsis juttingae - BAMBER & THURSTON, 1995: 139-140.

MATERIAL EXAMINED. — **New Caledonia**. BATHUS 1: stn CP 702, 22°55.97'S, 165°34.67'E, 591-660 m, 18.03.1993: 1 ♂ (MNHN-Py 915).

REMARKS. — This specimen has the propodi of all four legs of similar, *juttingae*, morphology. The remaining characters, such as the shape of the chelae, the setosity of the legs, and the structure of the cement gland aperture, agree likewise with *juttingae*.

The question whether *P. (B.) juttingae* is a synonym of *P. (B.) scoparia* Fage, 1956, is fully open now again. The discovery that the latter could have propodal dimorphism (STOCK, 1988, 1991b) seemingly solved the problem, but propodal dimorphism is lacking in the present specimen from New Caledonia. BAMBER & THURSTON (1995) were also unable to shed new light on the question. A possibility, still to be proved, is that males have a *juttingae* morphology (all legs alike, propodal sole 'normal'), whereas females have a *scoparia* morphology (propodus of legs 1 to 3 with dense brush of sole spinules, that of leg 4 'normal').

P. (B.) juttingae is a bathypelagic species recorded so far only from the Bay of Biscay (STOCK, 1964; ARNAUD, 1974), but its look-alike *P. (B.) scoparia* is known from deeper waters in all three major oceans, including the New Caledonian region (STOCK, 1991b).

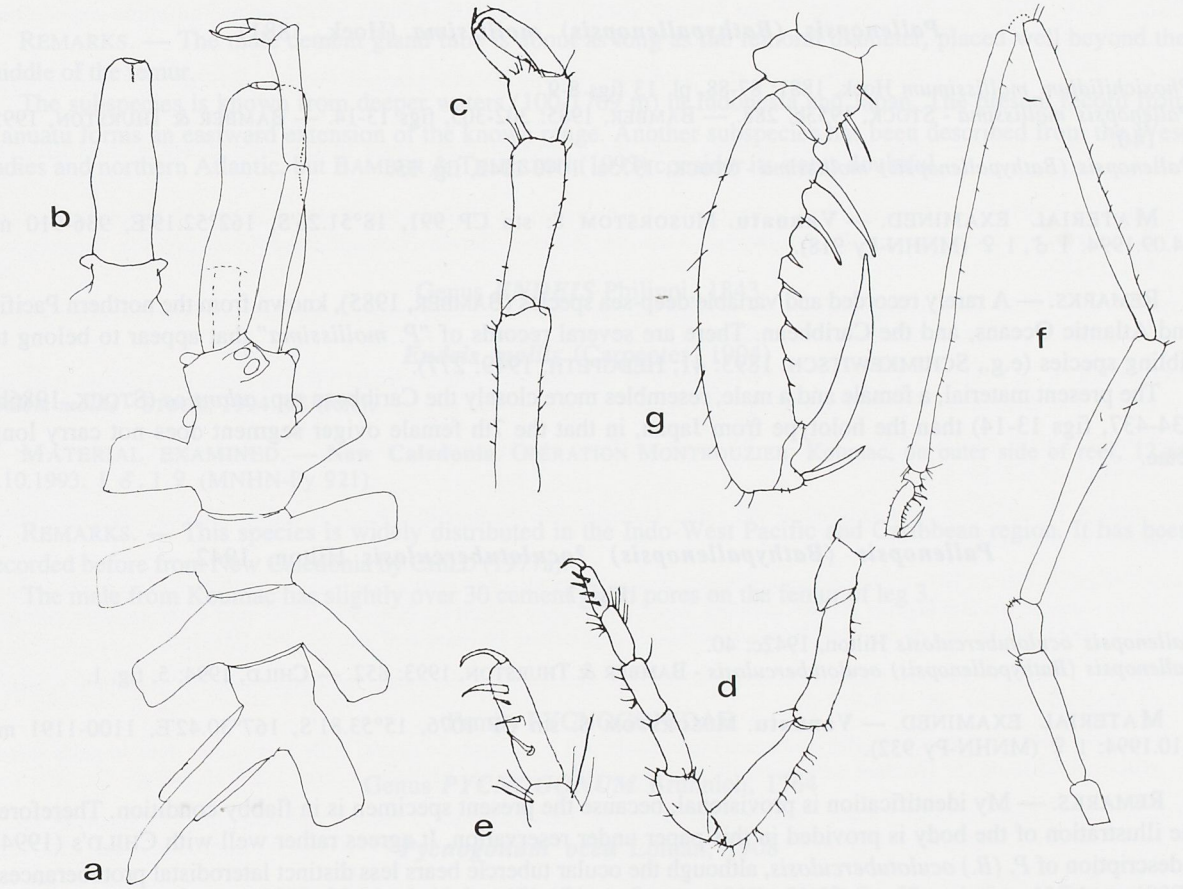


FIG. 7. — *Pallenopsis (Bathypallenopsis) ?oculotuberculosis* Hilton, 1942, ♀: **a**, trunk, dorsal; **b**, proboscis, ventral; **c**, chelifore; **d**, oviger; **e**, distal part of oviger; **f** leg 3; **g**, distal segments of leg 3.

Pallenopsis (Bathypallenopsis) longirostris Wilson, 1881

Pallenopsis longisrostris Wilson, 1881; 252-253, pl. 4 figs 19-22, pl. 5 figs 24-25. — GILTAY, 1942: 459. — NEEDLER, 1943: 13, fig. 16. — HEDGPETH, 1948: 210-211, fig. 21a-b. — ARNAUD, 1974: 150. — STOCK, 1981c: 462-463, fig. 5 (distinction & synonymy). — ARNAUD & CHILD, 1988: 142.

Pallenopsis (Bathypallenopsis) longirostrum - STOCK, 1975a: 1032.

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn CP 957, 20°33.48'S, 169°35.69'E, 1180-1160 m, 20.09.1994: 1 ♂ (MNHN-Py 916). — Stn CP 1008, 18°53.29'S, 168°52.65'E, 919-1000 m, 25.09.1994: 1 ♂ (ZMA Pa. 202.061). — Stn CP 1082, 15°52.62'S, 167°20.36'E, 540-465 m, 5.10.1994: 1 ♀ (MNHN-Py 917).

REMARKS. — This deep-water species is mainly recorded from the northern Atlantic Ocean. There is one record (ARNAUD & CHILD, 1988) from the Zululand area (Southern Africa). BARNARD (1954: 122) records it, according to ARNAUD & CHILD (1988), under the name of *P. oscitans* (HOEK, 1881) from waters off Cape Point, but TURPAEVA (1991) and STOCK (1994) believe that this material is referable to *P. californica* Schimkewitsch, 1893, and neither to *P. longirostris* nor to *P. oscitans*.

So, it appears that the present records form the first from the Pacific Ocean. *P.(B.) longirostris* belongs to a closely knit group of sibling species. It differs from *P. (B.) safari* Stock, 1984 (Sri Lanka) in the shape of the chela, and from *P. (B.) oscitans* (Atlantic Ocean) in the armature of the 10th oviger segment.

Pallenopsis (Bathypallenopsis) mollissima (Hoek, 1881)

Phoxichilidium mollissimum Hoek, 1881: 87-88, pl. 13 figs 8-9.
Pallenopsis mollissima - STOCK, 1953b: 288. — BAMBER, 1985: 302-305, figs 13-14. — BAMBER & THURSTON, 1995: 140.
Pallenopsis (Bathypallenopsis) mollissima - STOCK, 1975a: 1040-1042, fig. 35.

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn CP 991, 18°51.26'S, 162°52.19'E, 936-910 m, 24.09.1994: 1 ♂, 1 ♀ (MNHN-Py 918).

REMARKS. — A rarely recorded and variable deep-sea species (BAMBER, 1985), known from the northern Pacific and Atlantic Oceans, and the Caribbean. There are several records of *"P. mollissima"* that appear to belong to sibling species (e.g., SCHIMKEWITSCH, 1893: 41; HEDGPETH, 1949: 277).

The present material, a female and a male, resembles more closely the Caribbean ssp. *atlantica* (STOCK, 1986b: 434-437, figs 13-14) than the holotype from Japan, in that the 7th female oviger segment does not carry long setae.

Pallenopsis (Bathypallenopsis) ?oculotuberculosis Hilton, 1942

Fig. 7

Pallenopsis oculotuberculosis Hilton, 1942c: 40.
Pallenopsis (Bathypallenopsis) oculotuberculosis - BAMBER & THURSTON, 1993: 852. — CHILD, 1994: 5, fig. 1.

MATERIAL EXAMINED. — **Vanuatu**. MUSORSTOM 8: stn CP 1076, 15°53.81'S, 167°30.42'E, 1100-1191 m, 4.10.1994: 1 ♀ (MNHN-Py 932).

REMARKS. — My identification is provisional, because the present specimen is in flabby condition. Therefore, the illustration of the body is provided in this paper under reservation. It agrees rather well with CHILD's (1994) redescription of *P. (B.) oculotuberculosis*, although the ocular tubercle bears less distinct laterodistal protuberances. Moreover the Vanuatu specimen differs in the much longer proboscis.

The female oviger (fig. 7d), not illustrated in CHILD's paper, bears a strikingly curved terminal seta or spine, oviger segment 6 (♀) is swollen, and the propodal heel spines are very long (fig. 7g).

There is also some resemblance to *P. (B.) antipoda* Clark, 1972b, but this resemblance might be due to the fact that the holotype of *antipoda* is, like the Vanuatu specimen, a flabby female. At any rate, *antipoda* differs from the present material in the propodal armature, consisting of scarce and strong sole spines, and in the 6th oviger segment (♀), which is slender and elongate. Parenthetically, it should be noted that *antipoda* might be a junior synonym of *P. (B.) pacifica* Hilton, 1942, of which CHILD (1995b) recently has redescribed the holotype.

Measurements of female from MUSORSTOM 8 Stn CP 1076 (mm): Length trunk (frontal margin cephalic segment to tip abdomen) 4.7; width across 2nd crurigers 3.0; length abdomen 2.6; length proboscis (ventral) 4.8; greatest diameter proboscis 2.0.

Third leg: femur 8.5; first tibia 9.0; second tibia 12; tarsus + propodus 2.3.

Pallenopsis (Bathypallenopsis) t. tydemani Loman, 1908

Fig. 8

Pallenopsis (Bathypallenopsis) t. tydemani - STOCK, 1994: 53 (refs).

MATERIAL EXAMINED. — **Indonesia**. KARUBAR: stn CP 91, Tanimbar Island, 08°44'S, 131°05'E, 884-891 m, 5.11.1991: 1 ♂ (MNHN-Py 919).

Vanuatu. MUSORSTOM 8: stn CP 1127, 15°58.86'S, 166°37.82'E, 1052-1058 m, 10.10.1994: 1 ♂ (MNHN-Py 920).

REMARKS. — The male cement gland tube is about as long as the femoral diameter, placed well beyond the middle of the femur.

The subspecies is known from deeper waters (100-1709 m) in Indonesia and Japan. The present record from Vanuatu forms an eastward extension of the known range. Another subspecies has been described from the West Indies and northern Atlantic, but BAMBER & THURSTON (1993) consider its status doubtful.

Genus *ENDEIS* Philippi, 1843

Endeis mollis (Carpenter, 1904)

Endeis mollis - STOCK, 1994: 68 (refs).

MATERIAL EXAMINED. — **New Caledonia**. OPÉRATION MONTROUZIER: Koumac, on outer side of reef, 12 m, 7.10.1993: 1 ♂, 1 ♀ (MNHN-Py 921).

REMARKS. — This species is widely distributed in the Indo-West Pacific and Caribbean region. It has been recorded before from New Caledonia by CHILD (1977a).

The male from Koumac has slightly over 30 cement gland pores on the femur of leg 3.

Family PYCNOGONIDAE

Genus *PYCNOGONUM* Brünnich, 1764

Pycnogonum occa Loman, 1908

Pycnogonum occa Loman, 1908: 35-36, pl. 12 figs 171-174. — STOCK, 1968b: 61-62, fig. 22c-e (refs). — CHILD, 1988: 27.

MATERIAL EXAMINED. — **New Caledonia**. BATHUS 4: stn DW 923, 18°51.51'S, 163°24.17'E, 502-470 m, 6.08.1994: 1 ♀ (MNHN-Py 922).

REMARKS. — Apparently of variable morphology. The present specimen agrees better with *P. occa* than with any other *Pycnogonum* species. It appears to be closely related to *P. africanum* Calman, 1938, but differs at first sight by its widely separated crurigers.

P. occa was previously recorded from waters of 567-2470 m in the Philippines, Indonesia, and the Kermadec Trench.

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12

Brachiopodes récoltés dans les eaux de la Nouvelle-Calédonie et des îles Loyauté, Matthew et Chesterfield

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RÉSUMÉ

Au cours des campagnes BIOCAL, BIOGEOCAL, CALSUB, CHALCAL 2, MUSORSTOM 4, 5 et 6, SMIB 1 et 4, et VOLSMAR, qui ont exploré, de 1985 à 1989, le domaine bathyal du pourtour de la Nouvelle-Calédonie et des îles Chesterfield principalement, 26 espèces de brachiopodes ont été inventoriées. Celles-ci révèlent la diversité, jusqu'alors insoupçonnée, de ce groupe dans cette région, avec 19 genres et 14 familles représentées. Un genre nouveau (*Kanakythyris*) et quatre espèces nouvelles sont décrits (*K. pachyrhynchos*, *Stenosarina globosa*, *S. lata, Fallax neocaledonensis*). Plusieurs espèces (*Neorhynchia strebeli*, *Abyssothyris wyvillei*, *Kanakythyris pachyrhynchos*, *Nipponithyris afra*) présentent une sulcation (plissement inversé) marquée de la commissure frontale. Ce caractère, considéré comme typique des brachiopodes inféodés au domaine profond, apparaît, en Nouvelle-Calédonie, à des profondeurs moindres que celles habituellement constatées. Par ailleurs, dans plusieurs taxons, des différences de tailles entre espèces ou populations paraissent liées à la profondeur.

ABSTRACT

Brachiopods dredged from around New-Caledonia and the Loyalty, Matthew and Chesterfield Islands.

Twenty six species of brachiopods were dredged in the bathyal area surrounding New-Caledonia and the Chesterfield Islands, from 1985 to 1989, during the cruises BIOCAL, BIOGEOCAL, CALSUB, CHALCAL 2, MUSORSTOM 4, 5, 6, SMIB 1, 4, and VOLSMAR. That fauna shows a broad diversity, including 19 genera belonging to 14 families. A new genus (*Kanakythyris*) and four new species are described (*K. pachyrhynchos*, *Stenosarina globosa*, *S. lata*, *Fallax neocaledonensis*). Several species are strongly sulcate (*Neorhynchia strebeli*, *Abyssothyris wyvillei*, *K. pachyrhynchos*, *Nipponithyris afra*), a feature that is usually considered as typical of deep-sea brachiopods. Nevertheless, this feature also occurs in New-Caledonian species at lesser depths. Moreover, in several taxa, size differences between populations or species seem to be related to depth.

LAURIN, B., 1997. — Brachiopodes récoltés dans les eaux de la Nouvelle-Calédonie et des îles Loyauté, Matthew et Chesterfield. *In* : A. CROSNIER (ed.), Résultats des Campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176** : 411-471. Paris ISBN 2-85653-511-9.

INTRODUCTION

Dans l'océan Pacifique et ses régions adjacentes, les brachiopodes les mieux connus sont distribués autour de la Nouvelle-Zélande. C'est en effet dans cette région, où certaines espèces peuvent être recueillies à marée basse, qu'ont été faites les études les plus détaillées (e. g. THOMSON, 1927 ; RICHARDSON, 1981a, 1981b ; DAWSON, 1991 ; LEE, 1991). Les brachiopodes sont également abondamment cités autour du Japon (HATAI, 1940), à l'est de l'Australie (HEDLEY, 1905 ; RICHARDSON 1987) et dans un certain nombre de localités du Pacifique dont la Nouvelle-Calédonie était jusqu'alors exclue, excepté pour quelques formes côtières. A partir de 1985, plusieurs campagnes océanographiques, réalisées à l'initiative de l'Université de Lyon I (programmme ENVIMARGES), de l'ORSTOM et du Muséum national d'Histoire naturelle, ont permis de recueillir un important matériel provenant principalement du domaine bathyal. Cet article recense les espèces draguées au cours de ces campagnes effectuées dans les eaux de la Nouvelle-Calédonie et des îles Loyauté, Matthew et Chesterfield. La faune décrite comprend 26 espèces (dont trois nouvelles) réparties dans 19 genres (dont un nouveau), et 14 familles. La liste des stations et des espèces est donnée ci-après, des informations plus complètes sur les stations des campagnes BIOCAL, BIOGEOCAL, CHALCAL 2, MUSORSTOM 4, 5 et 6, et SMIB 1 et 4 peuvent être trouvées dans RICHER DE FORGES (1990), sur celles de la campagne VOLSMAR dans RICHER DE FORGES (1993). Les plongées CALSUB sont détaillées dans ROUX (1991 et 1994).

LISTE DES STATIONS ET ESPÈCES RÉCOLTÉES

Nouvelle-Calédonie. — BIOCAL.

Station KG 06. — 20°34,99'S, 166°52,67'E, 735 m : *Basiliola beecheri, Terebratulina reevei, Dyscolia johannisdavisi, Stenosarina crosnieri, Nipponithyris afra.*

Station DW 08. — 20°34,35'S, 166°53,90'E, 435 m : *Basiliola beecheri, Terebratulina reevei, Stenosarina crosnieri, Fallax neocaledonensis.*

Station KG 16. — 20°33,73'S, 167°21,86'E, 3680 m : *Thecidellina maxilla* (morte).

Station CP 23. — 22°45,84'S, 166°20,33'E, 2040 m : *Pelagodiscus atlanticus.*

Station CP 27. — 23°05,52'S, 166°26,41'E, 1850 m : *Pelagodiscus atlanticus.*

Station CP 30. — 23°09,65'S, 166°40,85'E, 1140 m : *Terebratulina* indet., *Eucalathis rugosa, Abyssothyris wyvillei, Stenosarina crosnieri, Fallax neocaledonensis.*

Station CP 31. — 23°07,26'S, 166°50,45'E, 850 m : *Stenosarina lata.*

Station DW 33. — 23°09,71' S, 167°10,27'E, 675 m : *Basiliola beecheri, Terebratulina reevei, Xenobrochus africanus, Stenosarina crosnieri, Fallax neocaledonensis.*

Station CP 34. — 23°11,88'S, 167°11,30'E, 710 m : *Basiliola beecheri.*

Station DW 36. — 23°08,64'S, 167°10,99'E, 650 m : *Basiliola beecheri, Stenosarina crosnieri.*

Station DW 37. — 22°59,99'S, 167°15,65'E, 350 m : *Stenosarina globosa, Fallax neocaledonensis.*

Station DW 38. — 22°59,74'S, 167°15,31'E, 360 m : *Basiliola lucida, Stenosarina globosa, Fallax neocaledonensis.*

Station DW 41. — 22°45,13'S, 167°11,74'E, 380 m : *Fallax neocaledonensis.*

Station CP 42. — 23°45,14'S, 167°12,12'E, 380 m : *Stenosarina globosa, Fallax neocaledonensis.*

Station DW 43. — 22°46,21'S, 167°14,50'E, 400 m : *Stenosarina globosa, Fallax neocaledonensis.*

Station DW 44. — 22°47,30'S, 167°14,30'E, 440 m : *Basiliola lucida, Grammetaria africana, Stenosarina* indet., *Fallax neocaledonensis.*

Station CP 45. — 22°47,34'S, 167°14,80'E, 430 m : *Fallax neocaledonensis.*

Station DW 46. — 22°53,05'S, 167°17,08'E, 570 m : *Grammetaria africana, Xenobrochus africanus, Stenosarina crosnieri, Fallax neocaledonensis.*

Station DW 48. — 23°00,43'S, 167°28,76'E, 775 m : *Basiliola beecheri, Terebratulina* indet., *Stenosarina* indet., *Nipponithyris afra.*

Station DW 51. — 23°05,27'S, 167°44,95'E, 700 m : *Basiliola beecheri, Grammetaria africana, Stenosarina* indet., *Fallax neocaledonensis.*

Station DW 53. — 23°09,80'S, 167°42,55'E, 1005 m : *Basiliola indet., Stenosarina crosnieri, Nipponithyris afra.*

Station CP 55. — 23°19,76'S, 167°30,46'E, 1170 m : *Abyssothyris wyvillei, Nipponithyris afra.*

Station CP 57. — 23°43,26'S, 166°58,06'E, 1550 m : *Pelagodiscus atlanticus, Abyssothyris wyvillei, Phaneropora galathaea.*

Station CP 58. — 23°56,52'S, 166°40,55'E, 2660 m : *Neorhynchia strebeli.*

Station CP 60. — 23°59,54'S, 167°07,41'E, 1530 m : *Abyssothyris wyvillei.*

Station CP 62. — 24°19,06'S, 167°48,65'E, 1395 m : *Abyssothyris wyvillei.*

Station DW 64. — 24°47,93'S, 168°09,12'E, 250 m : *Neoancistrocrania norfolki, Terebratulina pacifica.*

Station DW 65. — 24°47,90'S, 168°09,09'E, 275 m : *Terebratulina pacifica, Stenosarina crosnieri.*

Station DW 66. — 24°55,43'S, 168°21,67'E, 510 m : *Platidia davidsoni.*

Station DW 70. — 23°24,70'S, 167°53,65'E, 965 m : *Stenosarina lata.*

Station CP 75. — 22°19,35'S, 167°23,30'E, 825 m : *Abyssothyris wyvillei.*

Station DW 77. — 22°15,32'S, 167°15,40'E, 440 m : *Stenosarina globosa.*

Station DW 81. — 20°29,49'S, 166°46,68'E, 450 m : *Basiliola beecheri, Stenosarina crosnieri.*

Station DW 83. — 20°35,07'S, 166°53,99'E, 460 m : *Terebratulina reevei.*

Station CP 110. — 22°12,38'S, 167°09,93'E, 300 m : *Eohemithyris grayi, Fallax neocaledonensis.*

Nouvelle-Calédonie et îles Loyauté. — BIOGEOCAL.

Station KG 211. — 22°41,80'S, 166°32,53'E, 975 m : *Phaneropora galathaea.*

Station CP 214. — 22°43,09'S, 166°27,19'E, 1665 m : *Pelagodiscus atlanticus.*

Station CP 232. — 21°33,81'S, 166°27,07'E, 775 m : *Phaneropora galathaea.*

Station KG 252. — 21°31,11'S, 166°21,32'E, 330 m : *Eucalathis rugosa.*

Station DW 253. — 21°31,75'S, 166°28,73'E, 310 m : *Terebratulina* indet., *Eucalathis rugosa.*

Station CP 272. — 21°00,04'S, 166°56,94'E, 1650 m : *Pelagodiscus atlanticus.*

Station CP 273. — 21°01,53'S, 166°57,41'E, 1970 m : *Thecidellina maxilla.*

Station DW 289. — 20°36,35'S, 167°00,31'E, 835 m : *Abyssothyris wyvillei.*

Station DW 291. — 20°34,47'S, 166°54,33'E, 515 m : *Basiliola beecheri, Grammetaria africana, Terebratulina reevei, Stenosarina* indet., *Megerlia echinata.*

Station DW 292. — 20°28,23'S, 166°48,45'E, 470 m : *Kanakythyris pachyrhynchos.*

Station DW 296. — 20°38,35'S, 167°10,32'E, 1250 m : *Thecidellina maxilla.*

Station DW 307. — 20°35,38'S, 166°55,25'E, 475 m : *Basiliola beecheri, Terebratulina reevei, Platidia anomioides, Megerlia echinata.*

Station DW 308. — 20°40,07'S, 166°58,05'E, 550 m : *Terebratulina* indet., *Eucalathis rugosa.*

Station DW 311. — 20°49,07'S, 166°54,07'E, 1620 m : *Abyssothyris wyvillei.*

Station DW 313. — 20°58,95'S, 166°59,04'E, 1620 m : *Stenosarina* indet., *Fallax neocaledonensis.*

Station CP 317. — 20°48,12'S, 166°53,16'E, 1625 m : *Pelagodiscus atlanticus, Phaneropora galathaea.*

Station CP 329. — 21°09,05'S, 166°40,08'E, 2315 m : *Pelagodiscus atlanticus.*

Station CP 341. — 21°29,73'S, 166°47,37'E, 2334 m : *Pelagodiscus atlanticus.*

Îles Loyauté et Nouvelle-Calédonie. — CALSUB.

Plongée PL 09. — 20°54,32'S, 167°01,82'E, Lifou, Baie de Santal, 600 m : *Thecidellina* indet.

Plongée PL 15a. — 20°38,92'S, 166°58,18'E, Lifou, 270 m : *Eohemithyris grayi, Megerlia echinata.*

Plongée PL 15b. — 20°38,92'S, 166°58,18'E, Lifou, 538 m : *Eohemithyris grayi, Terebratulina* indet., *Eucalathis rugosa, Stenosarina* indet., *Thecidellina* indet.
Plongée PL 16. — 20°40,54'S, 167°02'E, Lifou, 400-850 m : *Stenosarina* indet.
Plongée PL 19. — 22°43,56'S, 167°20,91'E, 400 m : *Fallax neocaledonensis.*
Plongée PL 20. — 22°50,00'S, 167°22,73'E, 580 m : *Terebratulina* indet.

Nouvelle-Calédonie. — CHALCAL 2.

Station CP 19. — 24°42,85'S, 168°09,73'E, 271 m : *Stenosarina crosnieri.*
Station CP 26. — 23°18,15'S, 168°03,58'E, 296 m : *Stenosarina globosa, Frenulina sanguinolenta.*
Station DW 69. — 24°43,70'S, 168°07,90'E, 260 m : *Eohemithyris grayi.*
Station DW 71. — 24°42,26'S, 168°09,52'E, 230 m : *Terebratulina pacifica.*
Station DW 72. — 24°54,50'S, 168°22,30'E, 527 m : *Basiliola beecheri.*
Station DW 74. — 24°40,36'S, 168°38,38'E, 650 m : *Fallax neocaledonensis.*
Station DW 77. — 23°38,35'S, 167°42,68'E, 435 m : *Fallax neocaledonensis.*
Station DW 78. — 23°41,3'S, 167°59,6'E, 233 m : *Neoancistrocrania norfolki.*
Station DW 80. — 23°26,7'S, 168°01,8'E, 160 m : *Eohemithyris grayi, Frenulina sanguinolenta.*
Station DW 81. — 23°19,6'S, 168°03,4'E, 311 m : *Stenosarina globosa.*
Station DW 82. — 23°13,68'S, 168°04,27'E, 304 m : *Stenosarina globosa.*
Station DW 83. — 23°20,3'S, 168°05,5'E, 200 m : *Stenosarina globosa, Fallax neocaledonensis, Frenulina sanguinolenta.*
Station DW 84. — 23°23,8'S, 168°07,1'E, 170 m : *Eohemithyris grayi, Terebratulina pacifica, Fallax neocaledonensis, Frenulina sanguinolenta.*

Nouvelle-Calédonie. — MUSORSTOM 4.

Station DW 159. — 18°45,9'S, 163°15,6'E, 585 m : *Terebratulina reevei, Stenosarina* indet., *Fallax neocaledonensis.*
Station DW 162. — 18°35,'S, 163°10,30'E, 525 m : *Stenosarina indet., Frenulina sanguinolenta.*
Station CP 167. — 18°35,8'S, 163°06,4'E, 575 m : *Stenosarina crosnieri, Fallax neocaledonensis.*
Station DW 183. — 19°01,8'S, 163°25,8'E, 280 m : *Stenosarina globosa.*
Station DW 210. — 22°43,7'S, 167°09,3'E, 345 m : *Stenosarina globosa, Fallax neocaledonensis.*
Station DW 211. — 22°46,0'S, 167°09,8'E, 370 m : *Fallax neocaledonensis.*
Station DW 212. — 22°47,4'S, 167°10,5'E, 380 m : *Stenosarina globosa, Fallax neocaledonensis.*
Station CP 213. — 22°51,3'S, 167°12,0'E, 420 m : *Fallax neocaledonensis.*
Station CP 214. — 22°53,8'S, 167°13,9'E, 430 m : *Stenosarina globosa, Fallax neocaledonensis.*
Station DW 220. — 22°58,5'S, 167°38,3'E, 525 m : *Fallax neocaledonensis.*
Station DW 221. — 22°58,6'S, 167°36,8'E, 535 m : *Xenobrochus africanus, Stenosarina crosnieri, Fallax neocaledonensis.*
Station DW 222. — 22°57,6'S, 167°33,0'E, 430 m : *Fallax neocaledonensis.*
Station DW 223. — 22°57,0'S, 167°30,0'E, 550 m : *Fallax neocaledonensis.*
Station DW 226. — 22°47,2'S, 167°21,6'E, 390 m : *Fallax neocaledonensis.*
Station DW 230. — 22°52,5'S, 167°11,8'E, 400 m : *Fallax neocaledonensis.*
Station DW 231. — 22°33,7'S, 167°10,5'E, 75 m : *Frenulina sanguinolenta.*
Station DW 234. — 22°15,4'S, 167°08,3'E, 360 m : *Fallax neocaledonensis.*
Station CP 236. — 22°11,3'S, 167°15,0'E, 520 m : *Basiliola beecheri.*

Îles Chesterfield. — MUSORSTOM 5.

Station DW 251. — 25°06,36'S, 160°01,51'E, 1330 m : *Dyscolia johannisdavisi.*

Station DW 255. — 25°15,40'S, 159°54,48'E, 288 m : *Terebratulina pacifica.*
Station DW 263. — 25°21,30'S, 159°46,44'E, 190 m : *Nipponithyris? afra?*
Station DW 273. — 24°43,02'S, 159°43,26'E, 290 m : *Terebratulina reevei.*
Station DW 306. — 22°07,66'S, 159°21,40'E, 390 m : *Basiliola beecheri.*
Station DW 346. — 19°39,77'S, 158°27,07'E, 300 m : *Terebratulina reevei, Stenosarina* indet.
Station DC 361. — 19°52,50'S, 158°38,10'E, 400 m : *Basiliola lucida.*
Station DC 378. — 19°53,74'S, 158°38,30'E, 355 m : *Basiliola lucida, Stenosarina globosa.*
Station DC 379. — 19°53,20'S, 158°39,50'E, 385 m : *Stenosarina* indet.

Îles Loyauté. — MUSORSTOM 6.

Station DW391. — 20°47,35'S, 167°05,70'E, 390 m : *Basiliola beecheri, Eohemithyris grayi, Terebratulina reevei, Kanakythyris pachyrhynchos.*
Station DW 392. — 20°47,32'S, 167°04,60'E, 340 m : *Eohemithyris grayi, Kanakythyris pachyrhynchos.*
Station DW 393. — 20°48,29'S, 167°09,54'E, 420 m : *Terebratulina reevei.*
Station DW 394. — 20°49,46'S, 167°09,11'E, 570 m : *Basiliola beecheri, Terebratulina reevei.*
Station DW 397. — 20°47,35'S, 167°05,17'E, 380 m : *Eohemithyris grayi, Kanakythyris pachyrhynchos.*
Station DW 398. — 20°47,19'S, 167°05,65'E, 370 m : *Eohemithyris grayi, Terebratulina reevei, Kanakythyris pachyrhynchos.*
Station DW 399. — 20°41,80'S, 167°00,20'E, 285 m : *Eohemithyris grayi, Terebratulina reevei.*
Station DC 402. — 20°30,27'S, 166°49,28'E, 520 m : *Basiliola lucida, Stenosarina globosa, Megerlia echinata.*
Station DW 405. — 20°29,75'S, 166°41,00'E, 520 m : *Terebratulina reevei.*
Station DW 406. — 20°40,65'S, 167°06,80'E, 380 m : *Eohemithyris grayi, Kanakythyris pachyrhynchos.*
Station CP 408. — 20°41,10'S, 167°07,45'E, 380 m : *Eohemithyris grayi.*
Station DW 410. — 20°38,05'S, 167°06,65'E, 485 m : *Basiliola beecheri.*
Station DW 416. — 20°42,15'S, 166°59,60'E, 340 m : *Eohemithyris grayi.*
Station DW 417. — 20°41,80'S, 167°03,65'E, 284 m : *Eohemithyris grayi, Terebratulina reevei.*
Station DW 418. — 20°41,75'S, 167°03,35'E, 285 m : *Eohemithyris grayi, Terebratulina reevei.*
Station CP 419. — 20°41,65'S, 167°03,70'E, 285 m : *Eohemithyris grayi.*
Station DW 421. — 20°26,27'S, 166°40,17'E, 245 m : *Kanakythyris pachyrhynchos.*
Station DW 422. — 20°26,20'S, 166°40,31'E, 255 m : *Terebratulina reevei.*
Station DW 423. — 20°25,85'S, 166°40,50'E, 280 m : *Eohemithyris grayi, Terebratulina pacifica, Xenobrochus africanus.*
Station CP 427. — 20°23,35'S, 166°20,00'E, 800 m : *Abyssothyris wyvillei.*
Station DW 428. — 20°23,54'S, 166°12,57'E, 420 m : *Eohemithyris grayi, Kanakythyris pachyrhynchos.*
Station DW 429. — 20°23,29'S, 166°11,15'E, 360 m : *Basiliola beecheri.*
Station DW 431. — 20°22,25'S, 166°10,00'E, 20 m : *Frenulina sanguinolenta.*
Station CP 438. — 20°23,00'S, 166°20,10'E, 780 m : *Abyssothyris wyvillei.*
Station DW 439. — 20°46,40'S, 167°17,40'E, 288 m : *Eohemithyris grayi, Frenulina sanguinolenta.*
Station DW 441. — 20°53,76'S, 167°16,86'E, 80 m : *Frenulina sanguinolenta.*
Station DW 444. — 20°54,32'S, 167°17,82'E, 300 m : *Eohemithyris grayi.*
Station DW 453. — 21°00,50'S, 167°26,90'E, 250 m : *Eohemithyris grayi.*
Station CP 454. — 21°00,60'S, 167°26,50'E, 260 m : *Eohemithyris grayi.*
Station CP 455. — 21°00,65'S, 167°26,08'E, 260 m : *Eohemithyris grayi.*
Station DW 456. — 21°00,71'S, 167°26,35'E, 240 m : *Eohemithyris grayi, Xenobrochus africanus.*
Station DW 457. — 21°00,42'S, 167°28,71'E, 350 m : *Eohemithyris grayi, Xenobrochus africanus, Kanakythyris pachyrhynchos.*
Station DW 458. — 21°00,93'S, 167°29,96'E, 400 m : *Fallax neocaledonensis.*

Station DW 459. — 21°01,39'S, 167°31,47'E, 425 m : *Kanakythyris pachyrhynchos.*
Station DW 461. — 21°06,00'S, 167°26,20'E, 240 m : *Eohemithyris grayi, Grammetaria africana.*
Station DW 462. — 21°05,10'S, 167°26,85'E, 200 m : *Eohemithyris grayi.*
Station CP 464. — 21°02,30'S, 167°31,60'E, 430 m : *Stenosarina* indet., *Kanakythyris pachyrhynchos.*
Station DW 472. — 21°08,60'S, 167°54,70'E, 300 m : *Basiliola lucida.*
Station DW 473. — 21°08,80'S, 167°55,30'E, 230 m : *Terebratulina reevei.*
Station DW 474. — 21°08,80'S, 167°55,50'E, 260 m : *Terebratulina reevei.*
Station DW 477. — 21°07,98'S, 167°54,69'E, 550 m : *Megerlia echinata.*
Station DW 480. — 21°08,50'S, 167°55,98'E, 380 m : *Eohemithyris grayi, Terebratulina reevei, Kanakythyris pachyrhynchos.*
Station DW 481. — 21°21,85'S, 167°50,30'E, 300 m : *Eohemithyris grayi, Kanakythyris pachyrhynchos.*
Station DW 482. — 21°21,50'S, 167°46,80'E, 375 m : *Basiliola lucida, Terebratulina* indet.
Station DW 483. — 21°19,80'S, 167°47,80'E, 600 m : *Basiliola beecheri, Eohemithyris grayi.*
Station DW 486. — 20°21,40'S, 167°47,65'E, 370 m : *Stenosarina globosa.*
Station DW 487. — 21°23,30'S, 167°46,40'E, 500 m : *Stenosarina globosa, Fallax neocaledonensis.*
Station DW 489. — 20°48,37'S, 167°05,86'E, 700 m : *Abyssothyris wyvillei.*

Nouvelle-Calédonie. — SMIB 1.

Station DW 02. — 22°52'S, 167°13'E, 415 m : *Fallax neocaledonensis.*

Nouvelle-Calédonie. — SMIB 4.

Station DW 40. — 24°46,2'S, 168°08,7'E ; 250 m : *Terebratulina pacifica.*
Station DW 41. — 24°44,0'S, 168°08,6'E, 230 m : *Stenosarina crosnieri.*
Station DW 42. — 24°45,7'S, 168°08,4'E, 305 m : *Eohemithyris grayi.*
Station DW 43. — 24°46,6'S, 168°08,8'E, 240 m : *Terebratulina reevei.*
Station DW 44. — 24°46,0'S, 168°08,2'E, 285 m : *Terebratulina reevei, Stenosarina crosnieri, Thecidellina maxilla.*
Station DW 45. — 24°46,0'S, 168°08,7'E, 250 m : *Stenosarina crosnieri.*
Station DW 46. — 24°46,7'S, 168°08,5'E, 250 m : *Terebratulina pacifica.*
Station DW 53. — 23°40,1'S, 167°59,9'E, 260 m : *Basiliola beecheri?, Eohemithyris grayi, Stenosarina crosnieri.*
Station DW 56. — 23°20,6'S, 168°05,2'E, 245 m : *Terebratulina pacifica, Stenosarina crosnieri.*
Station DW 57. — 23°21,5'S, 168°04,6'E, 235 m : *Eohemithyris grayi, Terebratulina pacifica.*
Station DW 58. — 22°59,6'S, 167°24,2'E, 520 m : *Stenosarina crosnieri, Fallax neocaledonensis.*
Station DW 62. — 23°00,4'S, 167°21,8'E, 515 m : *Fallax neocaledonensis.*
Station DW 63. — 22°58,7'S, 167°21,1'E, 520 m : *Stenosarina crosnieri.*
Station DW 64. — 22°55,3'S, 167°16,4'E, 455 m : *Fallax neocaledonensis.*
Station DW 69. — 22°55,8'S, 167°14,3'E, 400 m : *Stenosarina globosa, Fallax neocaledonensis.*

Îles Matthew. — VOLSMAR.

Station DW 05. — 22°25,90'S, 171°46,50'E, 700 m : *Basiliola beecheri, Stenosarina crosnieri.*
Station DW 07. — 22°26,00'S, 171°44,10'E, 400 m : *Eohemithyris grayi, Terebratulina reevei.*
Station DW 09. — 22°22,70'S, 171°41,80'E, 300 m : *Eohemithyris grayi, Terebratulina reevei, Xenobrochus indianensis.*
Station DW 16. — 22°25,10'S, 171°40,70'E, 460 m : *Stenosarina crosnieri.*
Station DW 17. — 22°23,20'S, 171°41,70'E, 300 m : *Eohemithyris grayi, Terebratulina* indet., *Xenobrochus indianensis.*
Station DW 37. — 22°22,30'S, 168°42,50'E, 525 m : *Basiliola beecheri, Kanakythyris pachyrhynchos ?*

Station DW 38. — 22°21,60'S, 168°43,10'E, 420 m : *Basiliola lucida, Terebratulina reevei, Fallax neocaledonensis.*
Station DW 41. — 22°17.7'S, 168°41.2'E, 250 m : *Eohemithyris grayi.*
Station DW 48. — 21°00,1'S, 170°03,3'E, 200 m : *Eohemithyris grayi.*
Station DW 49. — 20°59,8'S, 170°03,5'E, 285 m : *Eohemithyris grayi.*
Station DW 51. — 20°58,5'S, 170°03,4'E, 450 m : *Basiliola beecheri, Eohemithyris grayi, Terebratulina reevei.*
Station DW 55. — 20°59,2'S, 170°01,9'E, 710 m : *Basiliola beecheri.*

ÉTUDE SYSTÉMATIQUE

Phylum BRACHIOPODA Dumeril, 1806

Classe INARTICULATA Huxley, 1869

Ordre ACROTRETIDA Kuhn, 1949

Famille DISCINIDAE Gray, 1840

Genre ***PELAGODISCUS*** Dall, 1908

Pelagodiscus atlanticus (King, 1868)

Discina atlantica King, 1868 : 170.
Discinisca atlantica - DAVIDSON, 1888 : 200.
Pelagodiscus atlanticus - DALL, 1908 : 440. — THOMSON, 1927 : 130. — HELMCKE, 1940 : 230. — HERTLEIN & GRANT, 1944 : 21. — COOPER, 1973 : 10, pl. 5, fig. 36. — ZEZINA, 1985 : 107.

Une synonymie complète de cette espèce peut être consultée dans la dernière référence citée.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. CP 23, 2040 m : 6 spms. — St. CP 27, 1850 m : 2 spms. — St. CP 57, 1550 m : 1 spm.
BIOGEOCAL : st. CP 214, 1665 m : 1 spm. — St. CP 272, 1650 m : 1 spm. — St. CP 317, 1625 m : 1 spm. — St. CP 329, 2315 m : 1 spm. — St. CP 341, 2334 m : 1 spm.

REMARQUES. — Cette espèce confirme, par sa présence autour de la Nouvelle-Calédonie, qu'elle est bien l'espèce de brachiopode actuel la plus largement répandue dans les océans du globe. Elle a été recueillie dans huit stations, à des profondeurs comprises entre 1550 et 2500 m, son intervalle bathymétrique connu allant d'environ 360 m à plus de 6000 m de profondeur. Elle apparaît néanmoins le plus fréquemment au delà de 1000 m.

Famille CRANIIDAE Menke, 1828

Genre ***NEOANCISTROCRANIA*** Laurin, 1992

Neoancistrocrania norfolki Laurin, 1992
Fig. 41 A-E

Neoancistrocrania norfolki Laurin, 1992 : 343-350, pl. I-II.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. DW 64, 250 m : 1 spm.
CHALCAL 2 : st. DW 78, 233 m : 1 spm.

La famille des Craniidae regroupe des espèces de brachiopodes inarticulés, à coquille calcaire ponctuée et à lophophore dépourvu de support squelettique. Avant les campagnes concernées par le présent travail, trois genres la

représentaient dans les océans actuels : *Craniscus*, *Neocrania* (qui ont tous deux un lophophore libre et une valve ventrale aplatie, fixée sur toute sa surface) et *Valdiviathyris* (qui n'est connu que par une seule valve dorsale juvénile portant des apophyses internes dont l'éventuelle fonction de support du lophophore n'a pu être établie).

Deux spécimens dragués sur la ride de Norfolk (BIOCAL, station DW 64 et CHALCAL 2, station DW 78), aux environs de 250 m de profondeur, possèdent une valve fixée très épaisse, à structure alvéolaire et une valve dorsale munie d'apophyses internes calcifiées de type "crura", auxquelles le lophophore est fixé par une paire de muscles élévateurs brachiaux. Ces caractéristiques ont justifié la création d'un nouveau genre et d'une nouvelle espèce, récemment décrits en détail (LAURIN, 1992). Ils ne sont que figurés dans le présent article.

Dans la famille des Craniidae, des structures internes similaires, mais sans fonction établie, ne sont connues que chez un genre crétacé (*Ancistrocrania*). La découverte de ce genre nouveau, bien que représenté par deux spécimens seulement, élargit donc de manière inattendue la diversité morphologique de la famille.

Classe ARTICULATA Huxley, 1869

Ordre RHYNCHONELLIDA Kuhn, 1949

Super-famille RHYNCHONELLACEA Gray, 1848

Famille BASILIOLIDAE Cooper, 1959

Genre ***BASILIOLA*** Dall, 1920

Le genre *Basiliola* réunit cinq espèces actuelles dont les distributions géographiques sont clairement distinctes :

- *B. lucida* (Gould 1862) récoltée autour du Japon, de 80 à 306 m de profondeur ;
- *B. beecheri* (Dall 1895), des îles Hawaii, entre 268 et 573 m ;
- *B. pompholyx*, Dall 1920, des Philipppines, de Bornéo et des Célèbes, entre 300 et 1070 m ;
- *B. elongata* Cooper 1959, créée pour quelques spécimens de *B. pompholyx* des Philippines, en raison de leur forme plus allongée, répartie entre 44 et 487 m ;
- *B. arnaudi*, seule espèce de l'océan Indien, récoltée dans une seule station (SE de Madagascar), à 380 m de profondeur.

Deux de ces espèces ont été recueillies autour de la Nouvelle-Calédonie (campagne BIOCAL) et des îles Chesterfield (campagne MUSORSTOM 5), dans des intervalles bathymétriques différents : *B. lucida* entre 355 et 400 m et *B. beecheri* entre 435 et 865 m.

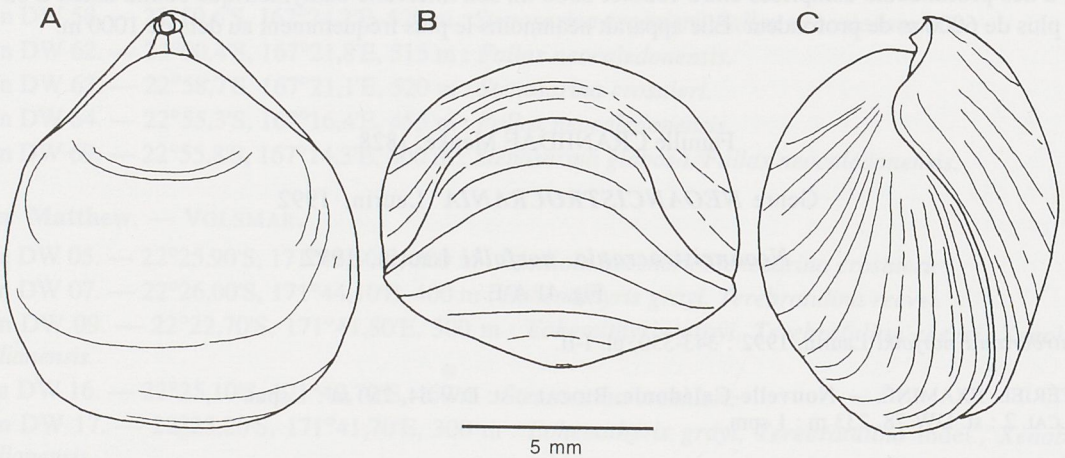


FIG. 1. — *Basiliola lucida* (Gould) : **A**, vue dorsale ; **B**, vue frontale ; **C**, vue latérale.

Basiliola lucida (Gould, 1862)

Fig. 1 A-C, 2 A-E, 42 A-C

Rhynchonella lucida Gould, 1862 : 120.
Hemithyris lucida - Dall, 1873 : 196.
Neohemithyris lucida - Yabe & Hatai, 1934 : 587, fig.4. — Hatai, 1938 : 179, pl. 17, fig. 6 ; 1940 : 210, pl. 1, fig. 44, pl. 6, fig. 106-107.
Basiliola lucida - Cooper, 1959 : 27, pl. 13, fig. 6-23. — Zezina & Smirnova, 1977 : 2-3. — Zezina, 1985 : 115.

Des synonymies complètes de cette espèce peuvent être consultées dans Hatai (1938 : 179 ; 1940 : 210).

Matériel examiné. — **Nouvelle-Calédonie**. Biocal : st. DW 38, 360 m : 1 spm. — St. DW 44, 440 m : 5 spms.
Îles Chesterfield. Musorstom 5 : st. DC 361, 400 m : 2 spms. — St. DC 378, 375 m : 14 spms.
Îles Loyauté. Musorstom 6 : st. DC 402, 520 m : 1 spm. — St. DW 472, 300 m : 3 spms. — St. DW 482, 375 m : 3 spms.
Îles Matthew. Volsmar : st. DW 38, 420 m : 14 spms.

Description et Remarques. — *Morphologie externe* (fig. 1) : *Basiliola* de petite taille à coquille translucide, correspondant à la description détaillée qu'en donne Hatai (1940). Valve pédonculaire relativement plate, fortement relevée au niveau du sinus médian (presque perpendiculairement au plan de commissure). Valve brachiale fortement bombée, créant la presque totalité du volume interne de la coquille. La commissure frontale est fortement uniplissée, mais ne détermine aucun bourrelet médian sur la valve brachiale. Par rapport aux *B. lucida* japonaises, la largeur est proportionnellement plus faible, mais fait l'objet d'une importante variabilité. Bec proportionnellement petit, à foramen hypothyride bordé de plaques deltidiales jointes et terminées antérieurement par le rebord allongé typique du genre, qui entoure le foramen d'une sorte de tube très court (fig. 2 A-B). Le pédoncule est court sur les spécimens observés. Les spécimens de Nouvelle-Calédonie ont une taille légèrement inférieure à celles des nombreux spécimens décrits au Japon (dans le tableau ci-après, les spécimens japonais mesurés - n° USNM - sont conservés au National Museum of Natural History, Washington).

Dimensions en mm	Longueur	Largeur	Hauteur
Musorstom 5, st. 378-1	10,1	9,5	7,0
Musorstom 5, st. 378-2	11,2	9,0	7,3
Musorstom 5, st. 378-3	9,7	8,9	6,9
USNM 110826	11,7	10,8	8,9
USNM 549445	12,6	11,1	8,2
USNM 550863	12,4	12,1	8,7

Structures internes (fig. 2 C-E) : Dans la valve pédonculaire, les plaques deltidiales sont jointes et ont tendance à se replier vers l'intérieur de la valve, le long de leur ligne de jonction. Leur extrémité antérieure est fortement résorbée, selon un tracé qui correspond à l'umbo de la valve brachiale. Le foramen est prolongé intérieurement par un très court collier pédonculaire. Les dents sont massives et fortement crantées (5 à 6 crans bien visibles), supportées par des lamelles dentales. Dans la valve brachiale, les fossettes sont corrélativement fortement crénelées. Les plaques cardinales sont de petite taille et prolongées par des crura divergents en forme de gouttières arquées, à concavité tournée vers la valve pédonculaire. Leur axe longitudinal est relevé vers la valve pédonculaire. Bien que ne prolongeant pas des lames crurales dorsales qui seraient situées sous les plaques cardinales, ces crura ont été rapprochés du type falcifère par Zezina et Smirnova (1977). Qu'ils soient directement observés (Zezina & Smirnova, 1977 : 67, fig. 3 ; présent travail, fig. 2) ou analysés au moyen de coupes sériées, comme chez les brachiopodes fossiles (Zezina & Smirnova, 1977 : 66, fig. 2 A), ils semblent en fait beaucoup plus proches du type canalifère.

En conclusion, la découverte de *B. lucida* autour de la Nouvelle-Calédonie remet en cause la définition même du genre *Basiliola* et de la famille des Basiliolidae (crura falcifères ou canalifères ?). Elle constitue, en outre, la première découverte de cette espèce au delà des mers bordières du Japon.

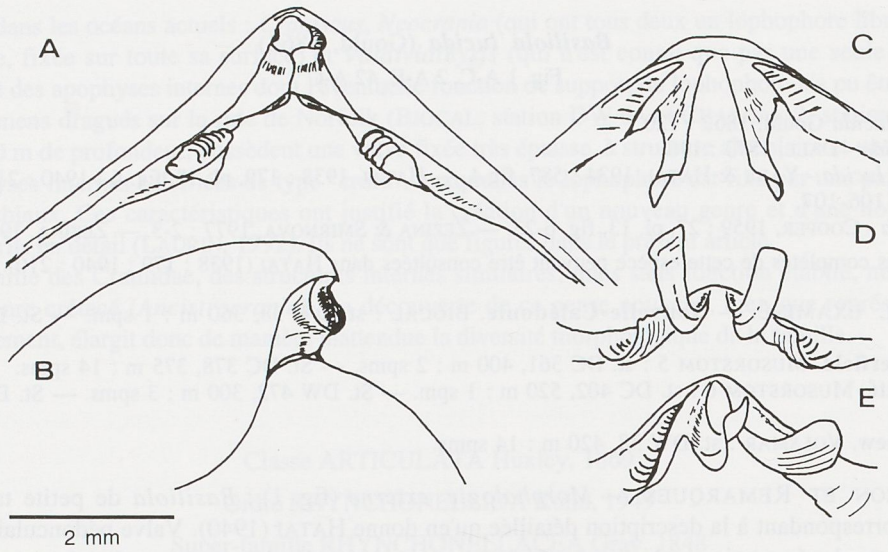


FIG. 2. — *Basiliola lucida* (Gould) : **A-B**, bec, plaques deltidiales terminées en tube et dents cardinales ; **C-E**, fossettes, plaques cardinales et crura: **C** vue dorsale ; **D**, vue basculée ; **E**, vue oblique.

Basiliola beecheri (Dall, 1895)

Fig. 3 A-D, 4 A-D, 42 D-K

Hemithyris beecheri Dall, 1895 : 717, pl. 31, fig. 1-4.
Basiliola beecheri - DALL, 1908 : 442 ; 1920 : 290. — ZEZINA, 1985 : 115.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. KG 06, 735 m : 11 spms. — St. DW 08, 435 m : 5 spms. — St. DW 33, 675 m : 6 spms. — St. CP 34, 710 m : 9 spms. — St. DW 36, 650 m : 4 spms. — St. DW 48, 775 m : 5 spms. — St. DW 51, 700 m : 10 spms. — St. DW 81, 450 m : 1 spm.
BIOGEOCAL : st. DW 291, 515 m : 1 spm. — St. DW 307, 475 m : 7 spms.
CHALCAL 2 : st. DW 72, 527 m : 1 spm.
MUSORSTOM 4 : st. CP 236, 520 m : 1 spm.

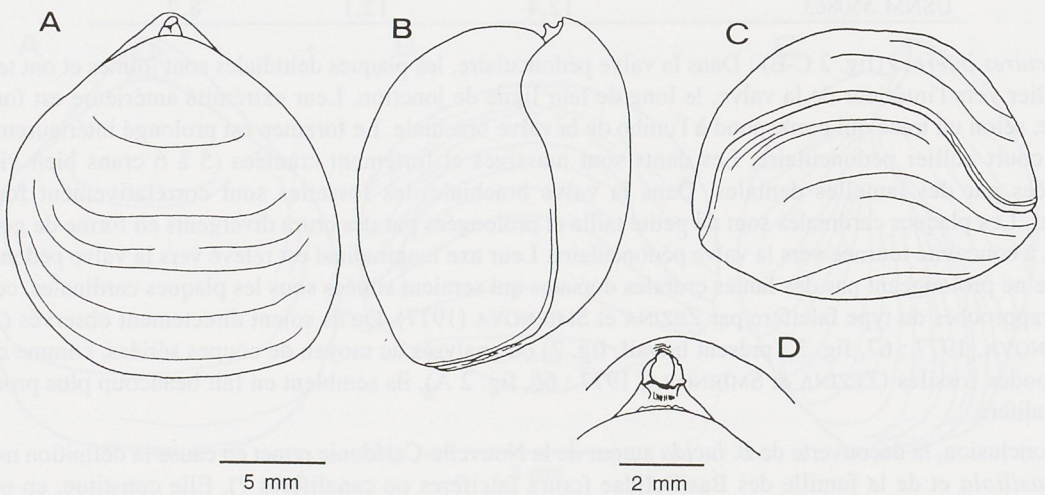


FIG. 3. — *Basiliola beecheri* (Dall) : **A**, vue dorsale ; **B**, vue latérale ; **C**, vue frontale ; **D**, détail du bec.

Îles Chesterfield. MUSORSTOM 5 : st. DW 306, 390 m : 1 spm.
Îles Loyauté. MUSORSTOM 6 : st. DW 391, 390 m : 2 spms. — St. DW 394, 570 m : 3 spms. — St. DW 410, 485 m : 6 spms. — St. DW 429, 360 m : 1 spm. — St. DW 483, 600 m : 2 spms.
Île des Pins - Ride de Norfolk. SMIB 4 : st. DW 53, 260 m : 1 spm.
Îles Matthew. VOLSMAR : st. DW 05, 700 m : 1 spm. — St. DW 37, 525 m : 3 spms. — St. DW 51, 450 m : 17 spms. — St. DW 55, 710 m : 1 spm.

REMARQUES. — A côté de *B. lucida* caractérisée par sa petite taille, les quatre autres espèces de *Basiliola* constituent un ensemble dont les morphologies et les tailles sont relativement proches. Seules des différences de proportions les séparent et leurs descriptions ne fournissent aucun critère solide susceptible de les distinguer avec certitude. Les distinctions spécifiques faites entre trois d'entre elles (*B. beecheri*, *B. pompholyx* et *B. arnaudi*) semblent d'ailleurs plus liées à leur répartition géographique qu'à leur morphologie. Dans une telle situation, les spécimens de Nouvelle-Calédonie (fig. 3-4) pourraient représenter un nouveau taxon, mais il eut été difficile de trouver le caractère distinguant celui-ci des trois espèces citées. *B. beecheri* a semblé la détermination la moins préjudiciable à une approche plus approfondie du groupe permettant de mieux évaluer les relations entre les espèces.

Dimensions en mm	Longueur	Largeur	Hauteur
BIOCAL, st. 51-1	16,5	15,7	10,8
BIOCAL, st. 51-2	15,2	13,6	10,2
BIOCAL, st. 51-3	14,8	12,6	9,4
BIOCAL, st. 81-1	18,0	15,9	13,0

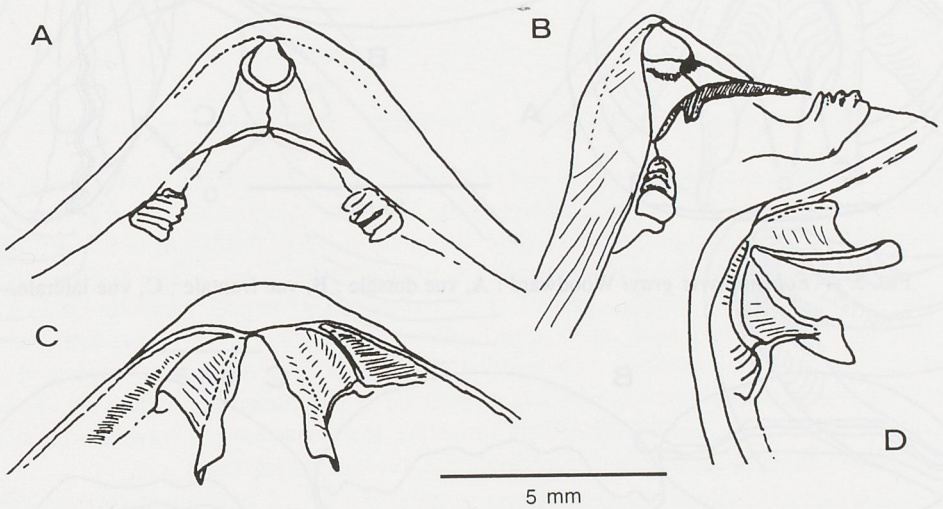


FIG. 4. — *Basiliola beecheri* (Dall) : **A-B**, bec, plaques deltidiales terminées en tube et dents cardinales ; **C-D**, fossettes, plaques cardinales et crura: **C**, vue dorsale ; **D**, vue basculée.

Genre ***EOHEMITHYRIS*** Hertlein & Grant, 1944

Eohemithyris grayi (Woodward, 1855)

Fig. 5 A-C, 6 A-F, 7 A-C, 42 L-R

Rhynchonella grayii Woodward, 1855 : 444, pl. 10, fig. 16.
Eohemithyris grayi - COOPER, 1959 : 31, pl. 20, fig. 17-23.
Basiliolella ferox d'Hondt, 1987 : 39, pl. 1, fig. 5-6, pl. 2, fig. 1-3, 5.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. CP 110, 300 m : 8 spms.
CHALCAL 2 : st. DW 69, 260 m : 1 spm. — St. DW 80, 160 m : 1 spm. — St. DW 84, 170 m : 75 spms.
MUSORSTOM 4 : st. CP 236, 520 m : 1 spm.
Îles Chesterfield. MUSORSTOM 5 : st. DW 306, 390 m : 1 spm.
Îles Loyauté. MUSORSTOM 6 : st. DW 391, 390 m : 8 spms. — St. DW 392, 340 m : 21 spms. — St. DW 397, 380 m : 25 spms. — St. DW 398, 370 m : 10 spms. — St. DW 399, 285 m : 3 spms. — St. DW 406, 380 m : 4 spms. — St. CP 408, 380 m : 4 spms. — St. DW 416, 340 m : 10 spms. — St. DW 417, 284 m : >200 spms. — St. DW 418, 285 m : 120 spms. — St. CP 419, 285 m : 50 spms. — St. DW 423, 280 m : 1spm. — St. DW 428, 420 m : 4 spms. — St. DW 439, 288 m : 3 spms. — St. DW 444, 300 m : 1 spm. — St. DW 453, 250 m : 25 spms. — St. CP 454, 260 m : 1 spm. — St. CP 455, 260 m : 1 spm. — St. DW 456, 240 m : 45 spms. — St. DW 457, 350 m : 23 spms. — St. DW 461, 240 m : 25 spms. — St. DW 462, 200 m : 70 spms. — St. DW 480, 380 m : 15 spms. — St. DW 481, 300 m : 70 spms. — St. DW 483, 600 m : 1 spm.
Île des Pins - Ride de Norfolk. SMIB 4 : st. DW 42, 305 m : 1 spm. — St. DW 53, 260 m : 1 spm. — St. DW 57, 235 m : 3 spms.
Îles Matthew. VOLSMAR : st. DW 07, 400 m : 20 spms. — St. DW 09, 300 m : 24 spms. — St. DW 17, 300 m : 52 spms. — St. DW 41, 250 m : 45 spms. — St. DW 48, 200 m : 1 spm. — St. DW 49, 285 m : 85 spms. — St. DW 51, 450 m : 1 spm.

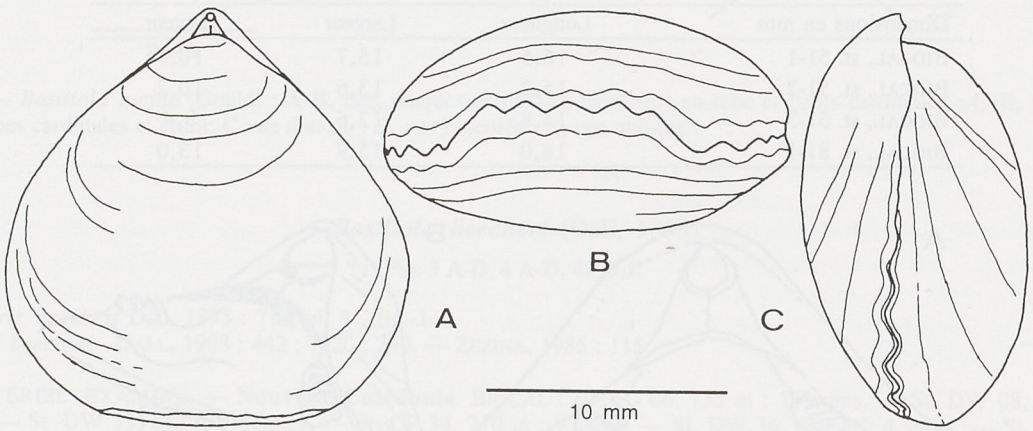


FIG. 5. — *Eohemithyris grayi* Woodward : **A**, vue dorsale ; **B**, vue frontale ; **C**, vue latérale.

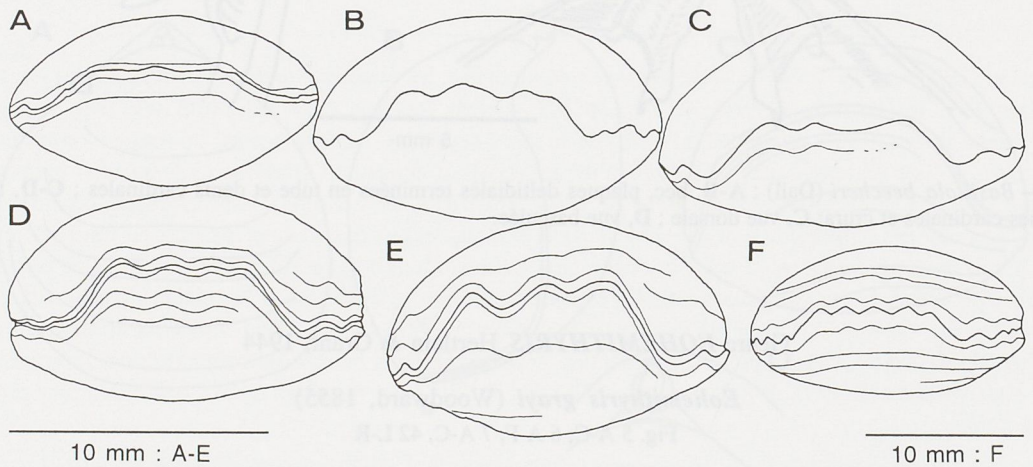


FIG. 6. — *Eohemithyris grayi* Woodward : variabilité de la commissure frontale et de la costulation.

Au cours de différentes campagnes, cette espèce a été draguée dans 41 stations situées entre 160 m et 600 m de profondeur, et réparties autour de la Nouvelle-Calédonie et des îles Chesterfield. Elle a notamment été trouvée à proximité d'une localité située au large de Yaté (D'HONDT, 1987). Le matériel étudié ici et celui décrit par cet auteur sont indiscutablement identiques. Cependant, l'attribution à un taxon particulier (*Basiliolella ferox*) ne peut être retenue, dans la mesure où ces spécimens ont avec *E. grayi* une similitude indiscutable.

DESCRIPTION. — *Morphologie externe* : Les spécimens étudiés sont conformes aux figurations publiées par D'HONDT (1987). La coquille est lisse, épaisse mais translucide. Le bec est petit, de même que le foramen, bordé par des plaques deltidiales jointes. La coquille est surtout caractérisée par le fort épaissement des valves et l'apparition de côtes arrondies dans le tiers antérieur des valves (fig. 5). Celles-ci sont associées à un pli de largeur et d'amplitude variable, portant de trois à six côtes (fig. 6).

Dimensions en mm	Longueur	Largeur	Hauteur
BIOCAL, st. 51-1	16,5	15,7	10,8

Structures internes : Elles sont typiques du genre, avec des callosités très développées sur les plaques cardinales, et de larges crura falcifères (fig. 7).

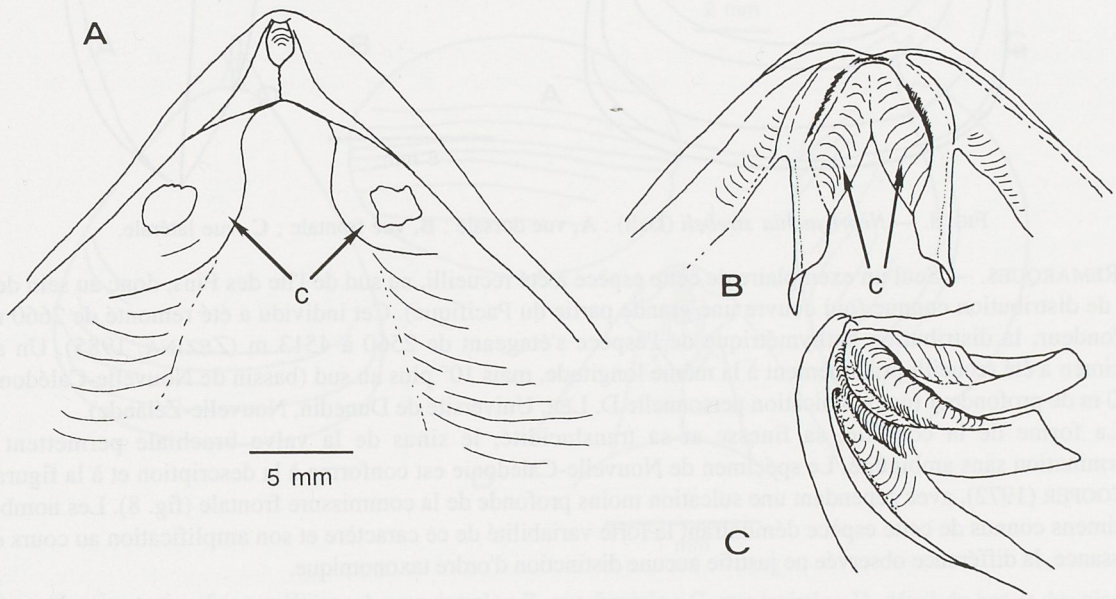


FIG. 7. — *Eohemithyris grayi* Woodward : **A**, détails du bec, des plaques deltidiales jointes et des dents cardinales entourées de callosités (c) ; **B-C**, fossettes, plaques cardinales épaissies de callosités (c) et crura vus en positions dorsale (**B**), et oblique (**C**).

DISCUSSION. — *E. grayi* n'était jusqu'alors connue que des îles Fidji. Une autre espèce du genre, *E. colurnus*, est décrite de la côte sud-est de l'Australie, ne différant de la première que par quelques caractères, essentiellement les proportions des callosités, et la force des côtes antérieures. Les centaines de spécimens récoltés en Nouvelle-Calédonie, presque à mi-chemin entre les îles Fidji et le sud-est australien, expriment une variabilité morphologique qui englobe totalement celle des spécimens figurés des deux espèces. Celles-ci devraient donc vraisemblablement être placées en synonymie, mais cette proposition ne peut être concrétisée ici, car tous les spécimens de collections, et notamment les types, n'ont pu être examinés. Néanmoins, le choix d'*E. grayi* serait conforme à l'application de la règle de priorité.

Genre ***NEORHYNCHIA*** Thomson, 1915

Neorhynchia strebeli (Dall, 1908)

Fig. 8 A-C, 43 A-C

Hemithyris strebeli Dall, 1908 : 441-442.

Neorhynchia strebeli - DALL, 1920 : 290. — HERTLEIN & GRANT, 1944 : 57, pl. 20, fig. 8-15. — COOPER, 1959 : 35, pl. 2, fig. 12-23 ; 1972 : 5-6, pl. 1, fig. 1-11 ; 1973 : 11, pl. 5, fig. 19-23. — MUIR-WOOD, 1961 : pl. 7, fig. 6-8. — ZEZINA, 1973 : 194 ; 1975 : 250-251 ; 1985 : 116.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. CP 58, 2660 m : 1 spm.

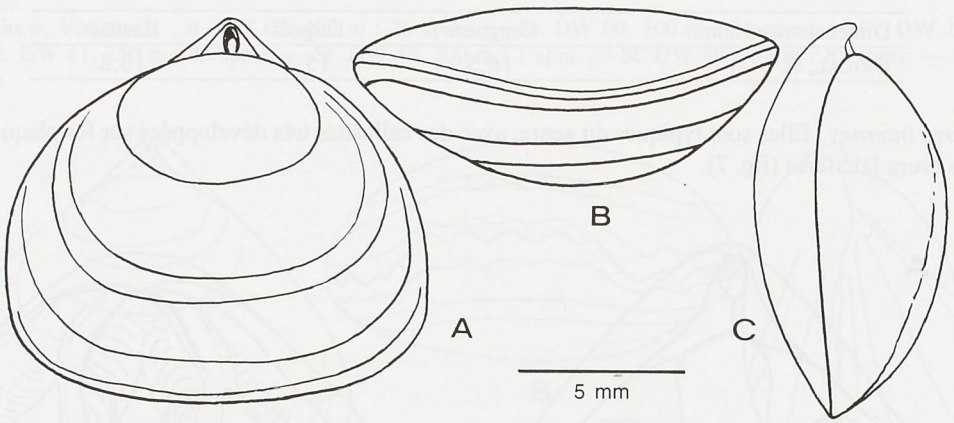


FIG. 8. — *Neorhynchia strebeli* (Dall) : **A**, vue dorsale ; **B**, vue frontale ; **C**, vue latérale.

REMARQUES. — Seul un exemplaire de cette espèce a été recueilli, au sud de l'île des Pins, donc au sein de son aire de distribution connue (qui couvre une grande partie du Pacifique). Cet individu a été remonté de 2660 m de profondeur, la distribution bathymétrique de l'espèce s'étageant de 2560 à 4513 m (ZEZINA, 1985). Un autre spécimen a été recueilli pratiquement à la même longitude, mais 10° plus au sud (bassin de Nouvelle-Calédonie) à 2930 m de profondeur (communication personnelle D. LEE, Université de Dunedin, Nouvelle-Zélande).

La forme de la coquille, sa finesse et sa translucidité, le sinus de la valve brachiale permettent une détermination sans ambigüité. Le spécimen de Nouvelle-Calédonie est conforme à la description et à la figuration de COOPER (1972), avec cependant une sulcation moins profonde de la commissure frontale (fig. 8). Les nombreux spécimens connus de cette espèce démontrant la forte variabilité de ce caractère et son amplification au cours de la croissance, la différence observée ne justifie aucune distinction d'ordre taxonomique.

Dimensions en mm	Longueur	Largeur	Hauteur
BIOCAL, st. 58-1	12,3	13,5	6,0

Famille FRIELEIIDAE Cooper, 1959

Genre ***GRAMMETARIA*** Cooper, 1959

Grammetaria africana Hiller, 1986

Fig. 9 A-D, 10 A-B, 11

Grammetaria africana Hiller, 1986 : 103-105.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. DW 44, 440 m : 1 spm. — St. DW 46, 570 m : 2 spms. — St. DW 51, 700 m : 1 spm.
BIOGEOCAL : st. DW 291, 515 m : 1 spm.
Îles Loyauté. MUSORSTOM 6 : st. DW 461, 240 m : 2 spms.

REMARQUES. — *G. africana* n'était représentée jusqu'alors que par un unique spécimen, recueilli au large des côtes d'Afrique du Sud, entre 560 et 620 m de profondeur. La découverte de quatre spécimens dans trois stations situées au sud de l'île des Pins (entre 440 et 700 m de profondeur) élargit donc notablement l'échantillonnage, ainsi que le domaine géographique connu de l'espèce et du genre. En effet, *G. bartschi*, seule autre espèce du genre, n'est connue que par trois spécimens au large des Philippines, à des profondeurs de 295 à 545 m et par un spécimen recueilli entre la Nouvelle-Zélande et la Nouvelle-Calédonie, par 803-789 m de fond (communication personnelle D. LEE, Université de Dunedin, Nouvelle-Zélande). Par ailleurs, les différences entre les deux espèces sont essentiellement des différences de taille ; leur distinction mériterait sans doute une analyse plus approfondie, à condition de disposer d'un matériel suffisant.

Grammetaria présente de nombreuses affinités avec *Sphenarina*, genre du Pliocène de Sicile : ces deux taxons semblent actuellement devoir plus leur distinction à leur répartition stratigraphique et géographique qu'à leurs réelles différences morphologiques (qui porteraient en particulier sur l'absence de septum chez *Sphenarina*, mais ce point reste à vérifier et à comparer à l'extrême réduction de cette structure chez les *Grammetaria* étudiées ici).

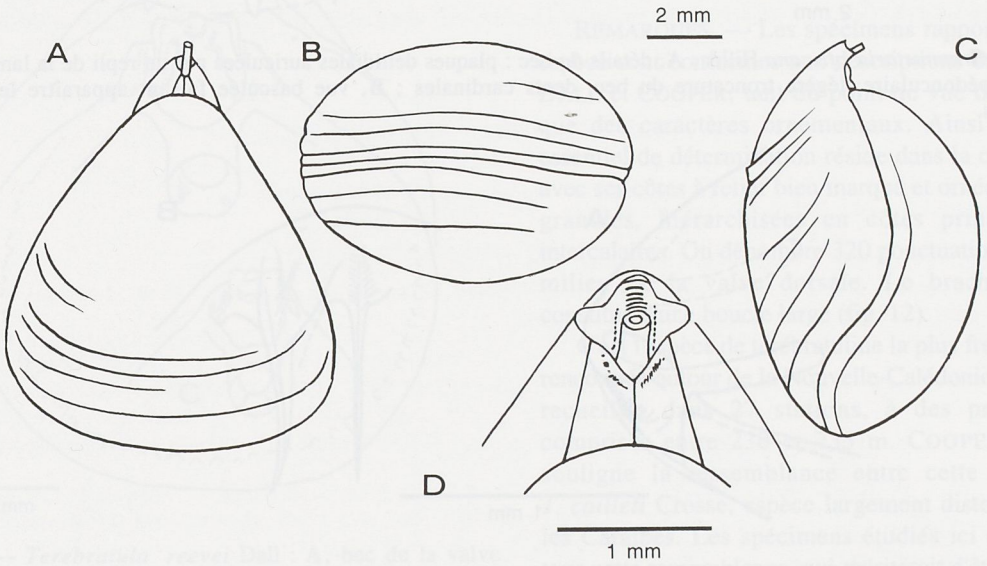


FIG. 9. — *Grammetaria africana* Hiller : **A**, vue dorsale ; **B**, vue frontale ; **C**, vue latérale ; **D**, détail du bec et des plaques deltidiales auriculées.

DESCRIPTION. — *Morphologie externe* (fig. 9) : Coquille fine, translucide, allongée, de forme triangulaire, moins large que longue. De fines capillations longitudinales sont observables (avec difficulté) à la surface des valves. La commissure frontale est rectimarginée tandis que les commissures latérales sont sinueuses, définissant des "joues" latérales sur la valve pédonculaire. Le bec est pointu, avec un foramen submésothyride, délimité par deux plaques deltidiales jointes et auriculées (fig. 9 D). En fin de croissance, les rebords des valves se relèvent fortement et augmentent le bombement des deux valves.

Dimensions en mm	Longueur	Largeur	Hauteur
BIOGEOCAL, st. 291-1	9,3	7,8	5,1
BIOGEOCAL, st. 291-2	11,3	9,5	7,0

Structures internes : Dans la valve pédonculaire, des lamelles dentales fines, presque parallèles, portent de minuscules dents (fig. 10). Dans la valve brachiale, les plaques cardinales sont très ténues et prolongées de crura fins, rectilignes et aplatis parallèlement au plan de symétrie (fig. 11). COOPER (1959) a désigné de tels crura comme étant spinulifères. Le septum très bas est à peine visible, il se raccorde à une ébauche de septalium localisée à l'apex de la valve.

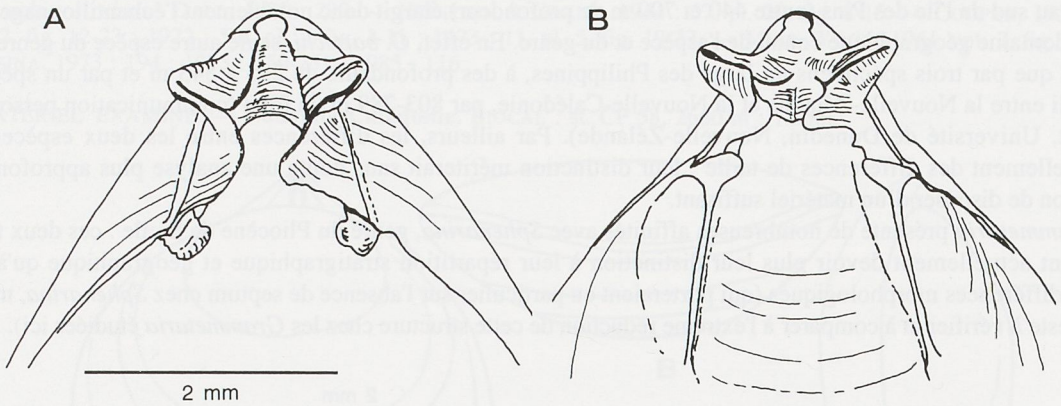


FIG. 10. — *Grammetaria africana* Hiller : **A**, détails du bec : plaques deltidiales auriculées par un repli de la lame calcaire, collier pédonculaire, légère troncature du bec, dents cardinales ; **B**, vue basculée faisant apparaître les lamelles dentales.

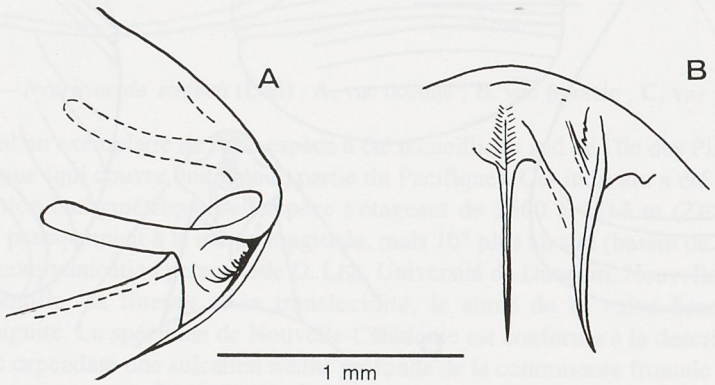


FIG. 11. — *Grammetaria africana* Hiller : structures internes: crura et septum.

Ordre TEREBRATULIDA Waagen, 1883
Sous-ordre TEREBRATULIDINA Waagen, 1883
Famille CANCELLOTHYRIDIDAE Thomson, 1926

Genre ***TEREBRATULINA*** d'Orbigny, 1847

Le genre *Terebratulina* est un des genres de brachiopodes actuels les plus diversifiés avec plus de 25 espèces réparties dans presque toutes les mers du globe. Parmi ces espèces, certaines sont largement répandues et présentent une importante variabilité morphologique intraspécifique. C'est le cas des spécimens récoltés autour de la Nouvelle-Calédonie, lorsqu'ils sont en nombre suffisant pour apprécier cette variabilité.

Terebratulina reevei Dall, 1920

Fig. 12 A-C, 43 D-F

Terebratulina reevei Dall, 1920 : 305. — Cooper, 1973 : 379-380, pl. 42, fig. 19-33. — Zezina, 1981 : 14 ; 1985 : 129.

Matériel examiné. — **Nouvelle-Calédonie**. Biocal : st. KG 06, 735 m : 5 spms. — St. DW 08, 435 m : 11 spms. — St. DW 33, 675 m : 1 spm. — St. DW 83, 460 m : 1 spm.

Biogeocal : st. DW 291, 515 m : 7 spms. — St. DW 307, 475 m : 3 spms.

Musorstom 4 : st. DW 159, 585 m : 1 spm.

Îles Chesterfield. Musorstom 5 : st. DW 273, 290 m : 1 spm. — St. DW 346, 300 m : 1 spm.

Îles Loyauté. Musorstom 6 : st. DW 391, 390 m : 4 spms. — St. DW 393, 420 m : 4 spms. — St. DW 394, 570 m : 2 spms. — St. DW 398, 370 m : 1 spm. — St. DW 399, 285 m : 12 spms. — St. DW 405, 520 m : 1 spm. — St. DW 417, 284 m : 1 spm. — St. DW 418, 285 m : 4 spms. — St. DW 422, 255 m : 2 spms. — St. DW 473, 230 m : 5 spms. — St. DW 474, 260 m : 1 spm. — St. DW 480, 380 m : 6 spms.

Île des Pins - Ride de Norfolk. Smib 4 : st. DW 43, 240 m : 2 spms. — St. DW 44, 285 m : 4 spms.

Îles Matthew. Volsmar : st. DW 07, 400 m : 1 spm. — St. DW 09, 300 m : 2 spms. — St. DW 38, 420 m : 6 spms. — St. DW 51, 450 m : 30 spms.

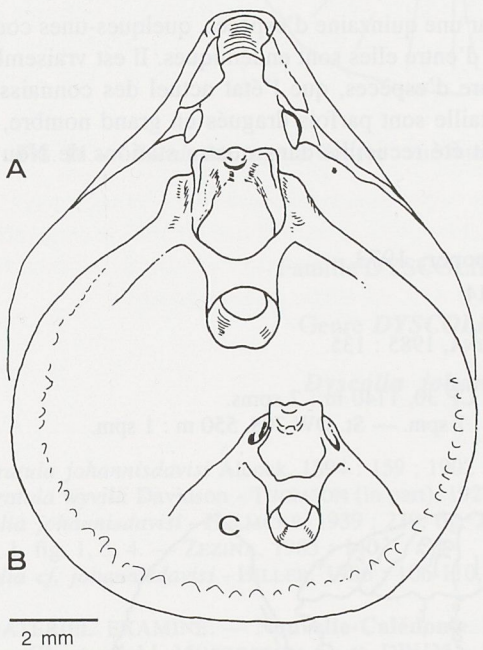


Fig. 12. — *Terebratula reevei* Dall : **A**, bec de la valve pédonculaire ; **B-C**, vue interne de la valve brachiale d'un spécimen adulte (B) et d'un jeune (C).

Remarques. — Les spécimens rapportés à cette espèce sont conformes aux descriptions données par Dall et Cooper, tant du point de vue de la forme que des caractères ornementaux. Ainsi le critère essentiel de détermination réside dans la costulation, avec ses côtes à relief bien marqué et ornées de petits granules, hiérarchisées en côtes principales et intercalaires. On dénombre 320 ponctuations/mm^2 au milieu de la valve dorsale. Le brachidium est constitué d'une boucle large (fig. 12).

C'est l'espèce de térébratuline la plus fréquemment rencontrée autour de la Nouvelle-Calédonie ; elle a été recueillie dans 27 stations, à des profondeurs comprises entre 230 et 735 m. Cooper (1973a) souligne la ressemblance entre cette espèce et *T. cailleti* Crosse, espèce largement distribuée dans les Caraïbes. Les spécimens étudiés ici confirment tous cette ressemblance, qui mériterait d'être analysée avec plus de détails.

Terebratulina pacifica Yabe & Hatai, 1934

Fig. 43 G-I

Terebratulina pacifica Yabe & Hatai, 1934 : 661, fig. 22-24, 29. — Hatai, 1936 : 67 ; 1940 : 230-232, pl. 6, fig. 28-30, 32-35, 41-44, 47, 102-105. — Zezina, 1985 : 131.

Matériel examiné. — **Nouvelle-Calédonie**. Biocal : st. DW 64, 250 m : 10 spms. — St. DW 65, 275 m : 5 spms.

Biogeocal : st. DW 308, 550 m : 1 spm.

Ride de Norfolk. Chalcal 2 : st. DW 71, 230 m : 10 spms. — St. DW 84, 170 m : 2 spms.

Île des Pins - Ride de Norfolk. Smib 4 : st. DW 40, 250 m : 2 spms. — St. DW 46, 250 m : 3 spms. — St. DW 56, 245 m : 1 spm. — St. DW 57, 235 m : 1 spm.

Îles Loyauté. MUSORSTOM 6 : st. DW423, 280 m : 1 spm.
Îles Chesterfield. MUSORSTOM 5 : st. DW 255, 288 m : 1 spm.

REMARQUES. — Cette espèce, plus grande que la précédente, se caractérise par son contour plus oblong et une plus grande finesse de costulation, sans granules associés aux côtes. On dénombre 224 ponctuations/mm^2 au milieu de la valve dorsale. Elle a été recueillie dans 10 stations, à des profondeurs comprises entre 170 et 288 m.

Jusqu'alors, cette espèce n'était décrite que dans les mers bordières du Japon. Elle n'a d'affinités qu'avec des espèces provenant de la même région, telles que *T. kitakamiensis* Hayasaka, 1938, ou *T. kyusyuensis* Yabe & Hatai, 1934.

Famille CHLIDONOPHORIDAE Thomson, 1926

Genre *EUCALATHIS* Fischer & Oehlert, 1890

Le genre *Eucalathis* a une répartition mondiale reposant sur une quinzaine d'espèces, quelques-unes couvrant d'assez vastes domaines géographiques, tandis qu'une dizaine d'entre elles sont endémiques. Il est vraisemblable qu'une analyse comparative systématique réduirait ce nombre d'espèces, que l'état actuel des connaissances contraint à maintenir. Alors que ces brachiopodes de petite taille sont parfois dragués en grand nombre, seuls quelques individus isolés de l'espèce *Eucalathis rugosa* ont été recueillis dans quatre stations de Nouvelle-Calédonie.

Eucalathis rugosa Cooper, 1973

Fig. 13 A-C, 14

Eucalathis rugosa Cooper, 1973 : 388-389, pl. 44, fig. 1-9. — ZEZINA, 1985 : 135.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. CP 30, 1140 m : 2 spms.
BIOGEOCAL : st. KG 252, 330 m : 1 spm. — St. DW 253, 310 m : 1 spm. — St. DW 308, 550 m : 1 spm.
Îles Loyauté. CALSUB : plongée 15b, 538 m : 3 spms.

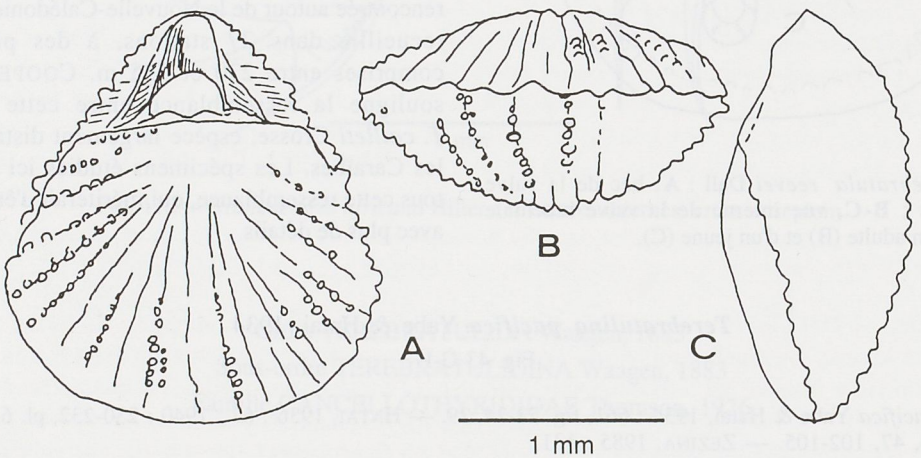


FIG. 13. — *Eucalathis rugosa* Cooper : **A**, vue dorsale ; **B**, vue frontale ; **C**, vue latérale.

REMARQUES. — La taille de la coquille et ses caractéristiques externes, notamment la forte costulation et son aspect granuleux (fig. 13), correspondent exactement à celles décrites et figurées par COOPER (1973a). Les structures internes de la valve brachiale présentent la fine boucle caractéristique, attachée à deux processus cruraux

proéminents (fig. 14). La costulation et les petits tubercules qui ornementent la coquille rendent très imprécis le dénombrement des ponctuations, qui apparaissent cependant très denses (>400/mm^2).

Dimensions en mm	Longueur	Largeur	Hauteur
BIOGEOCAL, st. 252	1,9	1,8	1,0

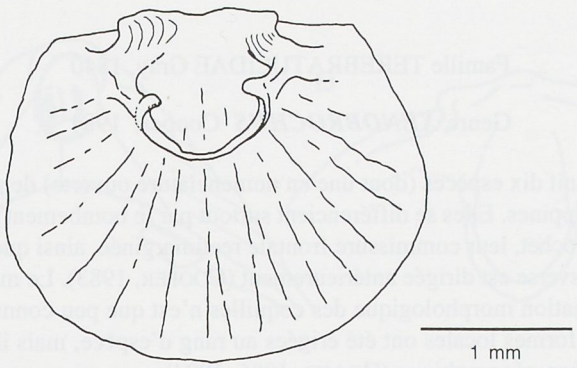


FIG. 14. — *Eucalathis rugosa* Cooper : vue interne de la valve brachiale montrant la boucle du brachidium.

Famille DYSCOLIIDAE Fischer & Oehlert, 1891

Genre ***DYSCOLIA*** Fischer & Oehlert, 1890

Dyscolia johannisdavisi (Alcock, 1894)

Fig. 43 J-L

Terebratula johannisdavisi Alcock, 1894 : 159 ; 1902 : 383, fig. 83. — JOUBIN, 1907 : 6. — BLOCHMANN, 1908 : 638.
Terebratula wyvilli Davidson - THOMSON (in part), 1927 : 201.
Dyscolia johannisdavisi - HELMCKE, 1939 : 239, fig. 241 ; 1940 : 261, fig. 25, 25 b. — MUIR-WOOD, 1959 : 300-302, pl. 1, fig. 1, 3, 4. — ZEZINA, 1985 : 140.
Dyscolia cf. johannisdavisi - HILLER, 1986 : 106-110, text-fig. 4-5.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. KG 06, 735 m : 2 spms.
Îles Chesterfield. MUSORSTOM 5 : st. DW 251, 1330 m : 1 spm.

REMARQUES. — Deux coquilles vides et trois fragments de valves de cette espèce, enfouis dans les premiers centimètres du sédiment, ont été remontés de 735 m de profondeur dans un carottier USNEL (1/4 de m^2). Leur état de conservation est bon, sans encroûtement, et le brachidium d'un spécimen est parfaitement conservé.

D. johannisdavisi est une espèce rare, d'abord trouvée dans l'océan Indien (au large des îles Maldives), à des profondeurs comprises entre 786 et 1463 m. ALCOCK (1894) n'a disposé que d'un unique individu (une coquille vide) pour décrire son holotype (HELMCKE, 1940). MUIR-WOOD (1959) a ensuite décrit une valve brachiale et une valve pédonculaire isolées. HILLER (1986) a disposé de quatre spécimens provenant de la côte est de l'Afrique du Sud, dont sans doute le premier exemplaire vivant de cette espèce.

L'espèce la plus répandue de ce genre, *D. wyvilli* (Davidson), est distribuée en de nombreuses localités de l'océan Atlantique, où l'on trouve également *D. subquadrata* (Jeffreys) et *D. ewingi* Cooper.

Quelques coquilles vides provenant de l'extrême Sud-Pacifique, de l'Antarctique (FOSTER, 1974) et de la mer de Davis (ZEZINA, 1980) ont été rapportées à ce genre (avec réserve et sous la dénomination sp.). Leur forme et leur taille sont cependant éloignées de celle de *D. johannisdavisi* et on peut considérer que les spécimens de Nouvelle-Calédonie constituent le seul jalon pertinent de la présence du genre dans le Pacifique.

La morphologie des coquilles correspond à la description détaillée donnée par MUIR-WOOD (1959). Leur ponctuation au centre de la valve brachiale est très peu dense : 57/mm^2.

Dimensions en mm	Longueur	Largeur	Hauteur
BIOCAL, st. 6 -1	60,2	50,3	32,5

Famille TEREBRATULIDAE Gray, 1840

Genre ***XENOBROCHUS*** Cooper, 1981

Le genre *Xenobrochus* réunit dix espèces (dont une en nomenclature ouverte) de petites térébratules de l'océan Indien et de la région des Philippines. Elles se différencient surtout par le bombement de leur valve pédonculaire, la courbure corrélative de leur crochet, leur commissure frontale rectimarginée, ainsi que par la forme de la boucle du brachidium dont la bande transverse est dirigée antérieurement (COOPER, 1983). Le matériel relatif à chaque espèce étant relativement rare, la variation morphologique des coquilles n'est que peu connue. Même si certaines restent en nomenclature ouverte, des formes locales ont été érigées au rang d'espèce, mais il est clair que leur distinction ressortit beaucoup à leur position géographique (HILLER, 1986, 1994).

La lecture attentive des diagnoses et descriptions ne va pas sans dénoter un certain nombre d'incohérences lorsque l'on procède à une comparaison caractère par caractère (e.g. le genre est caractérisé par un collier pédonculaire court, mais une espèce est identifiable à son collier pédonculaire tubulaire). Ces disparités mettent en évidence la difficulté de caractérisation des genres chez les Térébratulidés, à partir d'une somme de caractères non encore testés quant à leur réelle signification phylogénétique. En l'état actuel de la systématique, les deux formes trouvées autour de la Nouvelle-Calédonie sont attribuées aux espèces *X. africanus* et *X. indianensis*.

Xenobrochus africanus (Cooper, 1973)

Fig. 15 A-C, 16 A-B

Gryphus africanus Cooper, 1973 : 8-9, pl. 4, fig. 31-38.
Xenobrochus africanus - COOPER, 1981 : 20, pl. 4, fig. 30-35 ; 1983, pl. 2, fig. 20-23. — ZEZINA, 1985 : 154. — HILLER, 1986 : 111-113, fig. 6.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. DW 33, 675 m : 3 spms. — St. DW 46, 570 m : 1 spm.
MUSORSTOM 4 : st. DW 221, 535 m : 2 spms.
Îles Loyauté. MUSORSTOM 6 : st. DW 423, 280 m : 1 spm. — St. DW 456, 240 m : 1 spm. — St. DW 457, 350 m : 1 spm.

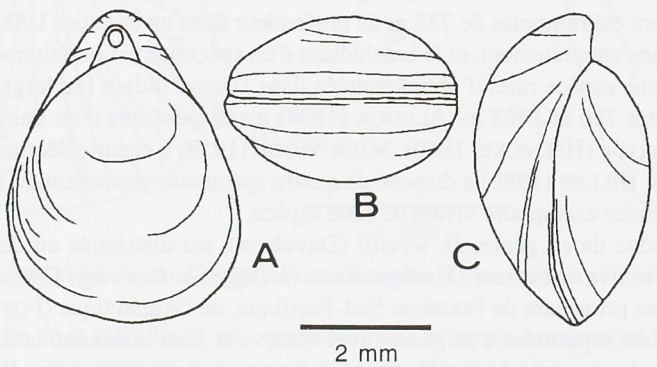


FIG. 15. — *Xenobrochus africanus* (Cooper) : **A**, vue dorsale ; **B**, vue frontale ; **C**, vue latérale.

REMARQUES. — Cette espèce de petite taille n'était connue jusqu'à maintenant qu'au large de la baie de Durban (Afrique du Sud), à des profondeurs de 300 à 400 m. Elle a été décrite en détail par COOPER (1973b, 1981a, 1983) et HILLER (1986). Les spécimens de Nouvelle-Calédonie, dragués entre 240 et 675 m, présentent les mêmes caractéristiques (fig. 15-16 A), en particulier la bande transverse de la boucle du brachidium dont la forme est convexe vers la partie antérieure de la valve (fig. 16 B). Les ponctuations sont de densité variable, de 170 à 300/mm^2 à l'avant des valves.

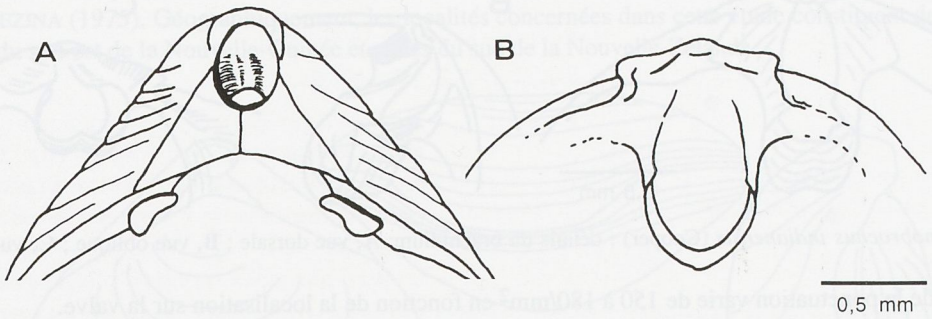


FIG. 16. — *Xenobrochus africanus* (Cooper) : **A**, détails du bec ; **B**, détail de l'intérieur de la valve brachiale.

Dimensions en mm	Longueur	Largeur	Hauteur
BIOCAL, st. 33-1	4,5	3,7	2,4
BIOCAL, st. 33-2	4,7	3,6	2,6
MUSORSTOM 4, st. 423	7,9	5,7	4,8

Xenobrochus indianensis (Cooper, 1973)

Fig. 17 A-C, 18 A-C

Gryphus indianensis Cooper, 1973 : 9-10, pl. 4, fig. 17-30.
Xenobrochus indianensis - COOPER, 1983 : pl. 2, fig. 24-29. — ZEZINA, 1985 : 154.

MATÉRIEL EXAMINÉ. — **Îles Matthew**. VOLSMAR : st. DW 09, 300 m : 1 spm. — St. DW 17, 300 m : 17 spms.

REMARQUES. — Cette espèce, dont la taille atteint 11,3 mm, n'a jusqu'alors été décrite qu'au large des côtes de Somalie, à une profondeur comprise entre 65 et 72 m. Les 18 spécimens de l'est de la Nouvelle-Calédonie ont été dragués plus profondément (300 m), mais en possèdent les caractères, malgré une taille maximale plus faible

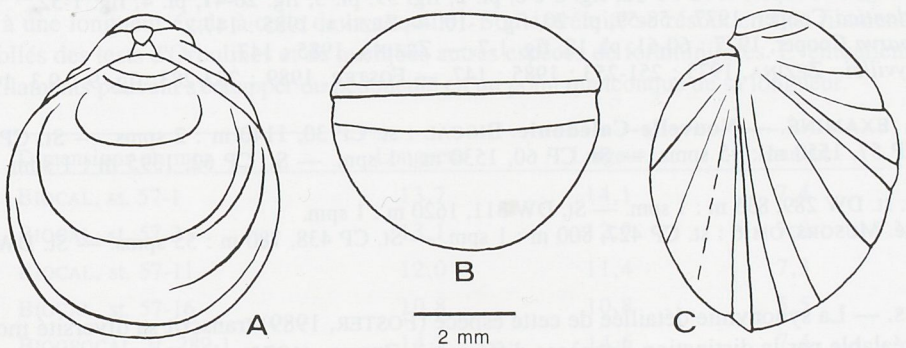


FIG. 17. — *Xenobrochus indianensis* (Cooper) : **A**, vue dorsale ; **B**, vue frontale ; **C**, vue latérale.

(8 mm). Fine et presque translucide, la coquille est très bombée, avec une profonde valve pédonculaire au bec fortement incurvé et muni d'un court collier pédonculaire (fig. 17). Les parties umbonales des valves sont épaissies par des callosités. Les structures internes (fig. 18) comprennent un processus cardinal assez développé, et la boucle du brachidium, dirigée antérieurement (caractère cardinal du genre), possède un petit repli médian en direction ventrale (en principe absent chez les autres espèces du genre).

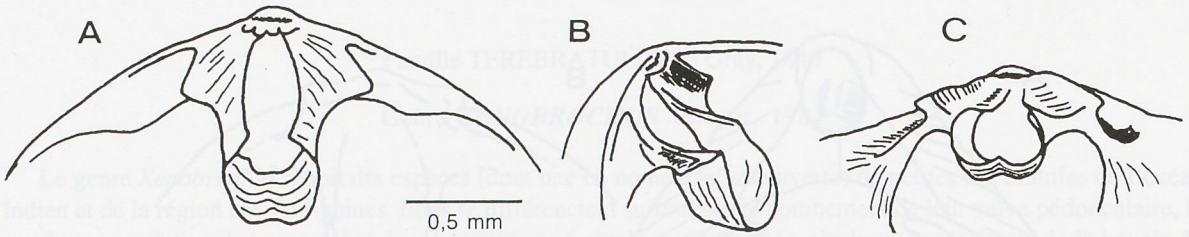


FIG. 18. — *Xenobrochus indianensis* (Cooper) : détails du brachidium: **A**, vue dorsale ; **B**, vue oblique ; **C**, vue basculée.

La densité de la ponctuation varie de 150 à 180/mm^2 en fonction de la localisation sur la valve.

L'attribution à l'espèce *X. indianensis* est faite avec réserve, en raison de la finesse des valves, qui semble propre à ces spécimens.

Dimensions en mm	Longueur	Largeur	Hauteur
VOLSMAR, st. 17 -1	6,6	5,7	4,5
VOLSMAR, st. 17 -2	8,3	6,0	6,2
VOLSMAR, st. 17 -3	7,4	6,9	4,8

Genre ***ABYSSOTHYRIS*** Thomson, 1927

Abyssothyris wyvillei (Davidson, 1878)

Fig. 19 A-C, 20, 43 M-R

Terebratula wyvilli Davidson, 1878 : 436-437.
Terebratula wyvillii - DAVIDSON, 1880 : 12, 27, pl. 2, fig. 7, 9.
Liothyris wyvillii - DAVIDSON, 1886 : 15-16, pl. 2, fig. 10-14 (non fig. 8-9).
Liothyrina wyvillii - DALL, 1908 : 444.
Gryphus wyvilli - DALL, 1920 : 321.
Abyssothyris wyvilli - THOMSON, 1927 : 190, fig. 56b.
Abyssothyris elongata Cooper, 1972 : 9-12, fig. 3 c-e, pl. 2, fig. 39, pl. 3, fig. 20-41, pl. 4, fig. 1-52.
Abyssothyris atlantica Cooper, 1977 : 58-59, pl. 20, fig. 1-10. — ZEZINA, 1985 : 147.
Abyssothyris? parva Cooper, 1977 : 60-61, pl. 18, fig. 1-7. — ZEZINA, 1985 : 147.
Abyssothyris wyvillei - ZEZINA, 1975 : 251-253 ; 1985 : 147. — FOSTER, 1989 : 282-283, fig. 9.1-9.3, 10.1-10.10.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. CP 30, 1140 m : 2 spms. — St. CP 55, 1170 m : 1 spm. — St. CP 57, 1550 m : 15 spms. — St. CP 60, 1530 m : 1 spm. — St. CP 62, 1395 m : 1 spm. — St. CP 75, 825 m : 1 spm.

BIOGEOCAL : st. DW 289, 835 m : 1 spm. — St. DW 311, 1620 m : 1 spm.

Îles Loyauté. MUSORSTOM 6 : st. CP 427, 800 m : 1 spm. — St. CP 438, 780 m : 55 spms. — St. DW 489, 700 m : 1 spm.

REMARQUES. — La synonymie détaillée de cette espèce (FOSTER, 1989) transcrit sa diversité morphologique, exprimée au préalable par la distinction d'espèces différentes. ZEZINA (1975) puis FOSTER (1989) ont discuté du

caractère factice de ces taxons, bien qu'une étude synthétique de toutes les populations disponibles d'*A. wyvillei* reste à réaliser pour définir son exacte structure morphologique.

A. wyvillei est une espèce d'extension très vaste (marges de l'océan Pacifique et extrême sud de l'océan Atlantique), habituellement recueillie à grande profondeur (d'environ 1800 à plus de 5000 m de profondeur, des coquilles vides ayant été remontées de 6179 m). Autour de la Nouvelle-Calédonie et au large des îles Chesterfield, *A. wyvillei* a été recueilli au-dessus de son intervalle bathymétrique connu, dans 7 stations dont les profondeurs s'échelonnent de 825 à 1620 m. Il devient ainsi moins strictement inféodé aux grandes profondeurs que ne le constatait ZEZINA (1975). Géographiquement, les localités concernées dans cette étude constituent des jalons entre les stations du sud-est de la Nouvelle-Guinée et celles du sud de la Nouvelle-Zélande.

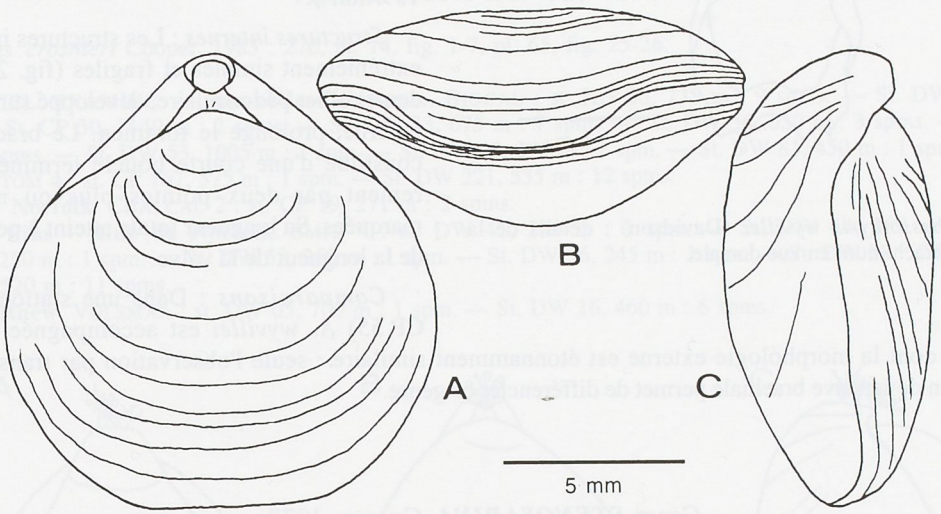


FIG. 19. — *Abyssothyris wyvillei* (Davidson) : **A**, vue dorsale ; **B**, vue frontale ; **C**, vue latérale.

DESCRIPTION. — *Morphologie externe* : Les spécimens rapportés à cette espèce sont conformes aux descriptions et figurations de DAVIDSON (1886). Ils se reconnaissent aisément à leur coquille fine, presque souple, marquée sur la valve brachiale d'un sinus médian qui résulte du tracé sulqué de la commissure frontale (fig. 19). Cette sulcation est nette sur tous les individus observés et la variabilité décrite par FOSTER (1989), depuis des formes rectimarginées jusqu'à des formes nettement sulquées, n'a pas été retrouvée. Par contre, la largeur relative du sinus médian est variable, dessinant une languette antérieure plus ou moins étroite, généralement corrélée à l'étroitesse de l'ensemble de la coquille. D'une manière générale, le contour dorsal de la coquille apparaît presque pentagonal.

Le foramen est limité par des plaques deltidiales petites et soudées. Le pédoncule est de longueur variable (de 1 mm environ à une longueur égale à celle de la coquille). Son extrémité se résout en fins filaments sur lesquels sont souvent collés des tests d'Orbulines et de quelques autres espèces de foraminifères. Eventuellement, quelques touffes de ces filaments peuvent s'échapper du pédoncule en un point quelconque de sa longueur.

Dimensions en mm	Longueur	Largeur	Hauteur
BIOCAL, st. 57-1	13,7	14,1	7,4
BIOCAL, st. 57-2	13,1	12,9	7,0
BIOCAL, st. 57-11	12,0	11,4	7,3
BIOCAL, st. 57-16	10,8	10,8	5,5
BIOGEOCAL, st. 289-1	14,5	14,5	7,4

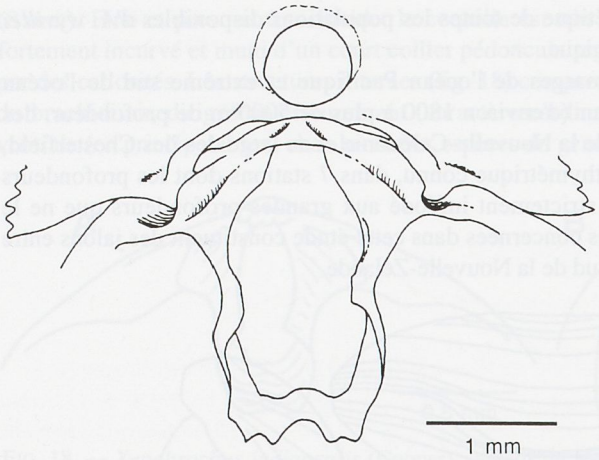


FIG. 20. — *Abyssothyris wyvillei* (Davidson) : détails de la boucle du brachidium en vue dorsale.

Ponctuation : Des comptages ont été effectués sur des spécimens de 11,3 à 13,4 mm de longueur. A hauteur de l'extrémité antérieure des empreintes des adducteurs, la densité de la ponctuation varie de 57 à 86/mm^2, tandis qu'elle atteint 88 à 119/mm^2 à proximité du bord antérieur de la valve. A dimensions égales, ces valeurs sont sensiblement plus faibles que celles indiquées par FOSTER (1989) pour des formes du Pacifique Sud-Ouest (125 à 139/mm^2).

Structures internes : Les structures internes sont extrêmement simples et fragiles (fig. 20). Un très court collier pédonculaire, développé surtout du côté externe, prolonge le foramen. Le brachidium est constitué d'une courte boucle terminée antérieurement par deux pointes plus ou moins bien marquées. Sa longueur totale atteint à peine le quart de la longueur de la valve.

Comparaisons : Dans une station (BIOCAL-CP 55) *A. wyvillei* est accompagnée de *Nipponithyris afra* dont la morphologie externe est étonnamment similaire : seule l'observation par transparence du septum médian de la valve brachiale permet de différencier ce genre.

Genre *STENOSARINA* Cooper, 1977

Stenosarina Cooper, 1977 : 95.
Stenobrochus Cooper, 1983 : 269.

Le genre *Stenosarina* et les cinq espèces qu'il rassemblait initialement ont été créés par COOPER (1977) pour identifier des spécimens provenant de la mer des Caraïbes. Puis une sixième espèce, antérieurement identifiée à *Terebratula (Liothyrina) sphenoidea* Philippi par FISCHER et OEHLERT (1891), a été rapportée à ce genre (COOPER, 1983) et récemment retrouvée dans la province mauritanienne au cours des campagnes CANCAP IV et VI, à proximité des îles du Cap Vert et des Canaries (LOGAN, 1988). La présence de ce genre amphi-atlantique au large de la Nouvelle-Calédonie est donc un fait majeur parmi les résultats des campagnes concernées par ce travail.

COOPER n'ayant disposé que d'un nombre réduit d'individus (l'espèce *S. parva* est par exemple créée pour un seul spécimen), l'ampleur de la variabilité morphologique de chaque espèce est inconnue. D'autre part, les caractéristiques diagnostiques sont parfois difficiles à apprécier : *S. oregonae* est une "grande *Stenosarina* avec un grand foramen" ; les distinctions entre espèces reposent principalement sur des différences de taille et de proportions des coquilles.

Par ailleurs COOPER (1983) a créé un nouveau genre (*Stenobrochus*) et une nouvelle espèce (*S. crosnieri*) pour des formes de l'océan Indien étonnamment proches de *Stenosarina*. *S. crosnieri* ne diffère des *Stenosarina* des Caraïbes que par la taille et des proportions de la coquille. Le brachidium est identique dans les deux genres, les quelques différences observées chez les structures internes restent du domaine des variations intraspécifiques. À propos de *Stenosarina* et *Stenobrochus*, COOPER (1983) écrit: "Ces deux genres sont très proches, et aussi similaires à *Dallithyris*. Dans la mesure où des genres caraïbes (*Chlidonophora*, *Dyscolia*, *Ecnomosia*) existent dans l'océan Indien, il est possible que *Dallithyris* et *Stenobrochus* soient dérivés de *Stenosarina*, ou vice-versa". La richesse du matériel néo-calédonien permet de constater à la fois une variabilité morphologique importante dans chaque échantillon et des différences entre échantillons, qui ne permettent cependant pas de procéder à des

distinctions taxinomiques à l'échelle du genre. Ces observations, ajoutées aux considérations de COOPER, suggèrent que *Stenosarina* et *Stenobrochus* ne constituent qu'un seul genre, le nom du premier créé (*Stenosarina*) étant à conserver en accord avec la règle de priorité. L'analyse précise de la variation morphologique fera l'objet d'une étude ultérieure, trois entités principales étant assez aisément discernables en Nouvelle-Calédonie et considérées comme des espèces. Une d'entre elles, qui peut être rapprochée de *S. crosnieri*, fait l'objet de descriptions complémentaires. Les deux autres *S. globosa* et *S. lata* sont nouvelles.

Stenosarina crosnieri (Cooper, 1983)

Fig. 21 A-D, 22 A-C, 23 A-B, 44 A-D

Stenobrochus crosnieri Cooper, 1983 : 270, pl. 14, fig. 1-7, pl. 65, fig. 25-26.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. KG 06, 735 m : 9 spms. — St. DW 08, 435 m : 21 spms. — St. CP 30, 1140 m : 2 spms. — St. DW 33, 675 m : 7 spms. — St. DW 36, 650 m : 3 spms. — St. DW 46, 570 m : 15 spms. — St. DW 53, 1005 m : 1 spm. — St. DW 65, 275 m : 1 spm. — St. DW 81, 450 m : 1 spm.

MUSORSTOM 4 : st. CP 167, 575 m : 1 spm. — St. DW 221, 535 m : 12 spms.

Ride de Norfolk. CHALCAL 2 : st. CP 19, 271 m : 2 spms.

Île des Pins - Ride de Norfolk. SMIB 4 : st. DW 41, 230 m : 1 spm. — St. DW 44, 285 m : 4 spms. — St. DW 45, 250 m : 1 spm. — St. DW 53, 260 m : 1 spm. — St. DW 56, 245 m : 1 spm. — St. DW 58, 520 m : 1 spm. — St. DW 63, 520 m : 11 spms.

Îles Matthew. VOLSMAR : st. DW 05, 700 m : 1 spm. — St. DW 16, 460 m : 6 spms.

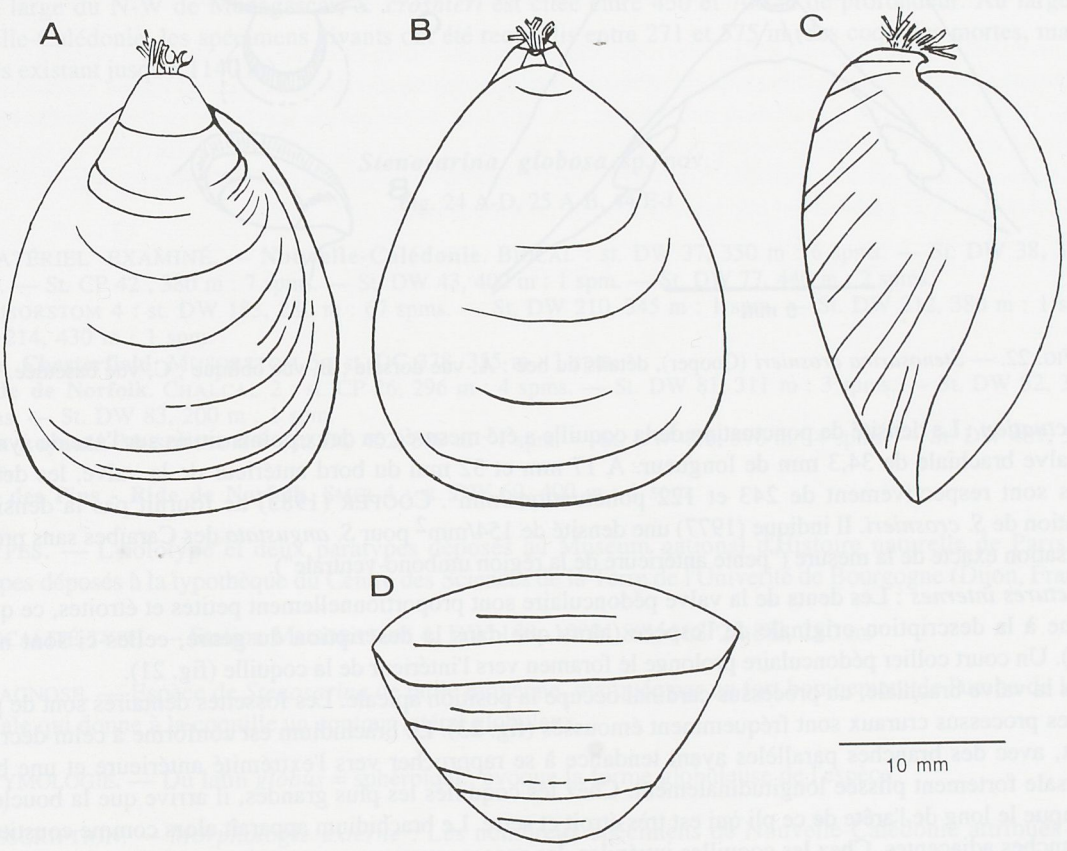


FIG. 21. — *Stenosarina crosnieri* (Cooper) : **A**, vue ventrale ; **B**, vue dorsale ; **C**, vue latérale ; **D**, vue frontale.

REMARQUES. — *Morphologie externe* : La caractéristique essentielle de cette espèce, qui la range sans ambiguïté dans le genre *Stenosarina*, est sa morphologie allongée, subtriangulaire, et sa commissure latérale fortement incurvée au point de définir des joues latérales de chaque côté de la valve pédonculaire. Celle-ci est par suite beaucoup plus profonde que la valve brachiale, elle-même fortement convexe, mais ne délimitant pratiquement aucun volume propre (fig. 21) : cette valve apparait dans les cas extrêmes comme un couvercle arqué sur la valve pédonculaire. Le foramen tronque fortement le crochet de la valve pédonculaire (fig. 22) et présente un contour labié. Les spécimens recueillis vivants ont un pédoncule court et trapu dont l'extrémité se résout en filaments. Chez des coquilles de 30 mm environ, ce pédoncule est long de 2 à 6 mm.

Dimensions en mm	Longueur	Largeur	Hauteur
MUSORSTOM 4, st. 221-10	40,0	30,8	22,7
MUSORSTOM 4, st. 221-1	35,5	30	23,1
MUSORSTOM 4, st. 221-3	35	32,1	23,4
MUSORSTOM 4, st. 221-4	31,1	28,3	20,7

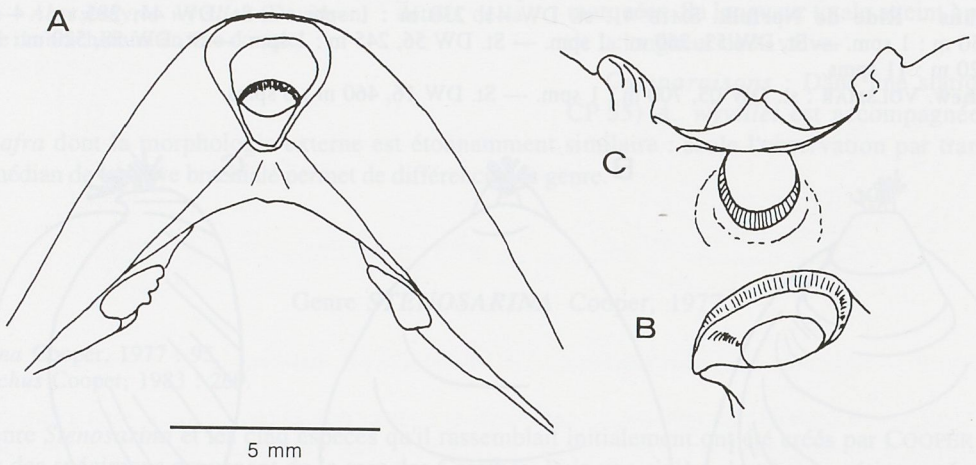


FIG. 22. — *Stenosarina crosnieri* (Cooper), détails du bec : **A**, vue dorsale ; **B**, vue oblique ; **C**, vue basculée.

Ponctuation : La densité de ponctuation de la coquille a été mesurée en deux points situés sur l'axe de symétrie d'une valve brachiale de 34,3 mm de longueur. A 17 mm et 32 mm du bord antérieur de la valve, les densités relevées sont respectivement de 243 et 122 ponctuations/mm^2. COOPER (1983) ne fournit pas la densité de ponctuation de *S. crosnieri*. Il indique (1977) une densité de 154/mm^2 pour *S. angustata* des Caraïbes sans préciser la localisation exacte de la mesure ("pente antérieure de la région umbono-ventrale").

Structures internes : Les dents de la valve pédonculaire sont proportionnellement petites et étroites, ce qui est conforme à la description originale de l'espèce (alors que dans la description du genre, celles-ci sont notées "fortes"). Un court collier pédonculaire prolonge le foramen vers l'intérieur de la coquille (fig. 21).

Dans la valve brachiale, un processus cardinal occupe la position apicale. Les fossettes dentaires sont de petite taille. Les processus cruraux sont fréquemment émoussés (fig. 23). Le brachidium est conforme à celui décrit par COOPER, avec des branches parallèles ayant tendance à se rapprocher vers l'extrémité antérieure et une bande transversale fortement plissée longitudinalement. Chez les coquilles les plus grandes, il arrive que la boucle soit interrompue le long de l'arête de ce pli qui est très étroit et serré. Le brachidium apparaît alors comme constitué de deux branches adjacentes. Chez les coquilles juvéniles, les processus cruraux sont pointus et la boucle présente un contour ogival, la pointe étant dirigée vers l'avant de la coquille.

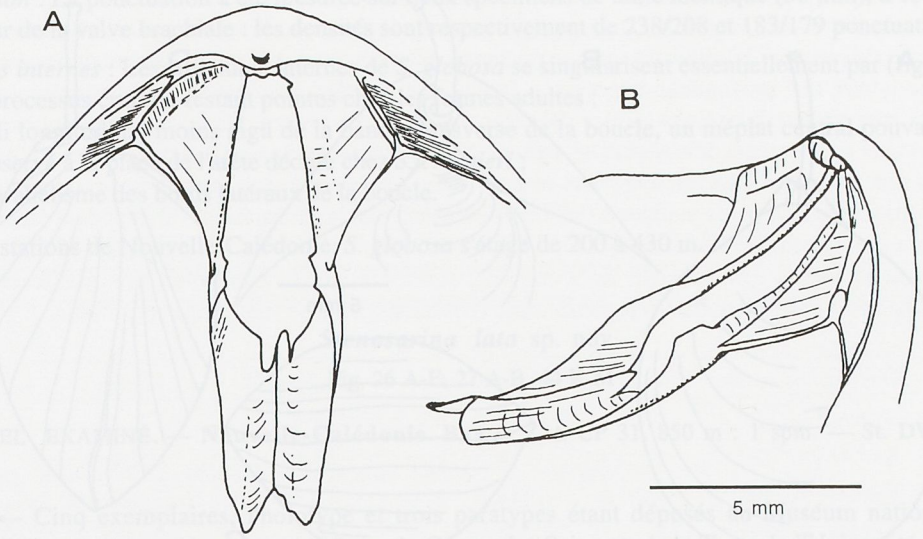


FIG. 23. — *Stenosarina crosnieri* (Cooper), boucle du brachidium : **A**, vue dorsale ; **B**, vue oblique.

Au large du N-W de Madagascar, *S. crosnieri* est citée entre 430 et 700 m de profondeur. Au large de la Nouvelle-Calédonie, les spécimens vivants ont été recueillis entre 271 et 575 m (des coquilles mortes, mais peu altérées existant jusqu'à 1140 m).

Stenosarina globosa sp. nov.

Fig. 24 A-D, 25 A-B, 44 E-J

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. DW 37, 350 m : 6 spms. — St. DW 38, 360 m : 5 spms. — St. CP 42 , 380 m : 7 spms. — St. DW 43, 400 m : 1 spm. — St. DW 77, 440 m : 2 spms.
MUSORSTOM 4 : st. DW 183, 280 m : 67 spms. — St. DW 210, 345 m : 1 spm. — St. DW 212, 380 m : 1 spm. — St. CP 214, 430 m : 1 spm.
Îles Chesterfield. MUSORSTOM 5 : st. DC 378, 355 m : 1 spm.
Ride de Norfolk. CHALCAL 2 : st. CP 26, 296 m : 4 spms. — St. DW 81, 311 m : 3 spms. — St. DW 82, 304 m : 19 spms. — St. DW 83, 200 m : 1 spm.
Îles Loyauté. MUSORSTOM 6 : st. DC 402, 520 m : 1 spm. — St. DW 486, 370 m : 4 spms. — St. DW 487, 500 m : 2 spms.
Île des Pins - Ride de Norfolk. SMIB 4 : st. DW 69, 400 m : 1 spm.

TYPES. — L'holotype et deux paratypes déposés au Muséum national d'Histoire naturelle de Paris. Trois paratypes déposés à la typothèque du Centre des Sciences de la Terre de l'Univerité de Bourgogne (Dijon, France).

LOCALITÉ TYPE. — Station MUSORSTOM 4, DW 183, 19°01,8'S, 163°25,8'E, 280 m.

DIAGNOSE. — Espèce de *Stenosarina* de taille moyenne, marquée par un fort bombement de l'umbo de la valve brachiale qui donne à la coquille un contour latéral globuleux.

ÉTYMOLOGIE. — Du latin *globus* = sphéroïdal ; évoque la forme globuleuse de l'espèce.

DESCRIPTION. — *Morphologie externe* : Les nombreux spécimens de Nouvelle-Calédonie attribués à cette espèce ont un contour arrondi, une valve brachiale profonde qui confèrent à la coquille un aspect presque globuleux, mais ils se caractérisent toujours par une commissure latérale sinueuse (fig. 24). La taille du foramen n'est pas

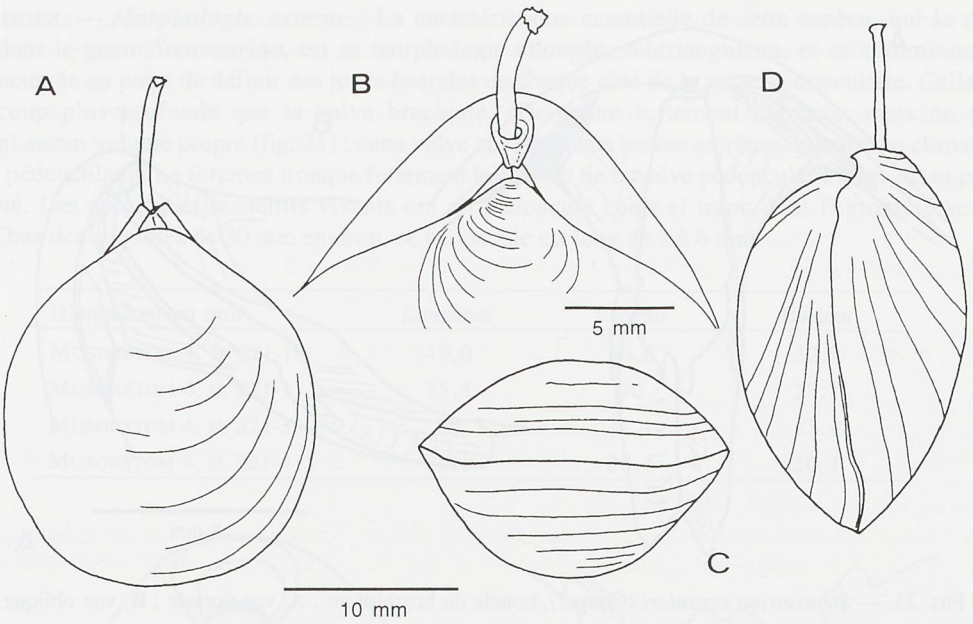


FIG. 24. — *Stenosarina globosa* sp. nov. : **A**, vue dorsale ; **C**, vue frontale ; **D**, vue latérale ; **B**, bec et pédoncule.

particulièrement grande, mais on peut s'interroger sur la signification de ce caractère : une forte résorption du bec étant caractéristique du genre, l'intensité de cette résorption, créant un foramen de plus ou moins grand diamètre, pourrait n'avoir valeur que de variation individuelle. La longueur du pédoncule traversant ce foramen est variable: on le trouve court (1,5 à 4 mm pour une coquille de 30 mm de longueur) ou long (9 à 15 mm pour un individu de même longueur), mais tous les individus issus d'une même station se rangent dans la même catégorie.

Les coquilles de *S. globosa* ont une taille maximale inférieure à celle de *S. crosnieri*.

Dimensions en mm	Longueur	Largeur	Hauteur
MUSORSTOM 4, st. 183-1	29,4	24,0	20,2
MUSORSTOM 4, st. 183-7	28,2	24,1	18,2
CHALCAL 2, st. 82-10	29,5	25,3	20,9
CHALCAL 2, st. 82-6	30,8	24,7	20,2

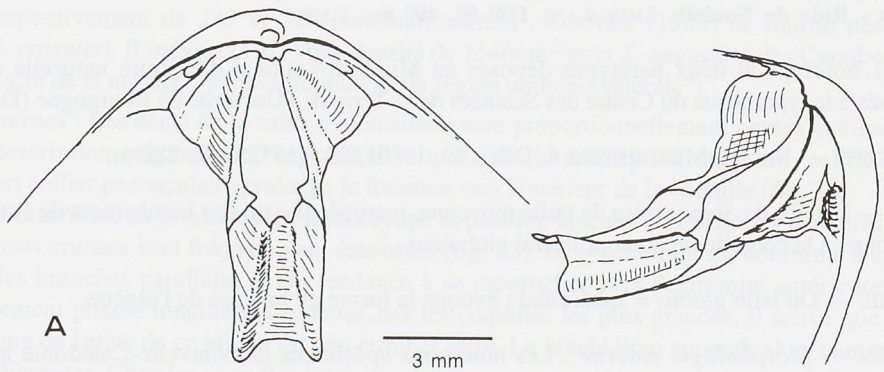


FIG. 25. — *Stenosarina globosa* sp. nov., boucle du brachidium : **A**, vue dorsale ; **B**, vue oblique.

Ponctuation : La ponctuation a été mesurée sur deux spécimens de taille identique (30 mm), à 15 et 25 mm du bord antérieur de la valve brachiale : les densités sont respectivement de 238/208 et 183/179 ponctuations/mm^2.

Structures internes : Les structures internes de *S. globosa* se singularisent essentiellement par (fig. 25) :

- les processus cruraux restant pointus chez les formes adultes ;
- le pli longitudinal moins aigü de la bande transverse de la boucle, un méplat central pouvant même être observé à la place de l'arête décrite chez *S. crosnieri* ;
- le parallélisme des bords latéraux de la boucle.

Dans les stations de Nouvelle-Calédonie, *S. globosa* s'étage de 200 à 430 m.

Stenosarina lata sp. nov.

Fig. 26 A-E, 27 A-B, 44 K-M

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. CP 31, 850 m : 1 spm. — St. DW 70, 965 m : 5 spms.

TYPES. — Cinq exemplaires, l'holotype et trois paratypes étant déposés au Muséum national d'Histoire naturelle de Paris, et un paratype à la typothèque du Centre des Sciences de la Terre de l'Université de Bourgogne (Dijon, France).

LOCALITÉ TYPE. — Sud-est de l'île des Pins, Nouvelle-Calédonie. Station BIOCAL, DW 70, 23°24,70'S, 167°53,65'E, 965 m.

DIAGNOSE. — Espèce de *Stenosarina* de petite taille, au contour triangulaire presque équilatéral, à coquille très mince et translucide.

ÉTYMOLOGIE. — De *latus* = large ; évoque le contour dorsal élargi de l'espèce.

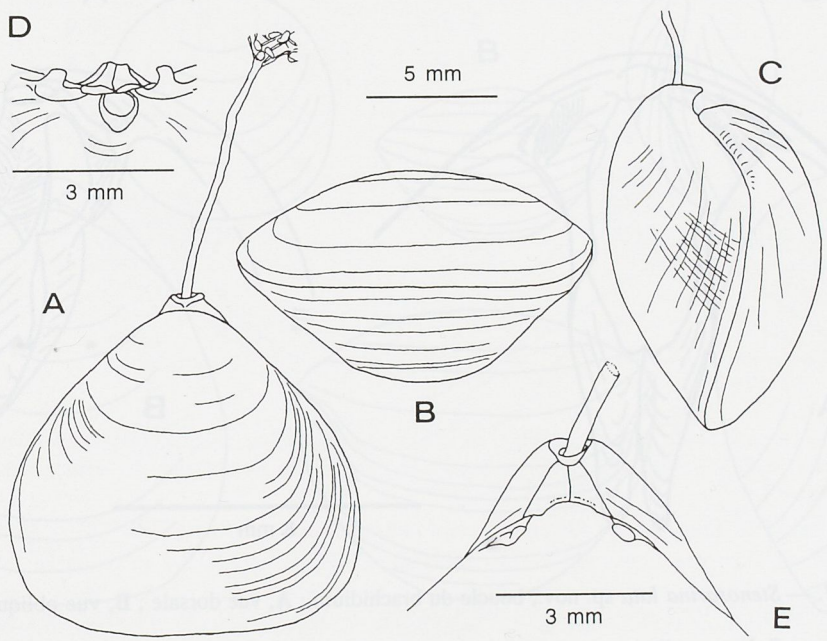


FIG. 26. — *Stenosarina lata* sp. nov. : **A**, vue dorsale ; **B**, vue frontale ; **C**, vue latérale ; **D**, bec basculé ; **E**, bec en vue dorsale.

DESCRIPTION. — *Morphologie externe* : Les cinq spécimens ont une taille relativement petite (12 à 14,5 mm de longueur) ; le contour triangulaire, presque équilatéral, est particulièrement caractéristique (fig. 26). La commissure latérale présente la sinuosité typique du genre, déterminant des joues nettement concaves et donnant à la valve pédonculaire une profondeur importante, tandis que la valve brachiale semble simplement épouser la courbure de la commissure latérale et ne pas déterminer de volume propre. Dans sa partie umbonale fortement bombée, cette valve paraît même déborder et se replier légèrement sur la valve pédonculaire.

Les valves sont fines, translucides, marquées de fines stries d'accroissement. De très fines costules ou bourrelets longitudinaux discontinus, à peine visibles à l'œil nu, sont situés sur les joues de la valve pédonculaire.

Le foramen est proportionnellement moyen, situé au-dessus d'un deltidium à deux plaques soudées. La longueur du pédoncule est au moins égale à celle de la coquille, son extrémité se ramifie en fins filaments (fig. 26 A). Ceux-ci sont attachés à des foraminifères planctoniques (Orbulines) ou à de fins débris coquilliers.

Dimensions en mm	Longueur	Largeur	Hauteur
BIOCAL, st. 70-1	14,5	15,8	9,1
BIOCAL, st. 70-2	14,3	13,9	8,4
BIOCAL, st. 70-3	13,5	13,5	8,1
BIOCAL, st. 70-4	12,0	12,1	7,8

Ponctuation : À 16 et 3,8 mm du bord antérieur de la coquille, la densité des ponctuations est respectivement de 160 et 232/mm^2.

Structures internes : La valve pédonculaire présente les mêmes caractères que chez les autres espèces du genre, avec des dents petites et un étroit collier pédonculaire (fig. 26 D). Dans la valve brachiale (fig. 27), les plaques cardinales sont assez étroites et leur marge externe est scellée à des rebords de fossettes proportionnellement plus élevés que dans les espèces précédentes. Les processus cruraux sont pointus, mais peu élevés. La bande transverse de la boucle est large, antérieurement rétrécie et bilobée, marquée en son axe médian par un pli longitudinal étroit dont le sommet, dirigé dorsalement, dessine une arête.

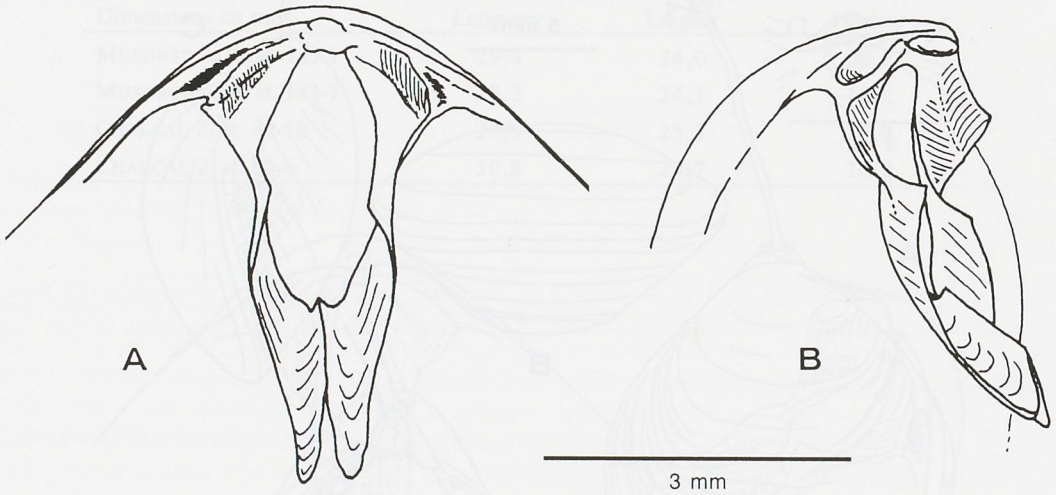


FIG. 27. — *Stenosarina lata* sp. nov., boucle du brachidium : **A**, vue dorsale ; **B**, vue oblique.

COMPARAISONS. — *S. lata* se distingue aisément des autres espèces du genre par son contour triangulaire, la finesse de ses valves et sa taille plus petite.

Genre *KANAKYTHYRIS* gen. nov.

ESPÈCE-TYPE. — *Kanakythyris pachyrhynchos* sp. nov.

ÉTYMOLOGIE. — Dédié aux habitants mélanésiens de la Nouvelle-Calédonie.

DESCRIPTION. — Térébratulidé de taille moyenne caractérisé par :
- une commissure frontale profondément sulquée, à contour assez quadrangulaire ;
- un bec très recourbé muni d'un foramen minuscule, mais fonctionnel ;
- de forts épaississements (callosités) des parties postérieures des valves.

Kanakythyris pachyrhynchos sp. nov.

Fig. 28 A-F, 29 A-C, 30 A-D, 45 A-N

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOGEOCAL : st. DW 292, 470 m : 2 spms.
Îles Loyauté. MUSORSTOM 6 : st. DW 391, 390 m : 6 spms. — St. DW 392, 340 m : 5 spms. — St. DW 397, 380 m : 1 spm. — St. DW 398, 370 m : 2 spms. — St. DW 406, 380 m : 1 spm. — St. DW 421, 245 m : 2 spms. — St. DW 428, 420 m : 1 spm. — St. DW 457, 350 m : 1 spm. — St. DW 459, 425 m : 1 spm. — St. CP 464, 430 m : 4 spms. — St. DW 480, 380 m : 2 spms. — St. DW 481, 300 m : 1 spm.
Îles Matthew. VOLSMAR : st. DW 37, 525 m : 1 spm.

TYPES. — L'holotype et cinq paratypes déposés au Muséum national d'Histoire naturelle de Paris. Quatre paratypes déposés à la typothèque du Centre des Sciences de la Terre de l'Université de Bourgogne (Dijon, France).

LOCALITÉ TYPE. — Station MUSORSTOM 6, DW 392, 20°47,32'S, 167°04,60'E, 340 m.

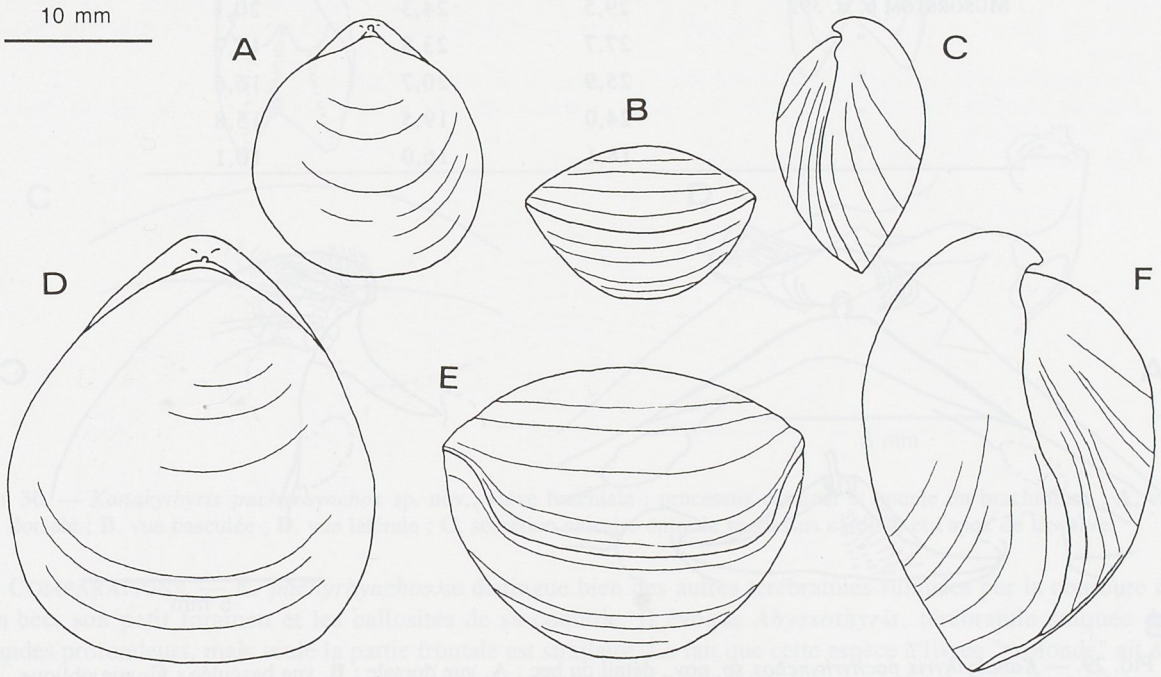


FIG. 28. — *Kanakythyris pachyrhynchos* sp. nov., spécimens jeune et adulte : **A**, **D**, vues dorsales ; **B**, **E**, vues frontales ; **C**, **F**, vues latérales.

DIAGNOSE. — Térébratulidé de grande taille, pouvant atteindre 30 mm à l'état adulte, caractérisé par un bec fortement recourbé muni d'un foramen très réduit, une commissure frontale à large sulcation. Les plaques deltidiales sont soudées en un large symphytium. Des callosités massives lestent l'intérieur des valves dans leur partie postérieure. Le brachidium est constitué d'une boucle à deux pointes projetées vers l'avant, la bande transverse étant marquée d'un pli médian aigu.

ÉTYMOLOGIE. — Du grec *pakhu - rhynchos* = bec épais ; en référence à l'épaississement important du bec de cette espèce.

DESCRIPTION. — *Morphologie externe* : *K. pachyrhynchos* est une térébratule au contour globuleux, légèrement ovoïde en vue dorsale (fig. 28). Sa coquille de couleur blanche est lisse, sans ornementation autre que de très discrètes stries de croissance. Elle se caractérise par un bec très recourbé, assez inhabituel pour une térébratule, sous lequel s'ouvre dorsalement un foramen de très petite taille de diamètre inférieur au millimètre chez les plus grands spécimens (fig. 29). De ce foramen sort néanmoins un pédoncule filiforme fonctionnel, disproportionné relativement à la taille de la coquille. Le critère distinctif le plus évident de cette espèce est la sulcation très ample de la commissure frontale, marquée par une déflexion quadrangulaire qui détermine, chez les adultes, une languette antérieure faisant presque un angle droit avec la partie postérieure de la valve. Ce plissement inverse (sulcation), moins perceptible chez les coquilles immatures (fig. 28 A-C), a été observé et considéré comme une convergence morphologique (homéomorphie) typique des brachiopodes profonds. On la rencontre ainsi chez des espèces associées dans les mêmes stations de la plaine abyssale de Californie, à des profondeurs de 3601 à 3972 m (*Neorhynchia profunda* - Rhynchonellida ; *Abyssothyris elongata* - Terebratulidina ; *Notorygmia abyssa* - Terebratellidina ; COOPER, 1972). Ce caractère "profond" est ici rencontré chez une forme nouvelle dont l'intervalle bathymétrique est relativement plus modeste (300 à 450 m).

Dimensions en mm	Longueur	Largeur	Hauteur
MUSORSTOM 6, st. 392	29,5	24,3	20,1
"	27,7	23,8	17,7
"	25,9	20,7	16,6
"	24,0	19,5	15,8
"	18,1	16,0	10,1

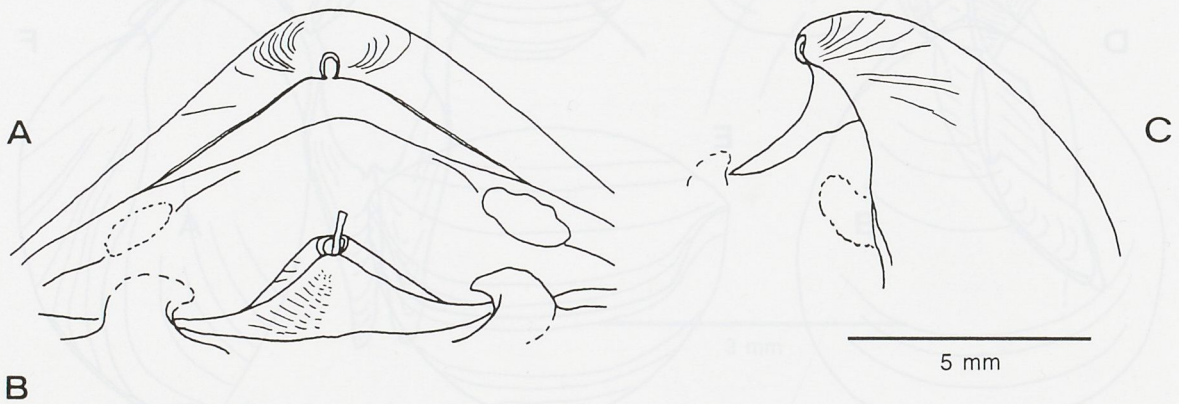


FIG. 29. — *Kanakythyris pachyrhynchos* sp. nov., détail du bec : **A**, vue dorsale ; **B**, vue basculée ; **C**, vue oblique.

Ponctuation : La densité de la ponctuation a été mesurée sur les valves brachiales de deux spécimens mesurant 18,1 et 29,5 mm de longueur, d'abord à la base de l'insertion des muscles adducteurs, puis à 4 mm du bord

antérieur de la valve brachiale : les densités sont respectivement de 112/123 et 223/447 ponctuations/mm^2. La ponctuation augmente donc très significativement avec la taille.

Structures internes : Les structures internes de *K. pachyrhynchos* se singularisent essentiellement par l'existence de forts épaississements (callosités) de la coquille dans sa partie antérieure. Placées sur une surface plane, les coquilles vides réagissent à la manière d'un "culbuto" et se positionnent naturellement sur le bec. L'intérieur de la valve pédonculaire est simple, un sillon médian dans l'épaississement assure le passage du pédoncule. Les dents semblent sortir des callosités sur le rebord de la valve : elles sont disposées très obliquement par rapport à l'axe de symétrie, allongées et peu crantées. En vue latérale, elles apparaissent comme des crochets recourbés vers l'arrière (fig. 29). Dans la valve brachiale, un puissant processus cardinal, fortement cranté, est renforcé par des sécrétions calcaires déposées contre l'apex de la valve (fig. 30). Les fossettes présentent la particularité d'être refermées par une paroi calcifiée à leur extrémité postérieure, dans la partie ayant perdu son rôle fonctionnel consécutivement à l'accroissement de taille des dents. Les plaques cardinales sont larges, incurvées, leur rebord interne plongeant en direction dorsale. Celui-ci est prolongé par des bases crurales, elles-mêmes prolongées par la boucle du brachidium. D'une longueur de 8 à 9 mm chez les grands spécimens, celle-ci possède deux crura à son origine, puis la boucle proprement dite est formée d'un ruban proportionnellement large, marqué vers l'avant par deux pointes entre lesquelles le ruban est fortement replié en direction ventrale.

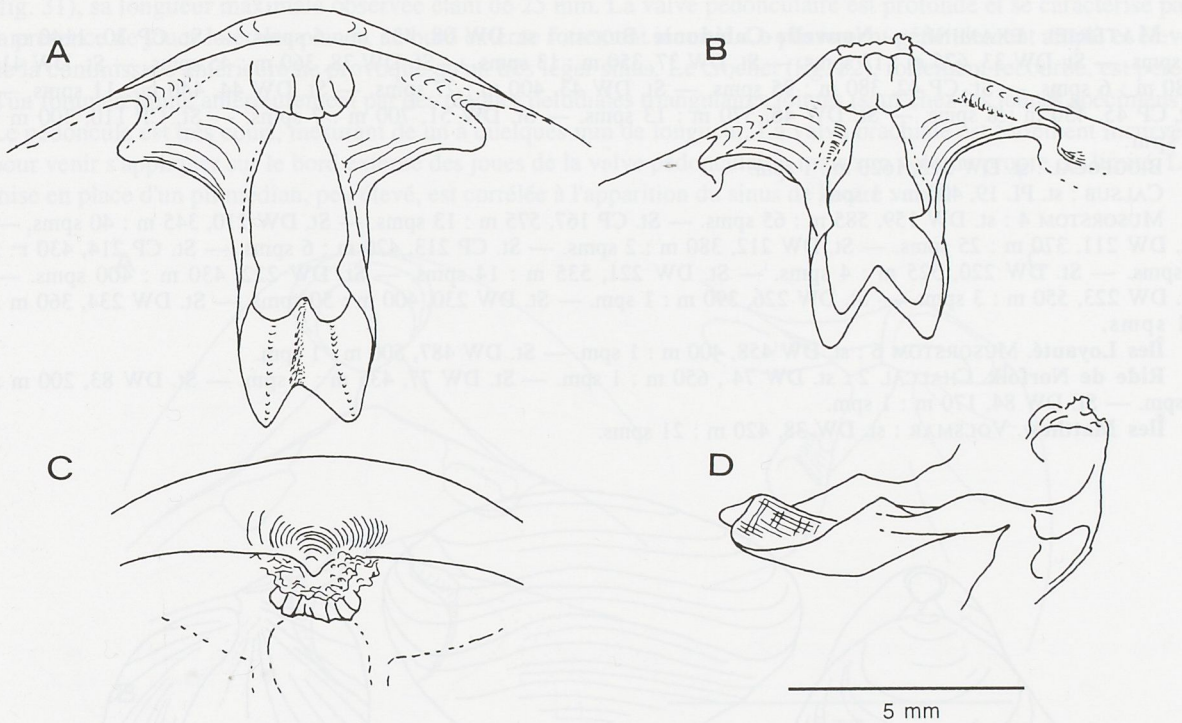


FIG. 30. — *Kanakythyris pachyrhynchos* sp. nov., valve brachiale : processus cardinal et boucle du brachidium : **A**, vue dorsale ; **B**, vue basculée ; **D**, vue latérale ; **C**, secrétion calcaire entre le processus cardinal et l'apex de la valve.

COMPARAISONS. — *K. pachyrhynchos* se distingue bien des autres térébratules sulquées par la courbure de son bec, son petit foramen et les callosités de sa coquille. Il évoque *Abyssothyris*, térébratule sulquée des grandes profondeurs, mais seule la partie frontale est similaire. Le fait que cette espèce à livrée "profonde" ait été remontée de 300-450 m est une constatation à rapprocher de la profondeur moindre à laquelle on trouve, autour de la Nouvelle-Calédonie, des espèces habituellement profondes, telles que *Pelagodiscus atlanticus*, *Abyssothyris wyvillei*.

Ordre TEREBRATULIDA Waagen, 1883

Sous-ordre TEREBRATELLIDINA Muir-Wood, 1955

Famille DALLINIDAE Beecher,1893

Genre ***FALLAX*** Atkins, 1960

Le genre *Fallax* a été créé par ATKINS pour des brachiopodes récoltés dans l'Atlantique Nord (approches de la Manche), homéomorphes de *Dallina septigera*, mais munis des lamelles dentales et présentant un brachidium de type campagiforme. Il comprend deux espèces : *F. dalliniformis* Atkins, retrouvée dans le golfe de Gascogne (COOPER, 1981b), et *F. antarcticus* Foster, représenté par deux spécimens provenant du Pacifique Sud-Ouest. Autour de la Nouvelle-Calédonie, les nombreux spécimens possédant les caractères de ce genre sont attribués à une espèce nouvelle.

Fallax neocaledonensis sp. nov.

Fig. 31 A-C, 32 A-C, 33, 34 A-D, 46 A-O

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. DW 08, 435 m : 6 spms. — St. CP 30, 1140 m : 2 spms. — St. DW 33, 675 m : 13 spms. — St. DW 37, 350 m : 13 spms. — St. DW 38, 360 m : 45 spms. — St. DW 41, 380 m : 6 spms. — St. CP 42, 380 m : 95 spms. — St. DW 43, 400 m : 27 spms. — St. DW 44, 440 m : 11 spms. — St. CP 45, 430 m : 8 spms. — St. DW 46, 570 m : 13 spms. — St. DW 51, 700 m : 7 spms. — St. CP 110, 300 m : 1 spm.

BIOGEOCAL : st. DW 313, 1620 m : 1 spm.

CALSUB : st. PL 19, 400 m : 1 spm.

MUSORSTOM 4 : st. DW 159, 585 m : 65 spms. — St. CP 167, 575 m : 13 spms. — St. DW 210, 345 m : 40 spms. — St. DW 211, 370 m : 25 spms. — St. DW 212, 380 m : 2 spms. — St. CP 213, 420 m : 6 spms. — St. CP 214, 430 m : 3 spms. — St. DW 220, 525 m : 4 spms. — St. DW 221, 535 m : 14 spms. — St. DW 222, 430 m : 400 spms. — St. DW 223, 550 m : 3 spms. — St. DW 226, 390 m : 1 spm. — St. DW 230, 400 m : 50 spms. — St. DW 234, 360 m : 11 spms.

Îles Loyauté. MUSORSTOM 6 : st. DW 458, 400 m : 1 spm. — St. DW 487, 500 m : 1 spm.

Ride de Norfolk. CHALCAL 2 : st. DW 74 , 650 m : 1 spm. — St. DW 77, 435 m : 1 spm. — St. DW 83, 200 m : 1 spm. — St. DW 84, 170 m : 1 spm.

Îles Matthew. VOLSMAR : st. DW 38, 420 m : 21 spms.

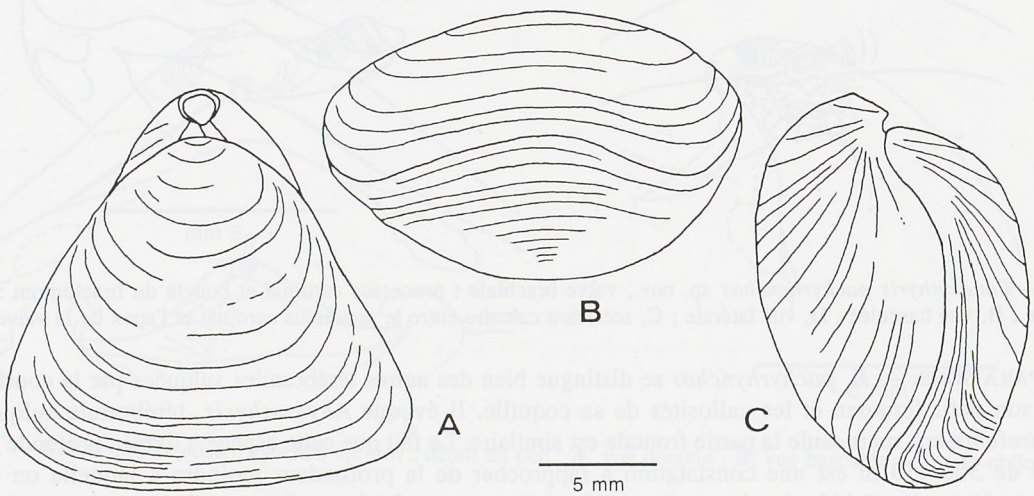


FIG. 31. — *Fallax neocaledonensis* sp. nov. : **A**, vue dorsale ; **B**, vue frontale ; **C**, vue latérale.

Île des Pins - Ride de Norfolk. SMIB 4 : st. DW 58, 520 m : 1 spm. — St. DW 62, 515 m : 1 spm. — St. DW 64, 455 m : 1 spm. — St. DW 69, 400 m : 70 spms.
Île des Pins. SMIB1 : st. DW 02, 415 m : 3 spms.

TYPES. — Holotype déposé au Muséum national d'Histoire naturelle de Paris ; paratypes déposés au Muséum national d'Histoire naturelle de Paris et à la typothèque du Centre des Sciences de la Terre de l'Université de Bourgogne (Dijon, France).

LOCALITÉ TYPE. — BIOCAL, station DW 38, 22°59,74'S, 167°15,31'E, profondeur 360 m.

DIAGNOSE. — *Fallax* de forme triangulaire, à bord antérieur quasi rectiligne en vue dorsale. Commissure frontale uniplissée en une voûte arrondie qui n'entraîne la formation d'un pli que sur la partie la plus antérieure de la valve brachiale. Présence de lamelles dentales. Brachidium typiquement campagiforme avec une boucle caractéristique en forme de "capuchon".

ÉTYMOLOGIE. — De la Nouvelle-Calédonie ; espèce très fréquente au large de cette île.

DESCRIPTION. — *Morphologie externe* : De couleur beige foncé, la coquille est triangulaire en vue dorsale (fig. 31), sa longueur maximale observée étant de 25 mm. La valve pédonculaire est profonde et se caractérise par la présence de joues latérales planes, au bord externe fortement incurvé. Le plissement généralement ample et élevé de la commissure antérieure ne provoque qu'un très léger sinus. Le crochet (fig. 32), fortement recourbé, est percé d'un foramen limité antérieurement par des plaques deltidiales triangulaires jointes (sauf chez les jeunes spécimens). Le pédoncule est très court, mesurant de un à quelques mm de longueur. La valve brachiale est fortement incurvée pour venir s'appliquer sur le bord externe des joues de la valve pédonculaire, mais son volume propre est limité. La mise en place d'un pli médian, peu élevé, est corrélée à l'apparition du sinus de l'autre valve.

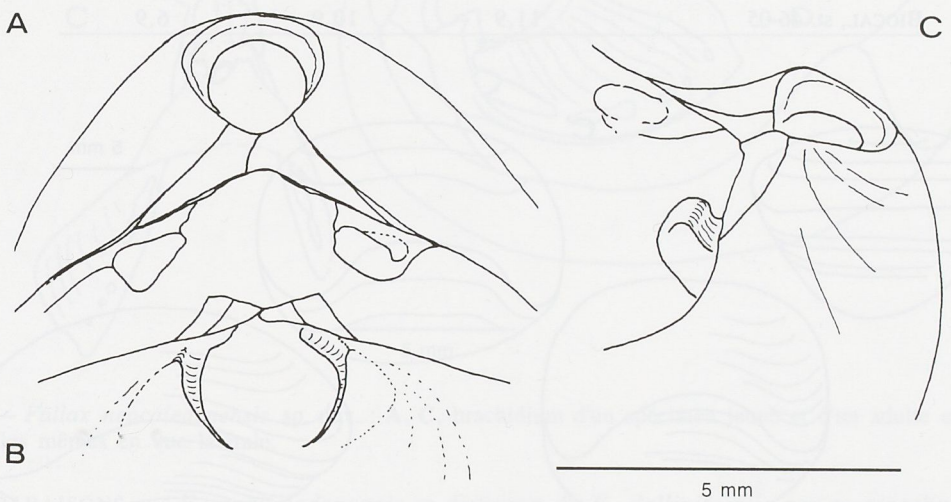


FIG. 32. — *Fallax neocaledonensis* sp. nov. : **A**, détails du bec en vue dorsale ; **B**, vue basculée montrant les lamelles dentales ; **C**, vue oblique.

Cette morphologie est sujette à de nombreuses variations, portant notamment sur la largeur relative et l'intensité de la courbure de la commissure frontale (fig. 33) : on trouve tous les intermédiaires entre des spécimens larges dont la courbure de la commissure frontale est généralement peu élevée, et des spécimens étroits à courbure plus accusée. Les variations les plus importantes portent sur la taille des coquilles de morphologie adulte : on ne remonte, dans certaines stations, que des individus dont la morphologie évoque celle de formes adultes (avec cependant un plissement de la commissure un peu moins marqué en moyenne), mais dont la taille maximale est significativement moins grande (15 mm de longueur). Cette diminution de taille semble en première approche liée

à la profondeur, les petits spécimens vivant dans un intervalle bathymétrique plus profond que les grands (la limite pouvant être empiriquement située aux environs de 500 m). Les différences entre petites et grandes coquilles pourraient d'ailleurs être interprétées comme signifiant une disparité spécifique. Une étude préliminaire montre qu'elles résultent d'altérations paedomorphique de la croissance, pouvant opérer dans le cadre de la variation intraspécifique (LAURIN & GASPARD, 1990).

Dimensions en mm	Longueur	Largeur	Hauteur
Formes de grande taille			
MUSORSTOM 4, st. 222-25	22,1	20	14,6
MUSORSTOM 4, st. 222-70	20,0	17,8	13,7
MUSORSTOM 4, st. 222-77	16,3	14,4	10,5
MUSORSTOM 4, st. 222-88	22,4	22,9	15
BIOCAL, st. 45	19,9	18,4	13,6
BIOCAL, st. 42-20	19,6	19,5	14,1
Formes de petite taille			
MUSORSTOM 4, st. 159-06	12,4	10,5	7,7
MUSORSTOM 4, st. 159-11	11,6	10,9	8
MUSORSTOM 4, st. 159-13	11,8	9,8	7,9
MUSORSTOM 4, st. 159-15	11,9	11,1	7,3
MUSORSTOM 4, st. 159-24	10,4	9,6	6,7
BIOCAL, st. 46-02	14,6	12,4	9,6
BIOCAL, st. 46-05	11,9	10,9	6,9

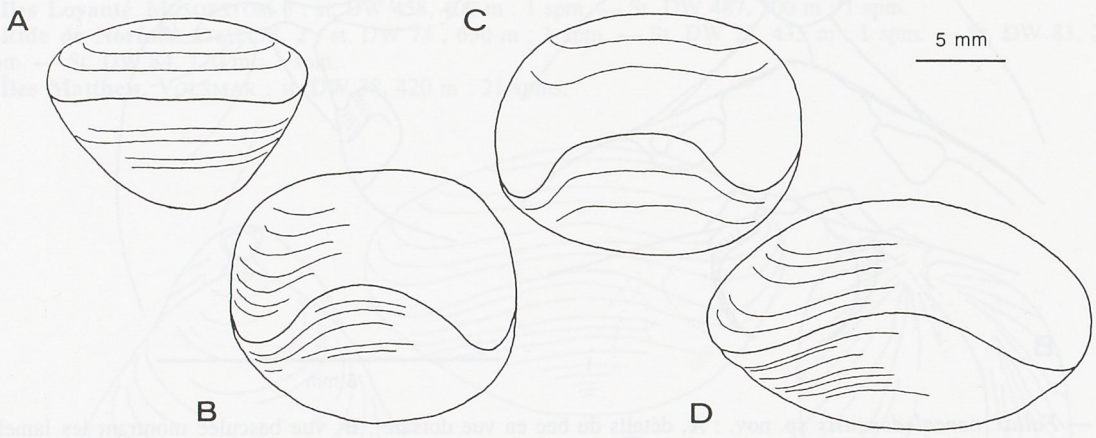


FIG. 33. — *Fallax neocaledonensis* sp. nov. : variabilité de la commissure frontale et de la largeur de spécimens adultes.

Ponctuation : Le nombre de ponctuations varie selon l'emplacement où il est relevé sur la coquille. Sur des valves brachiales d'environ 16 mm de longueur, il passe de 250-277/mm^2 (entre les empreintes des adducteurs) à 280-328/mm^2 (à proximité du bord antérieur de la valve).

Structures internes : Les structures internes sont pour la plupart typiques de celles du genre. Dans la valve pédonculaire, les dents sont très inclinées par rapport au plan de symétrie et supportées par des lamelles dentales arquées et restant très proches de la paroi de la valve (fig. 32 B). Dans la valve brachiale, les plaques cardinales sont

bien développées et se rejoignent sur le septum médian dont l'extension dépasse légèrement le milieu de la longueur de la valve. La boucle en ruban du brachidium typique du stade "campagiforme", se reconnait à sa forme en capuchon, d'abord conique chez les jeunes, puis échancrée par résorption chez les adultes (fig. 34). Elle est reliée antérieurement au septum, celui-ci s'étendant sur un tiers à la moitié de la longueur de la valve dorsale. Il est proportionnellement plus long chez les coquilles de petite taille.

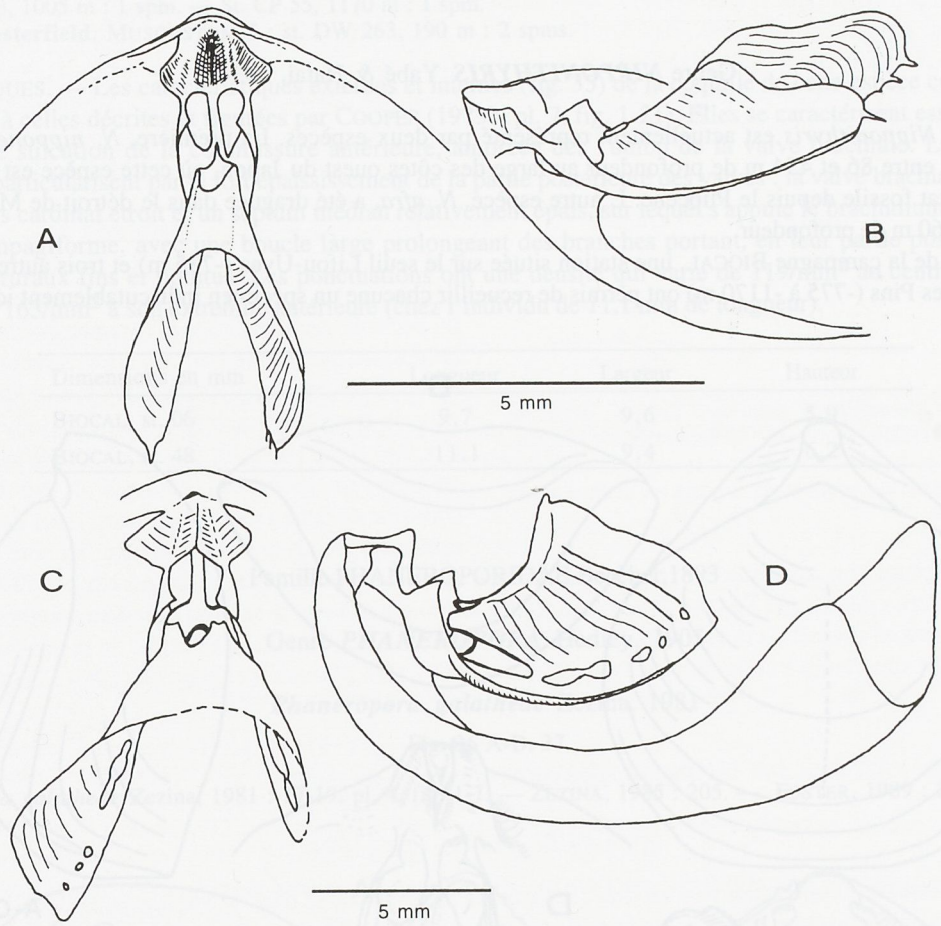


FIG. 34. — *Fallax neocaledonensis* sp. nov. : **A**, **C**, brachidium d'un spécimen jeune et d'un adulte en vue dorsale ; **B**, **D**, les mêmes en vue latérale.

COMPARAISONS. — *F. neocaledonensis* se distingue de *F. dalliniformis* par sa morphologie externe, notamment la courbure importante des commissures latérales et le contour dorsal plus triangulaire. Parmi les structures internes, la boucle du brachidium conserve chez *F. neocaledonensis* une forme en capuchon jusqu'au stade adulte, la résorption ne produisant que des perforations allongées, sans se poursuivre jusqu'à la réalisation de la boucle en ruban de *F. dalliniformis*.

F. neocaledonensis se distingue de *F. antarcticus*, celui-ci ayant un tracé plus rectiligne de la commissure latérale et un contour dorsal plus arrondi.

La morphologie triangulaire de *F. neocaledonensis* le rapproche de certaines espèces du genre *Campages* dont le contour est similaire, mais qui ne possèdent pas de lamelles dentales (fait vérifié sur *C. furcifera*, *C. asthenia*, *C. basilanica* - Collections N.M.N.H. Washington D.C.). Sa taille moyenne le rapproche de *C. furcifera*, mais, outre l'absence de lamelles dentales, cette espèce atteint une taille plus grande, accompagnée d'un plissement

beaucoup plus accentué de la commissure frontale. Le pédoncule est plus long et de plus faible diamètre chez *F. neocaledonensis* que chez *C. furcifera* (dans cette espèce le très court pédoncule maintient le foramen plaqué contre le support de l'animal, ce qui entraîne une résorption importante du bec). Extérieurement, *F. neocaledonensis* ressemble beaucoup à certaines espèces du genre *Dallina*. Certains spécimens miment *D. septigera*, d'autres sont des homéomorphes remarquables de *Dallina floridana*, qui ne se singularise que par un plissement plus anguleux de sa commissure frontale.

Genre ***NIPPONITHYRIS*** Yabé & Hatai, 1934

Le genre *Nipponithyris* est actuellement représenté par deux espèces. La première, *N. nipponensis*, existe actuellement entre 86 et 454 m de profondeur au large des côtes ouest du Japon, où cette espèce est par ailleurs connue à l'état fossile depuis le Pliocène. L'autre espèce, *N. afra*, a été draguée dans le détroit de Mozambique, entre 740 à 960 m de profondeur.

Au cours de la campagne BIOCAL, une station située sur le seuil Lifou-Uvea (-735 m) et trois autres situées au sud de l'île des Pins (-775 à -1170 m) ont permis de recueillir chacune un spécimen indiscutablement identifiable à *N. afra*.

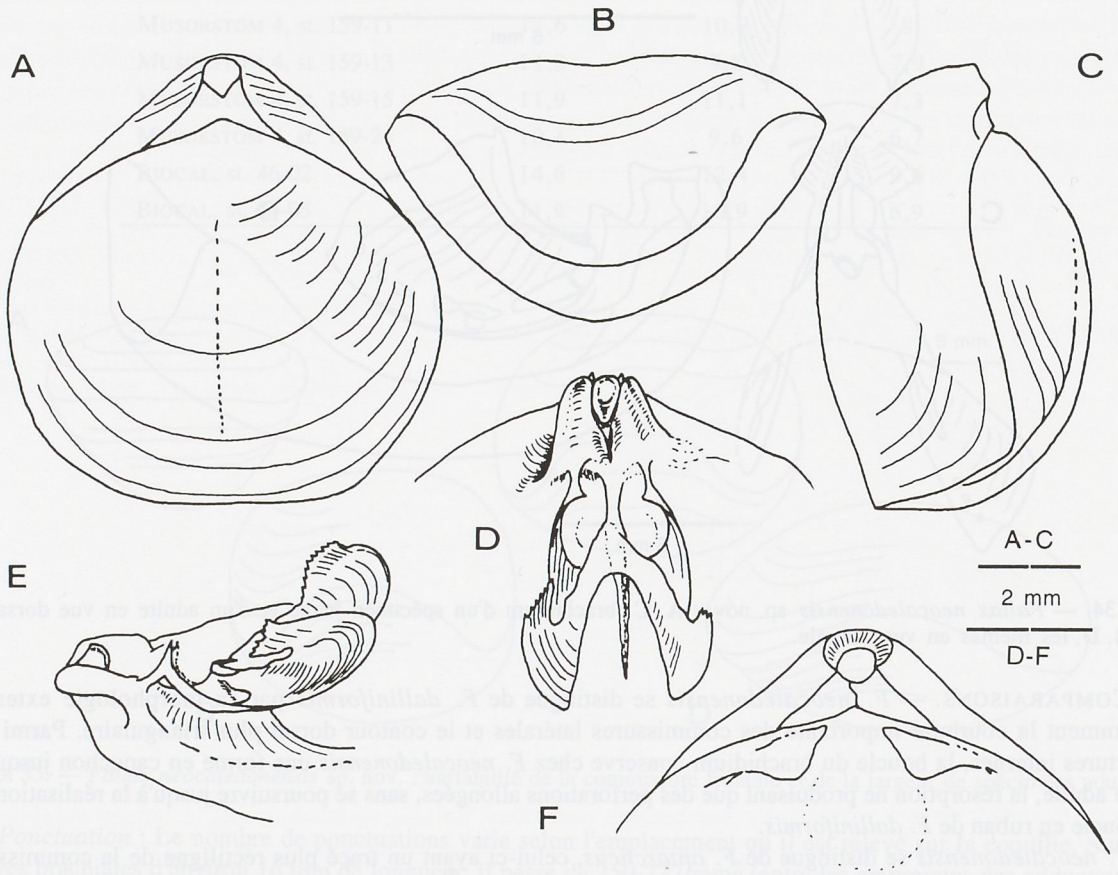


FIG. 35. — *Nipponithyris afra* Cooper : **A**, vue dorsale ; **B**, vue frontale ; **C**, vue latérale ; la ligne pointillée sur la vue dorsale matérialise la trace du septum ; **D**, structures internes de la valve brachiale (boucle cassée permettant de voir sa jonction avec le septum) ; **E**, vue latérale de la boucle du brachidium ; **F**, partie postérieure de la valve pédonculaire montrant l'épaississement de la coquille au niveau du foramen et les dents massives.

Nipponithyris afra Cooper, 1973

Fig. 35 A-F, 47 A-G

Nipponithyris afra Cooper, 1973 : 20-21, pl. 71, fig. 1-21. — Zezina, 1985 : 161.

Matériel examiné. — **Nouvelle-Calédonie**. Biocal : st. KG 06, 735 m : 1 spm. — St. DW 48, 775 m : 1 spm. — St. DW 53, 1005 m : 1 spm. — St. CP 55, 1170 m : 1 spm.
Îles Chesterfield. Musorstom 5 : st. DW 263, 190 m : 2 spms.

Remarques. — Les caractéristiques externes et internes (fig. 35) de la coquille de cette espèce correspondent exactement à celles décrites et figurées par Cooper (1973b, pl. 7, fig. 1-21). Elles se caractérisent essentiellement par l'intense sulcation de la commissure antérieure, amorcée dès l'umbo de la valve brachiale. Les structures internes se particularisent par le fort épaississement de la partie postérieure des valves : la valve brachiale comprend un processus cardinal étroit et un septum médian relativement épais, sur lequel s'appuie le brachidium. Celui-ci est de type campagiforme, avec une boucle large prolongeant des branches portant, en leur partie postérieure, des processus cruraux fins et pointus. Les ponctuations ont une densité qui varie de 119/mm^2 au centre de la valve brachiale, à 163/mm^2 à son extrémité antérieure (chez l'individu de 11,1 mm de longueur).

Dimensions en mm	Longueur	Largeur	Hauteur
Biocal, st. 06	9,7	9,6	5,9
Biocal, st. 48	11,1	9,4	6,2

Famille PHANEROPORIDAE Beecher,1893

Genre *PHANEROPORA* Hedley, 1905

Phaneropora galatheae Zezina, 1981

Fig. 36 A-D, 37

Phaneropora galatheae Zezina, 1981 : 17-19, pl. 4, fig. 1-7. — Zezina, 1985 : 205. — Foster, 1989 : 298, fig. 14.29-14.30.

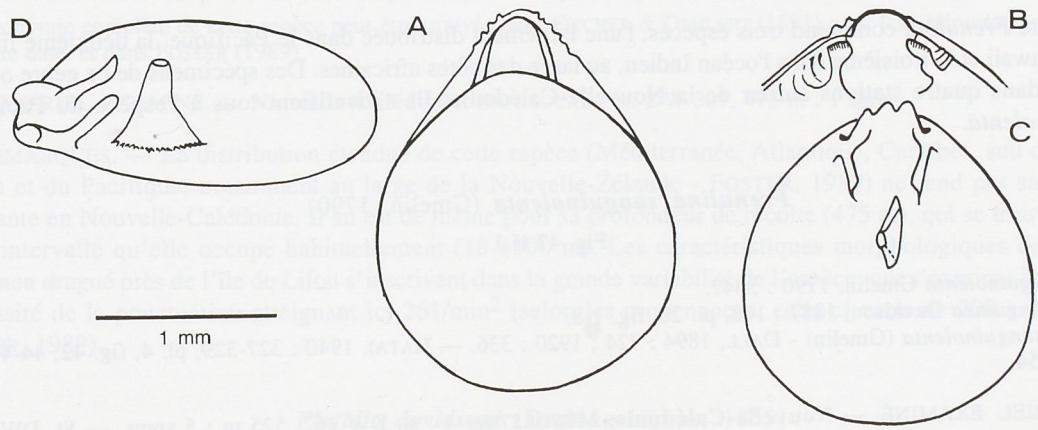


Fig. 36. — *Phaneropora galathaea* Zezina : **A**, vue dorsale ; **B**, détail du bec en vue basculée, valve brachiale ouverte ; **C, D**, intérieur de la valve brachiale montrant les crura et le septum en position centrale.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. CP 57, 1550 m : 4 spms. BIOGEOCAL : st. KG 211, 975 m : 1 spm. — St. CP 232, 775 m : 1 spm. — St. CP 317, 1625 m : 1 spm.

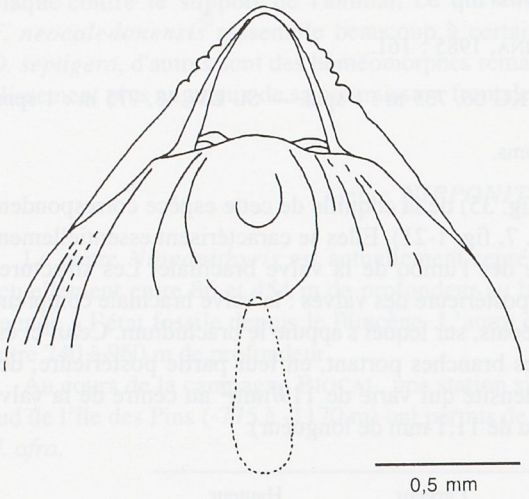


FIG. 37. — *Phaneropora galathaea* Zezina : détail du bec en vue dorsale montrant la finesse des plaques deltidiales et les bourrelets du bec ; le contour pointillé marque la position du sommet du septum au contact de la valve brachiale.

REMARQUES. — Cette petite espèce est actuellement connue entre 120° et 160° de longitude Est, du sud de la Nouvelle-Guinée aux abords de l'Antarctique (ZEZINA, 1985 ; FOSTER, 1989). Quelques exemplaires typiques ont notamment été dragués dans le bassin de Tasmanie à une profondeur de 1463 m (Museum of Victoria, Melbourne). *P. galatheae* n'a été recueillie en Nouvelle-Calédonie qu'à 7 exemplaires, dans quatre stations réparties entre Lifou et l'île des Pins à des profondeurs comprises entre 775 et 1625 m.

De taille comprise entre 2 et 4 mm, les coquilles exhibent tous les caractères de l'espèce (fig. 36), en particulier les petits bourrelets situés de part et d'autre du bec submésothyride, et le foramen bordé de plaques deltidiales très étroites (fig. 37). Les structures internes comportent des lamelles dentales bien individualisées dans la valve pédonculaire. Dans la valve brachiale (fig. 36), les cardinalia sont très simplifiés, avec une ébauche de processus cardinal et un brachidium constitué de deux crura très minces, issus de l'extrémité antérieure du rebord des fossettes. Ils sont orientés en direction du septum sans toutefois le rejoindre (alors que c'est le cas chez les spécimens décrits par ZEZINA -1981, mais non chez ceux décrits par FOSTER -1989). En forme de lame à sa base, le septum prend au sommet une forme de pilier qui vient au contact de la valve brachiale, lorsque la coquille est fermée. La densité de la ponctuation - 285 à 298/mm^2 - est supérieure à celle observée par ZEZINA (1981 : 170-225/mm^2) et FOSTER (1989 : 200/mm^2).

Famille LAQUEIDAE Thomson, 1927

Genre ***FRENULINA*** Dall, 1894

Le genre *Frenulina* comprend trois espèces, l'une largement distribuée dans le Pacifique, la deuxième limitée aux îles Hawaii et la troisième dans l'océan Indien, au large des côtes africaines. Des spécimens de ce genre ont été recueillis dans quatre stations autour de la Nouvelle-Calédonie. Ils s'identifient tous à l'espèce du Pacifique *F. sanguinolenta*.

Frenulina sanguinolenta (Gmelin, 1790)

Fig. 47 H-J

Anomia sanguinolenta Gmelin, 1790 : 3347.
Megerlia sanguinea Davidson, 1887 : 108, pl. 20, fig. 1-8.
Frenulina sanguinolenta (Gmelin) - DALL, 1894 : 724 ; 1920 : 336. — HATAI, 1940 : 327-329, pl. 4, fig. 42, 44-47, 49, 50, 52-54.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. MUSORSTOM 4 : st. DW 162, 525 m : 5 spms. — St. DW 231, 75 m : 2 spms.
Îles Loyauté. MUSORSTOM 6 : st. DW 431, 20 m : 40 spms. — St. DW 439, 288 m : 1 spm. — St. DW 441, 80 m : 2 spms.

Ride de Norfolk. CHALCAL 2 : st. CP 26, 296 m : 1 spm. — St. DW 80, 160 m : 10 spms. — St. DW 83, 200 m : 1 spm. — St. DW 84, 170 m : 1 spm.

REMARQUES. — Cette espèce a déjà été citée au large de la Nouvelle-Calédonie (THOMSON, 1927 ; D'HONDT, 1987) à des profondeurs de 200 à 400 m. Les individus examinés pour ce travail, qui proviennent des environs de l'île des Pins (Campagne BIOGEOCAL) et de la ride de Norfolk (Campagne CHALCAL 2), ont été dragués à des profondeurs similaires, entre 75 et 296 m.

Morphologie externe : Cette espèce de petite taille (généralement inférieure à 10 mm) se distingue aisément à ses motifs colorés rouge vif. Les spécimens recueillis exhibent la forte variabilité morphologique de la coquille, qui présente un sinus médian plus ou moins prononcé dans la valve brachiale, elle-même moins bombée que la valve pédonculaire. Le foramen est bordé de plaques deltidiales jointes sur une courte distance chez les spécimens adultes, éventuellement disjointes chez les formes plus juvéniles. Le développement de motifs colorés est très variable selon les individus.

Dimensions en mm	Longueur	Largeur	Hauteur
BIOCAL, st. 80-1	8,6	7,8	5,5
BIOCAL, st. 80-2	9,2	7,6	4,2
BIOCAL, st. 80-4	7,1	6,0	4,3

Ponctuation : Le dénombrement a été fait sur trois spécimens (respectivement de 10,9, 9,2 et 7,2 mm de longueur). Les valeurs vont de 188 à 197 ponctuations/mm^2 au niveau des empreintes des adducteurs, et de 170 à 198/mm^2 à proximité de la marge antérieure des valves brachiales.

Famille PLATIDIIDAE Dall, 1870

Genre ***PLATIDIA*** Costa, 1852

Platidia anomioides (Scacchi & Philippi, 1844)

Orthis anomioides Scacchi & Philippi, 1844 : 69, pl. 18, fig. 9.
Platidia anomioides - COSTA, 1852 : 48, pl. 3, fig. 4, 6. — FISCHER & OEHLERT, 1891 : 92, pl. 8, fig. 14 a-g. — ZEZINA, 1985 : 197-198. — FOSTER, 1989 : 288, fig. 13.12-13.19.
Platidia davidsoni - COOPER, 1973 : 21, pl. 4, fig. 18-29, pl. 5, fig. 37-38 (non Deslongchamps, 1855).
Platidia marionensis Cooper, 1981 : 24-25, pl. 2, fig. 37-39, pl. 5, fig. 15-34.

La synonymie complète de cette espèce peut être trouvée dans FISCHER & OEHLERT (1891) pour les références antérieures à cette date, et dans FOSTER (1989).

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOGEOCAL : st. DW 307, 475 m : 1 spm.

REMARQUES. — La distribution étendue de cette espèce (Méditerranée, Atlantique, Caraïbes, sud de l'océan Indien et du Pacifique, notamment au large de la Nouvelle-Zélande - FOSTER, 1989) ne rend pas sa présence étonnante en Nouvelle-Calédonie. Il en est de même pour sa profondeur de récolte (475 m), qui se trouve dans le large intervalle qu'elle occupe habituellement (18-1500 m). Les caractéristiques morphologiques de l'unique spécimen dragué près de l'île de Lifou s'inscrivent dans la grande variabilité de l'espèce, qui s'exprime jusque dans la densité de la ponctuation atteignant ici 261/mm^2 (selon les provenances, celle-ci varie de 200 à 490/mm^2 - FOSTER, 1989).

Platidia davidsoni (Deslongchamps, 1855)

Morrisia davidsoni Deslongchamps, 1855 : 443, pl. 10, fig. 20 a-d.
Terebratula (*Morrisia*) *davidsoni* - REEVE, 1861 : 184, pl. 10, fig. 42.

Platidia davidsoni - DALL, 1870 : 143. — DAVIDSON, 1887 : 154-156, pl. 21, fig. 23-27. — FISCHER & OEHLERT, 1891 : 100-102, pl. 8, fig. 15 a-d. — ATKINS, 1959 : 103-118. — COOPER, 1977 : 123, pl. 18, fig. 12-22, pl. 27, fig. 3-6. — LOGAN, 1979 : 65.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. DW 66, 510 m : 2 spms.

REMARQUES. — Les deux spécimens de *P. davidsoni* ont été remontés d'une profondeur de 510 m, dans la station la plus méridionale de la campagne BIOCAL. Ils présentent, à la surface de leur coquille, les "pustules" ou "papilles" caractéristiques, chacune correspondant au débouché extérieur d'une ponctuation mis en relief par une strie d'accroissement. La densité des ponctuations est d'environ 228/mm^2.

Il est remarquable de constater que la distribution de *P. davidsoni* correspond à une partie de celle de *P. anomioides* (dans l'est de l'Atlantique Nord et dans les Caraïbes), la seconde ayant cependant une distribution plus large incluant le Pacifique Sud et l'extrême sud de l'océan Indien. Retrouver ces deux espèces, même rares, au nord et au sud de la Nouvelle-Calédonie étend considérablement la distribution de *P. davidsoni* et renforce la similitude de distribution.

Famille KRAUSSINIDAE Dall, 1870

Genre ***MEGERLIA*** King, 1850

Megerlia echinata (Fischer & Oehlert, 1890)

Fig. 38 A-B, 39 A-B

Mühlfeldtia echinata Fischer & Oehlert, 1890 : 73.
Mühlfeldtia echinata - FISCHER & OEHLERT, 1891 : 90, pl. 7, fig. 13.
Pantellaria echinata - DALL, 1920 : 336. — JACKSON, 1921 : 48.
Megerlia echinata - ATKINS, 1961 : 89. — COOPER, 1973 : 18, pl. 1, fig. 1-3, pl. 3, fig. 27-31 ; 1977 : 125, pl. 17, fig. 14-22 ; 1981 : 17, pl. 3, fig. 3-4.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOGEOCAL : st. DW 291, 515 m : 2 spms. — St. DW 307, 475 m : 2 spms.
CALSUB : st. PL 15a, 270 m : 1 spm.
Îles Loyauté. MUSORSTOM 6 : st. DC 402, 520 m : 2 spms. — St. DW 477, 550 m : 9 spms.

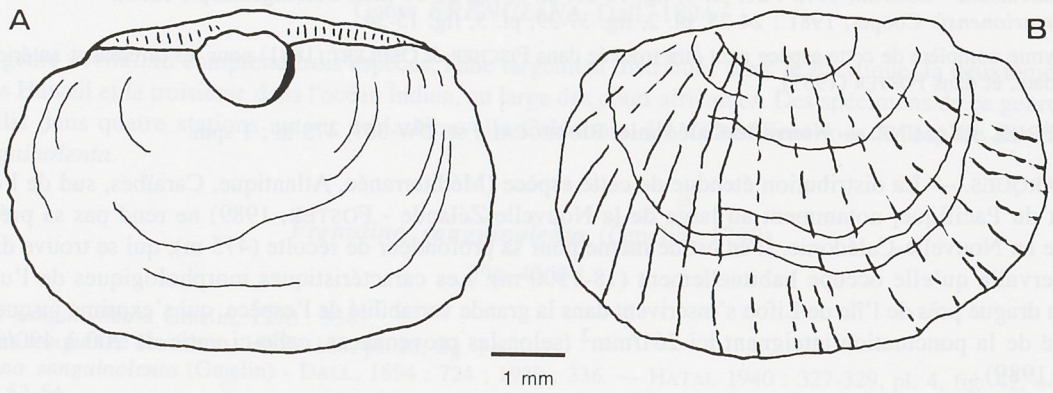


FIG. 38. — *Megerlia echinata* (Scacchi) : **A**, vue dorsale ; **B**, vue ventrale.

REMARQUES. — Les coquilles possèdent un foramen affectant presque exclusivement l'umbo de la valve brachiale ; une costulation est présente sur la valve pédonculaire ; la valve brachiale est très déformée marquée

surtout de fortes stries d'accroissement ; les structures internes (fig. 39) sont distordues corrélativement à la déformation de la valve brachiale. La densité de la ponctuation est de 116/mm^2.

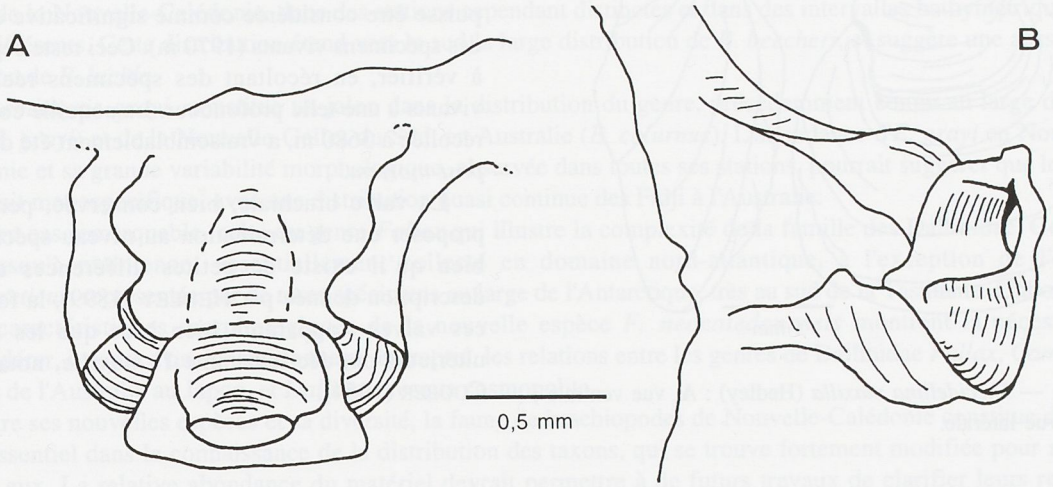


FIG. 39. — *Megerlia echinata* (Scacchi), détails du brachidium : **A**, vue dorsale ; **B**, vue oblique.

Ces *Megerlia* ont une morphologie qui les rapproche aussi de *Pantellaria*. Ce dernier genre apparaît souvent comme un variant déformé de *Megerlia,* dépourvu en outre de costulation dorsale (COOPER, 1981b). Ainsi l'espèce à large distribution *M. gigantea* est-elle rangée soit dans *Megerlia* (COOPER, 1981b), soit dans *Pantellaria* (ZEZINA, 1985). Les travaux récents ont interprété cette ressemblance en plaçant les deux genres en synonymie (BRUNTON, 1988). Le matériel étudié ici est en nombre insuffisant pour discuter plus avant cette question.

Dimensions en mm	Longueur	Largeur	Hauteur
BIOGEOCAL, st. 307	4,2	5,3	1,6

ORDRE INCERTAIN

Sous-ordre THECIDEIDINA Muir-Wood, 1955

Famille THECIDELLINIDAE Elliott, 1958

Genre ***THECIDELLINA*** Thomson, 1915

Thecidellina maxilla (Hedley, 1899)

Fig. 40 A-B

Thecidea maxilla Hedley, 1899 : 508, fig. 37.
Thecidellina maxilla - DALL, 1920 : 283. — COOPER, 1954 : 317, pl. 81, fig. 1-10. — ZEZINA, 1985 : 208. — D'HONDT, 1987 : 41, pl. IV, fig. 1-5.

MATÉRIEL EXAMINÉ. — **Nouvelle-Calédonie**. BIOCAL : st. KG 16, 3680 m : 1 spm (mort).
BIOGEOCAL : st. CP 273, 1970 m : 1 spm. — St. DW 296, 1250 m : 1 spm.
Île des Pins - Ride de Norfolk. SMIB 4 : st. DW 44, 285 m : 2 spms.

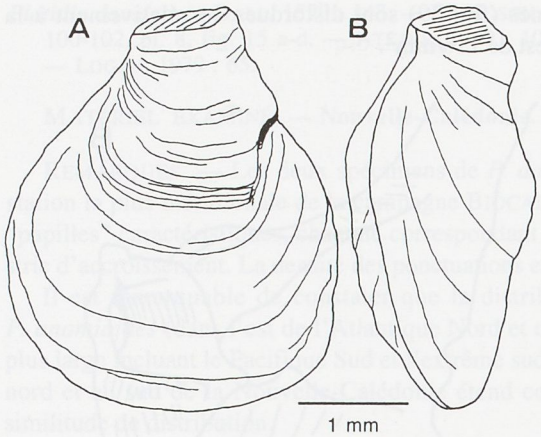


FIG. 40. — *Thecidellina maxilla* (Hedley) : **A**, vue ventrale ; **B**, vue latérale.

Seule une valve brachiale d'un individu de cette espèce (BIOGEOCAL, CP 273) est suffisamment bien conservée (fig. 40) pour que sa profondeur de récolte puisse être considérée comme significative de celle des spécimens vivants (1970 m). Ceci reste cependant à vérifier, en récoltant des spécimens réellement vivants à une telle profondeur. La coquille complète, récoltée à 3680 m, a vraisemblablement été déplacée *post-mortem*.

La valve brachiale, bien conservée, permet de proposer une détermination au niveau spécifique : bien qu'il existe de petites différences avec la description donnée par HEDLEY (1899), la forme de ces valves s'apparente bien à ce que les auteurs ultérieurs ont décrit comme *T. maxilla*, notamment COOPER (1954).

CONCLUSIONS

La série de campagnes océanographiques menées autour de la Nouvelle-Calédonie, entre 1985 et 1989, a mis en évidence la grande diversité et la relative abondance des brachiopodes dans cette région. Ceux-ci ont été collectés dans 178 des quelques 400 dragages et chalutages réalisés au cours de ces campagnes, au total 2940 spécimens presque tous vivants. Les stations à brachiopodes s'étagent régulièrement entre 160 et 2700 m de profondeur. Peu nombreuses au-dessus de 200 m, plus de la moitié d'entre elles se situent dans l'intervalle 290-575 m. La station la plus profonde atteint 3680 m.

Dans l'intervalle bathymétrique exploré (160-3680 m), la plus grande abondance de brachiopodes est nettement marquée entre 200 et 800 m de profondeur. Tous engins confondus, les traits dépassent fréquemment les 50 spécimens, avec un maximum supérieur à 400 dans une station située à 430 m. Des effectifs significatifs ont également été obtenus vers 1200, 1500 et 2000 m.

Avec 26 espèces distribuées dans 20 genres et 14 familles, cette étude montre la richesse et l'originalité de la faune de brachiopodes de cette région jusqu'à maintenant peu explorée dans le domaine bathyal. La découverte de deux nouveaux genres, *Neoancistrocrania* chez les Inarticulés, *Kanakythyris* chez les Articulés, et de 4 nouvelles espèces, *N. norfolki*, *Stenosarina globosa*, *S. lata*, *K. pachyrhynchos*, enrichit significativement ce groupe aujourd'hui pauvrement représenté (environ 300 espèces).

Du point de vue biogéographique, la présence d'un certain nombre d'espèces n'est pas totalement inattendue : c'est le cas de formes cosmopolites telles que *Pelagodiscus atlanticus*, *Abyssothyris wyvillei* ou de formes largement répandues dans le Pacifique telles que *Neorhynchia strebeli*, *Frenulina sanguinolenta*, ou les espèces de *Terebratulina*.

D'autres espèces ont des répartitions beaucoup plus originales. C'est le cas pour des formes connues auparavant dans le seul océan Indien, notamment au large de l'Afrique ou de Madagascar : *Grammetaria africana*, *Xenobrochus africanus*, *Xenobrochus indianensis*, *Stenosarina crosnieri*, *Nipponithyris afra*.

Le genre *Stenosarina* était jusqu'à maintenant connu d'une part dans les Caraïbes et d'autre part à proximité de Madagascar (sous le nom de *Stenobrochus*) : sa présence en abondance dans les eaux de Nouvelle-Calédonie étend sa distribution à un vaste domaine de type intertropical.

Le genre *Nipponithyris*, représenté par deux espèces, l'une au Japon, l'autre dans le détroit du Mozambique, accroît son aire de distribution. Comme pour le rhynchonellidé *G. africana* et le térébratulidé *X. africanus*, c'est la forme déjà connue près de l'Afrique qui existe à proximité de la Nouvelle-Calédonie.

Certaines espèces montrent des affinités avec d'autres régions du Pacifique et ses abords immédiats. Les aires de distribution connues des rhynchonelles *Basiliola beecheri* et *B. lucida* étaient jusqu'à maintenant disjointes, l'une largement répandue, de Kalimatan aux îles Hawaii, et l'autre limitée à la périphérie du Japon. On les trouve réunies autour de la Nouvelle-Calédonie, dans des stations cependant distinctes et dans des intervalles bathymétriques *pro parte* différents. Cette distribution étend vers le sud la large distribution de *B. beecheri*, et suggère une aussi large extension de *B. lucida*.

Eohemithyris grayi constitue un jalon dans la distribution du genre, précédemment connu au large des îles Fidji (*E. grayi*) et de la Nouvelle-Galles du Sud, en Australie (*E. colurnus*). L'abondance d'*E. grayi* en Nouvelle-Calédonie et sa grande variabilité morphologique, observée dans toutes ses stations, pourrait suggérer que le genre est en fait monospécifique, avec une distribution quasi continue des Fidji à l'Australie.

Autre cas remarquable, celui du genre *Fallax* qui illustre la complexité de la famille des Dallinidae. Ce genre était jusqu'à maintenant essentiellement collecté en domaine nord-atlantique, à l'exception de l'espèce *F. antarcticus*, représentée par de rares spécimens au large de l'Antarctique, très au sud de la Tasmanie. L'abondance et les caractéristiques morphologiques de la nouvelle espèce *F. neocaledonensis* montrent la nécessité de reconsidérer, à partir d'un échantillonnage approprié, les relations entre les genres de Dallinidae *Fallax*, *Campages*, présent de l'Australie au Japon, et *Dallina*, presque cosmopolite.

Outre ses nouvelles espèces et sa diversité, la faune de brachiopodes de Nouvelle-Calédonie constitue donc un jalon essentiel dans la connaissance de la distribution des taxons, qui se trouve fortement modifiée pour nombre d'entre eux. La relative abondance du matériel devrait permettre à de futurs travaux de clarifier leurs relations systématiques et biogéographiques.

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L'auteur remercie particulièrement Mme C. MONNIOT (UMR CNRS 5561, Dijon) pour sa contribution aux recherches bibliographiques, pour l'ingrat travail de dénombrement des ponctuations, et pour bien d'autres tâches ayant permis la réalisation de ce travail, et A. GODON (UMR CNRS 5561, Dijon) pour les prises de vues et les tirages photographiques. Les recherches bibliographiques ont été grandement facilitées par l'accès à la base de données informatisée de R. DOESCHER (SIBIC, NMNH, Smithsonian Institution, Washington D.C., U.S.A.). Les déterminations et descriptions ont bénéficié de discussions avec D. LEE (University of Otago, Dunedin, Nouvelle-Zélande) et J.R. RICHARDSON (Museum of Victoria, Melbourne, Australie) et d'échanges par Internet avec D. MACKINNON (University of Canterbury, Christchurch, Nouvelle-Zélande) et B. COHEN (University of Glasgow, Scotland). L'amélioration de l'article doit beaucoup aux remarques constructives des référés, C.H.C. BRUNTON (British Museum, Londres), D. MACKINNON (Christchurch, Nouvelle-Zélande) et O. ZEZINA (Moscou), ainsi qu'à l'insistance bienveillante d'A. CROSNIER. Enfin, mais non les moindres, remerciements à M. ROUX pour l'opportunité de participer aux campagnes BIOCAL et CALSUB.

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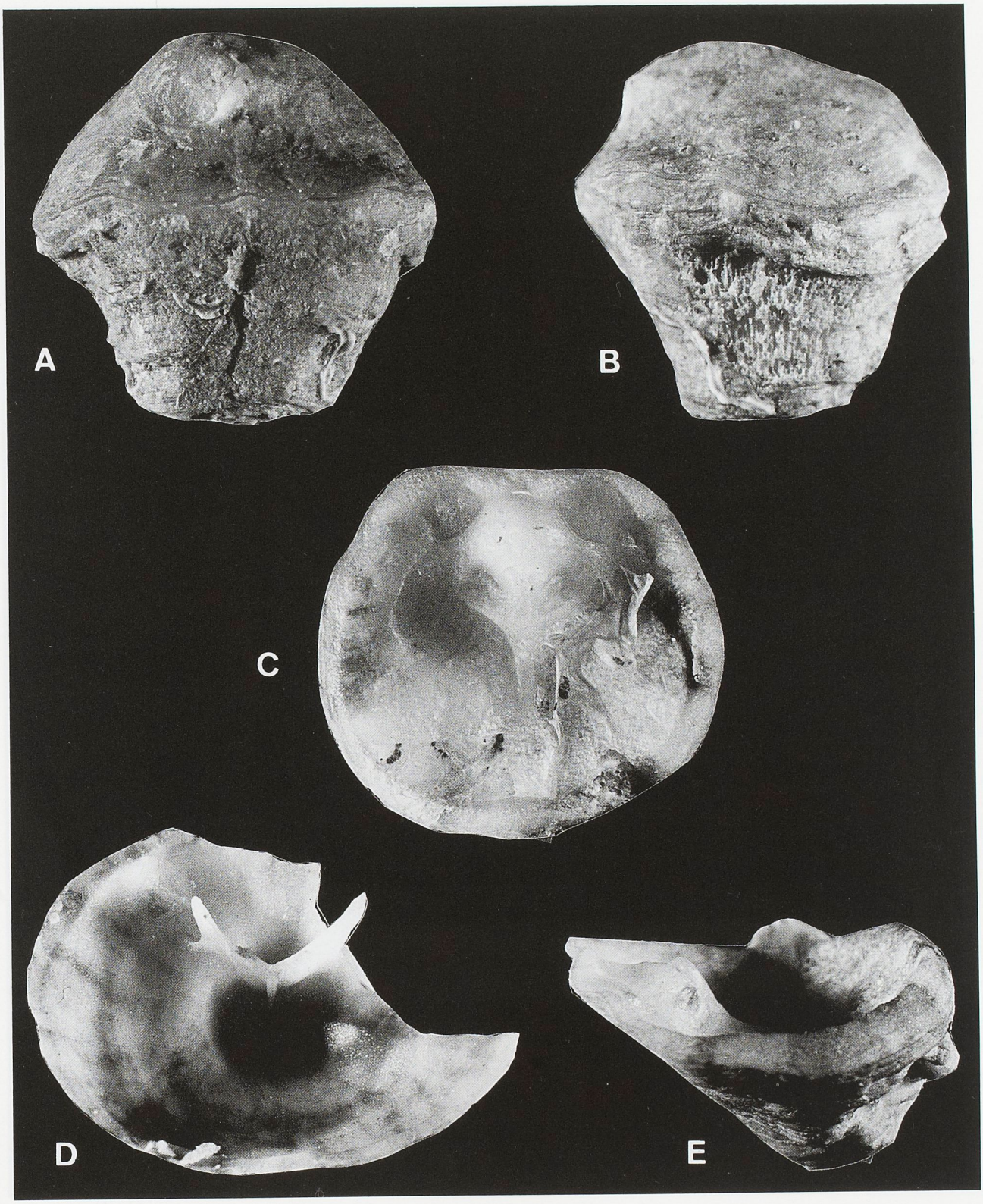
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FIGURE 41

Neoancistrocrania norfolki Laurin. Holotype, CHALCAL 2, St. 78 : **A**, vue postérieure (x 4,7). — **B**, vue latérale (x 4,7). — **C**, intérieur de la valve fixée montrant les empreintes musculaires (x 4,7).

Paratype, BIOCAL, St. 64 : **D**, intérieur de la valve brachiale montrant les apophyses sur lesquelles s'insèrent les muscles élévateurs du lophophore (x 5,5). — **E**, vue latérale de la valve fixée montrant la protubérance médiane (x 5).

Photos A. GODON


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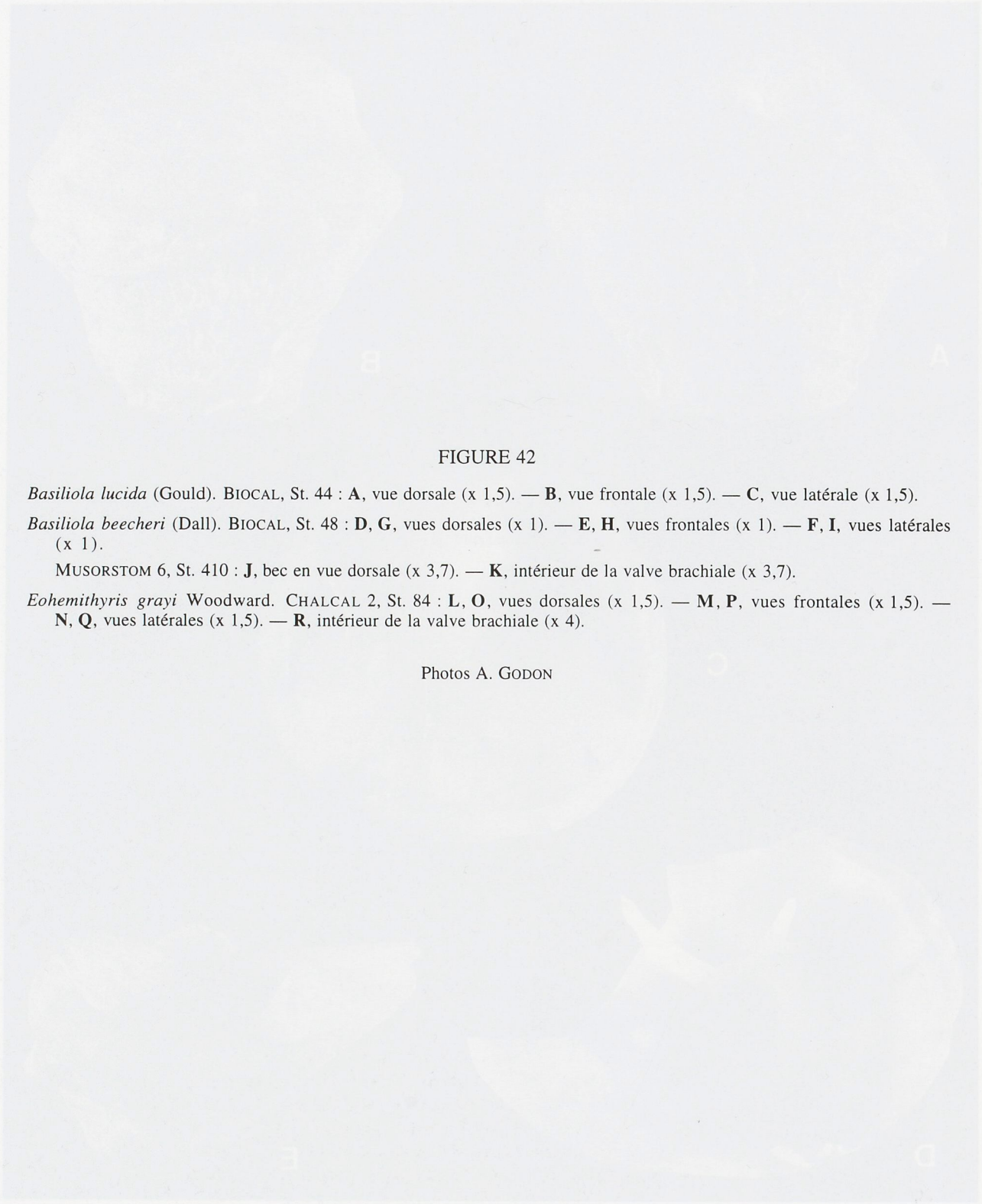


FIGURE 42

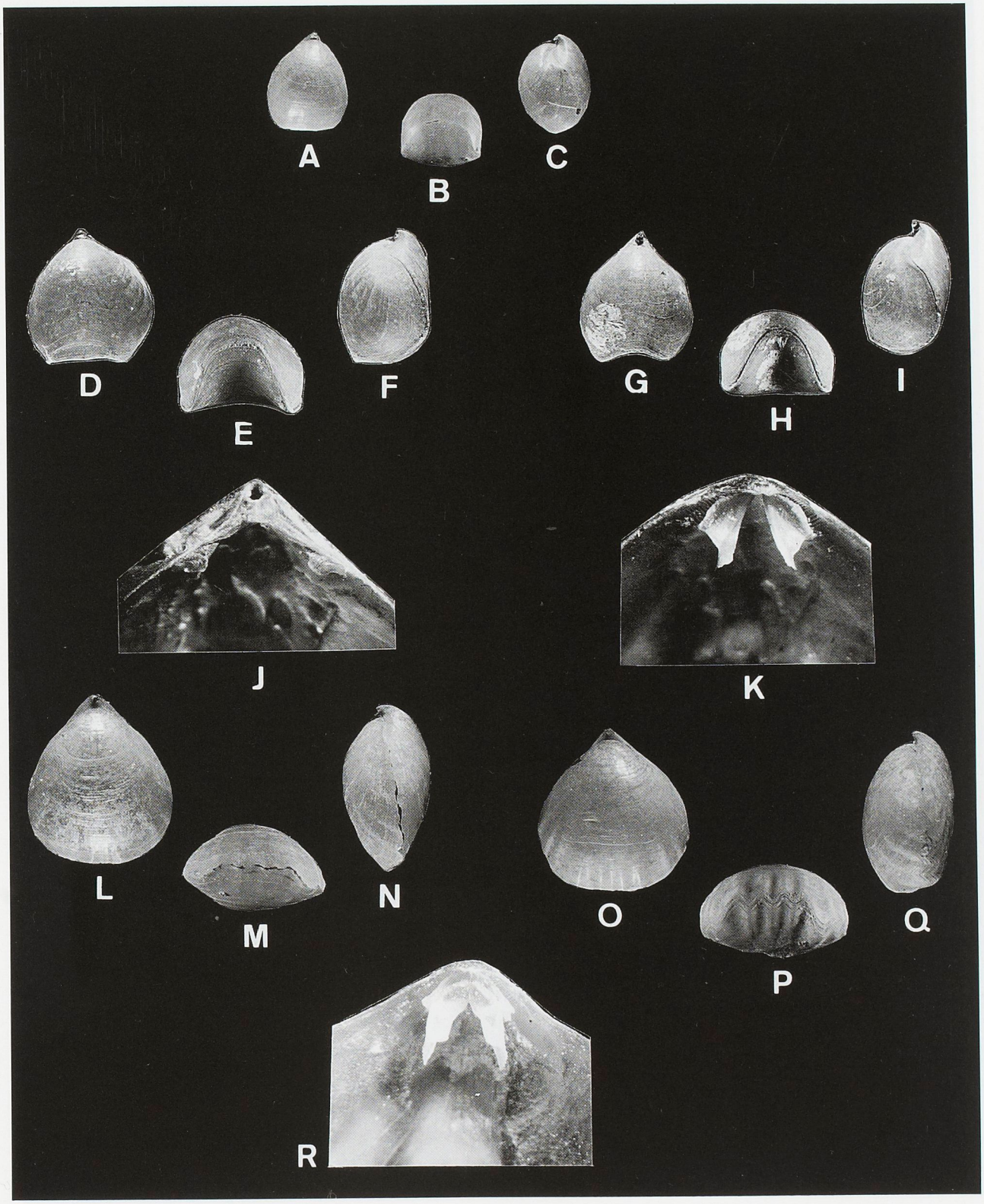
Basiliola lucida (Gould). BIOCAL, St. 44 : **A**, vue dorsale (x 1,5). — **B**, vue frontale (x 1,5). — **C**, vue latérale (x 1,5).

Basiliola beecheri (Dall). BIOCAL, St. 48 : **D**, **G**, vues dorsales (x 1). — **E**, **H**, vues frontales (x 1). — **F**, **I**, vues latérales (x 1).

MUSORSTOM 6, St. 410 : **J**, bec en vue dorsale (x 3,7). — **K**, intérieur de la valve brachiale (x 3,7).

Eohemithyris grayi Woodward. CHALCAL 2, St. 84 : **L**, **O**, vues dorsales (x 1,5). — **M**, **P**, vues frontales (x 1,5). — **N**, **Q**, vues latérales (x 1,5). — **R**, intérieur de la valve brachiale (x 4).

Photos A. GODON


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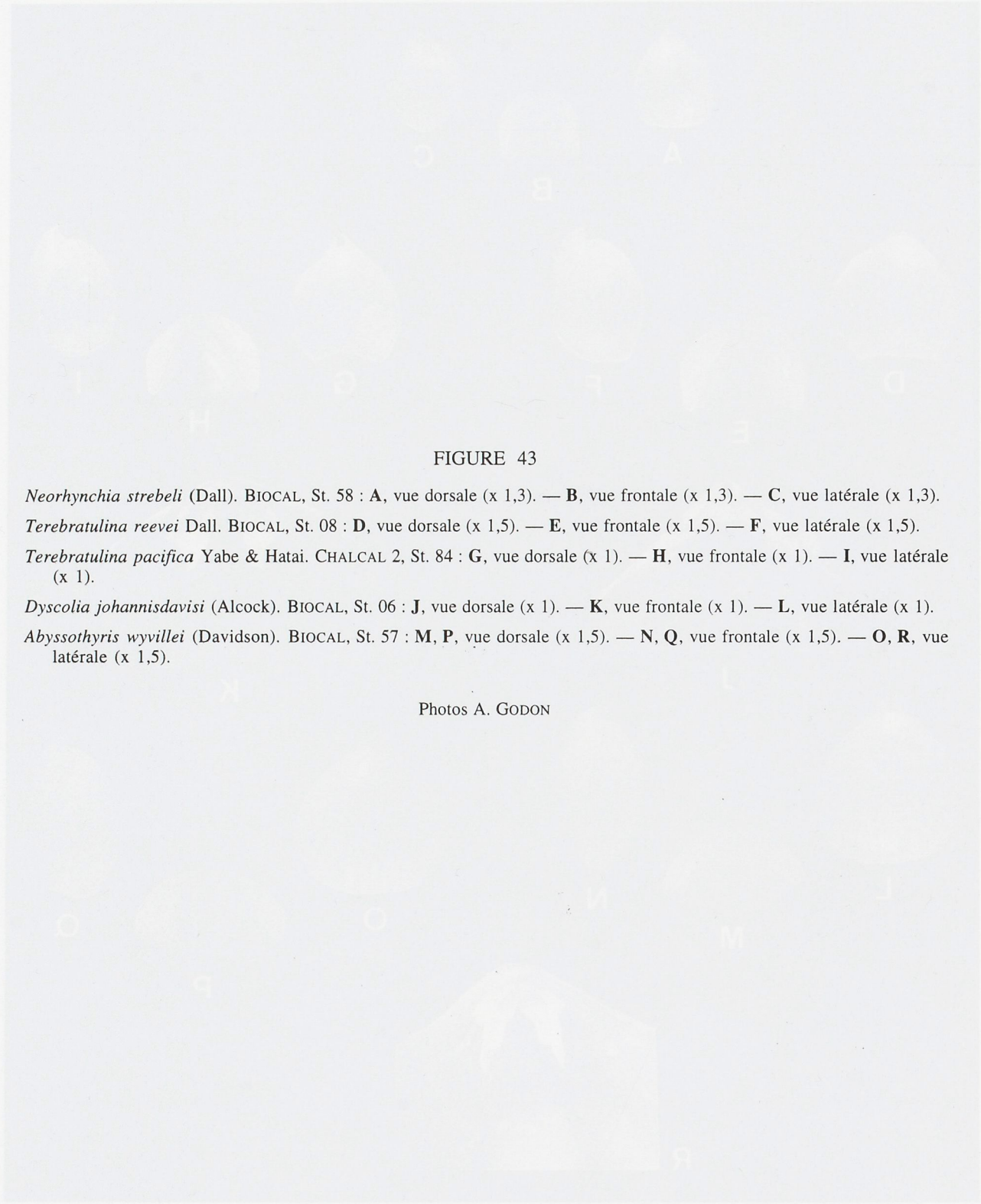


FIGURE 43

Neorhynchia strebeli (Dall). BIOCAL, St. 58 : **A**, vue dorsale (x 1,3). — **B**, vue frontale (x 1,3). — **C**, vue latérale (x 1,3).

Terebratulina reevei Dall. BIOCAL, St. 08 : **D**, vue dorsale (x 1,5). — **E**, vue frontale (x 1,5). — **F**, vue latérale (x 1,5).

Terebratulina pacifica Yabe & Hatai. CHALCAL 2, St. 84 : **G**, vue dorsale (x 1). — **H**, vue frontale (x 1). — **I**, vue latérale (x 1).

Dyscolia johannisdavisi (Alcock). BIOCAL, St. 06 : **J**, vue dorsale (x 1). — **K**, vue frontale (x 1). — **L**, vue latérale (x 1).

Abyssothyris wyvillei (Davidson). BIOCAL, St. 57 : **M**, **P**, vue dorsale (x 1,5). — **N**, **Q**, vue frontale (x 1,5). — **O**, **R**, vue latérale (x 1,5).

Photos A. GODON

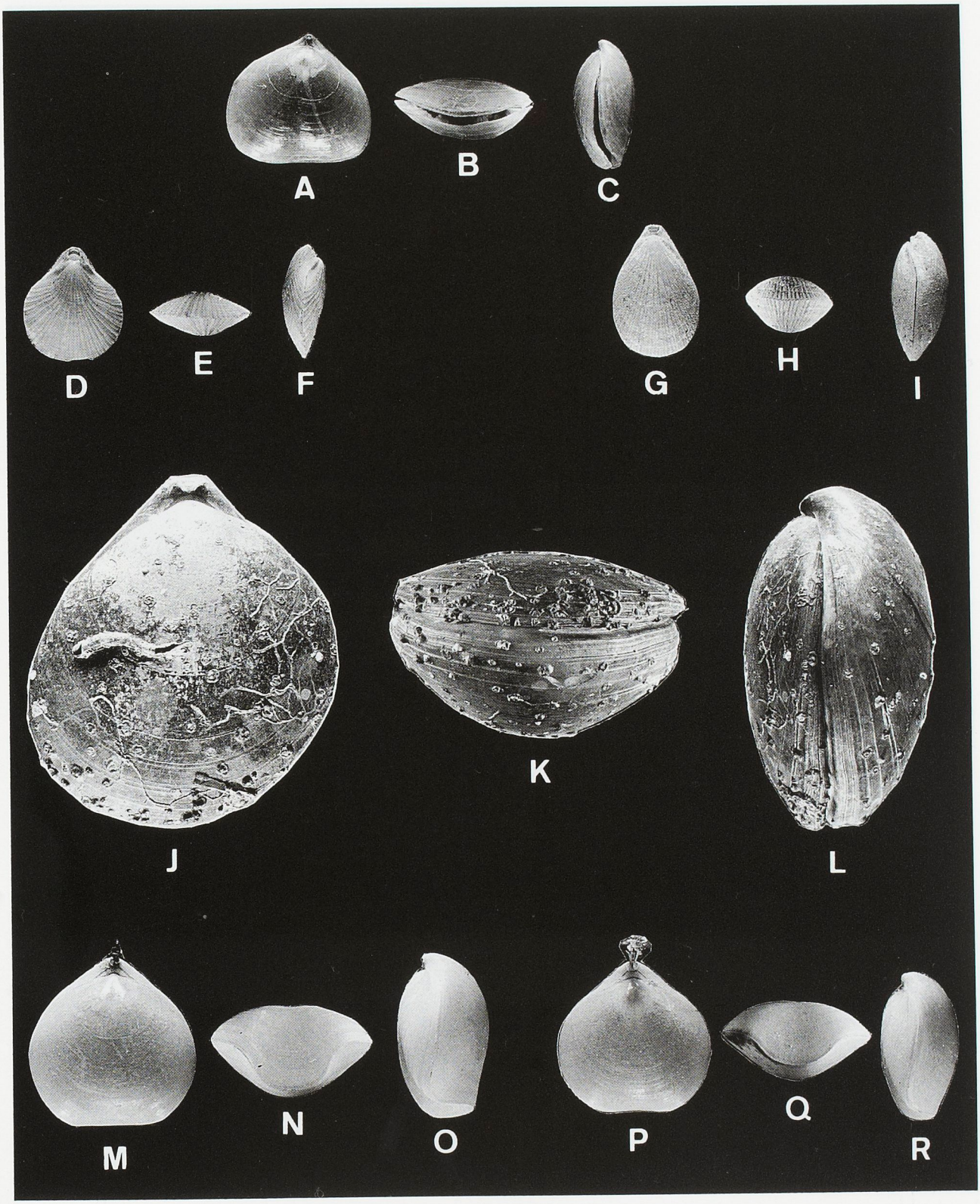

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FIGURE 44

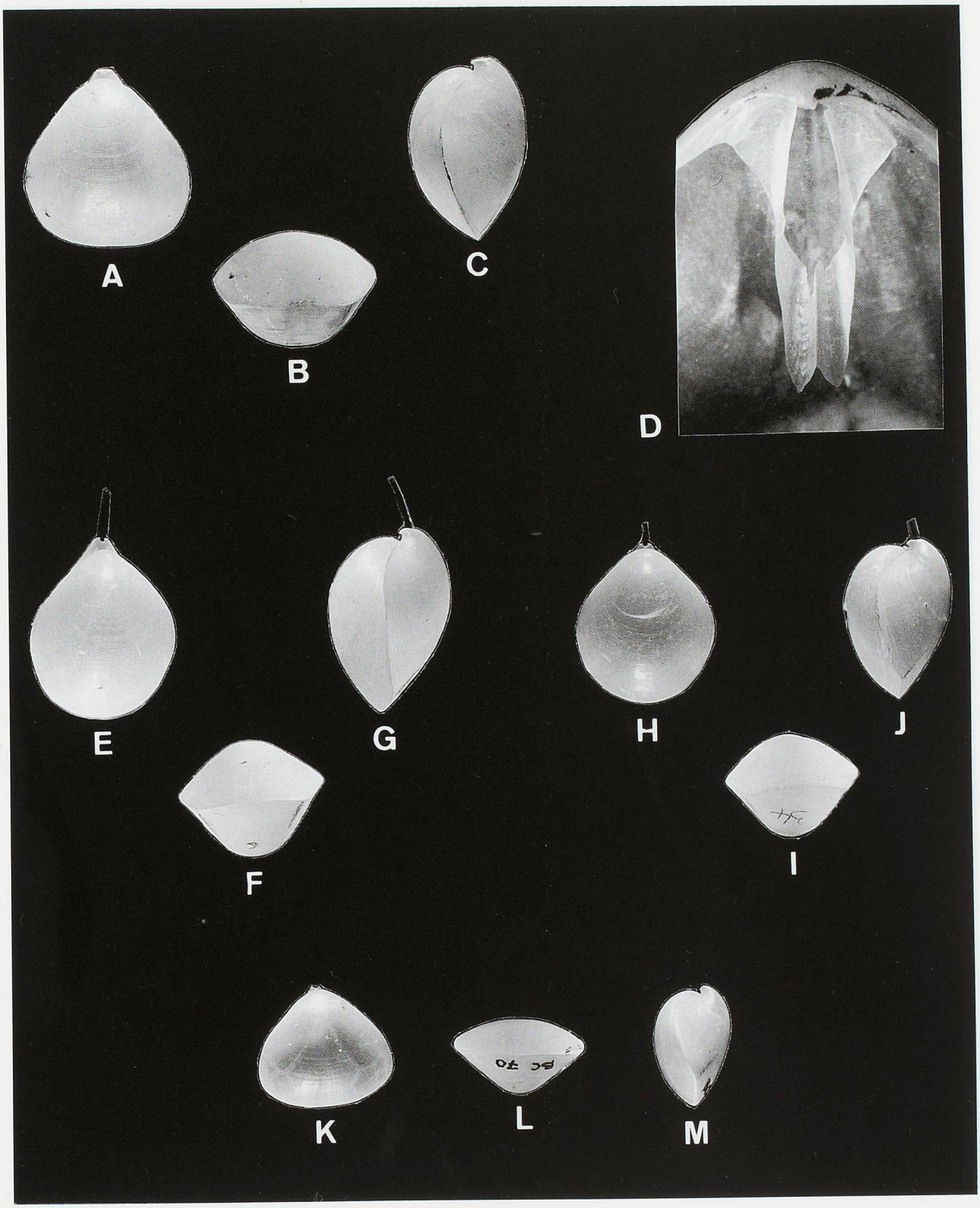
Stenosarina crosnieri (Cooper). MUSORSTOM 4, St. 221 : **A**, vue dorsale (x 1). — **B**, vue frontale (x 1). — **C**, vue latérale (x 1). — **D**, intérieur de la valve brachiale (x 4).

Stenosarina globosa sp. nov. Holotype, CHALCAL 2, St. 82 : **E**, vue dorsale (x 1). — **F**, vue frontale (x 1). — **G**, vue latérale (x 1).

Paratype, MUSORSTOM 4, St. 183 : **H**, vue dorsale (x 1); **I**, vue frontale (x 1). — **J**, vue latérale (x 1).

Stenosarina lata sp. nov. Holotype, BIOCAL, St. 70 : **K**, vue dorsale (x 1). — **L**, vue frontale (x 1). — **M**, vue latérale (x 1).

Photos A. GODON


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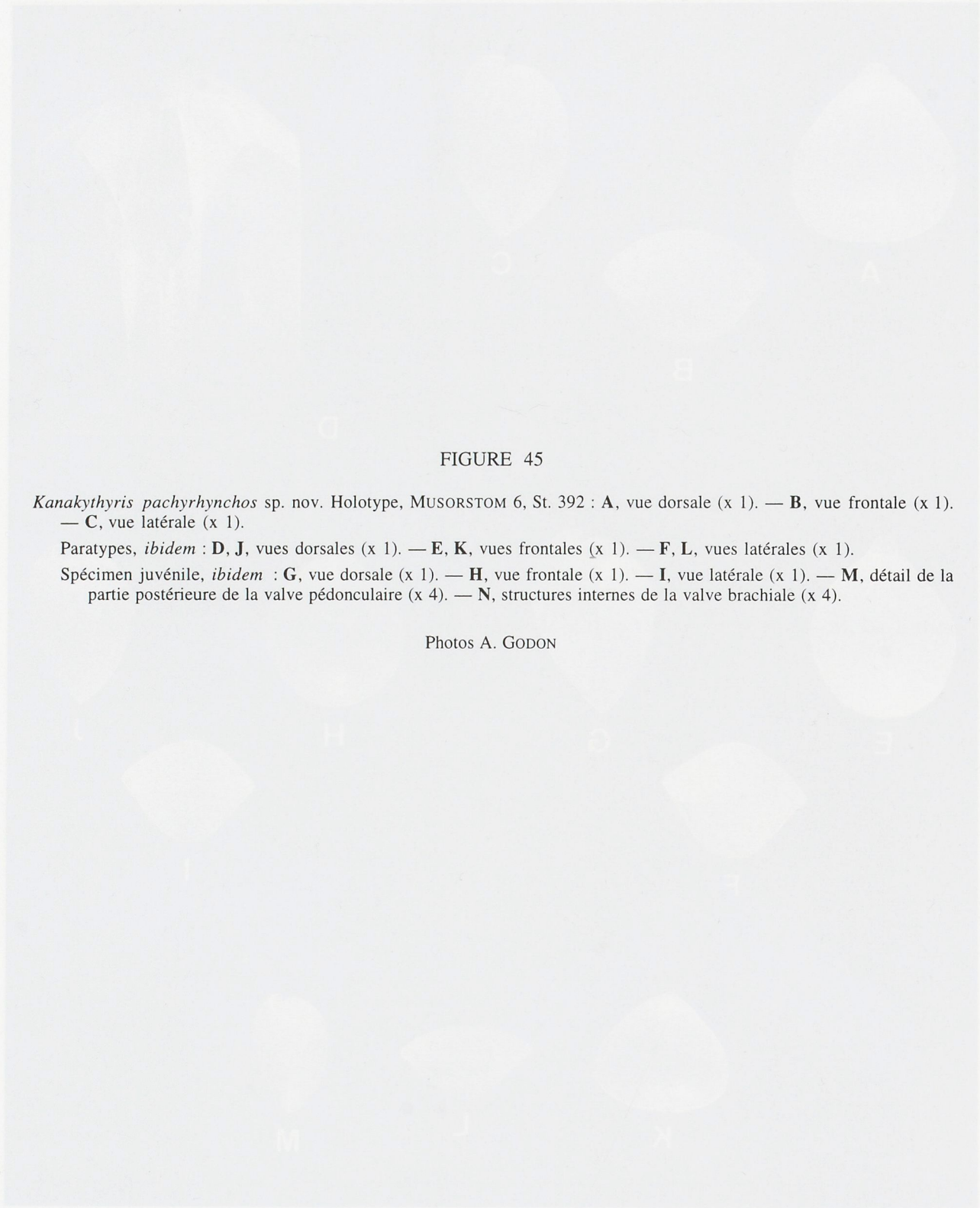


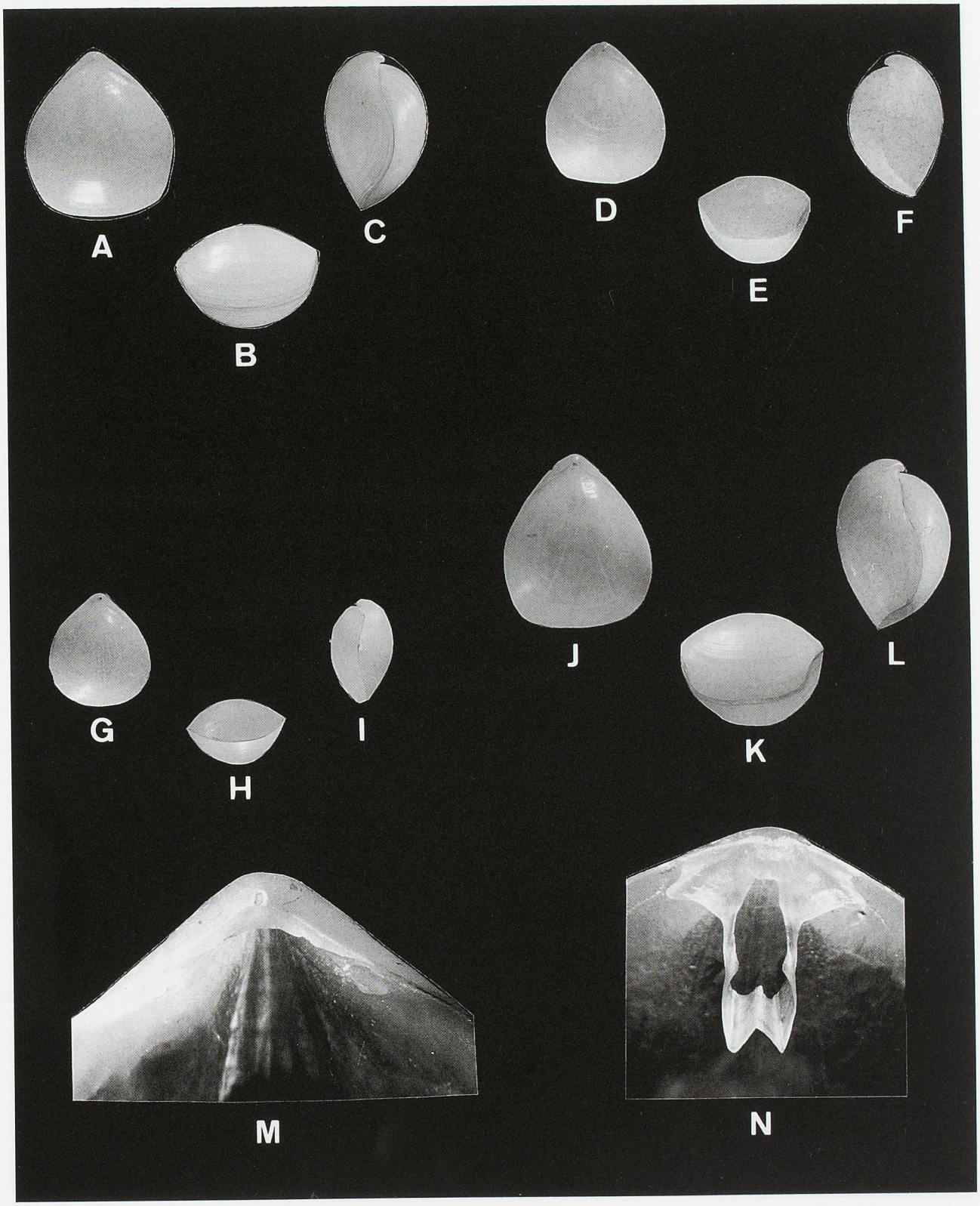
FIGURE 45

Kanakythyris pachyrhynchos sp. nov. Holotype, MUSORSTOM 6, St. 392 : **A**, vue dorsale (x 1). — **B**, vue frontale (x 1). — **C**, vue latérale (x 1).

Paratypes, *ibidem* : **D**, **J**, vues dorsales (x 1). — **E**, **K**, vues frontales (x 1). — **F**, **L**, vues latérales (x 1).

Spécimen juvénile, *ibidem* : **G**, vue dorsale (x 1). — **H**, vue frontale (x 1). — **I**, vue latérale (x 1). — **M**, détail de la partie postérieure de la valve pédonculaire (x 4). — **N**, structures internes de la valve brachiale (x 4).

Photos A. GODON


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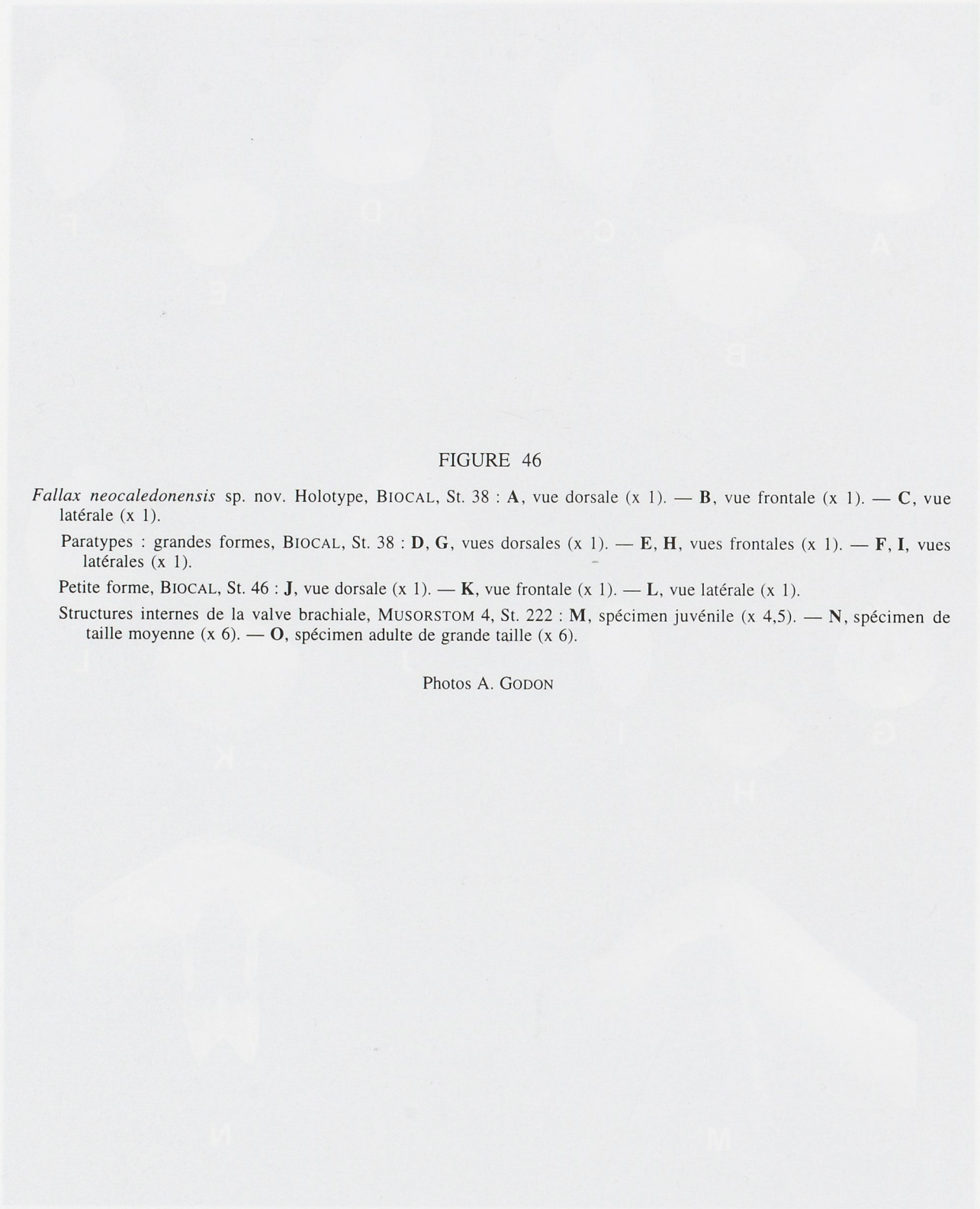


FIGURE 46

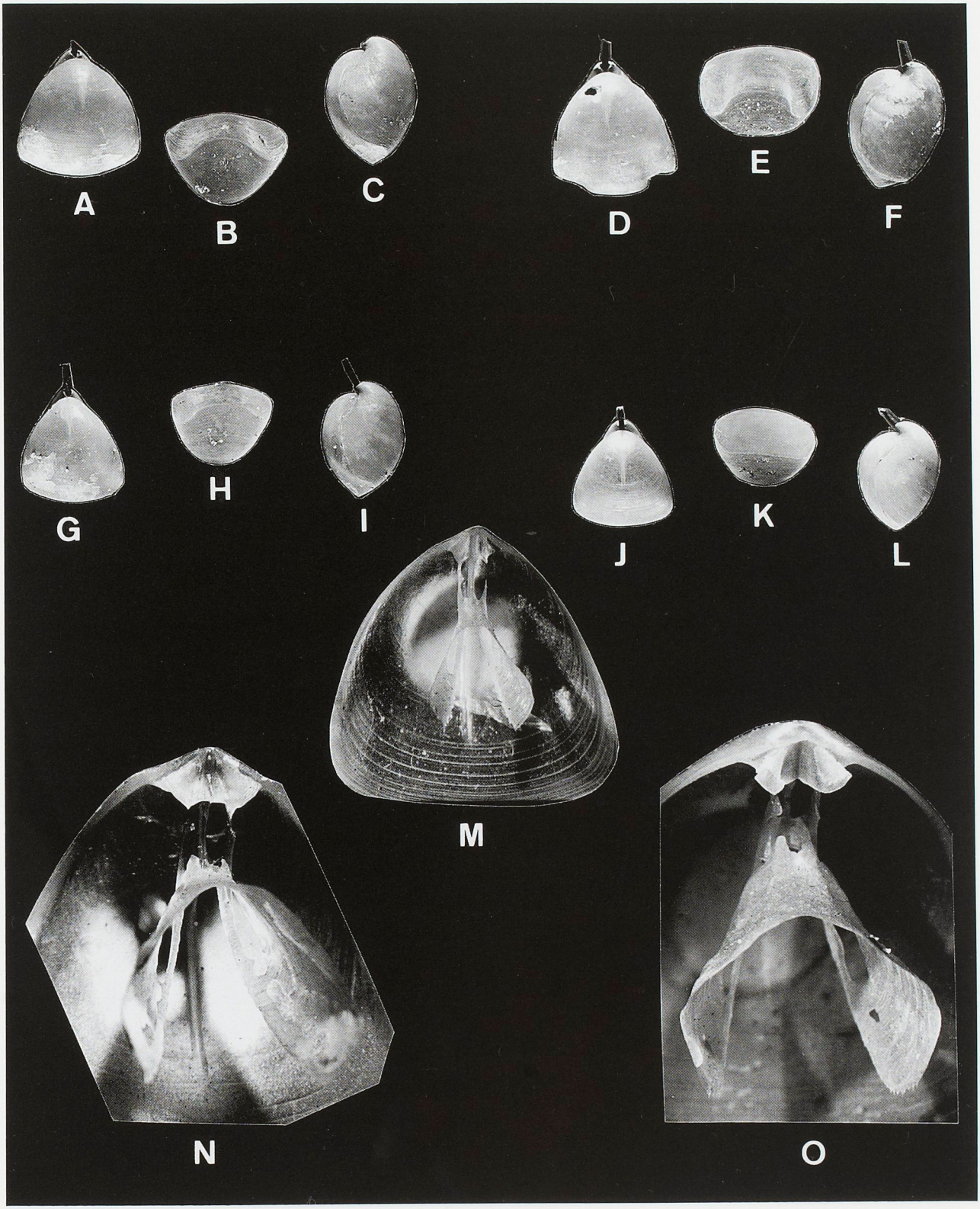
Fallax neocaledonensis sp. nov. Holotype, BIOCAL, St. 38 : **A**, vue dorsale (x 1). — **B**, vue frontale (x 1). — **C**, vue latérale (x 1).

Paratypes : grandes formes, BIOCAL, St. 38 : **D**, **G**, vues dorsales (x 1). — **E**, **H**, vues frontales (x 1). — **F**, **I**, vues latérales (x 1).

Petite forme, BIOCAL, St. 46 : **J**, vue dorsale (x 1). — **K**, vue frontale (x 1). — **L**, vue latérale (x 1).

Structures internes de la valve brachiale, MUSORSTOM 4, St. 222 : **M**, spécimen juvénile (x 4,5). — **N**, spécimen de taille moyenne (x 6). — **O**, spécimen adulte de grande taille (x 6).

Photos A. GODON


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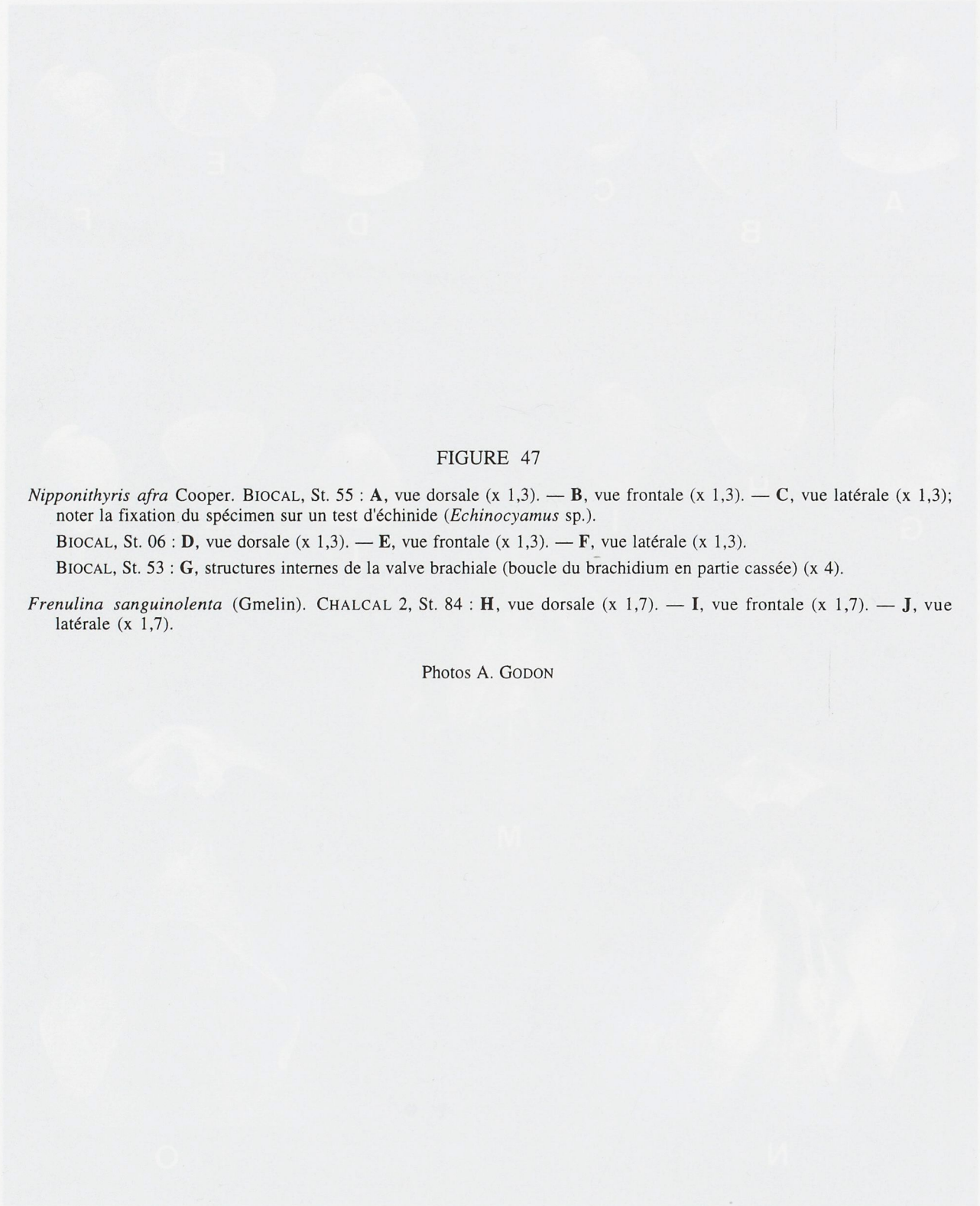


FIGURE 47

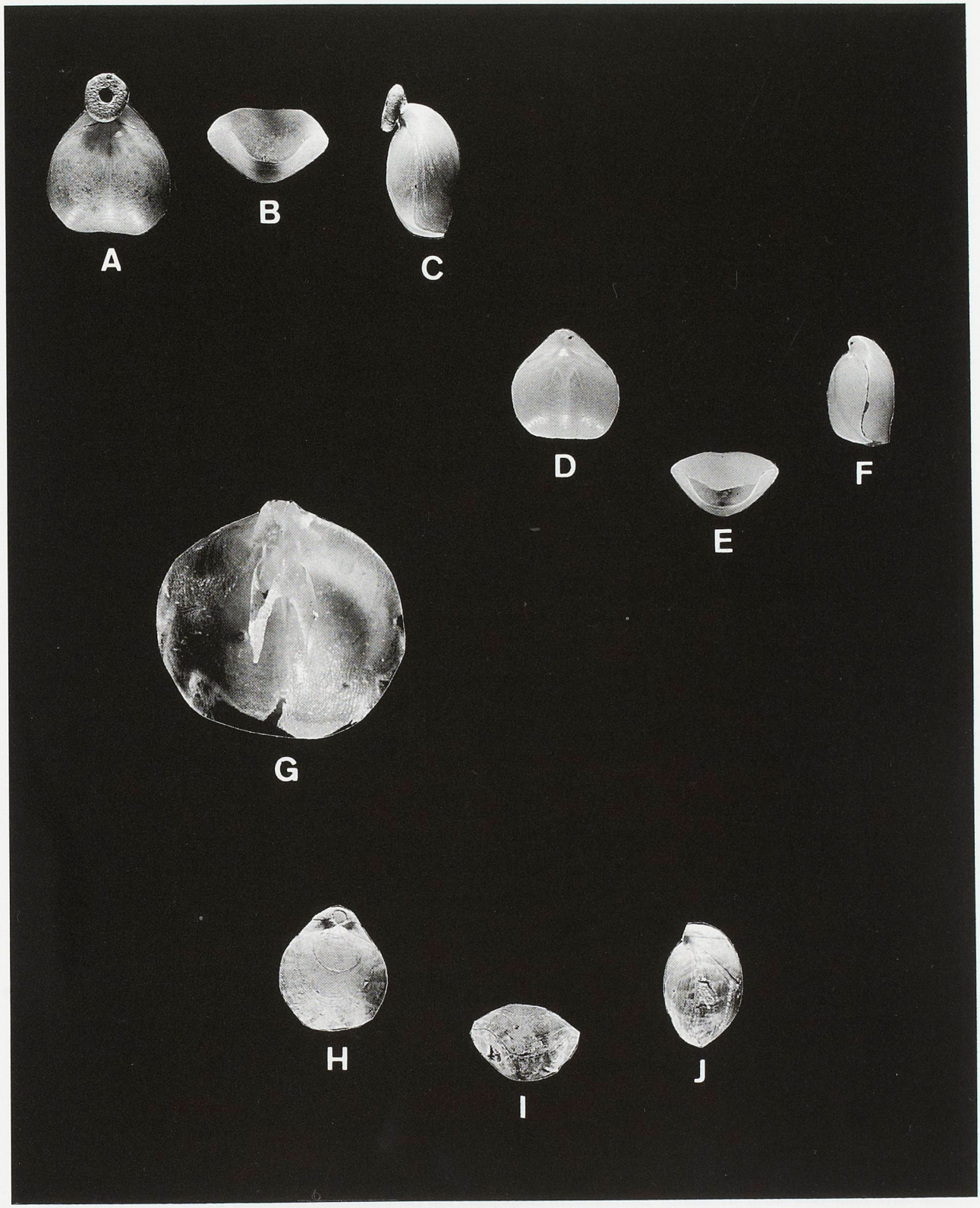
Nipponithyris afra Cooper. BIOCAL, St. 55 : **A**, vue dorsale (x 1,3). — **B**, vue frontale (x 1,3). — **C**, vue latérale (x 1,3); noter la fixation du spécimen sur un test d'échinide (*Echinocyamus* sp.).

BIOCAL, St. 06 : **D**, vue dorsale (x 1,3). — **E**, vue frontale (x 1,3). — **F**, vue latérale (x 1,3).

BIOCAL, St. 53 : **G**, structures internes de la valve brachiale (boucle du brachidium en partie cassée) (x 4).

Frenulina sanguinolenta (Gmelin). CHALCAL 2, St. 84 : **H**, vue dorsale (x 1,7). — **I**, vue frontale (x 1,7). — **J**, vue latérale (x 1,7).

Photos A. GODON


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13

Pisces Gadiformes: Taxonomy of grenadiers of the New Caledonian region, southwest Pacific

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ABSTRACT

Studies of recent bathyal collections mainly made during MUSORSTOM cruises have shown an extremely diverse grenadier fauna in the New Caledonian region. A total of 932 grenadier specimens (families Bathygadidae and Macrouridae) representing 49 species in 16 genera were collected from 102 samples taken from depths between 395 and 2105 m (mid-depth sounding). Of the 49 species, 15 (31%) were found to be new (one recently described) and two are treated as indeterminate. The collections were dominated by the genera *Caelorinchus* (14 spp., 5 new), *Ventrifossa* (7 spp., 2 new, but one not named), *Hymenocephalus (sensu lato)* (7 spp., 2 new), and *Nezumia* (5 spp., 3 new). This paper reports the taxonomic findings on the collections. A subsequent paper will report on aspects of the distribution and biology of grenadiers in the New Caledonian region.

RÉSUMÉ

Pisces Gadiformes : Taxonomie des grenadiers de la région néo-calédonienne (Pacifique sud-ouest).

L'étude des collections de poissons récoltés au cours des campagnes d'exploration du domaine bathyal de la zone économique de la Nouvelle-Calédonie, et plus particulièrement lors des campagnes MUSORSTOM, a mis en évidence la grande diversité des grenadiers dans cette région. Au total, 932 spécimens appartenant aux familles Bathygadidae et Macrouridae ont été étudiés: ils représentent 49 espèces, réparties en 16 genres. Ils ont été récoltés dans 102 stations situées entre 395 et 2105 m de profondeur. Sur ces 49 espèces, 15 (soit 31%) sont nouvelles: l'une a été décrite récemment par IWAMOTO & SAZONOV (1994), les 14 autres sont décrites dans le présent article; le statut de deux espèces demeure incertain. Les genres prédominants sont *Caelorinchus* (14 espèces dont 5 nouvelles), *Ventrifossa* (7 espèces dont 2 nouvelles, mais l'une sera nommée ultérieurement), *Hymenocephalus (sensu lato)* (7 espèces dont 2 nouvelles)

IWAMOTO, T. & MERRETT, N.R., 1997. — Pisces Gadiformes: Taxonomy of grenadiers of the New Caledonian region, southwest Pacific. *In*: A. CROSNIER (ed.), Résultats des Campagnes MUSORSTOM, Volume 18. *Mém. Mus. natn. Hist. nat.*, **176**: 473-570. Paris ISBN 2-85653-511-9.

et *Nezumia* (5 espèces dont 3 nouvelles). Le présent article traite de la taxonomie des grenadiers de ces collections. Un article en préparation traitera de la biogéographie et de la biologie des grenadiers de la région néo-calédonienne.

INTRODUCTION

The bathyal fauna of the region around New Caledonia in the southwestern Pacific had been little known prior to 1984, when ORSTOM (Institut français de Recherche scientifique pour le Développement en Coopération) and the Muséum national d'Histoire naturelle, Paris, began an extensive program of investigation of the bathyal environment. For background information on these explorations, see RICHER DE FORGES (1990, 1993), who provides a geological description and a brief history of exploration of the area, and includes an extensive list of publications resulting from these explorations with a list of vessel station data. LEHODEY *et al.* (1992) provide collection data for the cruise BERYX 11 on seamounts of the South East of New Caledonia and RICHER DE FORGES & MENOU (1993) do the same for the MUSORSTOM 7 expedition in the economic zone of the islands of Wallis and Futuna. Substantial fish collections accrued from these expeditions were deposited in the Muséum national d'Histoire naturelle (MNHN), where they were sorted into family group by Dr Bernard SÉRET and allocated to specialists to work up.

The grenadiers, families Macrouridae and Bathygadidae, constitute one of the most abundant fish group in the bathyal collections - representatives were found in 102 out of a total of 566 hauls made between 400 and 3690 m.

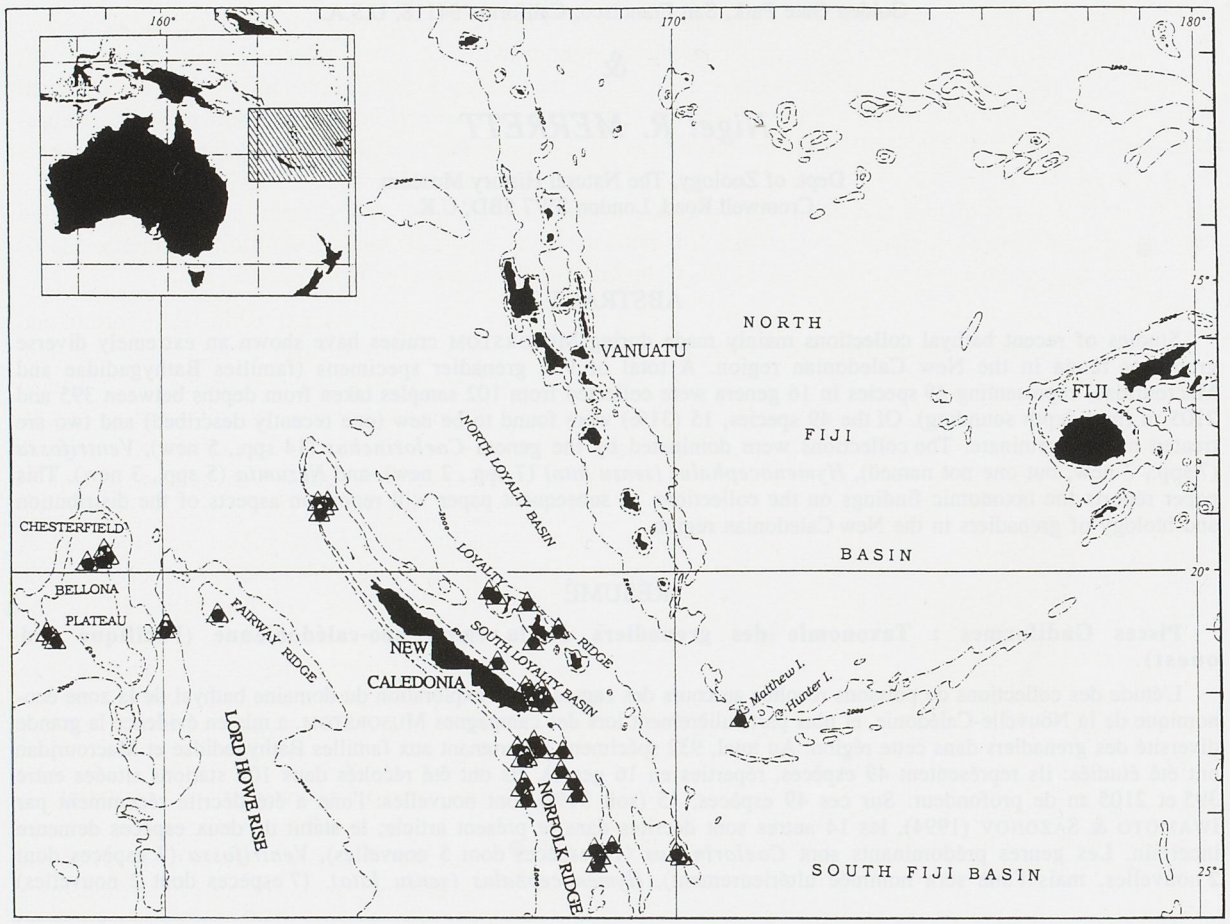


FIG. 1. — Map of region around New Caledonia with collection localities plotted as triangles with a solid circle. Hatched area within inset denotes area covered by larger map. MUSORSTOM 7 localities are not on this map.

These grenadier collections originated from between 395 and 2105 m, mid-depth sounding, but were concentrated in the 400-800 m range. In addition, two small grenadier collections made by Clive ROBERTS of the Museum of New Zealand (NMNZ) at localities to the south of New Caledonia were made available to us. The distributions of the grenadier collections used in this report are plotted on the map in Fig. 1.

This paper represents the first part of our report on the collection and will treat the taxonomy of the New Caledonia grenadiers. A subsequent paper will cover aspects of the distribution and ecology of the group. After the manuscript was submitted and accepted, the authors participated in a MUSORSTOM cruise (HALIPRO 2, see GRANDPERRIN *et al.*, 1997) during which additional grenadiers were collected. Also, we made a subsequent visit (April 1997) to the MNHN to examine an extensive collection of grenadiers from Vanuatu (MUSORSTOM 8 cruise, see RICHER DE FORGES, FALIEX & MENOU, 1996). It was not possible to incorporate all the new material into the current paper, but several had such important bearing on our concept of the species they represent that we felt it essential to include them. They included representatives of *Caelorinchus celaenostomus*, *C. shcherbachevi*, *Nezumia cliveri* and *N. coheni*. The remaining collections will be treated in our subsequent paper. Information on the collections provided here do not include these HALIPRO 2 catches nor the Vanuatu material.

MATERIALS AND METHODS

A variety of collecting gears was used, but the majority of ORSTOM samples were taken with a beam trawl (CP; 80 samples), with the remainder collected by an otter trawl (CC; 14 samples), Warren dredge (DW; 6 samples), and a Charcot dredge (DC; 2 samples). Details of the distribution of samples by depth strata are given in Fig. 2, which indicates that the majority (85%) of the samples were from the 400-800 m strata. Representational coverage of species richness, therefore, was most complete only within this relatively narrow range. The variation of effectiveness of the gears used in sampling active species like grenadiers (DW and DC<CP<CC), together with the lack of accurate times of arrival and departure of the gear to and from the seabed, prevented meaningful analysis of fish density or biomass. It is noteworthy here that the large proportion of samples (81%) from which no grenadiers were available fell in the following sample categories: DW, DC, CP, CC.

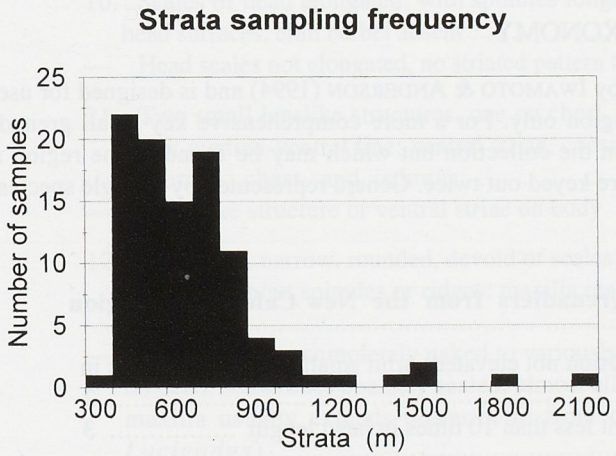


FIG. 2. — Distribution of grenadier samples by depth strata. A predominant portion (85%) of the 102 samples plotted were from 400-800 m strata.

Samples were fixed in saline formol and later transferred into 70% industrial ethanol. Counts and length measurements were made on the preserved material in accordance with IWAMOTO (1970) and IWAMOTO & SAZONOV (1988). The latter reference is also followed for general taxonomic abbreviations. Diagnoses are abridged as much as possible, and characters given in the diagnoses are not repeated in the descriptions except where more details are considered necessary. The diagnoses are compilations of data from current and other sources; ranges for counts and measurements may therefore not agree with the data enumerated for New Caledonian material.

In the lists of material examined, the names of the vessels are in both italics and quotations marks. The names of the cruises are printed in capital letters.

Institutional abbreviations follow LEVITON *et al.* (1985) and LEVITON & GIBBS (1988). For more detailed references to genera, the reader is referred to ESCHMEYER (1990).

RESULTS

A total of 932 specimens representing 16 genera and 49 species of grenadiers occurred in the samples examined. The collections were dominated by the genera *Caelorinchus* (14 species), *Hymenocephalus (sensu lato)* (7), *Ventrifossa* (7), and *Nezumia* (5). Thirty-nine of these species were represented by eight specimens or less, while only four species were represented by >32 specimens (Fig. 3). Fifteen species were found to be new (31%), although one of these was recently described by IWAMOTO & SAZONOV (1994). The representation of the species relative to abundance in the catches was not restricted to individual records (Fig. 3). Indeed, the most abundant species sampled was new (*Hymenocephalus megalops*, 209 specimens), together with another represented by 22 specimens (*Lucigadus acrolophus*), reflecting the novelty of the overall deep ichthyofauna of the area. Twelve of the new species and 18 already-named species are fully described. Two of the new species (in *Mataeocephalus* and *Ventrifossa*) are not formally named, although partial descriptions for them are included. These species are currently under study by others, who will described them using more extensive material from Australia. For the remaining 17 species, good descriptions are already available, so we provide only a diagnosis and limited description.

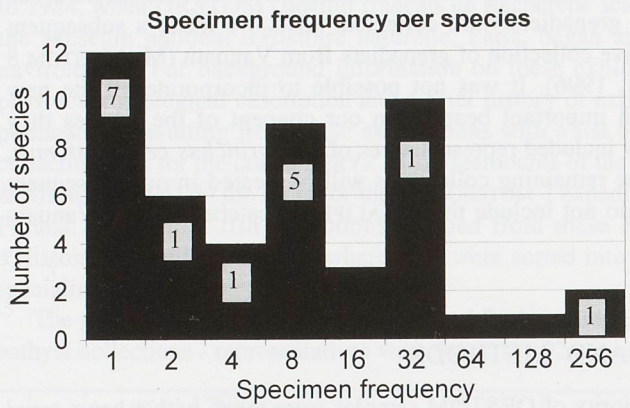


FIG. 3. — Bar graph relationship of species numbers and species frequency. Numbers within the bars indicate the number of new species with that specimen frequency (e.g., 12 spp. were represented by only one specimen, and of these 12, seven were new species).

TAXONOMY

The following key is adapted from one provided by IWAMOTO & ANDERSON (1994) and is designed for use in identifying grenadiers from the New Caledonian region only. For a more comprehensive key to all grenadier genera, see IWAMOTO (1990). Genera not present in the collection but which may be found in the region are enclosed in brackets; those marked with an asterisk are keyed out twice. Genera represented by a single species in the collection are keyed out with the species.

Key to genera and some species of grenadiers from the New Caledonian region

1. One continuous dorsal fin, anterior portion not elevated; orbit small, 10 or more times in head length **2**
— Two dorsal fins, the first elevated; orbit less than 10 times in head length **3**

2. Pelvic fins small, rays 5-6 ..... ***Squalogadus modificatus***
— Pelvic fins absent ..... [*Macrouroides inflaticeps*]

3. Origin of second dorsal fin immediately behind first and equally or better developed than anal fin; outer gill arch free from gill cover; gill-rakers on first arch slender, not tubercular **4**

— A distinct gap between dorsal fins; anal fin usually much better developed than second dorsal fin; outer gill arch restricted by folds of skin connecting upper and lower limbs to gill cover; gill rakers tubercular **5**

4. Chin barbel well developed; first dorsal, pectoral, and pelvic fins with a greatly elongated ray; pelvic fin rays 8 ..... ***Gadomus***
— No chin barbel; fins lacking a greatly elongated ray; pelvic fin rays 9 ..... ***Bathygadus cottoides***

5. Second spinous ray of first dorsal fin smooth **6**
— Second spinous ray of first dorsal fin serrated (weakly or much reduced in some) **9**

6. Snout strongly pointed, armed with coarse spiny scales that form a stout continuous ridge extending from snout tip to preopercle angle and terminating in a sharp point ..... ***Caelorinchus***
— Snout rounded to moderately pointed, no sharp ridge of modified scales extending from snout tip to preopercle angle **7**

7. Teeth large, widely spaced, in 1 row in lower jaw ..... ***Malacocephalus laevis***
— Teeth small to moderate, in 2 or more rows in lower jaw **8**

8. Head fragile, the skin membranous, mostly naked; head bones paper-thin; body scales thin, deciduous; pelvic fin rays 8-14; small lenslike structure on chest and before anus ..... ***Hymenocephalus****
— Head stout, skin thick, entirely scaled; head bones well developed; scales thick, adherent; pelvic rays 7 (rarely 6); no lenslike structure on chest ..... ***Trachonurus sentipellis***

9. Head massive, globose, soft; interopercle tightly adnate to preopercle; body scales along each side of second dorsal fin base enlarged ..... [*Cetonurus*]
— Head not especially massive or globose; interopercle not strongly adnate to preopercle; no enlarged scales along second dorsal fin base **10**

10. Scales of head elongated, with spinules longitudinally aligned to give striated pattern to head surfaces; chin barbel absent ..... [*Mesobius*]
— Head scales not elongated, no striated pattern to head surfaces **11**

11. Two small lenslike structures, one on chest, the other before anus, each connected by a black median-ventral line; ventral striae, consisting of fine parallel black lines on parts of abdomen, chest, and isthmus ..... ***Hymenocephalus****
— No lenslike structure or ventral striae on body **12**

12. Snout low, narrow, rounded, devoid of scales; no ridges on head; scales on head and front of body without spinules or ridges; maxilla reaches vertical to front margin of orbit ..... ***Haplomacrourus nudirostris***
— Snout angular, completely naked to variously covered with scales; ridges usually present on head, sometimes coarsely scaled; almost all scales covered with spinules or low ridges; maxilla usually extends posterior to front of orbit (except in *Sphagemacrurus* and *Lucigadus*) **13**

13. Branchiostegal rays 7 ..... **14**
— Branchiostegal rays 6 ..... **21**

14. Pelvic fin rays 5-7 ..... ***Pseudonezumia***
— Pelvic fin rays 8-14 ..... **15**

15. Snout completely or almost completely naked; no tubercular scales at tip or lateral angles ..... ***Kumba punctulata***
— Snout fully scaled or variously naked ventrally; scales present at tip and lateral angles **16**

16. Anus closer to anal origin than to pelvic insertions **17**
— Anus closer to pelvic insertions than to anal origin **18**

17. Outer gill slit about 10% or less of head length; outer rakers of first arch rudimentary or absent; snout prominently pointed; dorsal fin base not elevated ..... ***Mataeocephalus* acipenserinus***
— Outer gill slit about 20% or more of head length; outer rakers of first arch tubercular and distinctly developed; snout blunt, upturned; dorsal fin base elevated ..... ***Sphagemacrurus pumiliceps***

18. A stout suborbital shelf formed of two rows of coarsely spined scales; ventral edge of shelf forming a sharp ridge; snout variously naked ventrally ..... ***Nezumia***
— Suborbital shelf covered with several rows of small, relatively unmodified scales, no sharp ridge developed; underside of snout mostly scaled **19**

19. Ventral region of body appearing to have swung far forward so that gill membranes unite below orbit, pelvic fins below opercle ..... ***Lucigadus***
— Ventral region of body more normal; gill membranes unite under interopercle; pelvic fins below opercle or pectoral base **20**

20. Inner gill-rakers of first arch 13-17 ..... ***Ventrifossa***
— Inner gill-rakers of first arch 12 or fewer ..... [*Kuronezumia*]

21. Anus far removed from anal fin, closer to pelvic fins; pelvic rays 7 ..... ***Mataeocephalus**** sp. nov.
— Anus immediately before anal fin; pelvic rays 12-14 .... ***Coryphaenoides striaturus***

Family BATHYGADIDAE

DIAGNOSIS. — Gadiform fishes lacking a caudal fin; two dorsal fins present, the first elevated and with a flexible spine, the second starting immediately behind first and equally or (usually) better developed than anal fin; the two fins extending and meeting at end of tail; outer gill arch free from gill cover; gill rakers on first arch slender, lathlike; small villiform to cardiform teeth present on premaxillary and dentary only; mouth terminal and large, lacking a protruding snout; retia mirabilia and gas glands 2 or 4; no spinules on scales.

REMARKS. — The Indo-Pacific species of this family continue to pose many difficult taxonomic problems, despite the recent attempt at a world-wide revision by HOWES & CRIMMEN (1990). Extensive collections of the family made by former-Soviet vessels in the Indian Ocean have yet to be adequately examined; their study may help resolve some of the problems, but more comparative material is still needed from the Philippines and Indo-Malaysian region. Two genera, about 25 species, three in the area.

Genus ***BATHYGADUS*** Günther, 1878

Bathygadus Günther, 1878: 23 (type species *Bathygadus cottoides* Günther, 1878, by monotypy).
Melanobranchus Regan, 1903: 459 (type species *Bathygadus melanobranchus* Vaillant, 1888, by monotypy).
Regania Jordan *in* JORDAN & STARKS, 1904 (type species *Regania nipponica* Jordan *in* JORDAN & STARKS, 1904, by original designation).

DIAGNOSIS. — Chin barbel absent or minutely developed; first dorsal, pectoral, and pelvic fin lacking stout, notably elongated rays; retia and gas glands 2.

REMARKS. — GILBERT & HUBBS (1920) recognized 14 species in the genus, 11 of which were of Indo-Pacific origin. Of those 11, HOWES & CRIMMEN (1990) recognized only seven as species of *Bathygadus*. They relegated *B. furvescens* Alcock to the genus *Gadomus*, and sunk three others as junior synonyms (*Regania filamentosa* Smith & Radcliffe, 1912, *B. garretti* Gilbert & Hubbs, 1920, and *Melanobranchus micronema* Gilbert, 1905). IWAMOTO & ANDERSON (1994: 4) questioned some of their actions, in particular, the synonymization of *B. filamentosus* and *B. dubiosus* Weber, 1913 with *B. cottoides* Günther, 1878. We in turn have some doubts about HOWES & CRIMMEN's inclusion of *B. furvescens* into *Gadomus*. Their concept of the species was based on a putative syntype (BMNH 1896.9.11:2) and a number of other specimens received from near the type locality, but the original description was based clearly on a single 52 mm specimen that must be considered the holotype and only type specimen (*fide* W. N. ESCHMEYER, CAS, personal communication, Nov. 1995). MENON and YAZDANI (1968: 137) listed the specimen (ZSI F.13470) as holotype in their type catalog. ALCOCK's (1894a) original description clearly stated that there was no barbel, and he gave no mention of elongated fin rays, although in his *Descriptive Catalogue* (ALCOCK, 1899: 121), he noted that the "first dorsal, upper pectoral and outer ventral rays broken." The excellent illustration of the holotype (ALCOCK, 1894b, pl. 16, fig. 1) clearly shows the absence of elongated fin rays so typical of *Gadomus* species. These characters were confirmed by Yuri I. SAZONOV (ZMMGU) and Yuri N. SHCHERBACHEV (IOAN), who examined the holotype and six other specimens that "...had been identified as *B. furvescens* but belong to another genus - *Gadomus*" (*in litt.*, to TI, 1989) during a visit to the Zoological Survey of India in 1987. The six "other" specimens (ZSI Reg. #962-967) all had small barbels and a notably higher number of gill rakers, similar to those enumerated by HOWES & CRIMMEN (1990) for their specimens. The holotype had 6+18 outer, 3+16 inner rakers on the first arch, 2+15 inner and outer rakers on second arch, as compared with (5-6)+(20-21) / (3-4)+(17-19) on first arch, (2-3)+(16-18) / (3-4)+(16-18) on second arch.

Only one species was found in the New Caledonian collection.

Bathygadus cottoides Günther, 1878

Bathygadus cottoides Günther, 1878: 23 (between New Zealand and the Kermadec Islands, and Kermadec Is., 950-1280 m). — GÜNTHER, 1887: 154-155, pl. 42, fig. A (descr., fig.). — HOWES & CRIMMEN, 1990: 189.

MATERIAL EXAMINED. — 9 specimens.

New Caledonia. BIOCAL: stn CP 30, 23°08.44'S, 166°40.83'E, 1140 m, 29.08.1985: 1 specimen 59.0 mm HL (MNHN 1994-931). — Stn CP 57, 23°43.26'S, 166°68.06'E, 1490 m, 1.09.1995: 1 specimen 46.5 mm HL, 220 mm TL (CAS 86477). — Stn CP 68, 24°00.37'S, 168°07.03'E, 1430 m, 3.09.1985: 1 specimen 59.0 mm HL (MNHN 1994-930). — Stn CP 69, 23°51.38'S, 167°58.68'E, 1225 m, 3.09.1985: 1 specimen 57 mm HL, 275 mm TL (MNHN 1994-929).

Norfolk Ridge. HALIPRO 2: stn BT 43, 25°41'S, 167°11'E, 1030-1320 m, 15.11.1996: 3 specimens 17.9-33.8 mm HL, 75+-167 mm TL (CAS 90556). — Stn BT 55, 25°02'S, 168°45'E, 1098-1480 m, 17.11.1996: 1 specimen 96.8 mm HL, 460+ mm TL (CAS 90667). — Stn BT 59, 24°58'S, 168°42'E, 1312-1520 m, 18.11.1996: 1 specimen 62.1 mm HL, 285+ mm TL (CAS 90748). — Stn BT 66, 24°43'S, 168°28'E, 1126-1146 m, 19.11.1996: 1 specimen 71.1 mm HL, 427+ mm TL (CAS 90685). — Stn BT 75, 24°13'S, 167°36'E, 1128-1150 m, 21.11.1996: 2 specimens 72.7-74.0 mm HL, 350+-400+ mm TL (CAS 90992). — Stn BT 104, 25°23'S, 168°35'E, 1118-1124 m, 27.11.1996: 1 specimen 38.2 mm HL, 178+ mm TL (CAS 90835).

Loyalty Ridge. HALIPRO 2: stn BT 23, 25°04'S, 170°11'E, 1105-1360 m, 10.11.1996: 1 specimen 87.5 mm HL, 420+ mm TL (CAS 90993).

DIAGNOSIS (from current specimens only). — Pelvic fin rays 9; outer gill rakers first arch (5-6)+(19-20), 24-26 total; orbit 16-21% of HL; interorbital 30-37%; no chin barbel; gill rakers 8-14; color dark over entire body, including chest and gular membrane, head and fins black or blackish, gill filaments pale; pyloric caeca 18-25.

DESCRIPTION (*Counts* and *measurements*). — 1D. II,6-10; P. i13-i17; GR-I (inner) 3+(15-18), GR-II (outer/inner) 2+(15-17) / (2-3)+(15-17); pyloric caeca (7 spec.) 18-27. Total lengths 167+-460+ mm; HL 44.8-96.8 mm. The following in percent HL: snout 30-33; interorb. 30-37; suborb. 15-19 (fleshy measure), 12-17 (bony); postorb. 51-53; orb.-preop. 48-53; up.jaw 51-56; len. P. 55-62 (4 spec.).

SIZE. — To 97 mm HL and 46 cm TL.

DISTRIBUTION. — Off New Zealand, southern Australia, and New Caledonia, but possibly more widely distributed; depth range about 1030-1520 m.

REMARKS AND COMPARISONS. — *Bathygadus cottoides* is closely similar to *B. spongiceps*. According to HOWES and CRIMMEN (1990: 190), *B. cottoides* has a slightly longer upper jaw, slightly lower ascending premaxillary process, broader gap between premaxillary teeth bands, and fewer pectoral fin rays. Our New Caledonian specimens, however, obscure these differences and show almost complete overlap in characters. The pyloric caeca count in *B. spongiceps* is recorded by GILBERT and HUBBS (1920: 383) as 16, 17, and 21. In two (of three) specimens (CAS 86482) of *B. spongiceps* recently collected off the east coast of Luzon, we counted 15 each. These compare with the 18-25 we counted in seven New Caledonian specimens of *C. cottoides*. Our comparisons suggest that the two nominal species may be the same, but more specimens should be examined to verify this.

Specimens reported as *B. cottoides* from southern Africa by IWAMOTO and ANDERSON (1994: 3) should be re-examined, as they appear to differ significantly in several features from our New Caledonian representatives of that species. The low counts for pectoral fin-rays (i10-i14, rarely i15) and pyloric caeca (9-12), the somewhat wider interorbital space (35-40% of HL), the wide separation of anus and anal fin (about 5 scale rows), and the small adult size (large ovaries with individual eggs present in 41 mm HL specimen, CAS 82312, from off Cape of Good Hope, 1200 m) are sufficient to recognize them as distinct from our specimens of *B. cottoides*.

Genus ***GADOMUS*** Regan, 1903

Gadomus Regan, 1903: 459 (type species *Bathygadus longifilis* Goode & Bean, 1885, by original designation).

DIAGNOSIS. — Chin barbel usually long and well developed, rarely short; first dorsal, pectoral, and pelvic fins usually with one or more stout, elongated rays; retia and gas glands 4.

REMARKS. — Only two specimens of this genus were found in the collections, each representing a different species, one of which we are unable to assign to a known species. They can be distinguished by the following key:

— Barbel longer than head length; interorbital width about 1.5 into orbit diameter; outer gill rakers long, pointed, greatest length about 2.5 times least suborbital width .... **sp. indet.**

— Barbel less than half head length; interorbital width about equal to orbit diameter; gill rakers relatively short, bluntly tipped, greatest length about 1.5 least suborbital width ..... ***introniger***

Gadomus introniger Gilbert & Hubbs, 1920

Fig. 4

Gadomus introniger Gilbert & Hubbs, 1920: 401-405, fig. 5 (holotype USNM 78209, Buton Strait near Celebes; 1022 m; 7 paratypes, Philippines and East Indies).
Gadomus multifilis - RADCLIFFE, 1912: 106, text fig. 1 (part)(non *Bathygadus multifilis* Günther, 1887).

MATERIAL EXAMINED. — 1 specimen.
Matthew and Hunter Islands. VOLSMAR: stn CP 26, 22°22.80'S, 171°21.40'E, 980 m, 4.06.1989: 1 specimen male 67 mm HL, 390+ mm TL (MNHN 1997-656).

DIAGNOSIS. — Pelvic rays 8; greatly elongated ray in pectoral, pelvic, and first dorsal fins; barbel variable in length, from half eye diameter to two-thirds head length; interorbital width about equal to orbit diameter; outer gill rakers on first arch (4-6)+(20-25), short (about half interorbital), and bluntly tipped. Pyloric caeca about 30-52.

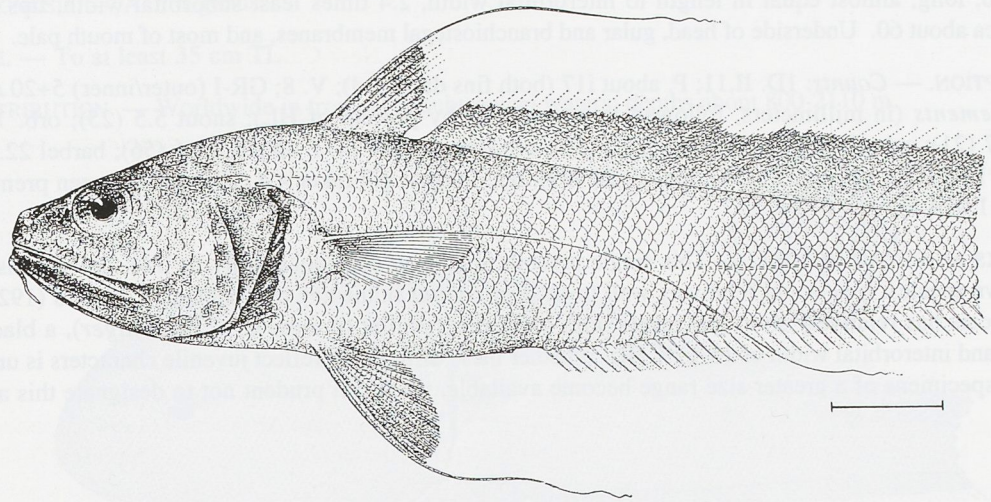


FIG. 4. — *Gadomus introniger* Gilbert & Hubbs (From GILBERT & HUBBS, 1920, fig. 5). Scale = 25 mm.

DESCRIPTION. — The reader is referred to the detailed and accurate original description of the species by GILBERT & HUBBS (1920).

Counts: 1D. II,10; P. i17/i18; GR-I (outer/inner) 5+22 / 4+17.

Measurements (in millimeters followed by percent of HL in parentheses): snout 19 (28); orb. 15.3 (23); interorb. 14.3 (21); suborb. 9.0 (13); postorb. 35.0 (52); orb.-preop. 31.5 (47); up.jaw 38 (57); barbel 6.4 (10); body depth 59 (88); ht. 1D. 92 (137); len. P. 160 (239); len. V. 101 (151); longest gill raker 6.2 (9.3); premaxillary teeth gap 2.5 (3.7); post. nostril 5.7 (8.5).

SIZE. — The Matthew and Hunter specimen appears to be the largest recorded at 39+ cm TL.

DISTRIBUTION. — Philippines to Indonesia (Borneo and Celebes) and Matthew and Hunter Islands, in 549-1280 m.

REMARKS AND COMPARISONS. — Our New Caledonian specimen agrees well with the original description except that the gular membrane in our specimen is not black but dusky to pale, and the branchiostegal membrane is black with paler areas over the rays and outer margin. The first dorsal in our specimen is black, whereas GILBERT & HUBBS (1920: 404) record it as "light throughout." The interorbital width is slightly wider than reported (21% HL compared with about 15-17%). We counted approximately 30 pyloric caeca, in contrast to the 35-52 recorded by GILBERT & HUBBS. Our count may have been inaccurate, however, because the caeca in our single specimen had to be removed from the everted stomach to be counted, and damage to the fragile caecal mass could not be avoided. HOWES & CRIMMEN (1990: 198) recorded 20 caeca in a single paratype.

The presence of this species in the collection is not surprising, as many *Gadomus* species appear to be widespread and New Caledonia would represent simply an extension of its known distribution. It should be expected also in tropical waters of Australia, especially off Queensland.

Gadomus sp. indet.

MATERIAL EXAMINED. — 1 specimen.

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CC 390, 21°00.90'S, 160°50.30'E, 745-825 m, 22.10.1986: 1 specimen 22.2 mm HL, 124 mm TL (MNHN 1996-962).

DIAGNOSIS. — Pelvic rays 8; greatly elongated ray in pectoral and pelvic fins (condition in first dorsal unknown); barbel very long, about equal to head length; interorbital narrow, 21% HL, 1.5 into orbit diameter; gill

rakers 5+20, long, almost equal in length to interorbital width, 2.4 times least suborbital width, tips pointed. Pyloric caeca about 60. Underside of head, gular and branchiostegal membranes, and most of mouth pale.

DESCRIPTION. — *Counts*: 1D. II,11; P. about i17 (both fins damaged); V. 8; GR-I (outer/inner) 5+20 / 3+15.

Measurements (in millimeters, followed in parentheses by percent of HL): snout 5.5 (25); orb. 7.0 (32); interorb. 4.7 (21); suborb. 1.8 (8); postorb. 11.0 (50); orb.-preop. 10.4 (47); up.jaw 12.6 (56); barbel 22.5 (101); body depth 15.5 (70); len. P. 35 (158); len. V. 22 (99); len. longest gill raker 4.4 (20); gap between premaxillary teeth bands 1.0 (4.5).

REMARKS AND COMPARISONS. — This single juvenile specimen does not readily fit into the circumscription of any known species. It keys out relatively well to *G. denticulatus* in the key by GILBERT & HUBBS (1920: 392), but that species has relatively short gill rakers with blunt tips (similar to those in *G. intermiger*), a black gular membrane, and interorbital width of 15-17% HL. Whether these differences reflect juvenile characters is uncertain. Until more specimens of a greater size range become available, we feel it prudent not to designate this as a new species.

Family MACROURIDAE

DIAGNOSIS. — Gadiforms with long dorsal and anal fins meeting at end of long tapered tail; caudal fin rudimentary (in Trachyrincinae) or absent; spinous dorsal ray present or absent; no teeth on palate; spinules usually present on body scales (rarely absent or rudimentary); retia and gas glands 2 to 6 (in some individuals of some species, as many as 7 to 11); nasal bones with median and lateral processes forming a distinctly protruding snout.

Subfamily MACROUROIDINAE

DIAGNOSIS. — Gadiforms with exceedingly large, spongy, bulbous head; dorsal and anal fins long, low, converging at end of tail; outer gill arch free from gill cover; outer series of gill rakers lathlike; pelvic fins absent or very small, with 5 or 6 rays; chin barbel absent.

REMARKS. — Two genera, each with a single species.

Genus *SQUALOGADUS* Gilbert & Hubbs, 1916

Squalogadus Gilbert & Hubbs, 1916: 156 (type species *Squalogadus modificatus* Gilbert & Hubbs, 1916, by original designation).

DIAGNOSIS. — Small pelvic fin present, with 5 or 6 rays.

REMARKS. — A single species, worldwide.

Squalogadus modificatus Gilbert & Hubbs, 1916

Fig. 5

Squalogadus modificatus Gilbert & Hubbs, 1916: 156-158, pl. 8, fig. 2 (holotype USNM 76864; off Kyushu, Japan, 1317 m)

Squalogadus intermedius Grey, 1959: 330 (holotype USNM 185606, Gulf of Mexico; 1097 m).

MATERIAL EXAMINED. — 2 specimens.

New Caledonia. BIOCAL: stn CP 60, 22°09.02'S, 167°33.18'E, 2110 m, 2.09.1985: 1 specimen 40 mm HL (MNHN 1994-928). — Stn CP 72, 24°01.45'S, 167°08.43'E, 1530 m, 4.09.1985: 1 specimen 42 mm HL (MNHN 1994-927).

DIAGNOSIS. — As for genus.

SIZE. — To at least 35 cm TL.

DISTRIBUTION. — Worldwide in tropical to subtropical waters; depths about 800-2110 m.

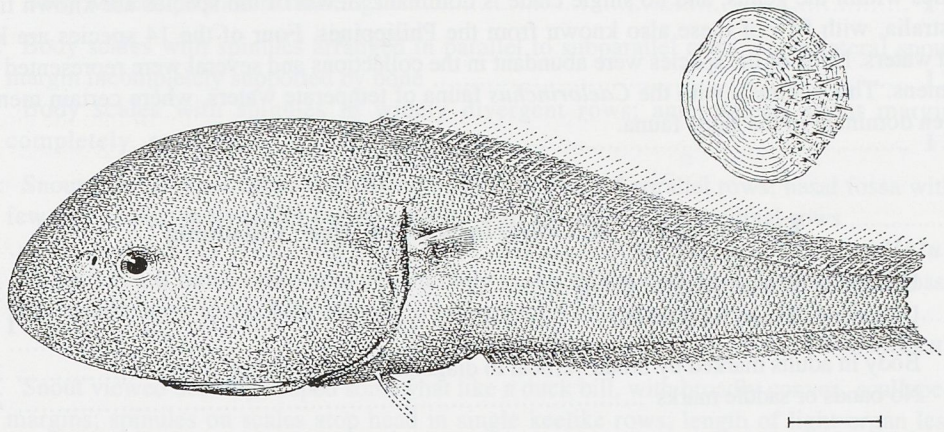


FIG. 5. — *Squalogadus modificatus* Gilbert & Hubbs (From GILBERT & HUBBS, 1916, pl. 8, fig. 2). Scale = 25 mm.

REMARKS AND COMPARISONS. — Only two juveniles (in poor condition) of this widely distributed species were collected. The species is distinguished from its only subfamilial relative, *Macrouroides inflaticeps* Smith & Radcliffe, 1912, by its small pelvic fins, which are absent in the latter species.

Subfamily MACROURINAE

DIAGNOSIS. — Two dorsal fins separated by a distinct gap, the first short and high, the second long and low, converging with better-developed anal fin at end of tail; an elongated spinous ray in first dorsal; outer gill arch attached to gill cover by membranes, restricting opening of gill slit; gill rakers all tubercular or tablike.

REMARKS. — This is the largest group of grenadiers with more than 250 species included among about 26 or more genera (depending on authority). Thirteen genera are found in New Caledonia.

Genus ***CAELORINCHUS*** Giorna, 1809

Caelorinchus Giorna, 1809: 179 (type species *Leidoleprus caelorhincus* Risso, 1810, by subsequent designation of FOWLER, 1936: 459).
Paramacrurus Bleeker, 1874: 370 (type species *Lepidoleprus australis* Richardson, 1839, by original designation).
Oxymacrurus Bleeker, 1874: 370 (type species *Macrurus japonicus* Temminck & Schlegel, 1842, by original designation).
Abyssicola Goode & Bean, 1896: 417 (type species *Macrurus macrochir* Günther, 1877, by monotypy).
Quincuncia Gilbert & Hubbs, 1920: 432 (as subgenus; type species *Coelorhynchus argentatus* Smith & Radcliffe, 1912, by original designation).
Mahia McCann & McKnight, 1980: 53 (type species *Mahia matamua* McCann & McKnight, 1980, by original designation).

DIAGNOSIS. — Branchiostegal rays 6; outer gill rakers absent; spinous dorsal ray lacking denticulations on leading edge (occasional few at tip of ray in rare individuals); snout armed with stout terminal scute; stout, spiny suborbital ridge extending continuously onto preopercle, ending in a sharp point; light organ well developed in

most species with dermal window on midline of belly and/or chest; pelvic rays almost always 7 (usually 6 in *Caelorinchus sexradiatus* Gilbert & Hubbs, 1920).

REMARKS. — This large genus of 100 or more species is represented in the New Caledonian fauna by 14 species, five of which are here newly described. Relationships of the 14 species appear to lie with several different clades within the genus, and no single clade is dominant. Seven of the species are known from the east coast of Australia, with five of these also known from the Philippines. Four of the 14 species are known from New Zealand waters. None of the species were abundant in the collections and several were represented by only one or two specimens. This contrasts with the *Caelorinchus* fauna of temperate waters, where certain members of the genus are often dominant in the slope fauna.

Key to species of *Caelorinchus* of New Caledonia

1. Underside of head naked or nearly so **2**
— Underside of head fully scaled **10**

2. Body in adults marked by broad vertical to diagonal bands or saddle marks **3**
— No bands or saddle marks **4**

3. A prominent dark horizontal streak behind orbits; black midventral strip expanded at both ends, anterior end just behind isthmus, posterior end before anus; anterolateral snout margin incompletely supported by bone ..... ***C. cingulatus***
— No streak behind orbit; large fossa on chest but not connected to anus by dark midventral streak; anterolateral snout margin completely supported by bone ..... ***C. cylindricus*** sp. nov.

4. Snout length about equal to orbit diameter; branchiostegal membrane dorsally and tip of first dorsal black; chin barbel almost as long as orbit diameter ..... ***C. melanobranchus*** sp. nov.
— Snout much longer than orbit; branchiostegal membrane and first dorsal not pigmented as above; chin barbel short, 1.7 or more into orbit diameter **5**

5. Light organ long, extending from anus to just behind isthmus **6**
— Light organ short, not extending forward of pelvic bases **8**

6. Body prominently mottled with dark blotches, the blotches forming irregular longitudinal stripes ..... ***C. argentatus***
— Body lacking mottled pattern **7**

7. A dusky to dark horizontal streak behind pectoral fin; first dorsal pale proximally, dusky distally; anterior 10-15 anal rays dark, remaining rays pale; anterolateral snout margin completely supported by bone ..... ***C. acutirostris***
— No dark streak on flanks; first dorsal with prominent black blotch; anal rays pale to white; anterolateral snout margin incompletely supported ... **C. *semaphoreus*** sp. nov.

8. Snout long, about twice orbit diameter; membrane behind spinous second ray of first dorsal fin black; body scales deciduous, covered with short, greatly reclined conical spinules in 8-11 parallel rows ..... ***C. spathulatus***
— Snout much less than twice orbit; first dorsal dusky, spine black or dusky, but membrane behind dusky to pale; scales adherent, spinules prominent, in 4-7 divergent rows **9**

9. Underside of snout immaculate; ventral half of trunk and tail white to pearlescent; body scales with 5-8 rows of sharp, narrow-bladed spinules ..... ***C. anatirostris***

— Underside of snout covered with dark papillae and hairy filaments giving dirty appearance to surface; body uniformly brown to grayish brown, not whitish ventrally; body scales with 4 or 5 rows of broad, widely butressed spinules ..... ***C. shcherbachevi*** sp. nov.

10. Body marked with prominent saddle marks ..... ***C. celaenostomus***
— Body without prominent markings **11**

11. Body scales with spinules arranged in parallel to subparallel rows; anterolateral snout margin incompletely supported by bone **12**
— Body scales with spinules in widely divergent rows; anterolateral snout margin completely supported **13**

12. Snout 1.9-2.0 times orbit; spinules on body scales in 5-7 parallel rows; nasal fossa with few tiny scales; most scales between orbits with spinules in longitudinal rows ..... ***C. parallelus***
— Snout 1.5-1.8 times orbit; spinules on body scales in 4-6 subparallel rows; nasal fossa fully scaled; most scales between orbits with spinules in divergent rows ..... ***C. kermadecus***

13. Snout viewed dorsally shaped somewhat like a duck bill, with broadly convex, scalloped margins; spinules on scales atop head in single keelike rows; length of light organ less than diameter of posterior nostril; anus immediately before anal fin ..... ***C. platorhynchus***
— Snout viewed dorsally relatively narrow, margins roughened and convex, but not scallop-edged; spinules atop head scales in divergent rows; length light organ about equal to posterior nostril; anus slightly removed from anal fin origin ..... ***C. sereti*** sp. nov.

Caelorinchus acutirostris Smith & Radcliffe, 1912

Fig. 6a

Coelorhynchus acutirostris Smith & Radcliffe, *in* RADCLIFFE, 1912: 134-136, pl. 30, fig. 2, text-fig. 10 (holotype USNM 72947, Philippines between Cebu and Bohol; 291 m).

Coelorinchus sp. 1 - ARAI *in* GLOERFELT-TARP & KAILOLA 1984: 85, fig. on p. 84 and photograph of specimen without caption on p. 82 (Indonesia).

MATERIAL EXAMINED. — 13 specimens.

New Caledonia. MUSORSTOM 4: stn CC 245, 22°07.00'S, 167°11.00'E, 415-435 m, 3.10.1985: 1 specimen 44.6 mm HL, 181 mm TL (MNHN 1996-961).

Philippines. *"Albatross"*, PHILIPPINES EXPEDITION 1907-1910: stn 5418, 10°08'50"N, 123°52'30"E, 291 m, 25.03.1909: holotype 205 TL (USNM 72947).

J.E. NORTON collection: Marinduque Island, Barrio Cowit, 234-256 m, 21.10.1966: 1 specimen 46.6 mm HL, 128+ mm TL (CAS 34171). — Southwest of Marinduque Island, east of Gaspar Island, 134-155 m, 29.09.1966: 4 specimens (CAS 34254).

Australia. Queensland, east of Murray Isles: 9°53'S, 144°23'E, 480 m, 28.05.1983: 2 specimens 47.5-67.9 mm HL, 147-221 mm TL (QM I.20657). — 9°51'S, 144°09'E, 464 m, May 1983: 4 specimens 38.3-69.2 mm HL, 110+-238 mm TL (QM I.20666).

Other specimens examined from Western Australia to be reported on in another publication.

DIAGNOSIS. — Snout length 47-58% HL; anterolateral margin completely supported by bone. Subopercle lacking prolonged ventral tip. Light organ extending from near isthmus to front of anus. Anus immediately before anal fin. Underside of head naked; nasal fossa usually naked, but small scattered scales in some specimens. Body scales small, covered with conical spinules in five to seven slightly divergent rows, 42-58 lateral line scales over a distance equal to predorsal length. Dark streak on belly extending horizontally from pectoral fin base to above anal fin origin; a curved dark streak (often faint or disrupted) passing below base of first dorsal fin from nape to second dorsal; chest and vent areas darkly punctulate to blackish; anterior 10-15 rays of anal fin blackish.

DESCRIPTION. — *Counts*: 1D. II,7-10 (usually 8 or 9); P. i15-i17; GR-I (inner) 6-8, GR-II (outer/inner) 5-6/6-8; scales 1D. 7-9, mid-1D. 5-7, 2D. (6) 7-8.5.

Measurements: Total length 110-238+ mm; HL 38.3-69.2 mm. The following in percent HL: preoral (40)42-52; internasal 13-20; interorb. 18-22; orb. 20-23; suborb. 11-13; postorb. 23-30; orb.-preop. 27-32; up.jaw 17-22; barbel 4-7; gill slit 8-13; pre-A. 126-153; V.-A. 26-44; isthm.-A. 48-68; body depth 36-57; 1D.-2D. 8-13; ht. 1D. 32-42; len. P. 28-41; len. V. 23-34; nostril 4-9.

Snout notably long and sharply pointed, length more than twice orbit diameter. Mouth small, inferior; upper jaw restricted laterally, maxillary extends to below posterior 1/3 of orbit. Premaxillary teeth band short, broad; mandibular band longer and more narrow, extending to end of rictus.

Height first dorsal less than postrostral length of head; second dorsal begins close behind first, anterior rays relatively well developed but not as long as opposites of anal fin. Outermost ray of pelvic barely extends to anus.

Scales small, exposed fields covered with slender, conical, relatively erect spinules in slightly to moderately divergent rows. Scale spinules on head ridges short, numerous, but not enlarged or especially coarse. Supraoccipital scute and postoccipital scute weakly developed. Narrow naked clefts run longitudinally from behind terminal scute along each side of median-dorsal area of snout.

Light organ belonging to Group IV of IWAMOTO (1990); expanded anterior end recessed in a deep fossa, expanded posterior end partially surrounding anus but not within a fossa; all of light organ, including anterior fossa, covered with scales.

Color in alcohol light brownish gray dorsally, paler ventrally on body, white on underside of head. Chest black, with midventral black streak of light organ extending to front of anus; strong contrast between dark streak and pale, somewhat whitish lateral sides of belly. Mouth, jaws, barbel immaculate; gullet gray; gular and branchiostegal membranes completely pale. Gill cavity pale to dusky; darker over inner opercular surface. First dorsal pale at base, dusky distally; pectorals light dusky; pelvics coarsely peppered, blackish distally, outer ray white; anal pale or lightly dusky.

SIZE. — To about 25 cm TL.

DISTRIBUTION. — New Caledonia; Philippines; Indonesia; Australia, off Queensland and Western Australia. Depth range 134-480 m

REMARKS AND COMPARISONS. — *Caelorinchus acutirostris* is a peculiar species among IWAMOTO's (1990) Group IV species in that it has a long light organ typical of the group, but complete bony support of the anterolateral margins of the snout. All other Group IV species have the anterolateral margin incompletely supported. The small scales and distinctive body markings in fresh specimens coupled with other diagnostic features make it unlikely to be mistaken for any other species.

Caelorinchus acutirostris appears to be marginal to New Caledonia, as our collections contained only one small individual. The species is apparently rather common in upper-slope waters of the Philippines, Indonesia, and northern Australia, but it seems not to be anywhere abundant — the most collected at any one station was four.

Caelorinchus anatirostris Jordan & Gilbert, 1904

Figs 6 c, c', c"

Coelorhynchus anatirostris Jordan & Gilbert *in* JORDAN & STARKS, 1904: 619-620, fig. (holotype CAS-SU 8550, Misaki, Japan; collected by K. AOKI by longline).

MATERIAL EXAMINED. — 7 specimens.

New Caledonia. BIOCAL: stn CP 40, 22°55.32'S, 167°23.30'E, 650 m, 30.08.1985: 2 specimens 22.5-30.5 mm HL, 92-125 mm TL (MNHN 1994-906). — Stn CP 75, 22°18.65'S, 167°23.30'E, 825 m, 4.09.1985: 1 specimen 54.0 mm HL, 212 TL, (MNHN 1994-904).

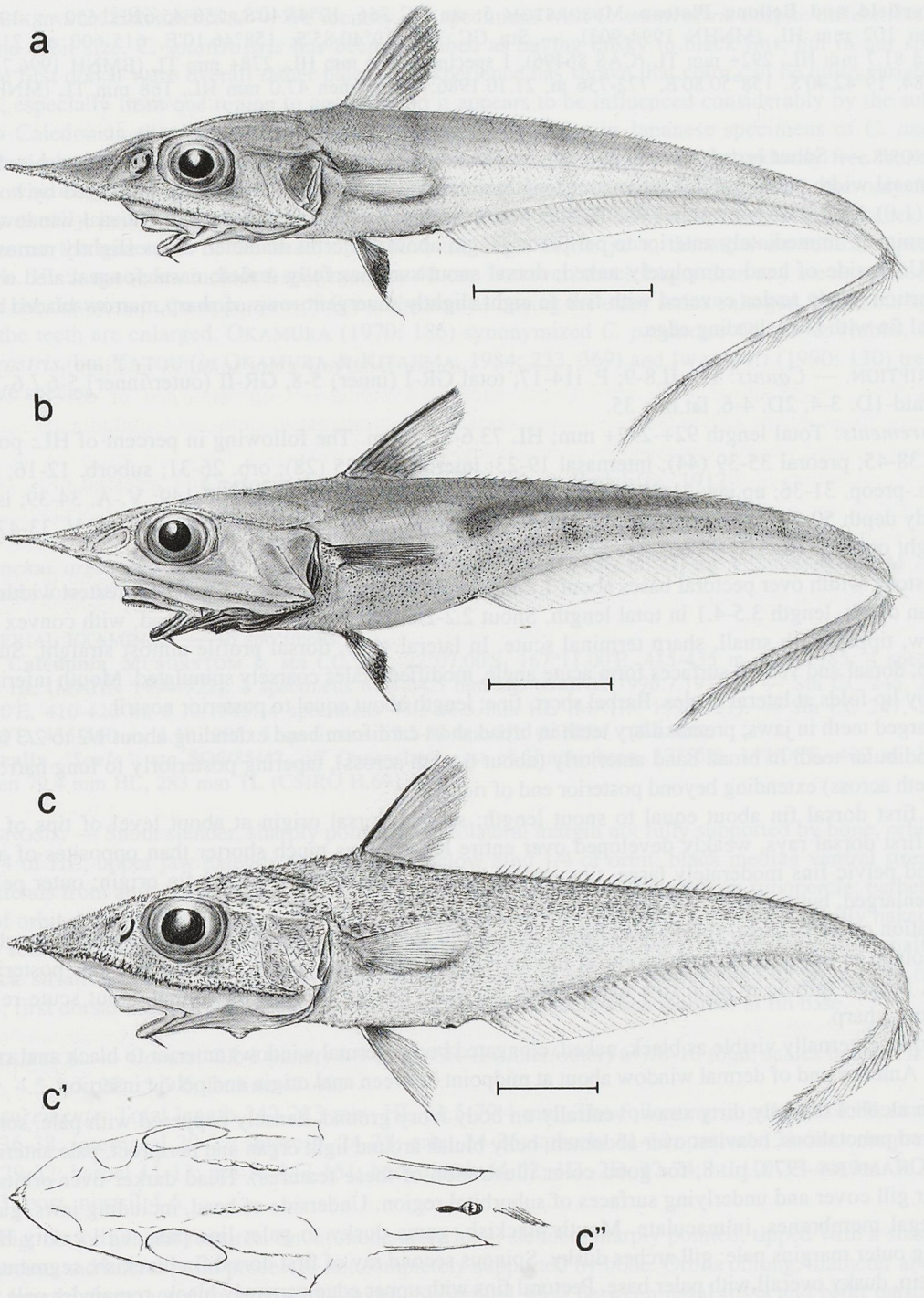


FIG. 6. — **a**, *Caelorinchus acutirostris* Smith & Radcliffe, 44.6 mm HL (MNHN 1996-961), off New Caledonia, MUSORSTORM 4, stn CC 245, 415-435 m. — **b**, *Caelorinchus argentatus* Smith & Radcliffe, 61.5 mm HL (BMNH 1996.7.19:2), off New Caledonia, MUSORSTOM 4, stn CC 245, 415-435 m. — **c**, *Caelorinchus anatirostris* Jordan & Gilbert, 81.7 mm HL (CAS 86496), off Chesterfield and Bellona Plateau, MUSORSTOM 5, stn CC 383, 615-600 m (**c'**, dorsal view of head, **c"**, anus area). Scales = 25 mm.

Chesterfield and Bellona Plateau: MUSORSTOM 5: stn CC 366, 19°45.40'S, 158°45.62'E, 650 m, 19.10.1986: 1 specimen 102 mm HL (MNHN 1994-903). — Stn CC 383, 19°40.85'S, 158°46.10'E, 615-600 m, 21.10.1986: 1 specimen 81.7 mm HL, 292+ mm TL (CAS 86496), 1 specimen 73.6 mm HL, 278+ mm TL (BMNH 1996.7.19:1). — Stn CC 384, 19°42.40'S, 158°50.80'E, 772-756 m, 21.10.1986: 1 specimen 47.0 mm HL, 168 mm TL (MNHN 1994-905).

DIAGNOSIS. — Snout broad, sharply pointed, moderately long, tipped with small, short scute, orbit about 1.3-1.8, internasal width about 1.9-2.3 into snout length; anterolateral margins completely supported by bone; orbit diameter (1.0) 1.1-1.4 of interorbital width. Subopercle terminates in long, slender tip. Dermal window of light organ prominent, immediately anterior to periproct, length about 1/3 orbit diameter. Anus slightly removed from anal fin. Underside of head completely naked; dorsal snout surfaces fully scaled; nasal fossa scaled over most ventral portion. Body scales covered with five to eight slightly divergent rows of sharp, narrow-bladed spinules. First dorsal fin with black leading edge.

DESCRIPTION. — *Counts*: 1D. II,8-9; P. i14-17; total GR-I (inner) 5-8, GR-II (outer/inner) 5-6 / 6-7; scales 1D. 5-6, mid-1D. 3-4, 2D. 4-6, lat.line 35.

Measurements: Total length 92+-292+ mm; HL 73.6-81.7 mm. The following in percent of HL: postrostral 58; snout 38-45; preoral 35-39 (44); internasal 19-23; interorb. 20-25 (28); orb. 26-31; suborb. 12-16; postorb. 30-33; orb.-preop. 31-36; up.jaw 21-27; barbel 6-10 (12); gill slit 10-11; pre-A. 147-149; V.-A. 34-39; isthm.-A. 56-61; body depth 50-54; 1D.-2D. 21-26; ht. 1D. 38-49; len. 1D. base 18-19; len. P. 44-48; len. V. 33-47; nostril 10; len. light organ 9-10.

Trunk stout, width over pectoral bases about 1.2 into greatest depth; head broad, robust, greatest width slightly greater than depth, length 3.5-4.1 in total length. Snout 2.2-2.6 into head, relatively broad, with convex sides in dorsal view, tipped with small, sharp terminal scute. In lateral view, dorsal profile almost straight. Suborbital ridge sharp, dorsal and ventral surfaces form acute angle, modified scales coarsely spinulated. Mouth inferior, gape restricted by lip folds at lateral angles. Barbel short, fine; length about equal to posterior nostril.

No enlarged teeth in jaws; premaxillary teeth in broad short cardiform band extending about 1/2 to 2/3 length of rictus; mandibular teeth in broad band anteriorly (about 6 teeth across), tapering posteriorly to long narrow band (about 4 teeth across) extending beyond posterior end of rictus.

Height first dorsal fin about equal to snout length; second dorsal origin at about level of tips of longest depressed first dorsal rays, weakly developed over entire length, rays much shorter than opposites of anal fin. Pectoral and pelvic fins moderately large, tips extend beyond vertical through anal fin origin; outer pelvic ray somewhat enlarged, but tapers to hair-fine tip.

Squamation overall coarse, spiny; head ridges strong and spiny. Spinules on body scales greatly overlapping, closely adjoined to one another, posteriormost tips infrequently free, increasing in height and size posteriorly on scale field, largest spinule in each row overlapping posterior margin of scale. Terminal snout scute relatively small, narrow, sharp.

Light organ externally visible as black, naked, elongated body (dermal window) anterior to black anal surround (periproct). Anterior end of dermal window about at midpoint between anal origin and pelvic insertion.

Color in alcohol dorsally dirty straw; ventrally on body ivory ground, densely peppered with pale, somewhat violet-colored punctations, heaviest over abdomen; belly bluish around light organ and periproct, pale anteriorly on chest (see OKAMURA 1970, pl. 8, for good color illustration of these features). Head darker over orbits; ivory ground over gill cover and underlying surfaces of suborbital region. Underside of head, including jaws, gular and branchiostegal membranes, immaculate. Mouth blackish, gums dusky to pale; lips pale. Gill cavity blackish except along outer margins pale; gill arches dusky. Spinous second ray of first dorsal fin blackish; segmented rays blackish at tip, dusky overall with paler base. Pectoral fins with upper edge narrowly black; remainder pale to light dusky. Pelvic fins pale, whitish to light dusky. Anal entirely pale, whitish.

SIZE. — To at least 43 cm TL.

DISTRIBUTION. — Southern Japan and East China Sea in 300-550 m; New Caledonia and Chesterfield and Bellona Plateau, in 600-855 m.

REMARKS AND COMPARISONS. — We identify our specimens with *C. anatirostris* despite differences in color, scales, and orbit size. *C. anatirostris* has been described as having dusky to black fins, but in our specimens, all but the first dorsal were overall rather pale. Our experience has shown that color can be quite variable within a species, especially from one region to another, and it appears to be influenced considerably by the substratum. Our New Caledonian specimens were overall very pale. The scales in Japanese specimens of *C. anatirostris* (as illustrated by OKAMURA, 1970, textfig. 80) appear to have spinules that are individually free from adjacent spinules, whereas in our specimens, the spinules, including the tips, are closely adjoined, the only free tip in each row usually being that of the last spinule. OKAMURA (1970: 187) noted two scale patches in larger specimens on the underside of the head, one above the angle of the jaws, the other on ventral aspects of the preopercle. His large series included specimens to 40 cm, however, much larger than any we examined. He also described the dentition in the upper jaw of *C. anatirostris* as having the outer series enlarged, but in our specimens, none of the teeth are enlarged. OKAMURA (1970: 186) synonymized *C. productus* Gilbert & Hubbs, 1916 with *C. anatirostris*, but YATOU (*in* OKAMURA & KITAJIMA, 1984: 233, 369) and IWAMOTO (1990: 130) treated each as separate species.

Caelorinchus argentatus Smith & Radcliffe, 1912

Fig. 6 b

Coelorhynchus argentatus Smith & Radcliffe, in RADCLIFFE, 1912: 137-138, pl. 31, fig. 1 (holotype USNM 72949; Sulu Sea, near Jolo; 582 m).

MATERIAL EXAMINED. — 16 specimens.

New Caledonia. MUSORSTOM 4: stn CC 245, 22°07.00'S, 167°11.00'E, 415-435 m, 3.10.1985: 4 specimens 51-67.5 mm HL (MNHN 1994-922): 2 specimens 61.5-64.5 mm HL (BMNH 1996.7.19:2-3). — Stn CC 246, 22°08.50'S, 167°11.50'E, 410-420 m, 3.10.1985: 4 specimens 44.5-66.5 mm HL (MNHN 1994-921). — Stn CC 247, 22°09.00'S, 167°13.30'E, 435-460 m, 4.10.1985: 5 specimens 62.5-83 mm HL (MNHN 1994-920).

Australia. *"Soela"*: stn SO6/85/47, off Queensland east of Hinchinbroo, 17°55'S, 147°06'E, 402 m, 29.11.1985: 1 specimen 79.4 mm HL, 283 mm TL (CSIRO H.691-02).

DIAGNOSIS. — Snout slender, sharply pointed; anterolateral margin not fully supported by bone; orbit diameter about 1/4 of HL; upper jaw extends posteriorly to below hind 1/4 of orbit; black median ventral streak of light organ extends from anus forward onto chest just behind isthmus; no projecting tab on subopercle; barbel about 1/2 or less of orbit. Underside of head naked except anterolateral margin of snout; nasal fossa wholly naked; spinules on body scales in widely divergent rows or in vaguely quincunx pattern. Faint dorsal stripe along half length of tail; black striations or punctations on gular membrane; mouth white; ventral edge of preopercle ridge often blackish; first dorsal fin dusky to blackish, spinous second ray black, no black border at fin base.

DESCRIPTION. — *Counts*: GR-I (inner) 8-9 total, GR-II (inner/outer) 6-7/8-10 total; scales below 1D. 8-9, mid-base 1D. 4.5-5.5, 2D. 5.5-6, lat.line 47-48.

Measurements: Total length 242-283 mm; HL 61.5-79.4 mm. The following in percent of HL: snout 44-45; preoral 36-38; internasal 20-22; interorb. 24-25; orbit 24-26; suborb. 11-12; postorb. 31-34; orb.-preop. 34-37; up. jaw 29-32; barbel 11-13; pre-A. 147-151; body depth 44-52; 1D.-2D. 22-24; ht. 1D. 33-44; len. P. 37-41; len. V. 28-33; post. nostril 4-6.

See Fig. 6b for general features. Snout moderately long, slender, sharply pointed, tipped with a sharp terminal scute; median and lateral nasal processes not completely supported by bone. Orbits oblong, diameter about 1.6-1.7 in snout length, about equal to interorbital width. Suborbital shelf between nasal fossa and orbit partially naked. Preopercle margin moderately angular, forming a moderate lobe. Gill opening relatively wide, extending forward to level of angle of lower jaws; gill membranes form a narrow free fold across isthmus.

Teeth small, fine, in long, moderately wide band in upper jaw, 6 or 7 teeth across widest point, extending to about end of rictus; in narrow band in lower jaw, about 4 teeth across widest point, extending slightly beyond end of rictus, inner teeth slightly larger.

First dorsal fin height less than postrostral length of head; pectoral and pelvic fins less than half head length; outer pelvic ray falling well short of anal origin. Second dorsal low throughout, height much less than well-developed anal fin.

Scales of head and body thin, finely covered with short, weak, erect, conical spinules. Those on body with spinules in irregularly quincunx pattern or in widely divergent rows. Scales over top of head with dense array of short spinules, most in somewhat divergent rows; a long, narrow, naked area immediately behind anterolateral snout margin; scales along anterolateral margin overlap broadly over ventral surfaces; median nasal ridge with slightly modified, somewhat rectangular-shaped scales covered with weak, short spinules. Suborbital ridge with modified scales, but spinules covering them not especially coarse and stout.

Luminescent organ long, expanded at each end, fully scale covered.

Color in alcohol. Body markings faint, somewhat blotchy over trunk; dorsum posteriorly from nape to about origin of second dorsal fin light brown. A rather faint, narrow stripe running dorsally below second dorsal fin, becoming narrower towards middle of tail and merging with dorsal profile; anterior end of stripe somewhat hockey-stick shaped, the head directed somewhat anteroventrally; seven or eight faint bands posteriorly on tail. Median nasal process black, readily visible through transparent head covering. Gular and branchiostegal membranes black, striated or reticulated pattern developed on former, outer border of latter pale. Jaws and lips blackish except at angle; mouth cavity immaculate; gill cavity dusky, heavily peppered over operculum. Black streak of ventral light organ slightly expanded around anus, extensively expanded at anterior end, forward to region behind isthmus. Second spinous ray of first dorsal and membrane immediately behind black or blackish to base, fin dark anteroventrally, pale posterodorsally; immediate base of fin rather pale. Pectoral fin light dusky, pale over ventralmost rays. Pelvic fin pale with small black botch at base and tip. In life, the ventral aspects of head and body probably widely silvery.

DISTRIBUTION. — So far known only from New Caledonia and Queensland coast of Australia, but may extend across northern Australia and into Indonesian waters (see Remarks concerning populations). Depth range 402-460 m.

SIZE. — Probably attains at least 30 cm TL.

REMARKS AND COMPARISONS. — We have identified our New Caledonian specimens as *C. argentatus*. However, in our examination of the holotype and several Sulu Sea specimens, we found slight differences in some measurements and counts from those taken from our New Caledonian and Queensland material: snout length (40-43% HL cf. 44-45%); preoral length (29-35% vs. 36-38%); postorbital length (33-37% vs. 31-34%); distance orbit to preopercle (35-42% vs. 34-37%); lateral line scales over a distance equal to predorsal length (35-44 vs. 47-48). These differences are so slight, however, that they might simply reflect individual variation and small sample size. The holotype and Sulu Sea specimens were so faded that pigmentation patterns could not be compared.

In the Western Australian region, there appear to be two "forms" of *C. argentatus*, although each may represent distinct species. Compared with the New Caledonian/Queensland specimens, one of these forms has a slightly shorter snout (41-44% HL), and slightly longer postorbital (34-36%) and orbit-to-preopercle distance (38-41%). The second form has somewhat shorter preoral length (33-37% HL), longer orbit-to-preopercle distance (36-41%), longer upper jaw (31-34%), longer barbel (12-16%), fewer lateral line scales (37-43), notable differences in body pigmentation, very sparse to absent spinulation on scales of the snout, and a gular membrane that lacks a striated pattern. These forms are currently being studied by IWAMOTO and Alan WILLIAMS for a comprehensive work on Western Australian grenadiers.

Caelorinchus celaenostomus McMillan & Paulin, 1993

Fig. 7

Caelorinchus celaenostoma McMillan & Paulin, 1993: 821-823, fig. 2 (New Zealand North Is., and Challenger Plateau in 606-975 m).

Coelorinchus sp. E - PAULIN *et al.*, 1989: 126 (in key).

MATERIAL EXAMINED. — 4 specimens.

Norfolk Ridge. BERYX 2: stn 3, Seamount B, 24°53.0'S, 168°22.3'E, 600-650 m, 24.10.1991: 1 specimen 57.9 mm HL, 224 mm TL (MNHN 1996-363, formerly NMNZ P.27431).

HALIPRO 2: stn 32, Mousquetaires Seamount, 25°19'S, 168°56'E, 697-1340 m, 12.11.1996: 1 specimen 143 mm HL, 52 cm TL (CAS 90982). — Stn 34, Mousquetaires Seamount, 25°23'S, 168°56'E, 643-1233 m, 12.11.1996: 1 specimen 116 mm HL, 32 cm TL (CAS 90670). — Stn 35, Mousquetaires Seamount, 25°23'S, 168°56'E, 640-740 m, 12.11.1996: 1 specimen 116 mm HL, 31 cm TL (CAS 90984).

DIAGNOSIS. — Snout long, about 2.5 into head length, laterally convex in dorsal view, bluntly tipped with small scute around which a small cluster of slightly coarsened scutelike scales; orbit about 1.7-1.8 in snout length, about 1.0 in interorbital width; internasal about 1.9 in snout length; anterolateral margins incompletely supported by bone; subopercle terminates in slender flexible flap. Light organ very small, scarcely noticeable as narrow naked margin anterior to anus. Underside of head completely and uniformly covered with small, finely spinulated scales, the spinules generally aligned in longitudinal series. Spinules on body scales narrow, closely imbricate, aligned in 4-8 divergent crestlike rows, largest spinule somewhat recurved bladelike. About 9 prominent saddle marks on body.

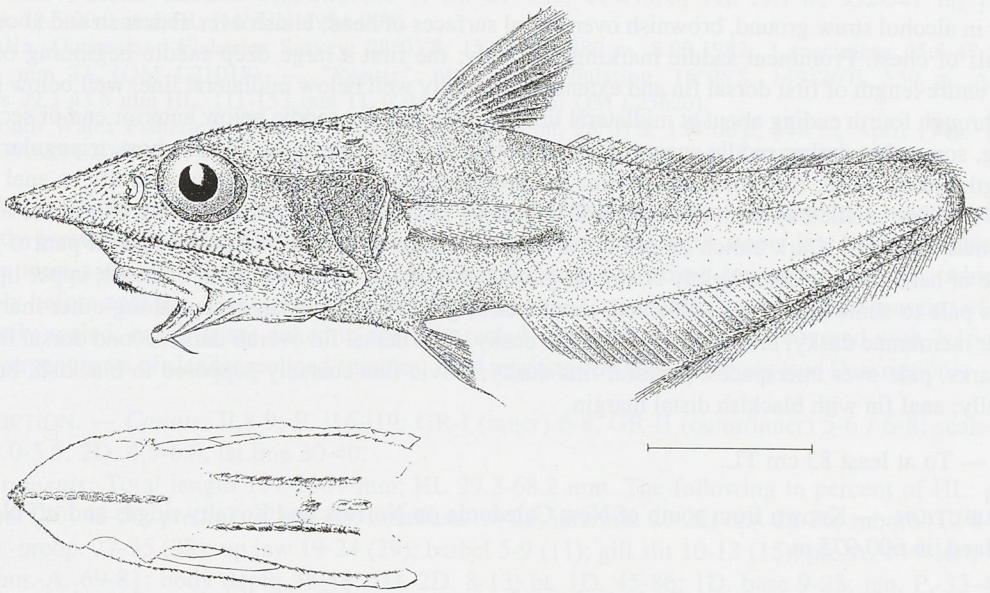


FIG. 7. — Juvenile of *Caelorinchus celaenostomus* McMillan & Paulin, 57.9 mm HL (MNHN 1996-363), Seamount B, southeast of New Caledonia, BERYX 2, stn 3, 600-650 m. Scale = 25 mm.

DESCRIPTION. — *Counts*: 1D. II,7-9; P. i16-i19; GR-I (inner) 8-10, GR-II (outer/inner) 6/8-9; scales 1D. 6.5, mid-1D. 4-7, 2D. 5.5-8, lat.line 37-43.

Measurements in mm: snout 40-52; preoral 30-45; internasal 12-20; interorb. 19-24; orb. 17-25; suborb. 8-14; postorb. 27-38; orb.-preop. 29-44; up.jaw 26-33; barbel 5-13; pre-A. 133-145; body depth 36-57; 1D.-2D. 13-23; ht. 1D. 32-50; len. base 1D. 13-19; len. P. 33-43; len. V. 21-45.

General features of fish seen in Fig. 7 and in original description. Head large, about 3.5-4 in total length, greatest width slightly less than snout length. Body depth about 6-6.5 in total length, equal to distance snout to midorbit. Mouth relatively large, upper jaw extends to or beyond vertical through posterior 1/3 of orbit; rictus little restricted posteriorly. Chin barbel small, tapering to filamentous tip.

Premaxillary teeth small except few larger ones peripherally at anterior end; in moderately broad bands occupying about 3/4 length of rictus. Mandibular teeth small, in long, broad, coarse band, which extends beyond end of rictus.

First dorsal fin about half length of head or less, spinous second ray with two small spinules at distal end of juvenile (MNHN 1996-363), but smooth in adults. Second dorsal begins close behind first, rays relatively well developed for genus, height about half that of corresponding anal portions. Anal fin well developed, origin below posterior end of first dorsal. Pectoral fin length less than half head length; extends posteriorly to below origin of second dorsal, well behind origin of anal. Inner rays of pelvic fin short, not extending to anus; outer ray slightly prolonged, extending to just beyond anal origin.

Head entirely scaled dorsally and ventrally; no naked grooves or naked areas atop snout; nasal fossa finely and fully scaled. Scales on top of head between orbits in 1-5 longitudinal divergent rows, middle row largest. Terminal snout scute small, heavy, forming with adjacent scales a broad, spiny cluster. Underside of snout covered with small, nonimbricate scales armed with crestlike rows of 1-4 erect, usually recurved, spikelike to somewhat caninelike spinules; scales posteriorly under suborbital and preopercle with spinule rows aligned so as to give somewhat striated appearance. Scales of dorsum below anterior end of second dorsal covered with 4-8, usually 7, in slightly divergent rows of narrow, conical to bladelike spinules, median row generally highest, posteriormost median spinule often larger than others on scale field.

Anus immediately in front of anal fin. A small light organ, externally visible as a small, blackish, partially naked area in front of anus; no fossa or dark midventral streak on belly and chest.

Color in alcohol straw ground, brownish over dorsal surfaces of head; bluish over abdomen and about one-third to one-half of chest. Prominent saddle markings on body: the first a large deep saddle beginning on nape and spanning entire length of first dorsal fin and extending ventrally well below midlateral line, well below pectoral fin (second through fourth ending about at midlateral line); second smaller saddle below anterior end of second dorsal; third long, somewhat darker saddle spanning about 9 longitudinal scale rows; fourth short, triangular, about one head length behind head; fifth long (about nine longitudinal scale rows), extending ventrally to anal base; sixth similar to fifth but smaller; seventh through ninth appearing more like widely spaced, long bands; the ninth ending as blackened tip of tail. Dark blotch on gill cover over opercle, subopercle and posterodorsal part of preopercle. Underside of head rather pale to lightly brownish-gray, darker along anterior margin of snout; upper lips blackish, lower lips pale to somewhat black splotched, mouth dark; gill cavity blackish except along outer margin. Barbel pale, gular membrane dusky; branchiostegals pale to dusky. First dorsal fin overall dark; second dorsal fin dark over saddle marks, pale over interspaces; pectoral fins dusky; pelvic fins coarsely peppered to blackish, but outer ray pale distally; anal fin with blackish distal margin.

SIZE. — To at least 83 cm TL.

DISTRIBUTION. — Known from south of New Caledonia on Norfolk and Loyalty ridges and off North Island, New Zealand, in 600-975 m.

REMARKS AND COMPARISONS. — *Caelorinchus celaenostomus* and *C. cylindricus* are the only two members of the genus from the New Caledonian region that have prominent saddlelike markings on the body. In the New Zealand region, several species have these saddle markings, but only *C. celaenostomus* McMillan & Paulin, 1993, has a long snout that is considerably longer than the orbit diameter and a completely scaled underside of head.

Comparison of the species with specimens of *C. quadricristatus* Alcock, 1891 from the Indian Ocean reveals a striking similarity in color pattern and squamation features, especially the following: spinule shape, arrangement and number of rows; completely scaled underside of head; nasal fossa scaled; upper surfaces of snout completely scaled; scales on interorbital space somewhat elongated, with spinules usually in a long longitudinal row flanked by shorter rows on each side. The list of shared features is considerable and include important diagnostic characters such as: incomplete support of anterolateral snout margin; second dorsal fin beginning close behind first; a small inconspicuous light organ; relatively large mouth with long premaxillary band of teeth and enlarged outer series; mouth and gill cavities dark; and most counts and many proportional measurements. The chief differences appear to lie in *C. quadricristatus* having a snout tipped with a sharper, narrower scute, absence of a black margin on the anal fin, and somewhat shorter first dorsal fin (1D. about 30-35% HL cf. 32-40%). Specimens of *C. quadricristatus* examined include: RUSI 14867 (2: 170-179 mm HL, 515+-522+ mm TL) from off Kenya in 738 m; RUSI 14087

(56.7-61.1 HL, 172+-172+ TL) from off Kenya; and ZMMGU P.12129 (60.4 HL, 171+ TL) from off the north end of the Andaman Islands. Data for a syntype (ZSI 13070, 56.5 HL, 128+ TL) were provided by Yuri N. SHCHERBACHEV (IOAN) and Yuri I. SAZONOV (ZMMGU).

Caelorinchus cingulatus Gilbert & Hubbs, 1920

Fig. 8

Coelorhynchus cingulatus Gilbert & Hubbs, 1920: 480-484, fig. 15 (holotype, USNM 78221; China Sea near Taiwan; 421 m).

MATERIAL EXAMINED. — 17 specimens.

New Caledonia. MUSORSTOM 4: stn CC 202, 18°58.00'S, 163°10.50'E, 580 m, 20.09.1985: 2 specimens 39-65 mm HL (MNHN 1994-907): 1 specimen 50 mm HL, 173+ mm TL (BMNH 1996.7.19:4), 1 specimen 68 mm HL, 290+ mm TL (CAS 86495).

Loyalty Islands. MUSORSTOM 6: stn DW 465, 21°03.55'S, 167°32.25'E, 480 m, 21.02.1989: 1 specimen 40.5 mm HL (MNHN 1994-908).

Wallis and Futuna Islands. MUSORSTOM 7: stn CP 559, 11°47.8'S, 178°19.1'W, 552-547 m, 19.05.1992: 2 specimens 19.5-20.0 mm HL (MNHN 1994-909).

Australia. Queensland Fisheries Survey: 28°03'S, 153°58'E, 480 m, 8.09.1982: 3 specimens 45.5-47.5 mm HL, 174+-190+ mm TL (QM I.21018). — *"Raptis"*: off Cape Tribulation, 16°08'S, 149°26'E, 550 m, April 1988: 3 specimens 29.3-43.6 mm HL, 111-153 mm TL (QM uncat., out of QM I.25620).

New South Wales Fisheries: *"Kapala"*, east of Danger Point, 28°01'S, 154°00'E, 548 m, April 1978: 1 specimen 61 mm HL (AMS I.20459-019), 3 specimens 24-40 mm HL, 93+-112 mm TL (AMS I.20459-014).

DIAGNOSIS. — Snout long, slender, 1.6-2.2 of orbit, anterolateral margin incompletely supported by bone; orbit slightly greater than interorbital width, much less than postorbital length; upper jaw less than orbit diameter; subopercle terminates in short, slender tip. Light organ long, extending forward almost to isthmus. Anus immediately before anal fin. Underside of head completely naked except along anterolateral margins of snout; top of snout fully scaled; nasal fossae naked to sparsely scaled ventrally. Body scales covered with 7-15 parallel to slightly divergent rows of slender reclined spinules. Bold markings on head and body (see Description).

DESCRIPTION. — *Counts*: II,8-9; P. i16-i19; GR-I (inner) 6-8, GR-II (outer/inner) 5-6 / 6-8; scales 1D. 5-7, mid-1D. 4.0-5.5, 2D. 4.5-6.0, lat.line 30-40.

Measurements: Total length 111-290+ mm; HL 29.3-68.2 mm. The following in percent of HL: postrostral 50-61; snout (40) 43-50; preoral (32) 34-45; internasal 18-20; interorb. 20-22; orb. 22-26; suborb. 12-14; postorb. 28-36; orb.-preop. 27-35 (38); up.jaw 19-24 (29); barbel 5-9 (11); gill slit 10-13 (15); pre-A. 144-164; V.-A. (33) 37-53; isthm.-A. 69-81; body depth 38-48; 1D.-2D. 8-13; ht. 1D. 45-86; 1D. base 9-23; len. P. 33-44; len. V. 32-45; nostril 4-9.

Body slender, somewhat cylindrical, width over pectoral bases slightly less than body depth; abdomen long, distance isthmus to anal fin greater than postrostral length of head; head width about equal to head depth. Snout sharply pointed, tipped with slender sharp scute. Suborbital ridge sharply defined, forming obtuse angle between stoutly scaled dorsal and naked ventral surfaces. Preopercle forms acute lobe posteroventrally. Mouth small, inferior; jaws restricted at lateral angles by lip folds; barbel slender, tapering to hair-fine tip, its length less than suborbital width.

Teeth all small, in broad short bands; premaxillary band extending about half length of rictus, mandibular band narrowing posteriorly, extending to end of rictus.

First dorsal fin high, spinous second ray greater than postrostral length of head; second dorsal high, rays almost as high, but not as thick, as opposites of well-developed anal fin. Pectoral and pelvic fins well developed, pectoral falls short of vertical through anus; outer pelvic ray extends to anus.

Body scales large, rather deciduous, densely covered with conical, slightly reclined spinules. Nasal fossa in most specimens naked or with small scales scattered along ventral edge; in a few specimens, scales more broadly cover ventral surface of fossa.

Light organ dilated at both ends, the anterior dermal window in shallow, scale-covered fossa.

Color in alcohol pale brownish gray to somewhat tawny on dorsum, pearl-white lateroventrally. Bold markings on body, notably a dark horizontal streak from posterodorsal margin of orbit passing below postorbital ridge to end of opercle, joining irregularly defined blotch over pectoral base that merges with diagonal band below first dorsal fin; band appears to join broad streak across first dorsal. A second fainter band below origin of second dorsal fin, followed by a darker diagonal band below 9th-12th ray, directed downward and forward in New Caledonian and smaller Queensland specimens to below midlateral line; in larger Queensland specimens, band directed down and posteriorly, extending faintly to above anterior end of anal fin. Fainter bands or saddles variously developed more posteriorly on tail. Underside of head completely pale; mouth, lips, gums, barbel, jaws creamish; underside of belly and chest darker, bluish to blackish. Dorsal fins darkened above body bands; second spinous ray of first dorsal pale near base but blackish along most of shaft, variably pale or dark distally. Pectoral fin clear to lightly dusky dorsally with thin, dark upper edge. Pelvic fins dusky, fairly dark in some specimens. Anal fin clear. Branchiostegal membranes dark dusky to blackish dorsally behind opercle and subopercle.

SIZE. — To about 30 cm TL.

DISTRIBUTION. — New Caledonia; off Queensland, Australia; China Sea off Taiwan; and Okinawa Trough. Depth range about 250-550 m.

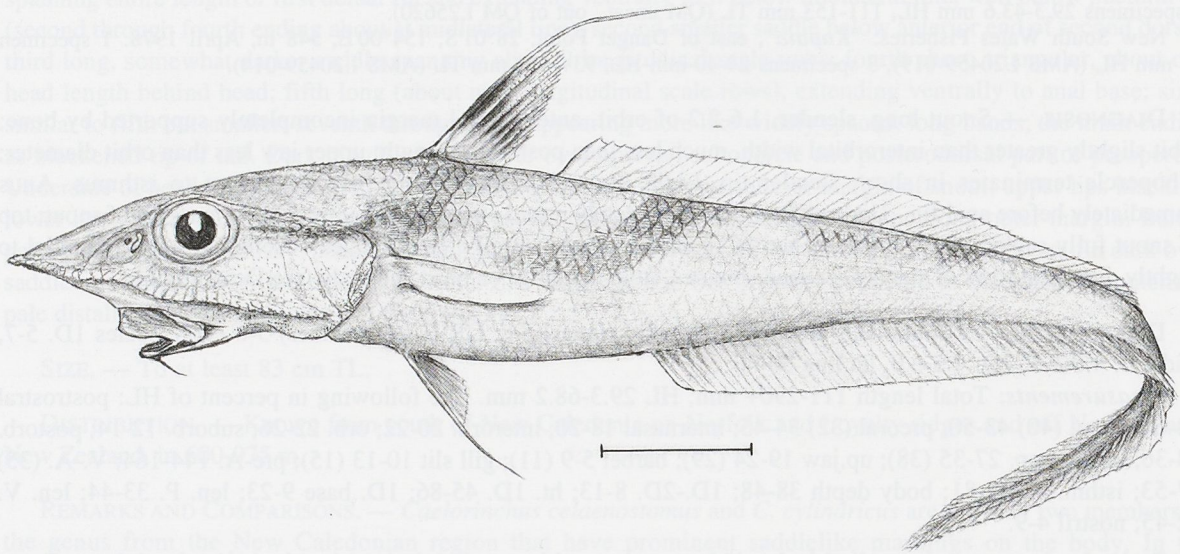


FIG. 8. — *Caelorinchus cingulatus* Gilbert & Hubbs, 61 mm HL (AMS I.20459-019), off Danger Pt., Queensland, Australia, 548 m. Scale = 25 mm.

REMARKS AND COMPARISONS. — Our New Caledonian and Queensland (Australia) specimens agree well with the original description of the species, which was based on two small specimens taken in the China Sea. In their description, GILBERT and HUBBS (1920: 483) described a dark oblique streak extending from the orbit to the preopercle angle that none of our specimens had. They also described the first dorsal fin as light dusky, without mention of the broad dark streak across the lower extent or the black membrane behind the spinous ray. The faded condition of the type specimens does not allow proper comparison of our specimens for these features, but the differences are so slight and agreement so strong, that we are confident of our identification. The small specimen described and figured by OKAMURA (*in* OKAMURA & KITAJIMA, 1984: 299, 366, pl. 161) from the Okinawa Trough agrees very closely with our specimens.

Caelorinchus cingulatus is closely similar to *C. spilonotus* Sazonov & Iwamoto, 1992, recently described from the Sala-y-Gomez Ridge in the southeastern Pacific. That species, however, lacks the anteroventrally directed bands

of *C. cingulatus*, the horizontal dark streak along the postorbital ridge, and the broad lateral streak on the first dorsal. The position of body bands differ, those in *C. spilonotus* being more forwardly placed (e.g., first band lies on nape anterior to first dorsal, second band below interspace of first and second dorsals). The first dorsal fin is also black-tipped, but otherwise pale, and somewhat shorter (34-49% of HL cf. 45-86%); the pelvic fin is somewhat shorter (27-39% HL cf. 32-45%).

Caelorinchus cylindricus sp. nov.

Fig. 9

MATERIAL EXAMINED. — 1 specimen.

Norfolk Ridge. BERYX 11: stn CP 4, seamount B, southeast of New Caledonia, 24°52.7'S, 168°21.8'E, 550-920 m, 14.10.1992: holotype, 42.2 mm HL, 192 mm TL (MNHN 1996-364).

DIAGNOSIS. — Snout shallow, somewhat dorsoventrally depressed; sharply pointed, tipped with small pointed terminal scute; orbit about 1.5 in snout length, about 1.2 of interorbital width; internasal about 2.0 in snout length; anterolateral margins completely supported by bone; orbit about 1.2 of interorbital width; mouth small, upper jaw about 1/4 of HL; subopercle terminates in short, acute angle without a prolonged tab. Anterior dermal window of light organ within large fossa far forward on chest, completely anterior to pelvic fin bases and lacking dark midventral streak connecting to periproct. Anus at anal origin. Underside of head entirely naked; nasal fossa naked except along ventral margin. Spinules on body scales narrow, spikelike to rather broadly bladelike, arranged in 9-11 parallel rows on scales below interspace between dorsal fins. A broad black blotch midlaterally on first dorsal; about 10 saddle marks on trunk and tail.

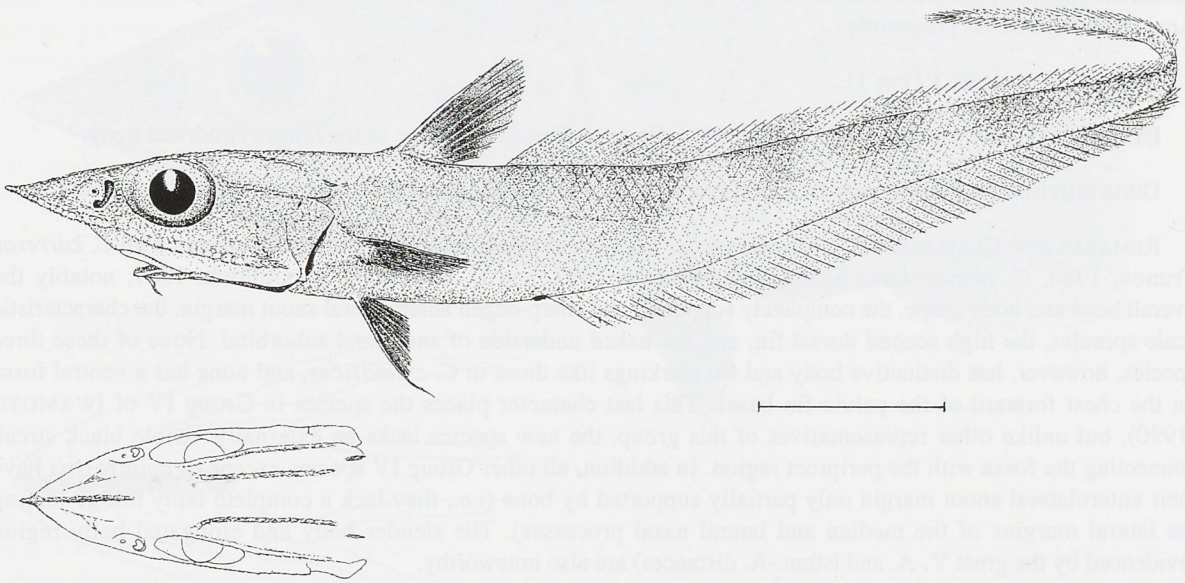


FIG. 9. — *Caelorinchus cylindricus* sp. nov., 42.2 mm HL, holotype (MNHN 1996-364), Seamount B, southeast of New Caledonia, BERYX 11, stn CP 4, 550-920 m. Scale = 25 mm.

DESCRIPTION. — *Counts*: 1D. II,9; P. i17/i17; GR-I (inner) 7, GR-II (outer/inner) 5/8; scales 1D. 8, mid-1D. 4.5, 2D. 6+1+11, lat.line 32.

Measurements in mm, percent HL in parentheses: postrostral 25.9 (61); snout 17.2 (41); preoral 16.3 (39); internasal 8.5 (20); interorb. 9.3 (22); orb. 11.5 (27); suborb. 5.8 (14); postorb. 14.0 (33); orb.-preop. 13.1 (31); up.jaw 10.1 (24); barbel 4.0 (10); pre-A. 68 (161); V.-A. 26 (62); isthm.-A. 38 (90); body depth 19 (45); 1D.-2D. 5.3 (13); ht. 1D. 23 (55); len. 1D. base 8.7 (21); len. P. 18 (43); len. V. 18 (43).

Head shallow, broad, greatest width about equal to greatest depth. Body rather terete, greatest width about equal to depth over anal fin origin; trunk long, anus behind head a distance equal to postrostral length of head. Barbel fairly stout at base, tapering to fine tip.

Short stout teeth in broad short bands in both jaws. No distinctly enlarged outer series in either jaw.

Height first dorsal less than postrostral length of head, no prolonged rays; spinous second ray with rudiment of a denticle near distal tip; second dorsal well developed throughout, height of fin rays about equal to opposites of anal fin. Tips of pectoral and pelvic fins fall well short of anus; outer pelvic ray filamentous, slightly prolonged. Origins of first dorsal and pelvic rays behind vertical through pectoral fin base, second dorsal begins close behind first dorsal, interspace less than length base of first dorsal.

Scales variable on body, those dorsally with spinules slender, spikelike and erect; scales ventrally on trunk and tail with broader bladelike spinules, often more reclined and in fewer rows. Dorsally on head, scales armed with short stout spinules in discrete, parallel, longitudinal rows, the spinules forming short comblike series. Dorsal surface of snout with narrow cleft on each side of median scaled section, but otherwise fully scaled; median nasal scaled ridge narrow. Head ridges with narrow, coarsened scales armed with stouter spinules than those on other scales. Small, elongated supraoccipical and postoccipital scutes developed.

Color in alcohol pale ground on body overlain with prominent saddle marks, most of which extend ventrally below lateral line. A faint saddle below origin of second dorsal followed by about eight more-prominent saddles. Trace of saddle marking below first dorsal fin. Scale pockets sharply outlined dorsally above midlateral line; fainter over abdomen and ventrally on tail; punctations rather heavy on tail below midlateral line. Chest and abdomen with bluish to violet tinge. Head dorsally somewhat swarthy; ventrally surfaces pale with small, scattered peppering; darker below snout tip. Gular membrane pale with scattered peppering; branchiostegal membrane black except along upper fringe. First dorsal fin dusky with black blotch midlaterally; second dorsal dark over saddle marks, paler between saddles. Pectoral and pelvic fins blackish. Anal fin dusky, darker posteriorly.

SIZE. — To at least 19 cm TL.

ETYMOLOGY. — From the Greek, *kylindros*, cylinder, roller, in reference to the long, cylindrical body.

DISTRIBUTION. — Known only from a single specimen collected on a seamount south of New Caledonia.

REMARKS AND COMPARISONS. — *Caelorinchus cylindricus* shares several important characters with *C. karrerae* Trunov, 1984, *C. immaculatus* Sazonov & Iwamoto, 1992, and *C. innotabilis* McCulloch, 1907, notably the overall head and body shape, the completely supported and sharp-edged anterolateral snout margin, the characteristic scale spinules, the high second dorsal fin, and the naked underside of snout and suborbital. None of these three species, however, has distinctive body and fin markings like those in *C. cylindricus*, and none has a ventral fossa on the chest forward of the pelvic fin bases. This last character places the species in Group IV of IWAMOTO (1990), but unlike other representatives of this group, the new species lacks an externally visible black streak connecting the fossa with the periproct region. In addition, all other Group IV species except *C. acutirostris* have their anterolateral snout margin only partially supported by bone (i.e., they lack a complete bony bridge joining the lateral margins of the median and lateral nasal processes). The slender body and elongated belly region (evidenced by the great V.-A. and isthm.-A. distances) are also noteworthy.

Caelorinchus kermadecus Jordan & Gilbert, 1904

Fig. 10

Coelorhynchus kermadecus Jordan & Gilbert, in JORDAN & STARK, 1904: 619 (reference to figure of specimen labeled *Macrurus parallelus* from Kermadec Islands in GÜNTHER, 1887, pl. 29, fig. A).

Coelorinchus kermadecus - PAULIN *et al.*, 1989: 126 (key to New Zealand macrourids). — MCMILLAN & PAULIN, 1993: 837 (key).

MATERIAL EXAMINED. — 2 specimens.

Norfolk Ridge and the Loyalties. BERYX 2: stn 7, Seamount K, south of New Caledonia, 24°42.0'S, 170°06.7'E, 802-833 m, 25.10.1991: 1 specimen 128 mm HL, 430+ mm TL (MNHN 1996-965, out of NMNZ P.27467), 1 specimen 140 mm HL, 486+ mm TL (NMNZ P.27467).

DIAGNOSIS. — Snout viewed dorsally broad, sides convex, dorsal profile of snout essentially straight from snout tip to orbits; snout length about 2.4-2.6 into HL, anterolateral margin incompletely supported by bone; orbit about 1.5-1.8 into snout, about equal to interorbital width; upper jaw extends to below hind 1/4 of orbits; subopercle forms slender flexible flap posteroventrally. Light organ very short, no external fossa. Anus removed by 2 scale rows from anal fin. Underside of head completely scaled; top of snout and nasal fossa scaled; no naked areas below orbit on suborbital shelf. Body scales large, with 4-7 subparallel slightly divergent rows of broadly triangular, imbricate spinules, middle row distinctly larger. Body medium grayish-brown overall, lacking whitish undersides except over jaws and gular membranes, which are somewhat dirty white; all fins dark dusky.

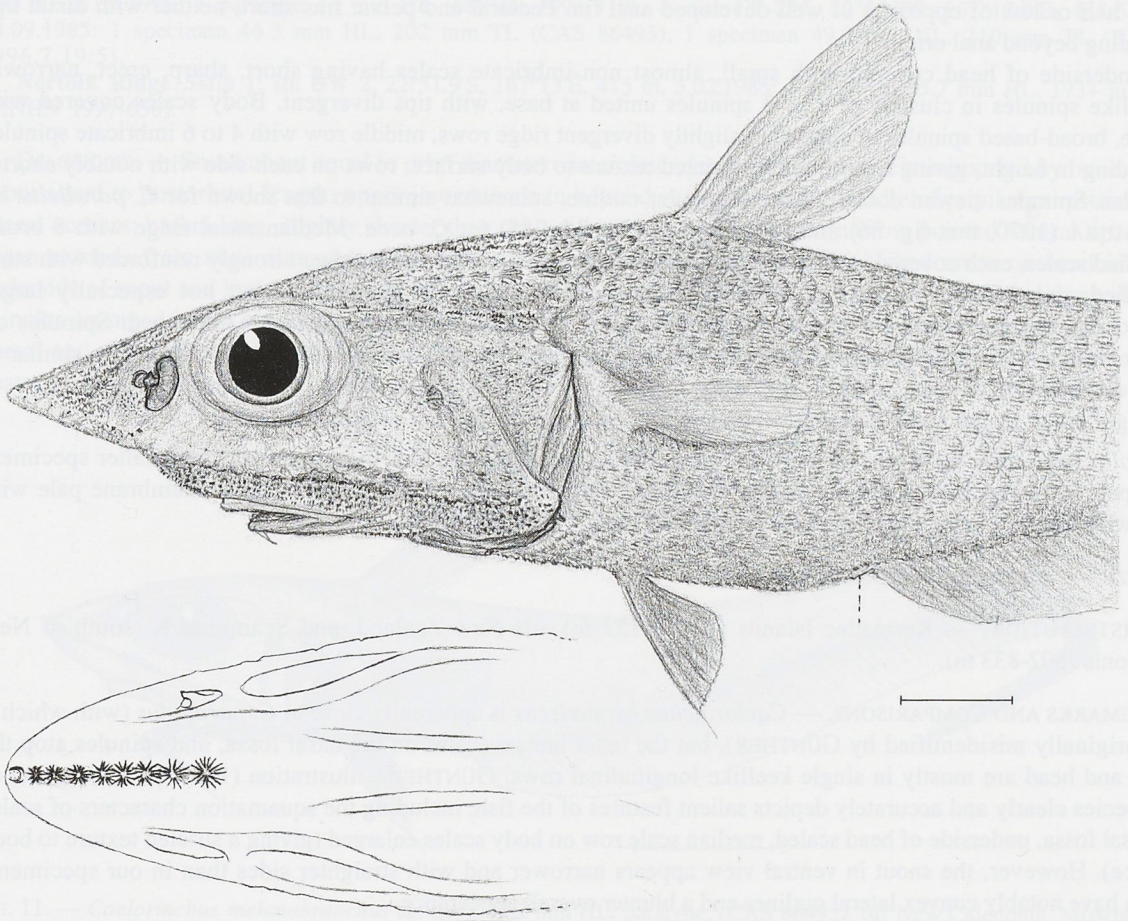


FIG. 10. — *Caelorinchus kermadecus* Jordan & Gilbert, 140 mm HL, 486+ mm TL (NMNZ P.27467), Seamount K, south of New Caledonia, BERYX 2, stn 7, 802-833 m. Scale = 25 mm.

DESCRIPTION. — *Counts*: 1D.II,8; P. i17-i18; GR-I (inner) 8-9, GR-II (outer/inner) 7 / 8-9; scales 1D. 6, mid-1D. 4.5, 2D. 5.5, lat.line 32-38.

Measurements: Total length 430+-486+ mm. The following in percent of HL: postrostral 61-62; snout 40; preoral 37-38; internasal 20; interorb. 25; orb. 25-26; suborb. 16; postorb. 36; orb.-preop. 39-40; up.jaw 27-28;

barbel 8-10; gill slit 13-14; pre-A. 141-150; V.-A. 45-476; isthm.-A. 69-73; body depth 51-55; ht. 1D. 44-45; len. 1D. base 17-18; len. P. 31-33; len. V. 33-40; nostril 8-10.

Head broad, about as wide as deep; body width across pectoral bases about 1.3 into greatest depth under first dorsal origin. Snout broadly spade-shaped viewed dorsally, acutely pointed in lateral profile, tipped with stout, blunt terminal scute (but possibly with protruding tip in smaller individuals with terminal scute complete). Suborbital ridge strong, heavily reinforced by coarsely modified spiny scales, sharply separating dorsal and ventral surfaces of head. Jaws inferior, mouth only slightly restricted at lateral corners by lip folds. Barbel small, fine, length slightly less than diameter posterior nostril.

Teeth in upper jaw in broad, short band, spanning somewhat more than half rictus length; mandibular teeth in holotype in cluster at anterior tip, narrowing abruptly to one or two irregular series posteriorly. In paratype, mandibular teeth in one to three irregular series. Mandibular teeth series long, extending past end of rictus.

First dorsal fin rather low, height much less than postrostral length of head; second dorsal low, height of rays about half or less of opposites of well-developed anal fin. Pectoral and pelvic fins short, neither with distal tips extending beyond anal origin.

Underside of head covered with small, almost non-imbricate scales having short, sharp, erect, narrowly bladelike spinules in clusters of 2 or 3 spinules united at base, with tips divergent. Body scales covered with coarse, broad-based spinules in parallel to slightly divergent ridge rows, middle row with 4 to 6 imbricate spinules ascending in height, giving longitudinally striated texture to body surface; rows on each side with notably shorter spinules. Spinules viewed dorsally have triangular outline, somewhat similar to that shown for *C. parallelus* by OKAMURA (1970, text-fig. 86) and IWAMOTO (1990, fig. 265) for *C. occa*. Median nasal ridge with 8 broad modified scales, each covered with low, radiating rows of spinules. Other head ridges strongly reinforced with stout modified scales. Posttemporal scute developed at anterior origin of lateral line, but not especially large; supraoccipital scute relatively inconspicuous. Scales along midline of nape somewhat thickened. Spinules on scales between parietal ridges erect, bladelike, aligned in 1 to 5 divergent, comblike rows. Small scales, similar to those on underside of head, cover most of nasal fossa.

Light organ length about half vertical diameter of posterior nostril, not externally visible.

Color uniformly light grayish brown. Fins all dark dusky. Mouth dark in larger, black in smaller specimen. Lips pale in larger, dark edged in smaller specimen. Barbel pale. Gill cavity black. Gular membrane pale with somewhat swarthy tinge; branchiostegal membranes dark.

SIZE. — Attains at least 58 cm TL.

DISTRIBUTION. — Kermadec Islands (1097-1152 m), off New Zealand, and Seamount K, south of New Caledonia (802-833 m).

REMARKS AND COMPARISONS. — *Caelorinchus kermadecus* is apparently close to *C. parallelus* (with which it was originally misidentified by GÜNTHER), but the latter has no scales on the nasal fossa, and spinules atop the snout and head are mostly in single keellike longitudinal rows. GÜNTHER's illustration (1887, pl. 29, fig. A) of the species clearly and accurately depicts salient features of the fish, including the squamation characters of scales on nasal fossa, underside of head scaled, median scale row on body scales enlarged (giving a striated texture to body surface). However, the snout in ventral view appears narrower and with straighter sides than in our specimens, which have notably convex lateral outlines and a blunter overall appearance.

The two New Caledonian specimens of *C. kermadecus* were compared with two paratypes of *C. smithi* Gilbert & Hubbs, 1920 (CAS-SU 23993) from the Sulu Sea. The two species appear superficially close and many diagnostic features agree. The chief difference between the two lies in the incompletely supported anterolateral snout margin in *C. kermadecus*. *C. kermadecus* also has a broader snout viewed dorsally, with convex sides and a blunt tip that blends in with the outline (protruding terminal snout scute in *C. smithi*, although young individuals of *C. kermadecus* may have a more acute terminal scute). The spinules on body scales are also broader-based in *C. kermadecus*, the greatest base width of the largest median spinule is about equal to its greatest height. The entire ridge of spinules appears broad, whereas in *C. smithi*, the spinules are narrow based and more erect, giving a

sharper, thinner spinule ridge, and the rows are much more divergent. Finally, the suborbital shelf and the median nasal ridge are distinctly narrower in *C. smithi.*

The widespread *C. acanthiger* Barnard, 1925, which has been recorded from New Zealand (PAULIN *et al.*, 1989), may be confused with *C. kermadecus* because of its close similarity in general morphology and in squamation features, but it can be differentiated by the lack of scales on the nasal fossa, the nakedness extending to the suborbital ridge.

Caelorinchus melanobranchus sp. nov.

Fig. 11

MATERIAL EXAMINED. — 5 specimens.

New Caledonia. MUSORSTOM 4: stn CP 216, off southern tip of New Caledonia, 22°59.5'S, 167°22.0'E, 490-515 m, 29.09.1985: holotype 41 mm HL, 210 mm TL (MNHN 1994-911). — Stn CP 213, 22°51.3'S, 167°12.0'E, 405-530 m, 28.09.1985: 1 paratype 33 mm HL (MNHN 1994-910). — Stn CP 215, 22°55.7'S, 167°17.0'E, 485-520 m, 28.09.1985: 1 specimen 46.3 mm HL, 202 mm TL (CAS 86493), 1 specimen 49.2 mm HL, 210 mm TL (BMNH 1996.7.19:5).

Norfolk Ridge. SMIB 1: stn DW 2, 22°51.9'S, 167°13'E, 415 m, 5.02.1986: 1 specimen 45.7 mm HL, 193+ mm TL (MNHN 1997-658).

DIAGNOSIS. — Snout about equal to orbit diameter; anterolateral margin incompletely supported by bone; orbit about equal to postorbital length; upper jaw extends to beyond vertical through middle of pupil, not restricted at lateral corners; barbel long, slightly shorter than orbit diameter; subopercle with narrow pointed ventral tip. Light organ extends from anus almost to isthmus. Anus immediately before anal fin. Naked areas on head include underside of snout and lower jaws, nasal fossae, and most of suborbital region. Body scales covered with needlelike spinules arranged in 10-14 more-or-less parallel rows, the individual spinules separate and non-overlapping. First dorsal and pelvic fins with distinct black tips; branchiostegal membrane with pronounced black blotch dorsally; posterior end of anal black; mouth pale.

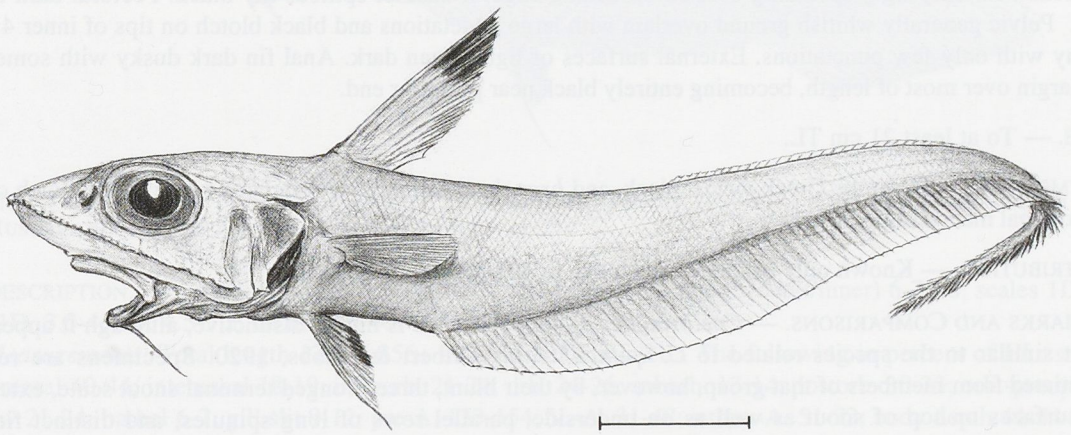


FIG. 11. — *Caelorinchus melanobranchus* sp. nov., 49.2 mm HL, paratype, (CAS 86493), off New Caledonia, MUSORSTOM 4, stn CP 215, 485-520 m. Scale = 25 mm.

DESCRIPTION. — *Counts*: 1D. II,9-11; P. i17-i18; total GR-I (inner) 7-10, GR-II (outer/inner) 6-9 / 8-9; scales 1D. 10-11, mid-1D. 6.5-7.5, 2D. 6.5-8, lat.line 42.

Measurements: Total lengths 193+-210 mm; HL 45.7-49.2 mm. The following in percent of HL: postrostral 67-69; snout 33-35; preoral 25-28; internasal 20; interorb. 19-20; orb. 32-35; suborb. 12-13; postorb. 34; orb.-preop. 33-34; up.jaw 34-35; barbel 26-30; gill slit 17-18; pre-A. 153-164; V.-A. 50-57; isthm.-A. 82-95; body depth 55-60; 1D.-2D. 13-14; ht. 1D. 70-78; len. 1D. base 27; len. P. 44-49; len. V. 42-52; nostril 9-10.

General features seen in Fig. 11. Body slender, greatest depth less than postrostral length of head. Head more than 4 in TL. Snout viewed laterally with gently convex dorsal and ventral profiles, from above, snout sides more convex; tip with rather blunt, 3-pronged terminal scute, median portion largest, 2 lateral prongs much smaller; leading edge of snout and suborbital ridge with row of embedded thickened scales passing to posterior angle; suborbital shelf well formed but lacking sharp ridgelike edge, posterior tip of ridge not protruding over remainder of preopercle bone. Barbel notably long and thick, gradually tapering and not forming hair-fine tip; more than twice least suborbital width.

Premaxillary band of teeth broad, about 3 to 4 teeth wide over most of length, tapering rapidly to posterior end; teeth all small, none especially enlarged. Mandibular teeth band about 3 teeth wide, tapering to 1 row.

First dorsal fin high, slightly greater than postrostral length. Pectoral and pelvic fins well developed, origin of former slightly before those of pelvic and first dorsal fins. Outer pelvic ray much thicker and longer than inner rays, extends posteriorly to anus. Origin of second dorsal fin close behind first dorsal; second dorsal fairly well developed anteriorly but height of anterior rays much less than opposites of well-developed anal fin.

Light organ of group IV type, as defined by IWAMOTO (1990), confined in a long midventral depression, anterior end expanded into broad oval fossa connected by groove or shallow channel to slightly expanded region immediately before small periproct area. Fossae and connecting groove lined with spinuleless scales.

Scales relatively small for genus, surfaces of head rather smoothly covered except for naked areas and ridges. Areas dorsally on each side behind anterolateral margins of snout, and area between median nasal and supranarial ridges naked. Scales of head ridges stouter than other head scales, but not especially spiny nor protruding. Body scales densely covered with slender, needlelike, slightly recurved and reclined spinules arranged in generally parallel rows, although some scales with spinule rows slightly divergent or convergent.

Color in alcohol somewhat grayish straw, darker over anterior portion of interorbital and at snout tip; abdominal region somewhat violet tinged, beneath whitish ventral surfaces. Lips, mouth, barbel, gills, and hyoid areas of gill cover pale; black blotch on branchiostegal, but gular and branchiostegal membranes otherwise dark dusky over exposed surfaces; opercle and part of subopercle blackish where black inner membranes show through. First dorsal black over tips of second spinous ray and anterior 3 rays; posteriorly and ventrally, fin membranes transparent with only light speckling over rays; leading edge of base of spinous ray black. Pectoral dark dusky overall. Pelvic generally whitish ground overlain with large punctations and black blotch on tips of inner 4 rays; outer ray with only few punctations. External surfaces of light organ dark. Anal fin dark dusky with somewhat paler margin over most of length, becoming entirely black near posterior end.

SIZE. — To at least 21 cm TL.

ETYMOLOGY. — From the Greek *melas*, black, and *branchos*, fish gills, in reference to the black blotch on the branchiostegal membrane.

DISTRIBUTION. — Known only off New Caledonia, in 405-530 m.

REMARKS AND COMPARISONS. — *Caelorinchus melanobranchus* is highly distinctive, although it appears to be most similar to the species related to *C. quincunciatus* Gilbert & Hubbs, 1920. Specimens are readily differentiated from members of that group, however, by their blunt, three-pronged terminal snout scute, extensive naked surfaces on top of snout as well as on underside, parallel rows of long spinules, and distinct fin and branchiostegal markings.

Caelorinchus parallelus (Günther, 1877)

Fig. 12

Macrurus parallelus Günther, 1877: 439 ("off Inosima" [Enoshima, Japan]; no holotype designated).

Macrurus (Coelorhynchus) parallelus - GÜNTHER, 1887: 125-127 (in part; Japan, Kermadec Is., and off New Zealand; no type specimens designated, but 8 specimens from "*Hyalonema*-ground, off Inosima, Japan, Station 232; depth 345 fathoms" should be considered syntypes; the Kermadec Islands specimens, stations 170A and 171 are considered syntypes of *Caelorinchus kermadecus* Jordan & Gilbert, 1904).

See IWAMOTO (1990: 179) for additional comments on synonymy.

MATERIAL EXAMINED. — 3 specimens.

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CP 323, 21°18.52'S, 157°57.62'E, 970 m, 4.10.1986: 1 specimen 105.5 mm HL, 356+ mm TL (MNHN 1996-957). — Stn CP 337, 19°53.80'S, 158°38.00'E, 412-430 m, 15.10.1986: 1 specimen 57.0 mm HL, 172+ mm TL (CAS 86487).

Japan: 1 specimen 77.5 mm HL, 255+ mm TL (CAS-SU 8300).

DIAGNOSIS. — Snout 1.7-1.9 of orbit diameter, anterolateral margin not completely supported by bone; orbit about equal to interorbital width, less than postorbital length; upper jaw less than one-quarter of head length; subopercle with a long, slender, flexible ventral tip. Light organ scarcely developed; no external dermal window nor dark median-ventral black streak. Anus immediately before anal fin. Underside of head covered with tiny scales armed with a single crestlike row of tall spinules; top of snout completely scaled; scales between parietal ridges covered mostly with elongated scales having longitudinal row of crestlike scales; few minute scales on nasal fossa. Body scales covered with broad spinules arranged in 6-9 parallel rows, middle row largest; the 6 or 7 spinules in middle row increasing in height posteriorly. Fins vary from dark dusky to rather pale; mouth dark.

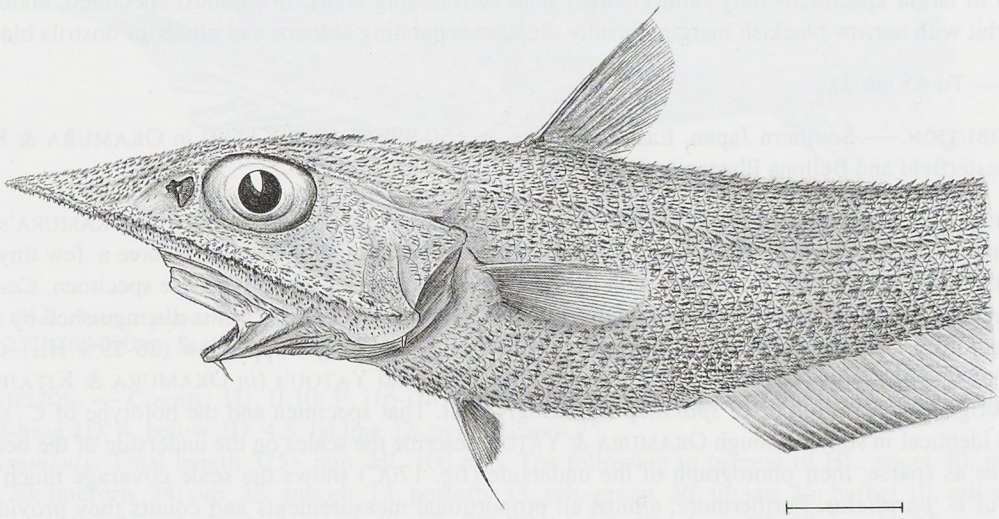


FIG. 12. — *Caelorinchus parallelus* (Günther), 105.5 mm HL (MNHN 1996-957), Chesterfield and Bellona Plateau, MUSORSTOM 5, stn CP 323, 970 m. Scale = 25 mm.

DESCRIPTION. — *Counts*: 1D. II,8-9; P. i17-i18; GR-I (inner) 8, GR-II (outer/inner) 6-7 / 8; scales 1D. 5.5-6, mid-1D. 3.5-4, 2D. 4.5-5.5, lat.line 35-40.

Measurements: Total length 172+ - 356+ mm, 55-105.5 mm HL. The following in percent of HL: snout 44-57; preoral 40-44; internasal 18-19; interorb. 21-24; orb. 24-26; suborb. 13-14; postorb. 30-33; orb.-preop. 30-33; up.jaw 21-24; barbel 6-7; gill slit 9-12; pre-A. 133-154; V.-A. 31-48; isthm.-A. 51-72; body depth 44-54 1D.-2D. 12-15; ht. 1D. 36-37; len. base 1D. 14-17; len. P. 36-37; len. V. 32-35; nostril 6-8.

The species is well described and illustrated by OKAMURA (1970: 198, pl. 42, text-fig. 86). Snout long, acuminate, ending in sharp spinous scute; viewed dorsally, margins of snout slightly concave near tip, but gently convex posteriorly. Head width about equal to height at isthmus. Mouth inferior, sides slightly restricted by lip folds; posterior end of maxilla under hind margin of orbit. Barbel small, slender.

Teeth all short, fine, none enlarged; those on upper jaw in broad short band, extending slightly more than half length of rictus; those on dentary in long narrow band, extending beyond end of rictus.

First dorsal rather low, height much less than postrostral length; interspace between first and second dorsal fins short, less than length base of first; second dorsal low throughout. Pectoral and pelvic fins short, each falling well short of anus. Anal fin well developed.

Underside of head extensively covered with small, non-imbricate scales having few (usually 2-4) erect, bladelike spinules, mostly in single row and closely adjoined, especially near base. Those between head ridges atop snout and orbits similar to those on underside of head, but with longer crestlike rows, and often with 2 or more parallel to slightly divergent rows. Ridge scales all strong, spiny; supraoccipital and posttemporal scutes moderately developed. Nasal fossa in Chesterfield and Bellona specimens with few tiny scales; that in Japan specimen (CAS-SU 8300) with substantially more and somewhat larger scales. Scales on mandibular rami sparse, confined posteriorly. Body scales as described and figured by OKAMURA (1970, text-fig. 86). Spinules bladelike with broad bases, in parallel rows, middle row largest with 3-5 highly imbricate spinules; rows immediately lateral often consisting of one slender, greatly reclined anterior spinule.

Light organ small, immediately before anus, length less than posterior nostril. Large specimen from station CP 323 (MNHN 1996-957; 356+ mm TL) had large fish (myctophid?) in stomach, in addition to remnant of small fish.

Color in alcohol overall medium to light brownish gray. Fins dusky, but anal somewhat blackish distally over anteriormost rays of large New Caledonian specimen. Mouth gray to blackish; lips dark or blackish; gill cavity and peritoneum black. Barbel pale; gular membranes darkish to pale; branchiostegal membrane blackish dorsally. Abdomen in larger specimens only faintly darker than surrounding areas; in smallest specimen, abdomen light bluish. Orbit with narrow blackish margin dorsally. Septum separating anterior and posterior nostrils blackish.

SIZE. — To 45 cm TL.

DISTRIBUTION. — Southern Japan, East China Sea, in 650-990 m (*fide* YATOU *in* OKAMURA & KITAJIMA, 1984); Chesterfield and Bellona Plateau in 412-970 m.

REMARKS AND COMPARISONS. — The two New Caledonian specimens agree well with OKAMURA's excellent description of *C. parallelus* and with a small CAS specimen from Japan. Our specimens have a few tiny scattered scales on the nasal fossae, which contrasts with the fairly numerous scales in the Japanese specimen. *Caelorinchus divergens* Okamura & Yatou, 1984 from the Okinawa Trough is closely similar but is distinguished by its shorter snout (about 40% HL), longer postorbital length (36-37% HL), and longer upper jaw (28-29% HL). Our Japan specimen of *C. parallelus* (CAS-SU 8300) follows OKAMURA and YATOU's (*in* OKAMURA & KITAJIMA 1984: 241-243) original description of *C. sparsilepis* strikingly well. That specimen and the holotype of *C. sparsilepis* are almost identical in size. Although OKAMURA & YATOU describe the scales on the underside of the head of their new species as sparse, their photograph of the underside (fig. 170C) shows the scale coverage much as in our specimen of *C. parallelus*. Furthermore, almost all proportional measurements and counts they provide in their table 19 fall within the ranges they give for *C. parallelus* in their table 18. The exceptions are the suborbital width (38% of orbit diameter, vs. 50-62.5% in *C. parallelus*) and orbit diameter (2.1 in snout, cf. 1.7-1.8).

Caelorinchus platorhynchus Smith & Radcliffe, 1912

Fig. 13

Coelorhynchus platorhynchus Smith & Radcliffe, *in* RADCLIFFE, 1912: 133-134, pl. 30, fig. 1, text-fig. 8 ("form alpha" in text-fig. 9 was referred to *C. acantholepis* by GILBERT and HUBBS, 1920: 488) (holotype USNM 72946, 387 mm TL; off Sipadan I., Borneo; 4°07'00"N, 118°49'54"E, 871 m).
Coelorhynchus platorhynchus - GILBERT & HUBBS, 1920: 486-487 (redescription).

MATERIAL EXAMINED. — 1 specimen.
Loyalty Islands. BIOGEOCAL: stn CP 232, 21°33.81'S, 166°27.07'E, 760-790 m, 12.04.1987: 1 specimen, 100 mm HL, 325+ mm TL (MNHN 1996-954).

DIAGNOSIS. — Snout about 2.5 into HL, broadly convex in dorsal view; anterolateral margin completely supported by bone; orbit diameter greater than interorbital width, less than postorbital length, 1.4 in snout length; upper jaw extends to hind margin of pupil; subopercle forms long, slender flap ventrally. Light organ small, length about equal to periproct region, much less than diameter of posterior nostril. Anus immediately before anal

fin. Underside of head covered with tiny non-imbricate scales armed with a single, high, crestlike row of 3-5 adjoined spinules; top of snout between ridges and nasal fossa covered with similar scales; scales on space between occipital ridges with mostly single, elongated, narrow, crestlike row of adjoined spinules. Body scales large, with 4 or 5 widely divergent rows of long, sharp, closely overlapping spinules; middle row largest; spinules increasing in height posteriorly, the last extending beyond posterior margin of scale. No prominent markings on body or fins.

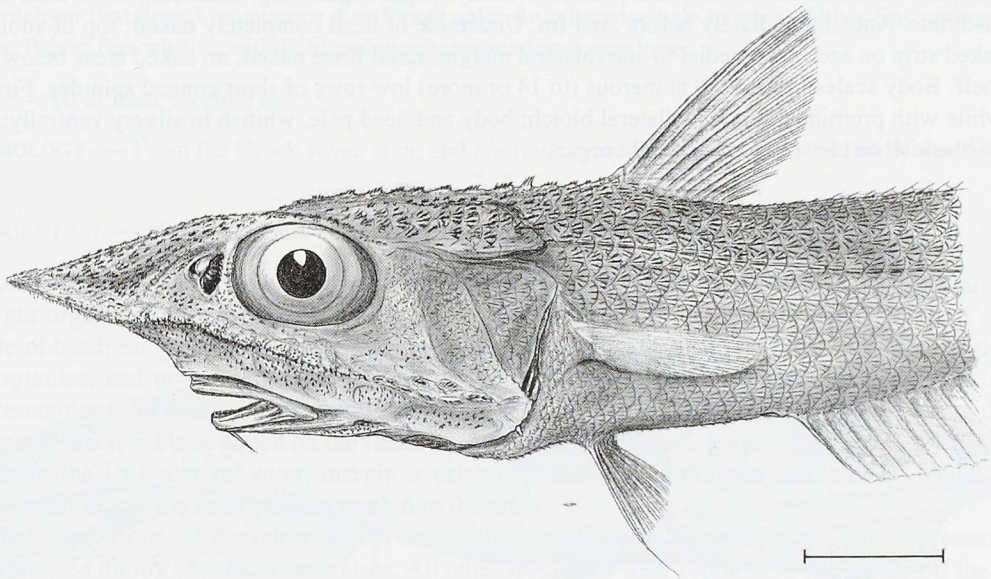


FIG. 13. — *Caelorinchus platorhynchus* Smith & Radcliffe, 100 mm HL (MNHN 1996-954), Loyalty Islands, BIOGEOCAL, stn CP 232, 760-790 m. Scale = 25 mm.

DESCRIPTION. — *Counts*: 1D. II,10; P. i16-i18; GR-I (inner) 8, GR-II (outer/inner) 7/9; scales below 1D. 5, below mid-base 1D. 4, below 2D. 4.5, lat.line 32; pyloric caeca 25.

Measurements: Total length 325+ mm; HL 100 mm. The following in percent of HL: snout 40; preoral 37; internasal 20; interorb. 24; orb. 28; suborb. 13; postorb. 33; orb.-preop. 36; up.jaw 26; barbel 10; gill slit 9; pre-A. 151; V.-A. 44; isthm.-A. 75; body depth 49; 1D.-2D. 22; ht. 1D. 49+; base 1D. 20; len. V. 27; nostril 8.

SIZE. — To 39 cm TL.

DISTRIBUTION. — Borneo, Philippines, Loyalty Islands, in 775-1033 m.

REMARKS AND COMPARISONS. — *Caelorinchus platorhynchus* has been well described by GILBERT and HUBBS (1920) and thus needs no repetition. The original illustrations (RADCLIFFE, 1912, pl. 30, fig. 1, and text-fig. 8) show important diagnostic features, especially the dorsal view of the head, where the broad, convex, scalloped margin of the snout and the peculiar, longitudinally aligned, crestlike rows of spinules are depicted.

The species appears to be closely similar in many diagnostic features with *C. smithi*, although that species has a more slender snout with slightly concave dorsal profile, and the scales on top of the head between the occipital ridges have several carinae, as opposed to the single keellike row on those scales in *C. platorhynchus*.

Caelorinchus semaphoreus sp. nov.

Fig. 14

MATERIAL EXAMINED. — 31 specimens.

New Caledonia. MUSORSTOM 4: stn CP 170, 18°57.0'S, 163°12.6'E, 485 m, 17.09.1985: holotype 104 mm HL, 335+ mm TL (MNHN 1996-956).

Australia. Queensland: *"Raptis"*, 17°30'S, 149°36'E, 420-445 m, April 1988: 21 specimens 108-240+ mm TL (QM I.25549), 8 specimens 197-307 mm TL (QM I.25546). — *"Soela"*: stn SO6/85/63, east of Flinders Reef, 17°31.2'S, 149°40.2'E, 402 m, 3 .12.1985: 1 specimen 162+ mm TL (CSIRO H.1188-06).

DIAGNOSIS. — Snout long, slender, 2.4-2.8 of orbit; anterolateral margin incompletely supported by bone; orbit about equal to interorbital width, much less than postorbital length; upper jaw extends to below hind margin of orbits; subopercle forms small short point posteroventrally. Light organ long, extending from anus to thorax just behind isthmus. Anus immediately before anal fin. Underside of head completely naked; top of snout scaled except for naked strip on each side medial to anterolateral margin; nasal fossa naked; no naked areas below orbit on suborbital shelf. Body scales large, with numerous (to 14 or more) low rows of short conical spinules. First dorsal fin pale to white with prominent black midlateral blotch; body and head pale, whitish to silvery ventrally; no bold marks except blackish on chest and around light organ.

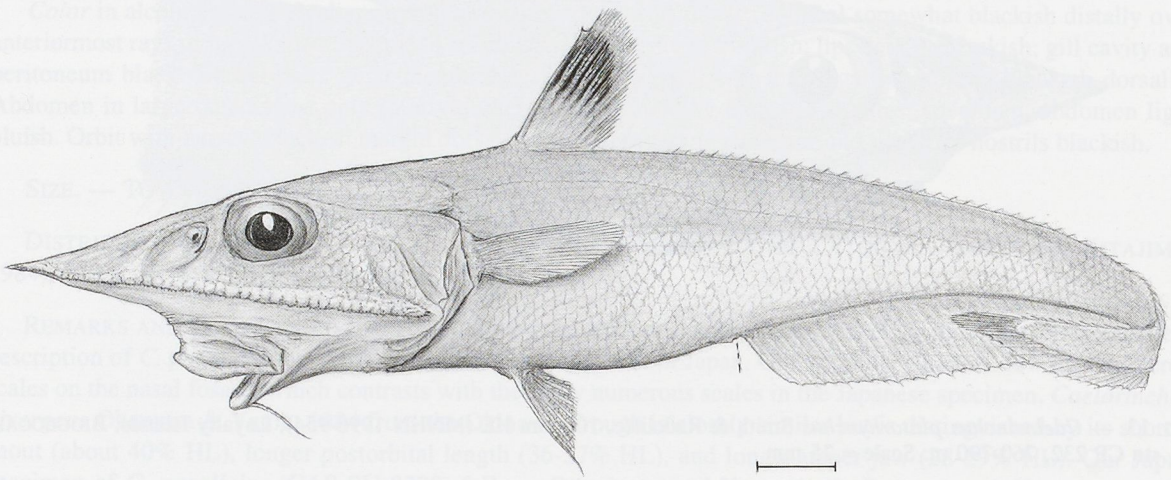


FIG. 14. — *Caelorinchus semaphoreus* sp. nov., 104 mm HL, holotype (MNHN 1996-956), off northwest point of New Caledonia, MUSORSTOM 4, stn CP 170, 485 m. Scale = 25 mm.

DESCRIPTION. — *Counts*: 1D. II,8-10; P. i14-i16; GR-I (inner) 7-8, GR-II (outer/inner) 5 / 7; scales 1D. 5-7, mid-1D. 4-6, 2D. 4.5, lat.line 45-48.

Measurements: Total lengths 119-307+ mm; HL 34.1-104 mm. The following in percent of HL: snout 47-53; preoral 37-52; internasal 16-21; interorb. 18-21; orb. 18-21; suborb. 11-13; postorb. 28-34; orb.- preop. 31-36; up.jaw 21-27; barbel 7-10 (17); gill slit 10-14; pre-A. 142-160; V.-A. 46-59; isthm.-A. 64-82; body depth 34-47; 1D.-2D. 11-17; ht. 1D. 32-37; len. base 1D. 11-18; len. P. 25-40; len. V. 24-36; nostril 4-8.

Body slender, somewhat cylindrical, width over pectoral bases almost equal to greatest depth of body; head width slightly greater than head depth. Abdomen long, distance isthmus to anal fin origin much greater than postrostral length. Snout sharply pointed, tipped with a narrow, spear-head shaped scute. Suborbital ridge sharply defined, forming obtuse angle between stout dorsal shelf and scaleless underside of head. Preopercle forming relatively narrow pointed lobe. Mouth small to moderate, 1/5 to 1/4 head length, jaws somewhat restricted laterally by lip folds; barbel short, finely tapered, its length less than least suborbital width.

Teeth all small, in broad short bands in premaxillary, extending about 2/3 length of rictus; mandibular band long, broad, 5 or 6 teeth across midlength, tapering posteriorly, extending well beyond end of rictus.

First dorsal fin low, height less than snout length; second dorsal much lower than anal fin; pectoral and pelvic fins rather small, each falling well short of vertical through anus.

Body scales relatively large, margin of scale pockets well marked dorsally. Larger body scales covered with low, slightly divergent rows of minute spinules, the longer rows with 12-18 spinules. Head scales generally stout, adherent, uniformly covered with short, erect, conical spinules, with slightly recurved tips. Modified scales on

ridges of head stout, strong, but not especially prickly. Scales over light organ fossae and midventral groove lack spinules.

Light organ prominent, dilated at each end into oval fossa with shallow connecting groove.

Color in alcohol light brown to grayish brown dorsally, paler laterally and ventrally, pearl-white to creamish over ventral 1/2 to 2/3 of trunk and tail, dark anteriorly on chest and midventrally on abdomen. Underside of head light dusky. Mouth, lips pale; gill cavity dark on medial wall, dusky laterally, pale along margin of gill cover. Black blotch on first dorsal on anterior 4 or 5 rays only; fin otherwise pale to white. Other fins without prominent markings. Pelvic fins whitish with faint melanophores scattered near base.

SIZE. — To at least 34 cm TL.

ETYMOLOGY. — From the Greek *sema,* sign, and *phoreus*, bearer; in reference to the boldly marked first dorsal fin.

DISTRIBUTION. — New Caledonia and Queensland, Australia, in 420-445 m.

REMARKS AND COMPARISONS. — *Caelorinchus semaphoreus* falls in that group of species characterized by: a long light organ extending from the anus to just behind the isthmus; a long, slender, acuminate snout; naked underside of head; bony support of anterolateral snout margin not complete; thin scales covered with short, fine, conical spinules; and no prominent pectoral blotch on trunk. In the lack of prominent body markings, it most closely resembles *C. argentatus* and its close relatives, but *C. semaphoreus* differs substantially from those species in having a distinctive black blotch on the first dorsal fin, a smaller barbel, longer snout, no characteristic series of scales along the anterolateral snout margin overlapping onto the ventral surface, and no naked area on the suborbital shelf below the anteroventral margin of the orbit.

The holotype, from off the northwestern end of the New Caledonian shelf, is the only representative of the species collected during MUSORSTOM cruises. All other specimens were captured in two trawls off the Queensland coast of Australia.

Caelorinchus sereti sp. nov.

Fig. 15 a, a'

MATERIAL EXAMINED. — 8 specimens.

New Caledonia. BIOCAL: stn CP 75, 22°18.65'S, 167°23.30'E, 825 m, 4.09.1985: holotype 116.5 mm HL (MNHN 1994-925). — Stn CP 32, 23°06.98'S, 166°51.20'E, 825 m, 29.08.1985: 1 paratype 97 mm HL, 360+ mm TL (CAS 86492).

Loyalty Islands. BIOGEOCAL: stn 232, 21°33.81'S, 166°27.07'E, 760-790 m, 12.04.1987: 1 paratype 99.6 mm HL, 347+ mm TL (CAS 86484).

MUSORSTOM 6: stn CP 427, 10°23.35'S, 166°20.00'E, 800 m, 17.02.1989: 1 paratype 131 mm HL, 450 mm TL (BMNH 1996.7.19:6).

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn DW 337, 19°53.80'S, 158°38.00'E, 412-430 m, 15.10.1986: 2 paratypes 114.0-114.5 mm HL (MNHN 1994-924). — Stn CC 384, 19°42.40'S, 158°50.80'E, 772-756 m, 21.10.1986: 1 paratype 61.5 mm HL (MNHN 1994-923), 1 paratype 121 mm HL (MNHN 1994-926).

DIAGNOSIS. — Snout long, narrow, sharply pointed; orbit about 1.4, internasal about 2.0 into snout length; anterolateral margin completely supported by bone. Orbit diameter 1.2 of interorbital width. Mouth small, upper jaw slightly less than orbit diameter. Subopercle terminates in long slender tip. Dermal window of light organ small but prominent, external length about equal to length posterior nostril. Anus slightly removed from anal fin. Underside of head covered with small prickly scales except along margins; nasal fossa and top of snout scaled. Body scales with 6 to 8 widely divergent spinule rows, middle row largest. First dorsal dark dusky, other fins dusky; body lacking distinctive markings in adults, but with faint to prominent saddles in young; mouth black, gums dark.

DESCRIPTION. — *Counts*: 1D. II,9; P. i17; total GR-I (inner) 9, GR-II (outer/inner) 7/9; scales 1D. 5, mid-1D. 3.5, 2D. 6, lat.line 33.

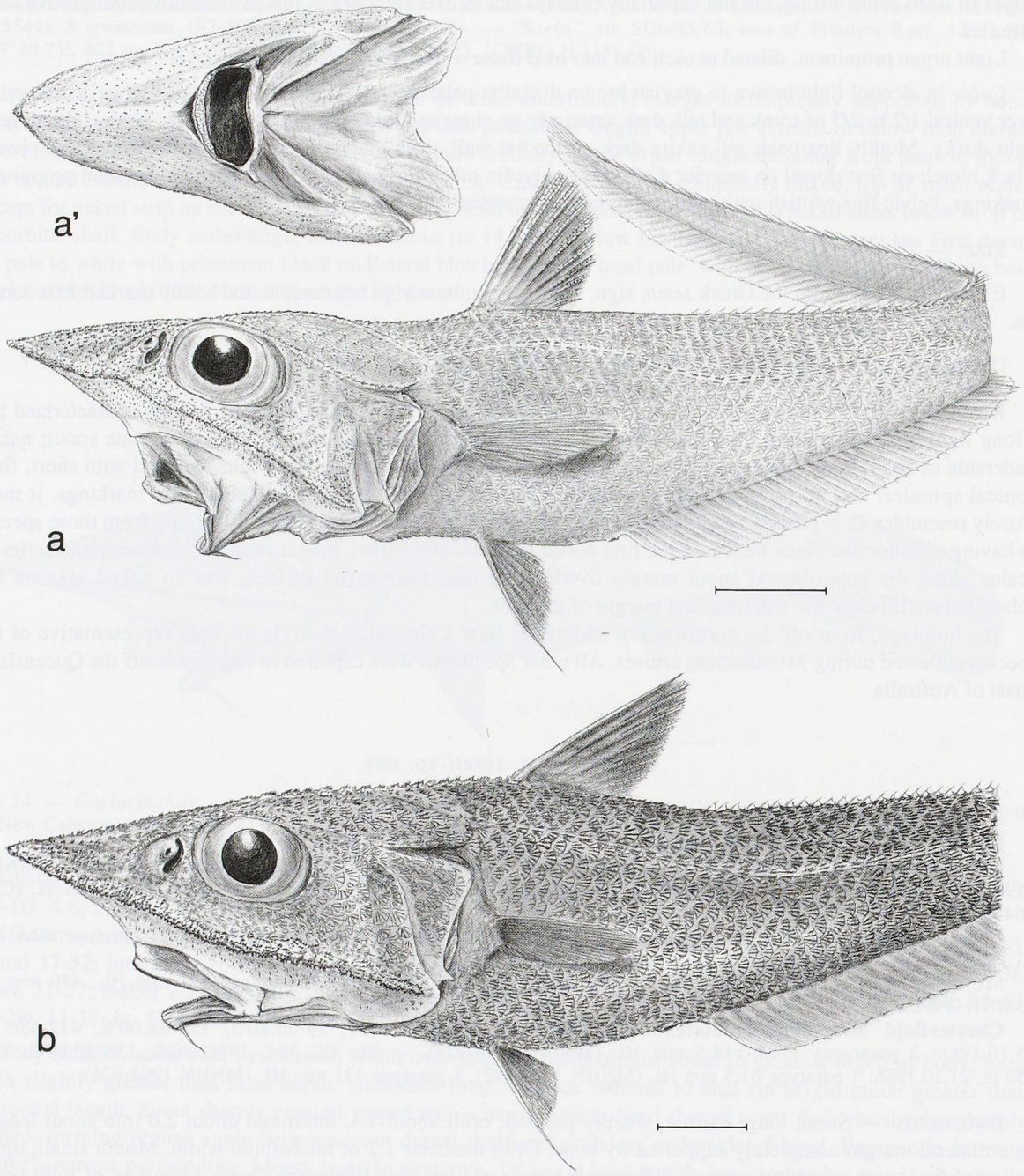


FIG. 15. — **a**, *Caelorinchus sereti* sp. nov., 97 mm HL, paratype (CAS 86492), New Caledonia, BIOCAL, stn CP 32, 825 m; and **a'** ventral view of head. — **b**, *Caelorinchus shcherbachevi* sp. nov., 126 mm HL, holotype (MNHN 1996-966), Seamount K, south of New Caledonia, BERYX 2, stn 9, 797-811 m. Scales = 25 mm.

Measurements: Total lengths 347+-459 mm; HL 61.5-131 mm. The following in percent of HL: snout 38-46; preoral 36-41; internasal 19-22; interorb. 21-25; orb. 26-29; suborb. 12-14; postorb. 26-33; orb.-preop. 29-36; up.jaw 22-27; barbel 8-13; gill slit 12-13; pre-A 154-156; V.-A. 41; isthm.-A. 62-67; body depth 53-56; 1D.-2D. 25; ht. 1D. 35-54; len. 1D. base 16-19; len. P. 37-50; len. V. 38-54; nostril 9.

Width over pectoral bases about 1.3 into greatest depth; head about 2.5 into total length; snout relatively narrow, gradually tapering to broad head, width over opercles slightly more than head depth. Preopercle forming rather narrow lobe posteroventrally; posterior tip of subopercle directed obliquely downward. Mouth gape wide, almost equal to horizontal orbit diameter, restricted at lateral angles by lip folds. Barbel short, fine, about equal to posterior nostril.

Small teeth in bands in both jaws; premaxillary band short, broad, 5 or 6 teeth across, extending about 2/3 length of rictus. Mandibular band long, narrow, 3 or 4 teeth across, extending beyond end of rictus.

Height of first dorsal fin much less than postrostral length of head; second dorsal weakly developed, rays much shorter than opposites of anal fin, which are well developed. Pectoral and pelvic fins moderate in size, longest rays of each fin extend about to origin of anal fin.

Underside of head covered with small, almost non-imbricate scales having short, sharp, erect, bladelike spinules in crestlike divergent rows; broad naked margin in front and around sides of mouth; anterior end of mandible naked; posteriorly, small scales cover median strip. Nasal fossa dotted with minute scales, each with few short, erect, conical to bladelike spinules. Scales atop snout and head with bladelike, erect spinules arrayed in divergent rows. Scales on trunk dorsally with broader, more reclined spinules, generally trihedral in cross section; spinules arrayed in widely divergent rows, middle row usually slightly higher than lateral rows; each row with 4 to 9 spinules.

Broad, short dermal window of light organ immediately anterior to anus, its anterior end about at midpoint between anal origin and pelvic insertion.

Color in alcohol light sandy-brown overall, paler ventrally, somewhat darker dorsally on head; belly (but not chest) somewhat darker; periproct and light organ black. Black lining of gill chamber showing through gill cover and branchiostegal membranes. Mouth entirely black; lips generally pale with streaks of blackish; membrane connecting premaxillary and maxillary black; maxillary dark, but terminal end pale. Barbel pale.

SIZE. — To at least 45 cm TL.

ETYMOLOGY. — Named for Bernard SÉRET, ORSTOM, in recognition of his studies of deep-sea fishes, his efforts in collecting deep-sea fishes off New Caledonia, and for making the grenadiers from those collections available to us.

DISTRIBUTION. — New Caledonia and Chesterfield and Bellona Plateau, in 412-825 m.

REMARKS AND COMPARISONS. — *Caelorinchus sereti* superficially resembles *C. flabellispinis* (Alcock, 1894a) and *C. trunovi* Iwamoto & Anderson, 1994, but differs primarily in its short premaxillary teeth band, which in the other two species is long, tapered, and spans most of the length of the rictus. The underside of the head in the two Indian Ocean species is also more fully scaled compared with *C. sereti*, the jaws are somewhat longer (maxillary extends to below hind edge of pupil, cf. about midorbit or slightly posterior), and the mouth is pale to grayish overall (not black).

Caelorinchus smithi Gilbert & Hubbs, 1920 shares many features with *C. sereti* but differs in having a more pointed snout, with long, slender terminal scute, and a completely scaled underside of head. *C. japonicus* (Temminck & Schlegel, 1842) is also closely similar, but it has a longer snout (slightly less than twice orbit diameter) and spinules on most scales between the occipital ridges are in single keellike rows (vs. divergent rows).

Caelorinchus shcherbachevi sp. nov.

Fig. 13 b

MATERIAL EXAMINED. — 3 specimens.

Loyalty Ridge. BERYX 2: stn 9, Seamount K, 24°44.55'S, 170°07.00'E, 790-825 m, 26.10.1991: female holotype 126 mm HL, 460+ mm TL (MNHN 1996-966, formerly NMNZ P.27508). — Stn 9, same data as for holotype: 1 paratype 118 mm HL, 435 mm TL (NMNZ P.27508).

HALIPRO 2: stn BT 13, Espoir Seamount, 24°18'S, 169°57'E, 805-835 m, 8.11.1996: 1 specimen 122 mm HL, 435+ mm TL (CAS 90995).

DIAGNOSIS. — Snout 2.5 in HL, viewed dorsally somewhat duck-bill shaped, lateral margins convex, completely supported by bone; terminal scute blunt; orbits large, about equal to interorbital width, 1.6-1.7 in snout. Subopercle terminates in slender acute flap. Dermal window of light organ prominent, immediately anterior to periproct, length about 1/3 orbit diameter. Anus slightly removed from anal fin. Underside of head covered with numerous dark filamentous and flaplike papillae; almost entirely naked except for patch above end of lower jaw and at end of preopercle; nasal fossa scaled over entire ventral surfaces. Spinules on body scales strong, bladelike, with broad buttresses; arranged in 4 or 5 divergent rows. First dorsal fin uniformly dark; other fins dark to dusky; mouth dark.

DESCRIPTION. — *Counts* (holotype first, if different): 1D. II,10, II,9-10; P. i16, i17-i18; total GR-I (inner) 8, 8-9, GR-II (outer/inner) 6/9, 8-9; scales 1D. 5.5, mid-1D. 4.5, 3.5-4.5, 2D. 5.5, 4.5-6.0, lat.line 33, 35.

Measurements: Total length 460+, 435-435+ mm, HL 126, 118-122 mm. The following in percent of HL (holotype first): snout 41, 42-42; preoral 35, 36-36; internasal 22, 20-22; interorb. 26, 25-26; orbit 25, 25-26; suborb. 14, 13-14; postorb. 35, 34-35; orb.-preop. 37, 37-38; up.jaw 29, 29-31; barbel 9, 9-10; gill slit 15, 14-15; pre-A. 148, 154-156; V.-A. 47, 47-49; isthm.-A. 76, 80-80; body depth 60, 48-54; 1D.-2D. 22, 20-22; ht. 1D. 51, 45+-48; len. base 1D. 21, 18-22; len. P. 37, 37-38; len. V. 36, 36-37; nostril 8.

Head large, stout, about 3.7 in TL; greatest width about equal to greatest height, much less than postorbital length; trunk moderately deep, width over pectoral bases about 1.3-1.4 in greatest depth. Snout viewed laterally shallow, sharply pointed, stoutly reinforced by scutelike scales, lateral margins sharp edged, underside somewhat concave in preserved specimens; dorsal profile straight. Mouth inferior, gape wide, scarcely restricted by lip folds; upper jaw extends posteriorly to below hind margin of pupil. Barbel short, fine, about 1/3 orbit diameter.

Teeth in cardiform bands in both jaws; teeth band in upper jaw broad, spanning about 3/5 length of rictus, that in lower jaw narrower, extending posteriorly beyond end of rictus. None of teeth enlarged.

Height of first dorsal about half head length, considerably more than postorbital length; second dorsal separated from first by distance about equal to or slightly more than length base of first dorsal; rays of second dorsal low throughout. Pectoral and pelvic fins rather short, tips of each falling short of vertical through anal fin origin; pectoral origin slightly in advance of pelvic origin, the 2 in advance of first dorsal origin. Anal fin well developed, origin about under that of second dorsal.

Squamation overall coarse, spiny; ridges of head stoutly reinforced by coarse, heavy, modified scales. About 10 broad scales on median nasal ridge, each with short spinules in low radiating rows, posteriorly pointing rows longest; supraorbital, occipital (or parietal), postorbital, and suborbital ridges strong, spiny. A distinct, somewhat coarsened scale at posterior end of occipital region; supraoccipital scute developed. Scales completely cover top of snout; large scales lateral to median nasal ridge with 4 to 7 narrowly crestlike divergent rows; those over areas immediately behind anterolateral margin of snout small and covered with sharply bladelike spinules or sharp, crestlike spinule rows; scales over interorbital with 4 or 5 divergent spinule rows. Ventral aspects of nasal fossa covered with small scales having small, erect, sharp, bladelike spinules. Underside of head almost completely naked, covered with somewhat scraggly appearing, dark, hairlike filaments and blackish, flaplike papillae of sensory lateralis system. Two patches of small, non-imbricate scales on underside of head: one immediately below suborbital ridge above posterior angle of lower jaw, the second at posterior end of preopercle. Body scales covered with strongly imbricate, relatively broad-based spinules; about 6 or 7 overlapping spinules in middle row of larger scales on dorsum below interspace of dorsal fins.

Color in alcohol light brownish to somewhat swarthy ground; slightly paler ventrally and over sides of head (but opercular region dark from blackish gill cavity). Gums pale; lower lips pale, upper lips pale to dusky; barbel lightly dusky. Uppermost margins of branchiostegal membrane dark; gill and gular membranes externally pale; gill cavity blackish except narrowly along outer margins. Abdomen with bluish tint, chest area light brownish gray. Dorsal, pectoral, and pelvic fins blackish; anal fin dusky, blackish posteriorly.

SIZE. — To more than 46 cm TL.

ETYMOLOGY. — Named for Yuri N. SHCHERBACHEV of IOAN, friend, colleague, and fellow student of grenadiers.

DISTRIBUTION. — So far known only from south of New Caledonia on the Loyalty Ridge, in 797-835 m.

REMARKS AND COMPARISONS. — This species is so closely similar to *C. anatirostris* that we considered recording our three large specimens as simply variants of that species. The two species share most of the diagnostic characters used to distinguish *C. anatirostris* from its congeners, but two important squamation features and the distinctive papillae on the underside of head of the new species appear to support specific recognition. The first scale feature concerns the number of spinule rows on body scales. In the *C. anatirostris* specimens we examined, the count ranged from 5-8, and OKAMURA (1970: 188) gave a count of 4-10, whereas our three specimens of *C. shcherbachevi* had only 4 or 5 rows. The low count in the new species is significant considering the size of our specimens (44-46+ cm), as compared with the *C. anatirostris* specimens we (9-29 cm) and OKAMURA (18-43 cm) examined. To a certain extent, the number of spinule rows increases with size in grenadiers, so we would expect the largest specimens of a species to have the highest number of rows, but our specimens of the new species have the lowest numbers.

The second scale feature concerns the shape of the spinules on body scales. In *C. shcherbachevi* the spinules increase in size and height posteriorly, with the largest spinule along the posterior margin of the scale in the middle row. When viewed from anteriorly, this large spinule is broadly triangular and somewhat pyramidal in shape, with the anterior edge somewhat thickened and forming a surface on which the adjacent spinule rests. Spinules in each row are closely imbricate and adjoined along their entire, or almost-entire, length, with only the tips free in some. Lateral spinule rows tend to be inclined towards the middle rows. In our New Caledonian specimens of *C. anatirostris*, the spinules are narrow, conical to narrowly bladelike, without broad lateral buttresses, and much more inclined than in the new species. OKAMURA's (1970, textfig. 80) figure of the scale in *C. anatirostris* is somewhat diagrammatic, but agrees rather well with the scales in the new species, except that the spinules are much less broad. In this feature, OKAMURA's specimens agree closer to the new species than does our New Caledonian specimens of *C. anatirostris*.

The underside of head in the new species has a somewhat dirty appearance from the dark hairlike and the larger flaplike sensory papillae covering the surface. These dark papillae are absent in *C. anatirostris*, and the underside of the head is immaculate.

Other differences include a broader interorbital space in the new species (about equal to orbit diameter, cf. 3/4ths orbit), longer upper jaw (29-31% HL, cf. 21-27%), uniformly blackish first dorsal (membrane between second spinous ray and first segmented ray black in *C. anatrostris*), and overall brownish-gray body color (cf. distinctly whitish or silvery ventrally on body in *C. anatirostris*).

Caelorinchus spathulatus McMillan & Paulin, 1993

Fig. 16

Caelorinchus spathulata McMillan & Paulin, 1993: 832-833, fig. 9 (New Zealand).

MATERIAL EXAMINED. — 84 specimens.

New Caledonia. MUSORSTOM 4: stn CC 202, 18°58.0'S, 163°10.5'E, 580 m, 20.09.1985: 1 specimen 66.5 mm HL, 262 mm TL (MNHN 1994-912), 6 specimens 61-70.5 mm HL (MNHN 1994-913), 3 specimens (BMNH 1996.7.19:7-9).

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CP 363, 19°47.90'S, 158°44.30'E, 700-685 m, 19.10.1986: 3 specimens 44.5-58.0 mm HL (CAS 86486, formerly MNHN 1994-919). — Stn CC 365, 19°42.82'S, 158°48.00'E, 710 m, 19.10.1986: 9 specimens 28.0-64.5 mm HL (MNHN 1994-915). — Stn CC 366, 19°45.40'S, 158°45.62'E, 650 m, 19.10.1986: 1 specimen 44.0 mm HL, 352 mm TL (MNHN 1994-916). — Stn CC 383, 19°40.85'S, 158°46.10'E, 615-600 m, 21.10.1986: 1 specimen 47.5 mm HL, 352 mm TL (MNHN 1994-914), 5 specimens 41.6-66.6 mm HL, 149+-231+ mm TL (CAS 86479). — Stn CP 386, 20°56.21'S, 160°51.12'E, 770-755 m, 22.10.1986: 1 specimen 56 mm HL (MNHN 1994-918). — Stn CC 390, 21°00.91'S, 160°50.30'E, 745-825 m, 22.10.1986: 1 specimen 66.5 mm HL (MNHN 1994-917).

New Zealand. Wanganella Bank, northwest of North Island, 33°07.4'S, 166°52.1'E, 670-710 m, 7.06.1986: 2 paratypes 65.5-68.0 mm HL, 240+-258+ mm TL (NMNZ P.22991).

Australia. Queensland, off Marion Reef, 19°06'S, 152°30'E, 650 m, 1987: 1 specimen 62.6 mm HL, 220+ mm TL (QM I.23616). — Queensland off Cape Tribulation, *"Raptis"*: 16°08'S, 149°26'E, 550 m, April 1988: 22 specimens, 165+-240 mm TL (QM I.25619), 15 specimens 76+-244 mm TL (QM I.25620).

"Soela", Queensland Plateau: stn SO6/85/34, 19°01.6'S, 150°43.1'E, 642 m, 24.11.1985: 1 specimen 225+ mm TL (CSIRO H1977-01). — Stn SO6/85/60, 16°59.8'S, 151°01.7'E, 696 m, 2.12.1985: 7 specimens 150-225+ mm TL (CSIRO H.1980-01). — Stn SO6/85/80, 16°59.8'S, 151°01.7'E, 696 m, 1985: 2 specimens 138+-160+ mm TL (CSIRO H1979-01). — Stn SO6/85/81, 17°03.2'S, 150°51.8'E, 610 m, 6.12.1985: 1 specimen 200 + mm TL (CSIRO H1976-01).

DIAGNOSIS. — Snout slender, sharply tipped, about twice orbit diameter; anterolateral margin completely supported by bone; orbit slightly greater than interorbital width, less than postorbital length; mouth restricted at posterior corners; length upper jaw much less than orbit diameter; subopercle terminates in long, slender tip. Large dermal window of light organ extends forward more than 2/3 distance to pelvic insertions, whitish naked groove extends beyond dermal window onto chest. Anus slightly removed from anal fin. Underside of head completely naked; top of snout covered with small, thin, finely spinulated scales; scales of median nasal ridge narrow; nasal fossa naked. Body scales highly deciduous, covered with short conical spinules in 8-11 parallel rows. First dorsal with black second spinous ray; mouth dark.

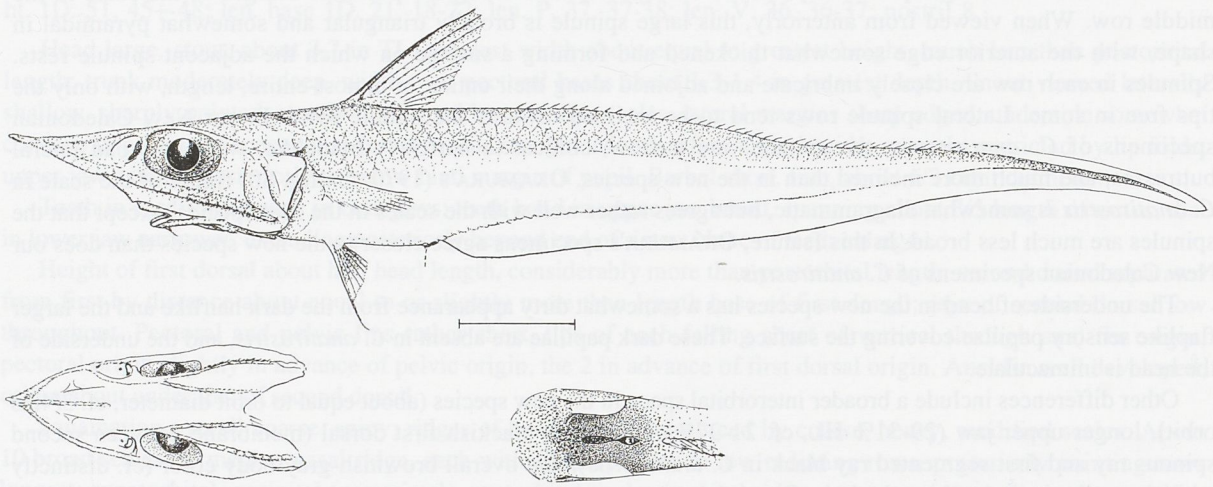


FIG. 16. — *Caelorinchus spathulatus* McMillan & Paulin, 66.5+ mm HL (MNHN 1994-912), New Caledonia, MUSORSTOM 4, stn CC 202, 580 m. Scale = 25 mm.

DESCRIPTION. — *Counts* (from 26 specimens): 1D. II,8-9; P. i13-i16; total GR-I (inner) 6-9, GR-II (outer/inner) 5-7 / 7-9; scales 1D. 4-5, mid-1D. 3-4.5 (6), 2D. 4.5-6 (7.5), lat.line 30-37.

Measurements: Total lengths 156+-262 mm; HL 41.6-70.5 mm. The following in percent of HL: postrostral 50-55; snout 45-52; preoral 41-53; internasal 17-23; interorb. 19-25; orb. 23-27; suborb. 10-14; postorb. 26-31; orb.-preop. 28-36; up.jaw (13, 14) 17-23; barbel 4-8; gill slit 7-9; pre-A. 133-153; V.-A. 27-39; isthm.-A. 49-62; body depth 37-48; 1D.-2D. 18-36; ht. 1D. 39-47; len. base 1D. 14-19; len. P. 28-43; len. V. 29-45; nostril 6-9.

Body slender, greatest depth less than greatest width of head, less than postrostral length. Head long, about 3.3-3.5 in TL. Snout about 2 or more times into HL, slender, sharply tipped with spearhead-shaped terminal scute. Suborbital ridge sharp, strong, forming acute angle between dorsal and ventral surfaces of head. Jaws short, less than 1/4 HL, restricted at angle by lip folds. Barbel short, fine; length about equal to or less than diameter of posterior nostril.

Teeth all small, none enlarged. Premaxillary teeth in short broad, untapered band, which falls well short of end of rictus. Mandibular teeth in bands, broad at symphysis (about 4 teeth across), narrowing abruptly laterally into tight band of teeth (about 3 teeth across), extending to end of rictus.

Height first dorsal fin much less than postrostral length, less than snout length; second dorsal low over length of fin, rays much lower than opposites of well-developed anal fin. Pectoral and pelvic fins short, outer pelvic ray barely extends to anal origin.

Scales on dorsum of trunk and tail large, covered with slender, greatly reclined, slightly recurved, conical spinules, aligned in 8-11 parallel rows, middle row with 6 or 7 spinules. Scales deciduous; body scales missing in most specimens.

Light organ externally visible as an elongated, rather broad, black scaleless structure immediately anterior to small periproct region. Organ situated in a shallow groove or fossa that continues anteriorly onto chest; floor of groove lined with transparent epidermis underlain with white, opaque membrane.

Color in alcohol: dorsum of trunk and tail pale, somewhat flesh colored, overlain with fine, netlike pattern of margins of scale pockets; ventrally pearl-white ground with numerous large, wide-spaced chromatophores having ivory centers (pearl-white overlay in New Caledonian specimens absent in New Zealand paratypes, and ventral half of specimens darkly peppered); dark violet on ventral surfaces of abdomen and most of chest; dermal window of light organ black. Head pearlescent white over gill covers, tawny or dusky over most other surfaces; entire underside of head immaculate in New Caledonian and Queensland specimens, but covered with fine melanophores in New Zealand paratypes. Median nasal bone dark. First dorsal fin with second spinous ray black, remaining rays pale or light dusky; upper edge of pectoral fin blackish, remainder pale; other fins pale or whitish to light dusky. Inner lining of mouth black, pale peripherally over oral valves, gums, lips. Inner lining of gill chamber black; peripheral margins pale; gill arches and rakers dark; filaments pale.

SIZE. — To more than 26 cm TL.

DISTRIBUTION. — New Caledonia, New Zealand (northwest of North Island), Chesterfield and Bellona Plateau, Australia off Queensland; in 550-825 m.

REMARKS AND COMPARISONS. — *Caelorinchus spathulatus* agrees in many important characters with *C. asteroides*, including naked underside of head; completely supported anterolateral snout margin; size of light organ; dark ventral surface of abdomen and chest, but with sides whitish; naked nasal fossa. The two species are readily differentiated, however, by their scale spinules and snout length, among other characters. The spinules in *C. asteroides* are broad-based, keel-shaped, with bases overlapping and adjoined, whereas those of *C. spathulatus* are conical, greatly reclined, and not adjoined. The snout in *C. spathulatus* is much longer than in *C. asteroides*, being about 1.7-2.0 times diameter of orbit, compared with only about 1.3-1.5 times. Another species in this complex, *Caelorinchus* sp. cf. *asteroides* Iwamoto & Williams MS from Western Australia, can be differentiated by its shorter snout, deeper body, smaller light organ, somewhat longer upper jaws (slightly longer than orbit diameter), and more upright scale spinules, which are arranged in widely divergent rows.

Genus ***CORYPHAENOIDES*** Gunner, 1765

Coryphaenoides Gunner, 1765: 50 (type species *Coryphaenoides rupestris* Gunner, 1765, by monotypy).

DIAGNOSIS. — Branchiostegal rays 6; light organ absent; spinous ray of first dorsal fin serrated (rarely, serrations rudimentary or lost); chin barbel present; snout tipped with a stout, spiny, tubercular scale; anus usually immediately before anal fin origin (rarely removed by more than 1 or 2 scale rows).

REMARKS. — More than 60 species, of which only one was represented in the collection. More trawl hauls at depths exceeding 2000 m will probably result in additional species, especially those that are wide ranging like *C. armatus* (Hector, 1875) and *C. rudis* Günther, 1878.

Coryphaenoides striaturus Barnard, 1925

Fig. 17

Coryphaenoides (Chalinura) striatura Barnard, 1925: 500-501 (off Cape Point, South Africa; 823-1737 m).
Coryphaenoides striaturus - IWAMOTO & SHCHERBACHEV, 1991: 214-217, figs 6-7.

MATERIAL EXAMINED. — 4 specimens.

New Caledonia. BIOCAL: stn CP 30, 23°08.44'S, 166°40.83'E, 1140 m, 29.08.1985: 1 specimen 41 mm HL (MNHN 1994-933). — Stn CP 57, 23°43.26'S, 166°58.06'E, 1490 m, 1.09.1985: 1 specimen 81 mm HL (MNHN 1994-932). — Stn CP 60, 24°01.45'S, 167°08.43'E, 1530 m, 2.09.1985: 1 specimen, 58 mm HL (MNHN 1996-955). — Stn CP 68, 24°00.37'S, 168°07.03'E, 1430 m, 3.09.1985: 1 specimen 26.8 mm HL, 128 mm TL (BMNH 1996.7.19:10).

DIAGNOSIS. — Snout completely and uniformly covered with small scales; pelvic fin rays 11-12 (usually 12); premaxillary teeth in broad cardiform band flanked by enlarged outer teeth, mandibular teeth irregularly uniserial; orbit 18-24% HL, interorbital 23-30%, preoral 10-16%, barbel 18-26%; body scales on dorsum below dorsal interspace with short, weak, conical spinules in 9-14 parallel rows.

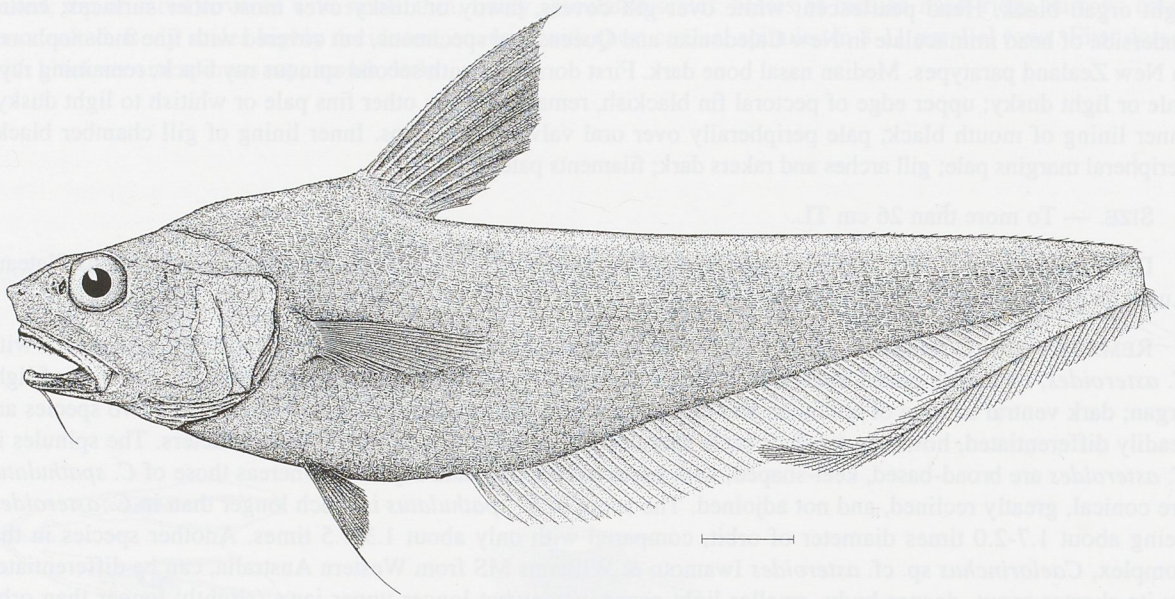


FIG. 17. — *Coryphaenoides striaturus* Barnard (From IWAMOTO & SHCHERBACHEV, 1991, fig. 6). Scale = 25 mm.

SIZE. — To at least 55 cm TL.

DISTRIBUTION. — Wide-ranging in southern hemisphere, from southeastern Atlantic across Indian Ocean to Australia and into western South Pacific (Tasman Sea, New Zealand, New Caledonia). Depth range 823-2010, most often between 1000 and 1400 m.

REMARKS AND COMPARISONS. — See IWAMOTO & SHCHERBACHEV (1991) for full description and illustration. This common deepwater species is first recorded from the southwest Pacific north of latitude 30°S. It appears to be most common in warm temperate waters and is probably marginally distributed in the New Caledonian region. That only one species of the genus was represented in the collections is somewhat unusual in that the deeper hauls were within the range occupied by other members of *Coryphaenoides*. Perhaps the use of larger nets at the deeper end of the sampling range would have resulted in other species being captured. The wide-ranging *C. armatus* (Hector, 1875), *C. carapinus* (Goode & Bean, 1883), and *C. rudis* Günther, 1878 should be expected.

Genus ***HAPLOMACROURUS*** Trunov, 1980

Haplomacrourus Trunov, 1980:3 (type species *Haplomacrourus nudirostris* Trunov, 1980, by original designation).

DIAGNOSIS. — Branchiostegal rays 7; jaws almost terminal, maxillary extends to vertical of anterior margin of orbits; scales on head and anterior part of body without spinules; snout and ventral aspects of head naked; head notably compressed laterally; snout smoothly rounded; a large, stout, serrated dorsal spine; pelvic rays 8; pectoral rays 26-29; light organ an elongated flattened pouch anterior to anus, lacking lens, but with a small dermal window between pelvic-fin insertions; anus about midway between pelvic and anal fins.

REMARKS. — A peculiar monotypic genus whose relationships are as yet obscure.

Haplomacrourus nudirostris Trunov, 1980

Fig. 18

Haplomacrourus nudirostris Trunov, 1980: 3-11 (holotype: ZIL 44345; southeastern Atlantic off southern Africa; 1230-1500 m; 10 paratypes from Indian Ocean, 790-1590 m).

MATERIAL EXAMINED. — **Wallis and Futuna Islands**. MUSORSTOM 7: stn CP 592, 12°32.4'S, 174°22.0'W, 775-730 m, 24.05.1992: 1 specimen 30 mm HL (MNHN 1994-934).

DIAGNOSIS. — As for genus.

SIZE. — To at least 58 cm TL (SHCHERBACHEV, 1987).

DISTRIBUTION. — Widespread in southern hemisphere from southeastern Atlantic off Africa, through Indian Ocean, Australia, and New Zealand, in 790-1590 m.

REMARKS. — This highly distinctive species is unlikely to be mistaken for any other grenadier except when very small. The forwardly placed mouth is unique among grenadiers, as is the combination of head greatly compressed and extensively naked.

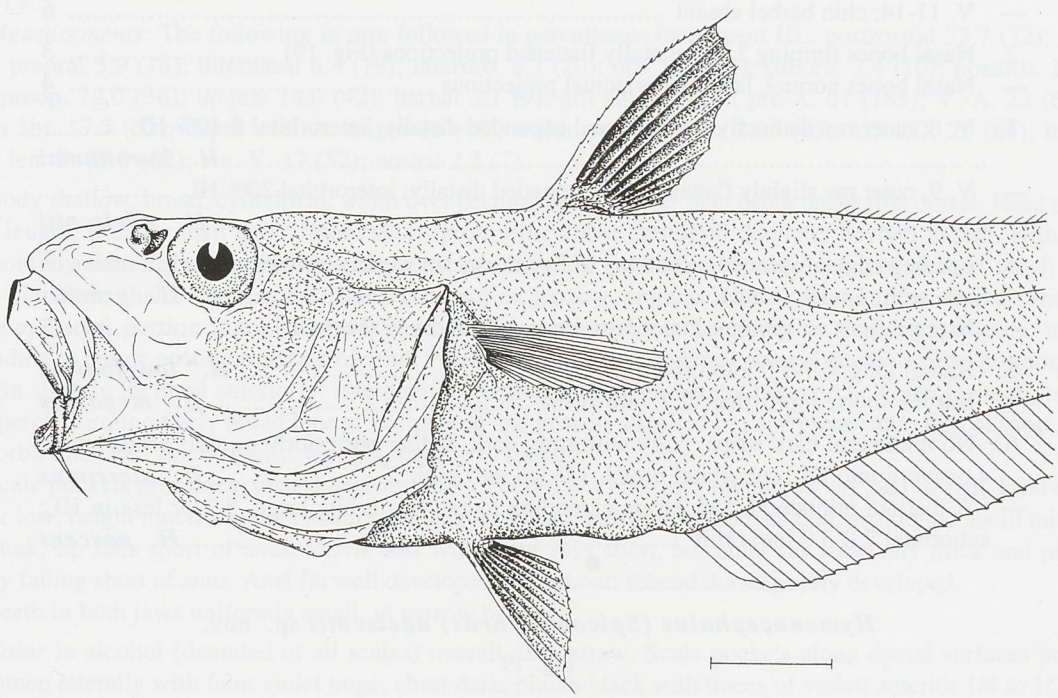


FIG. 18. — *Haplomacrourus nudirostris* Trunov, 89 mm HL (ZMMGU uncat.), Indian Ocean, *"Mesiatzev"* cruise 7, trawl 25, 1162 m. Scale = 25 mm.

Genus *HYMENOCEPHALUS* Giglioli

Hymenocephalus Giglioli *in* GIGLIOLI & ISSEL, 1884: 228 (type species *Hymenocephalus italicus* Giglioli *in* GIGLIOLI & ISSEL, 1884, by original designation).

Hymenogadus Gilbert & Hubbs, 1920: 521 (as subgenus; type species *Hymenocephalus gracilis* Gilbert & Hubbs, 1920, by original designation).

DIAGNOSIS. — Branchiostegal rays 7; spinous ray of first dorsal smooth, except in subgenus *Hymenogadus*; striae, consisting of fine, parallel black lines over silvery pigment on isthmus, pectoral girdle and chest; light organ tubular, 2 lenslike windows, 1 before pelvic base, the other before anus. Inner gill rakers usually more than 18; retia and gas glands 2; anus immediately in front of anal fin origin; barbel present or absent. Species all small, rarely more than 25 cm TL.

REMARKS. — We use the generic name in the broadest sense of SAZONOV & IWAMOTO (1992) and IWAMOTO (1990) to include the distinctive clades *Hymenogadus* and *Spicomacrurus* Okamura, 1970, each of which are represented by two species. The discovery of a new species of *Spicomacrurus* in the collections was most unexpected and further emphasizes the biogeographic uniqueness of the region.

Members of the genus were surprisingly well represented in the collection with seven species, two of which are here described as new. The species are generally western Pacific in distribution except for the wide-ranging species *H. gracilis* and *H. aterrimus*. Based on the number of specimens captured, *H. megalops* and *H. nascens* were the two most abundant grenadiers in the fauna. The latter species was the most often captured, having been taken in 20 separate hauls.

There are now 22 species of *Hymenocephalus* that we consider valid (including the two new ones here described), but we expect that number to increase as better studies with more extensive material become available.

Key to species of *Hymenocephalus* of New Caledonia and adjoining areas

1. V. 7-9; chin barbel present **2**
— V. 11-14; chin barbel absent **6**

2. Nasal bones forming 3 horizontally flattened projections (Fig. 19) **3**
— Nasal bones normal, lacking horizontal projections **4**

3. V. 8, outer ray distinctly flattened and expanded distally; interorbital 6-10% HL ..... ***H. kuronumai***
— V. 9, outer ray slightly flattened and expanded distally; interorbital 20% HL ..... ***H. adelscotti***

4. Leading edge of spinous second ray of first dorsal fin weakly serrated; inner gill rakers on first arch 14-18 (total) ..... ***H. gracilis***
— No serrations on spinous dorsal rays; inner gill rakers 17-24 (total) **5**

5. Barbel long, 0.7-1.0 into orbit ..... ***H. longibarbis***
— Barbel short, more than 2.2 into orbit ..... ***H. megalops***

6. No midlateral dark stripe, body uniformly dark, fading posteriorly on tail; orbits small, 4 or more into HL; suborbital broad, 1.0-1.6 into orbit ..... ***H. aterrimus***
— A distinct midlateral dark stripe extending to tail tip; orbits large, 3.2 or less in HL; suborbital 2.0-3.0 into orbit ..... ***H. nascens***

Hymenocephalus (Spicomacrurus) adelscotti sp. nov.

Fig. 19

MATERIAL EXAMINED. — 1 specimen.

Wallis and Futuna Islands. MUSORSTOM 7: stn CP 631, about 250 nautical miles north of Vanua Levu, Fiji, 11°54.0'S, 179°31.6'W, 600 m, 29.05.1992: female holotype 33.0 mm HL, 162 mm TL (MNHN 1994-882).

DIAGNOSIS. — Three broad horizontal processes of nasal bones forming leading edge of snout; pelvic rays 9, outer prolonged ray slightly broadened and flattened distally; total gill rakers on first arch (outer/inner) 8 / 11.

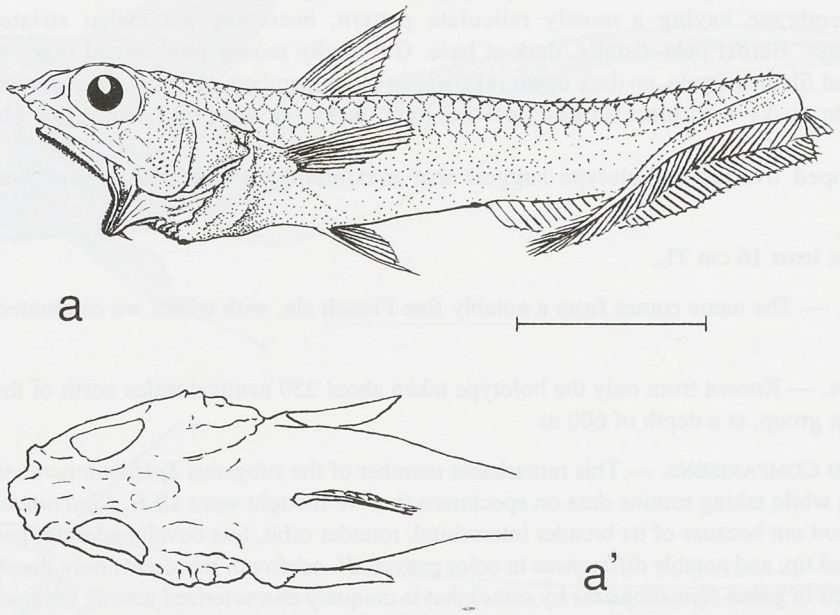


FIG. 19. — **a**, *Hymenocephalus adelscotti* sp. nov., 33.0 mm HL, holotype (MNHN 1994-882), near Wallis and Futuna Islands, MUSORSTOM 7, stn CP 631, 600 m; and **a'** dorsal view of head. Scale = 25 mm.

DESCRIPTION. — *Counts*: 1D. II,10; P. i19-i20; GR-II (outer/inner) 9 / 11; scales 1D. 5, 2D. 3.5, lat.line abt. 19.

Measurements: The following in mm followed in parentheses by percent HL: postrostral 23.7 (72); snout 9.7 (29); preoral 5.9 (18); internasal 6.4 (19); interorb. 6.7 (20); orb. 9.4 (28); suborb. 3.4 (10); postorb. 14.6 (44); orb.-preop. 12.0 (36); up.jaw 14.0 (42); barbel 3.1 (9); gill slit 8.2 (25); pre-A. 61 (185); V.-A. 22 (67); body depth abt. 17.5 (53); depth over A. origin 16 (48); width over P. bases 21.5 (65); 1D.-2D. 20 (61); ht. 1D. 20 (61); len. P. 20.5 (62); len. V. 17 (52); nostril 2.3 (7).

Body shallow, broad, cylindrical, width over pectoral bases greater than depth under first dorsal. Head about 5 in total length; broader than deep. Snout short, protruding about one pupil diameter beyond mouth, with 3 broad, horizontally flattened projections characteristic of subgenus. Interorbital space relatively narrow, much less than orbit diameter, shallowly concave. Suborbital region narrow, angular in cross section, forming distinct ventral surface; dorsal portion much narrower than ventral portion. Mouth subinferior, large, gape wide, upper jaw extending to below posterior margin of orbit. Preopercle broadly rounded at posteroventral corner; posterior vertical margin slightly inclined anteriorly. Interopercle completely hidden behind preopercle. Opercle small, triangular; subopercle forming fairly broad lobe at ventral end and broadly exposed beyond preopercle. Barbel short, less than half orbit diameter, thick at base, tapering rapidly to fine tip.

Scale pockets prominent over dorsal surfaces of body, but no scales remain on any part of fish. First dorsal fin rather low, height much less than postrostral length of head; pectoral well developed, positioned about midlaterally on trunk, tip falls short of anus. Pelvic fins with inner rays short, but outer ray relatively thick and prolonged, barely falling short of anus. Anal fin well developed throughout; second dorsal poorly developed.

Teeth in both jaws uniformly small, in narrow bands.

Color in alcohol (denuded of all scales) overall dirty straw. Scale pockets along dorsal surfaces prominent. Abdomen laterally with faint violet tinge; chest dark, bluish-black with traces of violet; anterior 1/4 to 1/3 of belly with same color, becoming paler towards anus. Ventral striae confined to shallow, broad, triangular area, the apex at pectoral base, anterior end along shoulder girdle, posterior end extending posteriorly toward, but not reaching,

anus. Striae confined on abdomen to lateral surfaces above pelvic fins, none over ventral surfaces of belly and chest. Snout with generically characteristic black leading margin of snout; no extensions of black margin on supranarial or suborbital ridges. Mouth pale; lips, edges of lower jaw, gular membrane, and branchiostegal rays black; gular membrane having a mostly reticulate pattern, becoming somewhat striated near bases of branchiostegal rays. Barbel pale distally, dark at base. Gill cavity mostly pale, broad outer margins dark; gill arches, rakers, and filaments pale, no dark upper rakers as in other members of genus. First dorsal distally blackish; pectoral fins light dusky with blackish base; pelvics light dusky on inner rays, outer ray white; anal fin pale throughout.

Well-developed ovaries in holotype suggest that maximum size for this species much less than for *H. kuronumai*.

SIZE. — To at least 16 cm TL.

ETYMOLOGY. — The name comes from a notably fine French ale, with which we celebrated the discovery of the new species.

DISTRIBUTION. — Known from only the holotype taken about 250 nautical miles north of the island of Vanua Levu in the Fijian group, at a depth of 600 m.

REMARKS AND COMPARISONS. — This remarkable member of the subgenus *Spicomacrurus* was discovered by one of us (NRM) while taking routine data on specimens that we thought were all *H. (Spicomacurus) kuronumai*. The specimen stood out because of its broader interorbital, rounder orbit, less developed outer pelvic ray that lacks a notably expanded tip, and notable differences in color pattern. *H. adelscotti* represents only the second species in a subgenus (included in genus *Hymenogadus* by some) that is uniquely characterized among the macrourids in having the nasal bones forming three horizontally flattened processes. In their cylindrical body and low gill raker counts, the two species resemble members of subgenus *Hymenogadus* (*H. gracilis* and *H. tenuis* Gilbert & Hubbs, 1916), neither of which, so far as we know, exceed about 130 mm in total length.

Hymenocephalus aterrimus Gilbert, 1905

Fig. 20 a

Hymenocephalus aterrimus Gilbert, 1905: 666-667, pl. 93 (holotype: USNM 51649; off Kauai, Hawaiian Is., 704-914 m).

Hymenocephalus (Papyrocephalus) aterrimus - GILBERT & HUBBS, 1920: 539 (name only, as type species of *Papyrocephalus* new subgenus).

MATERIAL EXAMINED. — 25 specimens.

New Caledonia. BIOCAL: stn CP 31, 23°07.26'S, 166°50.45'E, 850 m, 29.08.1985: 2 specimens 28-32 mm HL (MNHN 1994-872), 2 specimens 29.5-35.0 mm HL (CAS 86491).

Norfolk Ridge. BERYX 11: stn CP 58, Azteque Seamount, 23°19.20'S, 167°59.35'E, 850-920 m, 22.10.1992: 14 specimens 27-33 mm HL (NMNZ P.29053).

Wallis and Futuna Islands. MUSORSTOM 7: stn CP 564, Eaglestone Ridge, northeast of Rotuma, 11°46.1'S, 178°27.4'W, 1015-1020 m, 20.05.1992: 1 specimen 27 mm HL (MNHN 1994-873). — Stn CP 565, Alexa Bank, northwest of Rotuma, 11°47.4'S, 178°25.8'W, 900 m, 20.05.1992: 1 specimen 27 mm HL (MNHN 1994-874). — Stn CP 567, 11°47.0'S, 178°27.3'W, 1010-1020 m, 20.05.1992: 1 specimen 24 mm HL (MNHN 1994-875). — Stn CP 592, 12°32.4'S, 174°22.0'W, 775-730 m, 24.05.1992: 4 specimens 26-31 mm HL (MNHN 1994-876).

DIAGNOSIS. — Pelvic fin rays 12-14; no chin barbel; suborbital broad, 17-22% HL; orbit usually 4 or more into HL (22-28% HL), 1.0-1.6 into interorbital width; color in alcohol uniformly dark brown to black.

DESCRIPTION. — *Counts* (6 spec.): 1D. II,8-9 (11); P. i12-i14 (i15); total GR-I (outer/inner) 14-20 / 22-27, GR-II 22-25 / 20-26.

Measurements: Total lengths 102+-148 mm; HL 25-34 mm. The following in percent of HL: postrostral 73-74; snout 30-33; interorb. 36-39; postorb. 48-54; orb.-preop. 49-58; up.jaw 53-59; pre-A. 146-159; body depth 73-75; len. P. 63-75 (2 spec.); len. V. 99 (1 spec.).

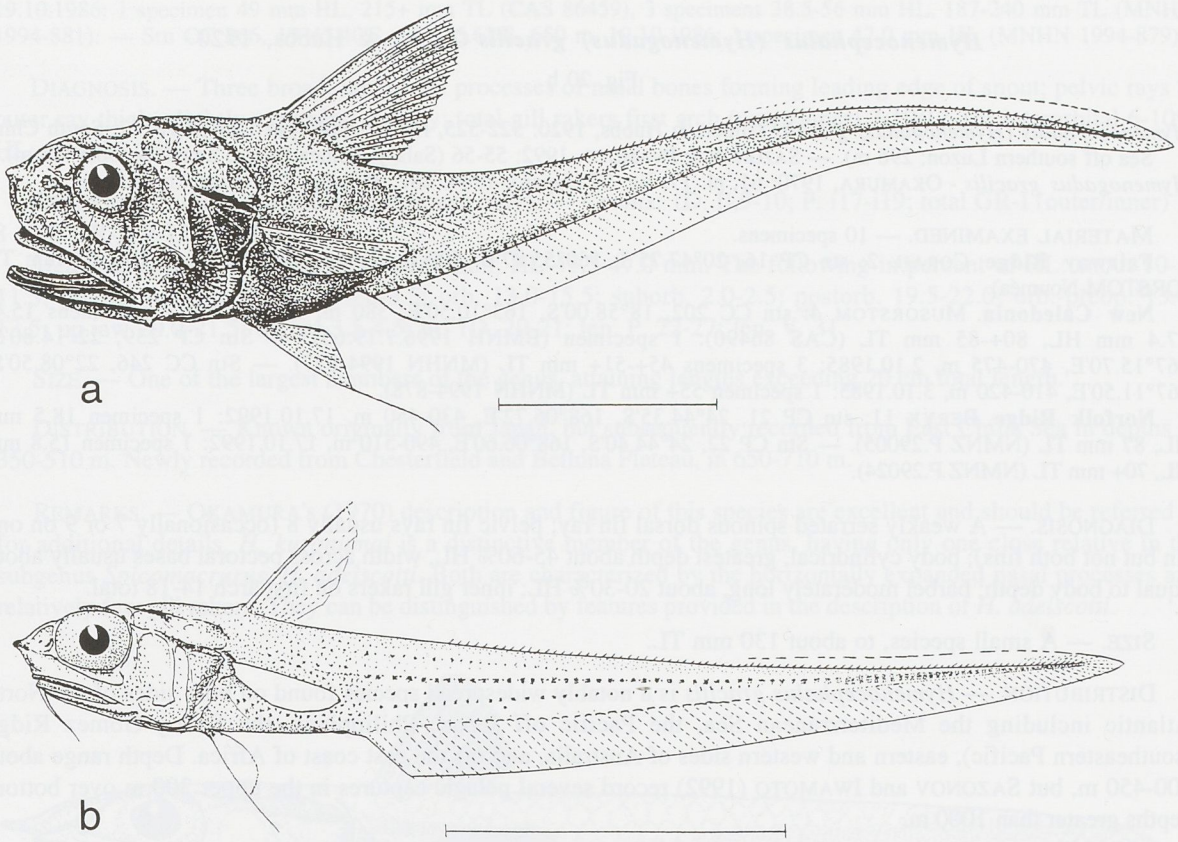


FIG. 20. — **a**, *Hymenocephalus aterrimus* Gilbert. Composite of specimens from NMNZ P.29053, Azteque Seamount, south of New Caledonia, BERYX 11, stn CP 58, 850-920 m. — **b**, *Hymenocephalus gracilis* Gilbert & Hubbs, 17.4 mm HL (CAS 86490), New Caledonia, MUSORSTOM 4, stn CC 202, 580 m. Scales = 28 mm.

SIZE. — To at least 18.5 cm TL.

DISTRIBUTION. — Recorded from Hawaii, Sala-y-Gomez and Nazca ridges (although questionably by SAZONOV and IWAMOTO, 1992; may be another species), New Caledonian region, tropical western North Atlantic, and Indian Ocean. Depth distribution approximately 340-1463 m.

REMARKS AND COMPARISONS. — See the original description by GILBERT (1905) for a good description and illustration of the species. MARSHALL and IWAMOTO (*in* MARSHALL, 1973) and SAZONOV and IWAMOTO (1992) provide additional information. This widespread species is readily distinguished from most of its congeners by the high pelvic ray count and absence of a chin barbel coupled with small orbits. The very membranous nature of the head bones, dark body color lacking silvery reflections, small eyes, and associated wide suborbital region led GILBERT and HUBBS (1920) to erect subgenus *Papyrocephalus* for this and related species. In the New Caledonian area, *H. aterrimus* is unlikely to be mistaken for any other member of the genus owing to these attributes.

SAZONOV and IWAMOTO (1992: 54-55) found differences in the head depth and width, and the height of the nasal ridge in their specimens, which led them to consider the Nazca and Sala-y-Gomez ridges specimens as only related to *H. aterrimus*. But they stated that "the poor condition of the specimens...might account for the apparent differences". So far as we can tell, our specimens from New Caledonia are no different from specimens from Hawaii and other areas from which we have representatives, although these specimens are generally in poor condition.

Hymenocephalus (Hymenogadus) gracilis Gilbert & Hubbs, 1920

Fig. 20 b

Hymenocephalus (Hymenogadus) gracilis Gilbert & Hubbs, 1920: 522-525, fig. 31 (holotype USNM 78227, South China Sea off southern Luzon; 296 m). — SAZONOV & IWAMOTO, 1992: 55-56 (Sala-y-Gomez Ridge, Zanzibar; 380-410 m).
Hymenogadus gracilis - OKAMURA, 1970: 61, pl. 17, fig. 27 (Japan); 1984: 201, 359, fig. 143 (East China Sea).

MATERIAL EXAMINED. — 10 specimens.

Fairway Ridge. CORAIL 2: stn CP 16, 20°47.75'S, 160°55.87'E, 500 m: 1 specimen 12.3 mm HL, 61 mm TL (ORSTOM-Nouméa).

New Caledonia. MUSORSTOM 4: stn CC 202, 18°58.00'S, 163°10.50'E, 580 m, 20.09.1985: 2 specimens 15.4-17.4 mm HL, 80+-85 mm TL (CAS 86490): 1 specimen (BMNH 1996.7.19:65). — Stn CP 239, 22°14.80'S, 167°15.70'E, 470-475 m, 2.10.1985: 3 specimens 45+-51+ mm TL (MNHN 1994-877). — Stn CC 246, 22°08.50'S, 167°11.50'E, 410-420 m, 3.10.1985: 1 specimen 55+ mm TL (MNHN 1994-878).

Norfolk Ridge. BERYX 11: stn CP 21, 24°44.35'S, 168°06.72'E, 430-450 m, 17.10.1992: 1 specimen 18.5 mm HL, 87 mm TL (NMNZ P.29005). — Stn CP 22, 24°44.40'S, 168°06.60'E, 490-510 m, 17.10.1992: 1 specimen 15.8 mm HL, 70+ mm TL (NMNZ P.29024).

DIAGNOSIS. — A weakly serrated spinous dorsal fin ray; pelvic fin rays usually 8 (occasionally 7 or 9 on one fin but not both fins); body cylindrical, greatest depth about 45-60% HL, width across pectoral bases usually about equal to body depth; barbel moderately long, about 20-30% HL; inner gill rakers on first arch 14-18 total.

SIZE. — A small species, to about 130 mm TL.

DISTRIBUTION. — *Hymenocephalus gracilis* is a notably widespread species found on both sides of the North Atlantic including the Mediterrranean Sea, the Pacific off Japan, Philippines, the Sala-y-Gomez Ridge (southeastern Pacific), eastern and western sides of Australia, and off the east coast of Africa. Depth range about 300-450 m, but SAZONOV and IWAMOTO (1992) record several pelagic captures in the upper 300 m over bottom depths greater than 1000 m.

REMARKS AND COMPARISONS. — The original description by GILBERT and HUBBS (1920) is excellent and should be referred to for details. The only species *H. gracilis* is likely to be confused with in the New Caledonia area is *H. longibarbis*, a much larger species that lacks serrations on the leading edge of the spinous dorsal ray and has more gill rakers on the first arch (usually more than 20 on inner side). Other differences are noted in the description of *H. longibarbis*. *H. tenuis* Gilbert & Hubbs, 1917 from Hawaiian waters is apparently most closely related to *H. gracilis*, but "differences between the two species are slight...and should be reevaluated..." (SAZONOV & IWAMOTO, 1992: 56).

Hymenocephalus gracilis was represented in the collections by only a few small specimens. Possibly, pelagic hauls may have resulted in more captures, as former Soviet vessels working off the Sala-y-Gomez Ridge in the southeastern Pacific collected numerous mesopelagic individuals between the surface and 300 m.

Hymenocephalus kuronumai Kamohara, 1938

Fig. 21 a

Hymenocephalus kuronumai Kamohara, 1938: 70 (Tosa Bay, Japan).
Hymenogadus (Spicomacrurus) kuronumai - OKAMURA, 1970: 64-67, pl. 3, text-fig. 28.
Hymenogadus kuronumai - OKAMURA *in* OKAMURA & KITAJIMA, 1984: 203, 359, fig. 144 (s. Japan, East China Sea; 400-510 m).

MATERIAL EXAMINED. — 6 specimens.

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CP 363, 19°47.90'S, 158°58.00'E, 700-685 m, 15.10.1986: 1 specimen 43.5 mm HL, 183 mm TL (MNHN 1994-880). — Stn CC 365, 19°42.82'S, 158°48.00'E, 710 m,

19.10.1986: 1 specimen 49 mm HL, 215+ mm TL (CAS 86459), 3 specimens 38.5-56 mm HL, 187-240 mm TL (MNHN 1994-881). — Stn CC 366, 19°45.40'S, 158°45.62'E, 650 m, 19.10.1986: 1 specimen 47.0 mm HL (MNHN 1994-879).

DIAGNOSIS. — Three broad, horizontal processes of nasal bones forming leading edge of snout; pelvic rays 8, outer ray thick, slightly expanded distally; total gill rakers first arch (outer/inner) 7-10/12-15; interorbital 6-10% HL; orbit 30-34%.

DESCRIPTION (New Caledonia specimens only). — *Counts*: 1D. II,9-10; P. i17-i19; total GR-I (outer/inner) 7-8 / 14, GR-II 9-12 / 12-13.

Measurements: Total lengths 183-240 mm; HL 43.5-47.0 mm. The following in percent of HL: snout 10-5-11.5; preoral 4.5-5.0; interorb. 3.0-3.5; orb. 13.0-15.5; suborb. 2.0-2.5; postorb. 19.5-22.0; orb.-preop. 13.0-13.5; up.jaw 20.0-21.5; barbel 3.5-4.5; ht. 1D. 20-21; len. P. 22-27; len. V. 31.

SIZE. — One of the largest members of the genus, attaining lengths exceeding 20 cm total length.

DISTRIBUTION. — Known originally from Japan, but subsequently recorded from East China Sea in depths of 350-510 m. Newly recorded from Chesterfield and Bellona Plateau, in 650-710 m.

REMARKS. — OKAMURA's (1970) description and figure of this species are excellent and should be referred to for additional details. *H. kuronumai* is a distinctive member of the genus, having only one close relative in the subgenus *Spicomacrurus*, *H. adelscotti*. Both are characterized by the horizontally expanded nasal processes and relatively few gill rakers. They can be distinguished by features provided in the description of *H. adelscotti*.

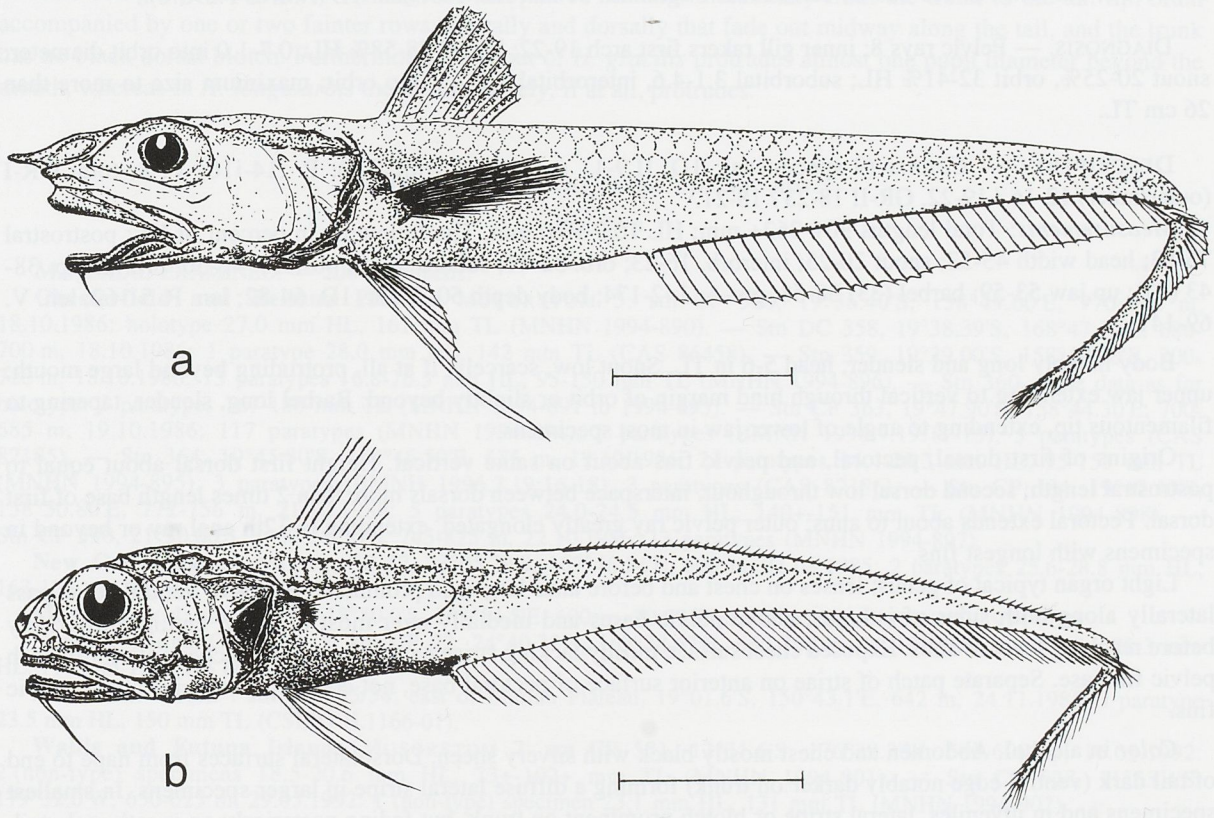


FIG. 21. — **a**, *Hymenocephalus kuronumai* Kamohara, 49 mm HL (CAS 86459), Chesterfield and Bellona Plateau, MUSORSTOM 5, stn CC 365, 710 m. — **b**, *Hymenocephalus longibarbis* (Günther), 35.5 mm HL (NMNZ P.29239), Seamount B, south of New Caledonia, BERYX 11, stn C4, 550-920 m. Scales = 25 mm.

Hymenocephalus longibarbis (Günther, 1887)

Fig. 21 b

Macrurus (Mystaconurus) longibarbis Günther, 1887: 139-140, pl. 17, fig. C. (holotype, BMNH 1887.12.7.94, off Matuka, Fiji Islands, 576 m).

MATERIAL EXAMINED. — 29 specimens.

New Caledonia. MUSORSTOM 4: stn CP 158, 18°49.30'S, 163°15.00'E, 620 m, 13.09.1985: 1 specimen 37 mm HL (MNHN 1994-884). — Stn CP 169, 18°54.03'S, 163°11.20'E, 600 m, 17.09.1985: 2 specimens 37.6-50.0 mm HL, 210-262+ mm TL (CAS 86478). — Stn CP 194, 18°52.80'S, 163°21.70'E, 550 m, 19.09.1985: 2 specimens (MNHN 1994-889). — Stn CC 202, 18°58.00'S, 163°10.50'E, 580 m, 20.09.1985: 6 specimens 11-20 mm HL (MNHN 1994-888), 2 specimens 39-44.8 mm HL, 230-140+ mm TL (CAS 86489). — Stn CC 245, 22°07.00'S, 167°11.00'E, 415-435 m, 3.10.1985: 1 specimen (MNHN 1994-883).

BIOCAL: stn CP 67, 24°55.44'S, 168°21.55'E, 500 m, 3.09.1985: 2 specimens (MNHN 1994-885). — Stn CP 109, 22°10.03'S, 167°15.22'E, 495 m, 9.09.1985: 3 specimens (MNHN 1994-887).

Norfolk Ridge. CHALCAL 2: stn CC 1, 24°54.96'S, 168°21.91'E, 500-580 m, 28.10.1986: 4 specimens (MNHN 1994-886).

SMIB 3: stn CP 4, 24°54.00'S, 168°21.50'E, 530 m, 20.05.1987: 1 specimen 20.8 mm HL, 130 mm TL (ORSTOM-Nouméa).

BERYX 11: stn C 4, Seamount B, 24°52.70'S, 168°21.80'E, 550-920 m, 14.10.1992: 2 specimens 35.5-36 mm HL, 191-183+ mm TL (NMNZ P.29239). — Stn CP 8, Seamount B, 24°53.65'S, 168°21.60'E, 540-570 m, 15.10.1992: 1 specimen 10.9 mm HL, 55+ mm TL (NMNZ P.29063). — Stn CP 22, Seamount B, 24°44.40'S, 168°06.60'E, 490-510 m, 17.10.1992: 1 specimen 55+ mm TL (NMNZ uncat. [out of P.29024]). — Stn CP 60, Azteque Seamount, 23°19.00'S, 168°00.37'E, 580-600 m, 22.10.1992: 1 specimen 31 mm HL, 140+ mm TL (NMNZ P.29076).

DIAGNOSIS. — Pelvic rays 8; inner gill rakers first arch 19-22; barbel 38-58% HL, 0.7-1.0 into orbit diameter; snout 20-25%, orbit 32-41% HL; suborbital 3.1-4.6, interorbital 1.7-2.1 into orbit; maximum size to more than 26 cm TL.

DESCRIPTION. — *Counts* (9 specimens): 1D. II,9-11 (one spec. with II,8); P. i14-i16; V. 8; total GR-I (outer/inner) 12-16 / 19-22, GR-II 18-23 / 18-21.

Measurements: Total lengths 90+-262+ mm; HL 10.9-50.0 mm. The following in percent of HL: postrostral 75-83; head width 45-53; snout 20-25; interorb. 16-23; orb. 32-41; suborb. 8-10; postorb. 42-50; orb.-preop. 38-43 (47); up.jaw 53-59; barbel (33) 38-58; pre-A. 142-174; body depth 50-72; ht. 1D. 64-82; len. P. 51-62; len. V. 69-141.

Body notably long and slender, head 5-6 in TL. Snout low, scarcely, if at all, protruding beyond large mouth; upper jaw extending to vertical through hind margin of orbit or slightly beyond. Barbel long, slender, tapering to filamentous tip, extending to angle of lower jaw in most specimens.

Origins of first dorsal, pectoral, and pelvic fins about on same vertical. Height first dorsal about equal to postrostral length; second dorsal low throughout; interspace between dorsals more than 2 times length base of first dorsal. Pectoral extends about to anus; outer pelvic ray greatly elongated, extending to 12th anal ray or beyond in specimens with longest fins.

Light organ typical of genus; lenses on chest and before anus large and prominent. Bands of ventral striae pass laterally along both sides of isthmus, above pelvic bases and medially over most of belly, ending posteriorly before reaching level of anus. Exposed chest surface mostly lacking striae except for small patches anterior to each pelvic fin base. Separate patch of striae on anterior surface of pectoral base, not connected to striae above pelvic fins.

Color in alcohol. Abdomen and chest mostly black with silvery sheen. Dorsolateral surfaces from nape to end of tail dark (ventral edge notably darker on trunk) forming a diffuse lateral stripe in larger specimens. In smallest specimens and in juveniles, lateral stripe or blotch prominent on trunk, but fading posteriorly on mostly pale tail. Ventral aspects of tail completely lacking pigmentation at all sizes. Suborbital region with black underlying stripe extending from below nostrils to angle of lower jaw and horizontal arm of preopercle ridge. Margins and septa of lower jaws with narrow black edges. Subopercle and interopercle black. Septa and edges of occipital sensory canal

narrowly edged in black. Branchiostegal rays black; intervening membrane mostly pale. Gular membrane black, with striae underlying most of skin. Barbel pale, base black; lips black. First dorsal fin faintly blackish distally but otherwise pale. Pectoral and pelvic fins dusky; outer pelvic ray pale. Anal fin mostly pale, but base of each fin ray marked with black dot.

SIZE. — Attains at least 23 cm TL.

DISTRIBUTION. — New Caledonian region (500-620 m); possibly also Indonesia and northern Australia.

REMARKS AND COMPARISONS. — *Hymenocephalus longibarbis* appears to be relatively common in shallow tropical slope waters of the New Caledonian region. It was originally described from a single *"Challenger"* specimen taken off the Fiji Islands. GILBERT and HUBBS (1920) distinguished *H. longiceps* from this species by the higher pectoral ray count (14-17 cf. 11) and shorter barbel (length less than 2/3 head). However, the pectoral ray count given in the original description for *H. longibarbis* is erroneous; OKAMURA (*in* OKAMURA & KITAJIMA, 1984: 357) reported 15 for the holotype, and our data for New Caledonian specimens show i14-i16. Our data for barbel length as a percentage of head length agree well with the 34-49% of head length in five specimens (CAS-SU 25454) of *H. longiceps* that we examined, but compared with the orbit diameter, *H. longibarbis* shows differences (barbel 0.7-1.0 into orbit, cf. 1.0-1.4). Other differences of note include the shorter snout in *H. longibarbis* (20-25% HL, cf. 25-28%), and higher ratios of orbit/interorbital (1.7-2.1 cf. 1.1-1.3) and orbit/suborbital (3.1-4.6, cf. 2.0-2.3). A third species with which *H. longibarbis* may be mistaken at small sizes is *H. gracilis*, which does not exceed about 120 mm TL. Both species are slender and have long barbels, but the weakly serrated spinous dorsal ray of *H. gracilis* is distinguishing, if it can be seen. The pigmentation pattern of *H. gracilis* is also very different in there being a prominent row of large melanophores running midlaterally from the trunk to the tail tip, often accompanied by one or two fainter rows ventrally and dorsally that fade out midway along the tail, and the trunk has no black dorsal blotch. Furthermore, the snout of *H. gracilis* protrudes almost one pupil diameter beyond the mouth, whereas in *H. longibarbis* the snout scarcely, if at all, protrudes.

Hymenocephalus megalops sp. nov.

Fig. 22 a

MATERIAL EXAMINED. — 206 specimens.

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CP 360, 19°36.40'S, 158°49.60'E, 770-810 m, 18.10.1986: holotype 27.0 mm HL, 161 mm TL (MNHN 1994-890). — Stn DC 358, 19°38.39'S, 168°47.17'E, 680-700 m, 18.10.1986: 1 paratype 28.0 mm HL, 142 mm TL (CAS 86458). — Stn 359, 19°39.00'S, 158°49.00'E, 700-720 m, 18.10.1986: 13 paratypes 16.8-26.3 mm HL, 95-150 mm TL (MNHN 1994-896). — Stn 360, same data as for holotype: 3 paratypes 167-180 mm TL (MNHN 1994-891 to 1994-893). — Stn CP 363, 19°47.90'S, 158°44.30'E, 700-685 m, 19.10.1986: 117 paratypes (MNHN 1994-894), 5 paratypes (BMNH 1996.7.19:11-15), 5 paratypes (CAS 82185). — Stn 364, 19°45.30'S, 158°46.50'E, 675 m, 19.10.1986: 21 paratypes 14.4-28.3 mm HL, 95-155 mm TL (MNHN 1994-895), 3 paratypes (BMNH 1996.7.19:16-18), 3 paratypes (CAS 82186). — Stn CP 384, 19°42.40'S, 158°50.80'E, 772-756 m, 21.10.1986: 5 paratypes 24.0-24.5 mm HL, 140+-151 mm TL (MNHN 1994-898). — Stn CP 390, 21°90.00'S, 1°60°50.30'E, 745-825 m, 22.10.1986: 13 paratypes (MNHN 1994-897).

New Caledonia. BIOCAL: stn CP 52, 23°05.79'S, 167°46.54'E, 600 m, 31.08.1985: 2 paratypes 25.6-28.8 mm HL, 163-174 mm TL (MNHN 1994-899).

MUSORSTOM 4: stn CP 199, 18°50.0'S, 163°14.5'E, 600 m, 20.09.1985: 12 paratypes (MNHN 1994-900).

Norfolk Ridge. CHALCAL 2: stn CP 22, 24°40.32'S, 163°38.67'E, 650-750 m, 28.10.1986: 1 paratype 28.3 mm HL, 170 mm TL (CAS 86485).

Australia: *"Soela"*: stn SO6/85/34: east of Marian Plateau, 19°01.6'S, 150°43.1'E, 642 m, 24.11.1985: 1 paratype 23.5 mm HL, 150 mm TL (CSIRO H.1166-01).

Wallis and Futuna Islands. MUSORSTOM 7: stn CP 531, 12°31.6'S, 176°39.3'W, 580-600 m, 16.05.1992: 2 (non-type) specimens 18.5-20.6 mm HL, 73+-102+ mm TL (MNHN 1994-901). — Stn CP 628, 11°53.4'S, 179°32.0'W, 650-625 m, 29.05.1992: 1 (non-type) specimen 23.1 mm HL, 131 mm TL (MNHN 1994-902).

DIAGNOSIS. — Pelvic rays 8; gill-rakers first arch (outer/inner) 12-19 / 20-24 [10-13 / 17-19 in MUSORSTOM 7 spec.]; barbel short 8-22% HL; orbits large 40-48%; snout usually 23-33%; orb.-preop. 36-47%; dorsolateral stripe on trunk fades out completely on tail.

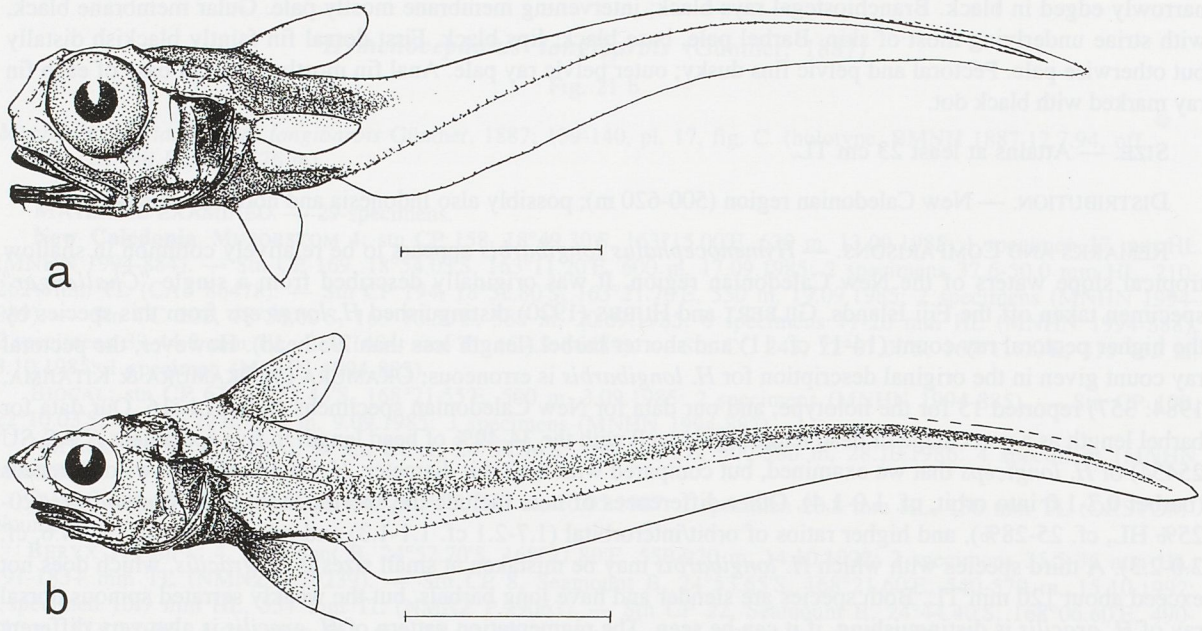


FIG. 22. — **a**, *Hymenocephalus megalops* sp. nov., 28 mm HL, paratype (CAS 86458), Chesterfield and Bellona Plateau, MUSORSTOM 5, stn DC 358, 680-700 m. — **b**, *Hymenocephalus nascens* Gilbert & Hubbs, 26.2 mm HL (NMNZ P.29101), Stylaster Seamount, south of New Caledonia, BERYX 11, stn DW 38, 550-690 m. Scales = 25 mm.

DESCRIPTION. — *Counts* (from 22 type specimens; see also Table 1): 1D. II,7-9, usually II,8; P. i13-i15.

Measurements: Total lengths 95-174+ mm; HL 14.4-28.8 mm. The following in percent of HL: postrostral 80-85; interorb. 24-36; suborb. 8-16; postorb. 39-53; up.jaw 53-59; pre-A. 140-158; body depth 56-79; ht. 1D. 61-78; len. P. 57-76; len. V. 63-91.

Head deep, broad, greatest width 1.2-1.5 into greatest depth; head covering membranous, transparent, bones firm to paper thin. Trunk short, length from pelvic base to anal origin about equal to combined lengths snout and orbit; tail slender, gently tapering to long fine tip. Snout short, barely if at all protruding beyond mouth; orbits large, greatest diameter steeply diagonal, about equal to postorbital length. Interorbital width about 1/2 to 2/3 orbit diameter. Mouth large, upper jaw extends posteriorly to below hind edge of orbit. Chin barbel short, fine.

Origin of first dorsal, pectoral, and pelvic fins about on same vertical. First dorsal length about equal to postrostral length; longest pectoral and pelvic rays extend past anal origin. Interspace between first and second dorsals about twice length base of first; second dorsal rudimentary; anal well developed.

Teeth all small, in narrow bands in both jaws, no enlarged teeth, as typical of genus.

Light organ with band of luminescent tissue (ventral striae) along sides of isthmus, passing posteriorly above pelvic base, then spreading posteriorly and mesially to each side of median ventral line, but falling well short of anus; a small patch in front of pelvic base. Lenses of light organ, at each end of median ventral line, small but prominent.

Color in alcohol. Nape and trunk above midlateral line black. Abdomen and chest also black, overlain with silvery, especially over ventral striae. Intervening areas on trunk (between black dorsum and ventrum) pale to silvery, with fine peppering. Posteriorly on tail completely pale, the black dorsal area on trunk rather abruptly ending, with fine peppering extending only a short distance beyond black area. Opercle and part of subopercle black. A black streak extending from angle of preopercle forward below orbit to snout above mouth. Anterior end of lower jaw and most of upper jaw black, but remaining parts of jaws pale. Fins generally pale, but pelvics proximally darker.

SIZE. — Attains at least 17 cm TL.

ETYMOLOGY. — From the Greek, *megas*, great, and *ops*, eye, in reference to the notably large eyes of the species.

DISTRIBUTION. — Known only from New Caledonia and adjacent regions and off Queensland, Australia. Three representatives (listed above as non-type material) of a possible subspecies from the northern margin of the North Fiji Basin were collected at two MUSORSTOM 7 stations. Depth range 600-825 m.

REMARKS AND COMPARISONS. — The new species belongs in that complex of species related to *H. striatissimus* Jordan & Gilbert, 1904 and appears to be most similar to two species recently described from the southeastern Pacific off the Nazca and Sala-y-Gomez ridges, viz, *H. neglectissimus* Sazonov & Iwamoto, 1992 and *H. semipellucidus* Sazonov & Iwamoto, 1992. *Hymenocephalus megalops* can be readily differentiated from those species by the gill-raker counts, which are generally higher in *H. megalops*, and by a combination of proportional measurements (see Table 1). *Hymenocephalus striatissimus* is most easily differentiated by its more heavily pigmented body, notably the tail region, which in the new species is immaculate (This pigmentation feature is noticeable even in old, faded *"Albatross"* specimens). Juveniles of *H. longibarbis* may on superficial examination be mistaken with *H. megalops* in that the color patterns are similar, but the long barbel in *H. longibarbis* is immediately distinguishing.

Three specimens collected on the Pacific Plate north of the North Fiji Basin during MUSORSTOM 7 differ from the type specimens in having lower gill raker counts (GR-I 10-13 lateral/17-19 mesial; GR-II 17-19 lateral/17-18 mesial). In this respect, they agree with *H. neglectissimus* and *H. semipellucidus*, but their suborbital is wider (12-17% HL cf. 5-10% and 9-11%, respectively) and barbel somewhat shorter (12-14% HL). Closer examination of more and better specimens may require their recognition as distinct species.

TABLE 1. — Comparison of selected counts and measurements of *Hymenocephalus megalops*, *H. neglectissimus*, and *H. semipellucidus*. Data for last two species from SAZONOV & IWAMOTO (1992). Figures in parentheses are means.

Character	*megalops*	*neglectissimus*	*semipellucidus*
Gill rakers (1st arch, lateral)	12-19(16)	11-15(13)	9-15(12)
Gill rakers (2nd arch, lateral; total)	20-23(21)	15-19(17)	15-20(17)
Gill rakers (2nd arch, mesial; total)	18-22(20)	16-19(17)	15-18(16)
Snout length	23-33(25)	16-24(20)	21-27(25)
Postorbital length	39-53(45)	38-43(41)	38-45(43)
Suborbital width	8-16(12)	5-10(7)	9-11(10)
Distance orbit to angle of preopercle	36-47(41)	28-37(32)	30-40(36)
Orbit diameter	40-48(43)	45-55(50)	43-51(46)
Barbel length	8-22(15)	15-28(22)	13-22(17)
Body depth	56-81(69)	75-92(83)	61-85(72)
Height first dorsal	61-85(74)	75-92(83)	66-96(77)
Length pectoral fin	57-76(67)	63-92(77)	58-78(70)

Hymenocephalus nascens Gilbert & Hubbs, 1920

Fig. 22 b

Hymenocephalus nascens Gilbert & Hubbs, 1920: 535-539, fig. 30 (holotype USNM 78229; Borneo, vicinity of Sibuko Bay; 759 m).

MATERIAL EXAMINED. — 206 specimens.

Celebes Sea. *"Albatross"*, PHILIPPINES EXPEDITION 1907-1910: stn 5589, Celebes Sea, vicinity of Sibuko Bay; 4°12'10"N, 118°38'08"E, 475 m, 29.09.1909: 9 paratypes, 18-25.5 mm HL, 126-127+ mm TL (CAS-SU 25460).

New Caledonia. BIOCAL: stn CP 31, 23°07.26'S, 166°50.45'E, 850 m, 29.08.1985: 2 specimens (MNHN 1994-853). — Stn CP 40, 22°55.32'S, 167°23.30'E, 650 m, 30.08.1985: 43 specimens (MNHN 1994-858), 5 specimens (BMNH 1996.7.19:19-23). — Stn CP 52, 23°05.79'S, 167°46.54'E, 600 m, 31.08.1985: 5 specimens (MNHN 1994-859).

MUSORSTOM 4: stn CP 158, 18°49.3'S, 163°15.0'E, 620 m, 15.09.1985: 2 specimens (MNHN 1994-862). — Stn CP 199, 18°50.0'S, 163°14.5'E, 600 m, 20.09.1985: 4 specimens (MNHN 1994-861).

Norfolk Ridge. BERYX 11: stn DW 38, Stylaster Seamount, 23°37.53'S, 167°39.42'E, 550-690 m, 19.10.1992: 1 specimen 26.2 mm HL, 148+ mm TL (NMNZ P.29101). — Stn CP 59, Azteque Seamount, 23°19.45'S, 167°59.85'E, 750-800 m, 22.10.1992: 1 specimen 18.5 mm HL, 95+ mm TL (NMNZ P.29107), 2 specimens 18.7-23.5 mm HL, 85+-102+ mm TL (NMNZ P.29108). — Stn CP 60, Azteque Seamount, 23°19.00'S, 168°00.37'E, 580-600 m, 22.10.1992: 3 specimens 22.4-25.5 mm HL, 80+-121+ mm TL (NMNZ P.29077).

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CP 359, 19°39.00'S, 158°49.00'E, 700-720 m, 18.10.1986: 1 specimen (MNHN 1994-856). — Stn CP 360, 19°36.40'S, 158°49.60'E, 770-810 m, 18.10.1986: 6 specimens 14.6-22.8 mm HL (CAS 86494), 5 specimens 14.4-24.4 mm HL (BMNH 1996.7.19:53-57). — Stn CP 363, 19°47.90'S, 158°44.30'E, 700-685 m, 19.10.1986: 13 specimens (MNHN 1994-854). — Stn CP 364, 19°45.30'S, 158°46.50'E, 675 m, 19.10.1986: 21 specimens 11.0-24.0 mm HL (MNHN 1994-855). — Stn CC 367, 19°36.80'S, 158°53.20'E, 855-830 m, 19.10.1986: 6 specimens 22.0-26.5 mm HL (MNHN 1994-860), 4 specimens 24.6-27.0 mm HL, 121+-134+ mm TL (CAS 86462). — Stn CP 390, 21°00.90'S, 160°50.30'E, 745-825 m, 22.10.1986: 2 specimens (MNHN 1994-857).

Wallis and Futuna Islands. MUSORSTOM 7: stn CP 531, 12°31.6'S, 176°39.3'W, 580-600 m, 16.05.1993, 5 specimens (MNHN 1994-863). — Stn CP 550, 12°14.8'S, 177°28.0'W, 800-810 m, 18.05.1993: 1 specimen 24.4 mm HL, 126+ mm TL (CAS 82173). — Stn CP 551, 12°15.3'S, 177°18.1'W, 791-795 m, 18.05.1992: 6 specimens (MNHN 1994-864). — Stn CP 552, 12°15.7'S, 177°22.8'W, 786-800 m, 18.05.1992: 11 specimens (MNHN 1994-865), 3 specimens (CAS 82174). — Stn CP 553, 12°16.8'S, 177°28.1'W, 780-794 m, 18.05.1992: 14 specimens (MNHN 1994-866). — Stn CP 554, 12°13.8'S, 177°28.0'W, 820-795 m, 18.05.1992: 2 specimens 24.5-28.0 mm HL (MNHN 1994-867). — Stn CP 562, 11°48.1'S, 178°22.1'W, 775-777 m, 19.05.1992: 21 specimens (MNHN 1994-871). — Stn CP 592, 12°32.4'S, 174°22.0'W, 775-730 m, 24.05.1992: 1 specimen (MNHN 1994-868). — Stn CP 631, 11°4.0'S, 179°31.6'W, 600 m, 29.05.1992: 4 specimens 20.0-22.5 mm HL (MNHN 1994-869). — Stn CP 632, 11°54.0'S, 179°56.3'W, 600-595 m, 29.05.1992: 8 specimens 17.0-27.0 mm HL (MNHN 1994-870).

DIAGNOSIS. — Pelvic rays 11-13 (usually 12 or 13); total gill-rakers first arch (outer/inner) 16-20 / 22-27, second arch 23-27 / 22-26; chin barbel absent; snout 26-31% HL; orbit 31-38%; suborb. 2.0-3.0, interorb. 1.0-1.4 into orbit; a prominent midlateral stripe; maximum size 16 cm TL.

DESCRIPTION. — *Counts* (20 spec.): 1D. II,9-12; P. i13-i17.

Measurements: Total lengths 79-148+ mm; HL 14.4-28.0 mm. The following in percent of HL: postrostral 74-77; preoral 13-19; interorb. 27-35; suborb. 12-16; postorb. 41-49; orb.-preop. 38-48; up.jaw 51-57; gill slit 29-35; pre-A. 139-160; V.-A. 43-52; depth 47-74; 1D.-2D. 48-67; ht. 1D. 68-83; len. P. 51-59; len. V. 71-94.

GILBERT and HUBBS (1920) provide a detailed description and an accurate illustration of the species, to which may be added the following notes: Scales deciduous and lacking in almost all specimens, but in NMNZ P.29101 (148 mm TL) a group of scales under first dorsal with short, spikelike spinules arranged in somewhat quincunx to roughly parallel rows; about 11 or 12 rows in the largest scale remaining.

Pigmentation pattern notable; midlateral to dorsolateral stripe rising posteriorly behind trunk quite prominent in most specimens. Stripe narrow, tapering posteriorly, and unbroken. No large black blotches present on trunk dorsally. Dorsolateral stripe, and ventrally on trunk and head, mostly silvery when fresh. Most silvery reflections disappear in formalin-preserved specimens, but some remain just over pelvic fins, where ventral striae persist. Chest and ventral (triangular-shaped) portion of belly black. Ventral striae in narrow strip along each side of isthmus, passing above and behind pelvic fin onto forward half of belly; striae on each side closely approximated but not meeting at ventral midline of belly; no striae on chest before pelvic bases. Black margin marking anterior and lateral borders of nape prominent. Cheeks relatively paler than in some species, especially anteriorly over preopercle; opercle and subopercle black; inner wall of suborbital bones with narrow black streak that extends onto preopercle. Underside of head, lips, gular membrane black. Snout ridges thinly marked in black. Fins generally dark dusky, with outer pelvic rays paler; anal fin light dusky.

SIZE. — Attains 16 cm TL.

DISTRIBUTION. — Widespread in western tropical Pacific, from South China Sea off Hong Kong, through Philippines and Indonesia, off northern Australia, to New Caledonia. Depth range from about 366 m to more than 800 m, although GILBERT and HUBBS (1920: 536) recorded one specimen from 183 m, which they suspected as possibly erroneous. In New Caledonian region, capture depths 600-855 m.

REMARKS AND COMPARISONS. — *Hymenocephalus nascens* is very close to the Japanese species *H. lethonemus* Jordan & Gilbert, 1904, the two being distinguished only by *H. nascens* having more pelvic fin rays. In *H. lethonemus*, the count is predominantly 11, whereas in *H. nascens* the count is usually 12 in Philippines and Indonesian specimens, usually 12 or 13 in New Caledonian specimens. *H. striatulus* Gilbert, 1905 from Hawaii and the Sala-y-Gomez Ridge is similar in many respects, but has a higher pelvic ray count (14-15), somewhat narrower interorbital space (21-29% HL, $\bar{x}$= 25%, cf. 27-35%), slightly larger orbits (35-42%, $\bar{x}$= 39%, cf. 31-38%), somewhat narrower suborbital (9-15%, $\bar{x}$= 11%, cf. 12-16%), and shorter postorbital (33-42%, $\bar{x}$= 37%, cf. 41-49%). *H. nascens* is also closely similar to *H. antraeus* Gilbert & Cramer, 1897 from Hawaii, but differs in having a narrower suborbital (3.7-5.0 into orbit, 7-10% of HL), somewhat narrower interorbital (1.3-1.5 into orbit, 24-28% HL), somewhat shorter postorbital (37-42% HL) and orb.-preop. distances (35-40%), longer V.-A. (58-63%), and longer P. (65-77%). In addition, all specimens of *H. antraeus* examined had a rudimentary barbel, whereas only one of the New Caledonian specimens we examined had such a rudiment.

Genus ***KUMBA*** Marshall, 1973

Kumba Marshall, 1973: 616 (type species *Kumba dentoni* Marshall, 1973, by original designation).

DIAGNOSIS. — Branchiostegal rays 7; anus in middle 1/3 of space between anal and pelvic fin bases, usually closer to latter; pelvic origin below or anterior to vertical of pectoral origin, anal origin below posterior half of first dorsal base; light organ present; most of dorsal surface of snout and almost entire ventral surfaces of snout, suborbital, and lower jaw naked; no terminal or lateral snout scutes; pelvic rays 8-12.

REMARKS. — This genus was recently revised by IWAMOTO and SAZONOV (1994), who described the new species *K. punctulata* from a MUSORSTOM specimen collected off New Caledonia and a juvenile from New Guinea. Nine species, only one from the New Caledonia region.

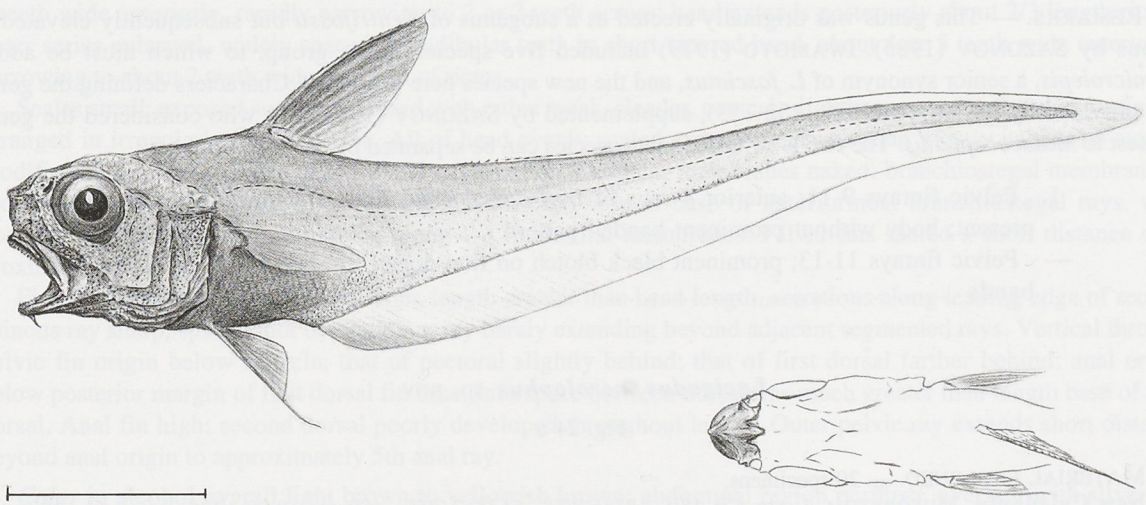


FIG. 23. — *Kumba punctulata* Iwamoto & Sazonov, 26.7 mm HL, holotype (MNHN-1994-34), Norfolk Ridge, 530 m (From IWAMOTO & SAZONOV, 1994, fig. 6). Scale = 25 mm.

Kumba punctulata Iwamoto & Sazonov, 1994

Fig. 23

Kumba punctulata Iwamoto & Sazonov, 1994: 233, figs 6-7 (holotype, MNHN 1994-34; New Caledonia, 530 m; 1 paratype from New Guinea).

MATERIAL EXAMINED. — 1 specimen.
Norfolk Ridge. SMIB 3: stn CP 4, 24°54.0'S, 168°21.5'E, 530 m, 20.05.1987: holotype 26.7 mm HL, 145+ mm TL (MNHN 1994-34).

DIAGNOSIS. — Snout almost entirely naked above and below; head not inflated, sensory pores large; V. 9-10; orbit 37-43% HL, upper jaw 40-41%, barbel 16-19%.

REMARKS AND COMPARISONS. — Among the New Caledonian grenadiers, this species is likely to be confused only with members of the genera *Nezumia*, *Lucigadus*, and possibly *Pseudonezumia*. The extensive naked areas on both the dorsal and ventral snout surfaces and the absence of a scutelike scale at the snout tip distinguish it from members of these genera.

Genus *LUCIGADUS* Gilbert & Hubbs, 1920

Lucigadus Gilbert & Hubbs, 1920: 553 (as subgenus of *Ventrifossa*; type species *Macrourus lucifer* Smith & Radcliffe, 1912, by original designation).
Lucigadella Gilbert & Hubbs, 1920: 552 (as subgenus of *Ventrifossa*; type species *Macrourus nigromarginatus* Smith & Radcliffe, 1912, by original designation).

DIAGNOSIS. — Branchiostegal ray 7; chin barbel present; spinous ray of first dorsal serrated; anus removed from anal fin, closer to pelvic insertions; light organ well developed, two dermal windows, one immediately before anus, the second between bases of pelvic fins; ventral region of body appearing to have swung far forward so that gill membranes unite below orbits, pelvic fins below opercle; suborbital shelf covered with several rows of small, relatively unmodified scales, with no sharp ridge developed; underside of snout mostly or completely scaled; teeth in both jaws small, in tapered bands, premaxillary band not reaching beyond posterior edge of maxillary process; scale spinules usually aligned in parallel rows.

REMARKS. — This genus was originally erected as a subgenus of *Ventrifossa* but subsequently elevated to genus by SAZONOV (1985). IWAMOTO (1979) included five species in the group, to which must be added *L. microlepis*, a senior synonym of *L. fasciatus*, and the new species here described. Characters defining the genus are provided by IWAMOTO (1979: 152-153), supplemented by SAZONOV (1985: 17), who considered the genus closest to *Malacocephalus*. The two New Caledonian species can be separated by the following key:

1. Pelvic finrays 9-11; anterior 4 rays of first dorsal dark, but no distinct black blotch present; body without prominent banded pattern ..... ***L. acrolophus***
— Pelvic finrays 11-13; prominent black blotch on first dorsal fin; body with broad dark bands ..... ***L. microlepis***

Lucigadus acrolophus sp. nov.

Fig. 24 a

MATERIAL EXAMINED. — 20 specimens.
New Caledonia. MUSORSTOM 4: stn CP 180, 18°56.80'S, 163°17.70'E, 450 m, 18.09.1985: holotype, 28.9 mm HL, 180 mm TL (MNHN 1994-957). — Stn CP 180, same data as for holotype: 2 paratypes 18.6-24.9 mm HL, 115-125+ mm TL (MNHN 1994-955 and 1994-956). — Stn CP 213, 22°51.30'S, 167°11.00'E, 405-430 m, 28.09.1985:

1 paratype 23.8 mm HL, 136 mm TL (MNHN 1994-954). — Stn CP 214, 22°53.80'S, 167°12.90'E, 425-440 m, 28.09.1985: 6 paratypes 10.4-26.4 mm HL, 66-158 mm TL (MNHN 1994-948 to 1994-953), 2 paratypes 22.2-22.8 mm HL, 129-135 mm TL (CAS 82184), 2 paratypes (BMNH 1996.7.19:24-25). — Stn CC 245, 22°07.00'S, 167°11.00'E, 415-435 m, 3.10.1985: 7 paratypes 19.8-28.5 mm HL, 135-168 mm TL (CAS 86480).

Norfolk Ridge. SMIB 1: stn DW 2, 22°51.9'S, 167°13'E, 415 m, 5.02.1986: 1 paratype 19.6 mm HL, 107+ mm TL (ORSTOM-Nouméa).

DIAGNOSIS. — Pelvic rays 10-11, rarely 9. Body plain, without prominent markings; first dorsal fin dark over anterior four or so rays, pale posteriorly, no black blotch; anal fin pale except for blackish distal margin of anteriormost rays. Scale patch on each side at base of anteriormost branchiostegal rays. Snout 28-32% HL, interorbital 28-35%, barbel 24-32%, scales below 2D. 8.5-10.

DESCRIPTION. — *Counts*: 1D. II,9-11 (usually 10); P. i18-i24; total GR-I (outer/inner) (7) 8-9/(9)10-12, GR-II (8)9-11/(8)9-11; scales midbase 1D. 7-10, lat.line 31-40.

Measurements: Total lengths 66-180 mm; HL 10.4-28.9 mm. The following in percent of HL: preoral 18-25; internasal 23-28; orb. 32-38; suborb. 14-18; postorb. 41-46; orb.-preop. 36-44; up.jaw 35-41; gill-slit 19-23; pre-A. (145)153-171; V.-A. 42-59; anus-A. 16-31; body depth 91-114; 1D.-2D. 46-75; ht. 1D. 108-129; len. P. 60-69; len. V. 60-73; nostril 6-15.

Head short, about 6 in TL, sides rather flat; trunk short, deep, compressed, ventral contours of body rising steeply behind anal fin origin, leveling off somewhat to end of long, laterally compressed tail. Head length about equal to or less than body depth. Snout short, blunt, rounded, protruding little beyond mouth, length less than orbit, about equal to or slightly less than broad interorbital. Mouth relatively small, upper jaw extends to below posterior 1/3 of orbit. Suborbital almost vertical with rounded contours, ridge low, inconspicuous in well-preserved specimens. Posterior preopercle margin almost vertical; opercle and subopercle form rather large surface of gill cover; a deep inflection in outer margin formed at juncture of opercle and subopercle; interopercle narrowly exposed at posteroventral corner. Gill membranes on each side narrowly joined far forward, below posterior margin of orbit or somewhat behind. Chin barbel moderately developed, slender, length greater than half orbit diameter. Large pores of cephalic sensory system along ventral margin of suborbital, margins of preopercle, and along ramus of lower jaw.

Light organ well developed; periproct large. Anus closer to pelvic insertions than to anal origin and located (with urogenital pore) at posterior end of periproct. A large lenslike structure immediately anterior to anus, with narrow connection to much smaller lenslike body between bases of pelvic fins.

Jaw teeth conical, slightly recurved, rather bluntly tipped. Premaxillary teeth in broad, tapered band, about 5 teeth wide anteriorly, rapidly narrowing to 2 or 3 teeth across; band extends posteriorly about 2/3 length rictus; outer series enlarged, widely spaced. Mandibular teeth in short tapered band, about 4 or 5 teeth wide anteriorly, narrowing to about 2 teeth wide near end of rictus.

Scales small, exposed surfaces covered with rather weak, slender, conical, slightly recurved and reclined spinules arranged in irregularly parallel rows. All of head evenly scaled except lower jaw rami mostly naked; no stoutly modified scales along ridges or at tip and angles of snout. Gular membranes naked; branchiostegal membrane in most specimens with patch of scales present on each side at base of anteriormost branchiostegal rays, with posterior extensions in some passing along 1-3 interradial membranes. Pelvic fins scaled a short distance over proximal surfaces.

Fins well developed. First dorsal high, length greater than head length, serrations along leading edge of second spinous ray sharp, spaced, not overlapping; ray barely extending beyond adjacent segmented rays. Vertical through pelvic fin origin below opercle; that of pectoral slightly behind; that of first dorsal farther behind; anal origin below posterior margin of first dorsal fin base. Interspace between dorsal fins much greater than length base of first dorsal. Anal fin high; second dorsal poorly developed throughout length. Outer pelvic ray extends short distance beyond anal origin to approximately 5th anal ray.

Color in alcohol overall light brown to yellowish brown; abdominal region purplish, overlain with silvery in some. Prominent melanophores behind and above abdomen; inner surfaces of shoulder girdle heavily pigmented. Sides and underside of head heavily freckled with large melanophores, notably heavy over opercle and subopercle.

Gill membrane also more densely peppered, but pigmentation not solid. Lips lightly peppered. Barbel darkly pigmented over basal 1/5th to 1/2 of length, but pale distally. Gill arches and rakers sparsely dotted with large melanophores. All of oral cavity pale; gill cavity generally pale except along distal margin and along outermost gill slit. First dorsal fin blackish along anterior 4 segmented rays and interradial membranes; rays posteriorly pale. Pectorals light dusky; pelvics blackish proximally and distally, less densely pigmented over middle of fin; outer ray distally pale; anal overall pale, but dark along thin distal margin of anteriormost rays.

SIZE. — To at least 18 cm TL.

ETYMOLOGY. — From the Greek, *akrolophos*, crest or mountain ridge, in reference to the submarine elevations in and around New Caledonia from which this species was collected.

DISTRIBUTION. — So far known only from off New Caledonia and the Norfolk Ridge, in 405-450 m.

REMARKS AND COMPARISONS. — *Lucigadus acrolophus* appears closely similar to *L. nigromarginatus* (Smith & Radcliffe, 1912) but is distinguished by its broader interorbital (28-35% HL cf. 22-26%), longer snout (26-32% cf. 24-28%), broader suborbital (14-18% cf. 12-15%), longer barbel (22-32% cf. 20-26%), deeper body (91-114% cf. 85-94%), higher 1D. (108-129% cf. 92-107%), and more scales below 2D. (8.5-10 cf. 7-8). The gular membrane in *L. nigromarginatus* is densely scaled, in contrast with the sparsely scaled or naked condition in the new species. Compared with *L. microlepis*, its congener from New Caledonia, the new species has a lower pelvic ray count, lack of prominent body markings, and prominent scale patches on the branchiostegal membrane.

Lucigadus microlepis (Günther, 1878)

Fig. 24 b

Coryphaenoides microlepis Günther, 1878: 26 (holotype BMNH 1887.12.7.104; Fiji Islands, 576 m).
Macrurus (Lionurus) microlepis - GÜNTHER, 1887: 142 (redescribed).
Macrurus fasciatus Weber, 1913: 157, pl. 1, fig. 5 (Madura & Arafura seas, *"Siboga"*, stns 12 and 251, 204-289 m)(junior homonym of *Macrurus fasciatus* Günther, 1878).
Macrurus vittatus - WEBER, 1913: 157 ("misprint" *fide* WEBER & DE BEAUFORT, 1929: 73).
Lionurus vittatus - GILBERT & HUBBS, 1920: 559 (name only).
Lionurus microlepis - GILBERT & HUBBS, 1916: 146 (listed).
Lionurus fasciatus - WEBER & DE BEAUFORT, 1929: 73, fig. 15 (description from WEBER, 1913).
Ventrifossa (Lucigadus) fasciata - IWAMOTO, 1979: 153 (listed).
Ventrifossa fasciata - IWAMOTO, 1990: 293, 296, fig. 668 (in key, listed).

MATERIAL EXAMINED. — 85 specimens.

Fiji. *"Challenger"*: stn 173, off Matuka, 576 m: holotype 15.5 mm HL, 95+ mm TL (BMNH 1887.12.7.104).

Wallis and Futuna Islands. MUSORSTOM 7: stn CP 606, 13°21.4'S, 176°08.3'W, 420-430 m, 26.05.1992: 5 specimens 14-20 mm HL (MNHN 1994-947).

New Caledonia. MUSORSTOM 4: stn CP 180, 18°56.8'S, 163°17.7'E, 450 m, 18.09.1985: 2 specimens 15-20 mm HL (MNHN 1994-935). — Stn CP 194, 18°52.8'S, 163°21.7'E, 550 m, 19.09.1985: 3 specimens 16-23 mm HL (MNHN 1994-944). — Stn CP 198, 18°49.4'S, 163°18.8'E, 590 m, 20.09.1985: 4 specimens 15.5-18.1 mm HL, 105-114 mm TL (CAS 84969). — Stn CP 199, 18°50.0'S, 163°14.5'E, 600 m, 20.09.1985: 1 specimen 14 mm HL (MNHN 1994-946). — Stn CP 202, 18°58.0'S, 163°10.5'E, 580 m, 20.09.1985: 1 specimen 14.8 mm HL, 92+ mm TL (MNHN 1994-945). — Stn CP 214, 22°53.8'S, 167°13.9'E, 425-440 m, 28.09.1985: 1 specimen 15.7 mm HL (CAS 86469). — Stn CP 216, 22°59.5'S, 167°22.0'E, 490-515 m, 29.09.1985: 3 specimens 16-20 mm HL (MNHN 1994-937). — Stn CP 239, 22°14.8'S, 167°15.7'E, 470-475 m, 2.10.1985: 5 specimens 13-21 mm HL (MNHN 1994-942). — Stn CP 240, 22°16.5'S, 167°16.5'E, 475-500 m, 2.10.1985: 1 specimen 20.4 mm HL, 126 mm TL (MNHN 1994-941). — Stn CC 247, 22°09.0'S, 167°13.3'E, 435-460 m, 4.10.1985: 2 specimens 13-14 mm HL (MNHN 1994-940).

BIOCAL: stn CP 67, 24°55.44'S, 168°21.55'E, 500 m, 3.09.1985: 11 specimens 13.9-20.3 mm HL, 95-127 mm TL (MNHN 1994-936).

Norfolk Ridge. SMIB 1: stn DW 2, 22°51.9'S, 167°12.5'E, 415 m, 5.02.1986: 1 specimen 13.3 mm HL (MNHN 1997-660).

SMIB 3: stn CP 4, 24°54.0'S, 168°21.5'E, 530 m, 20.05.1987: 2 specimens 19.0-22.6 mm HL, 116-127 mm TL (ORSTOM-Nouméa uncat.).

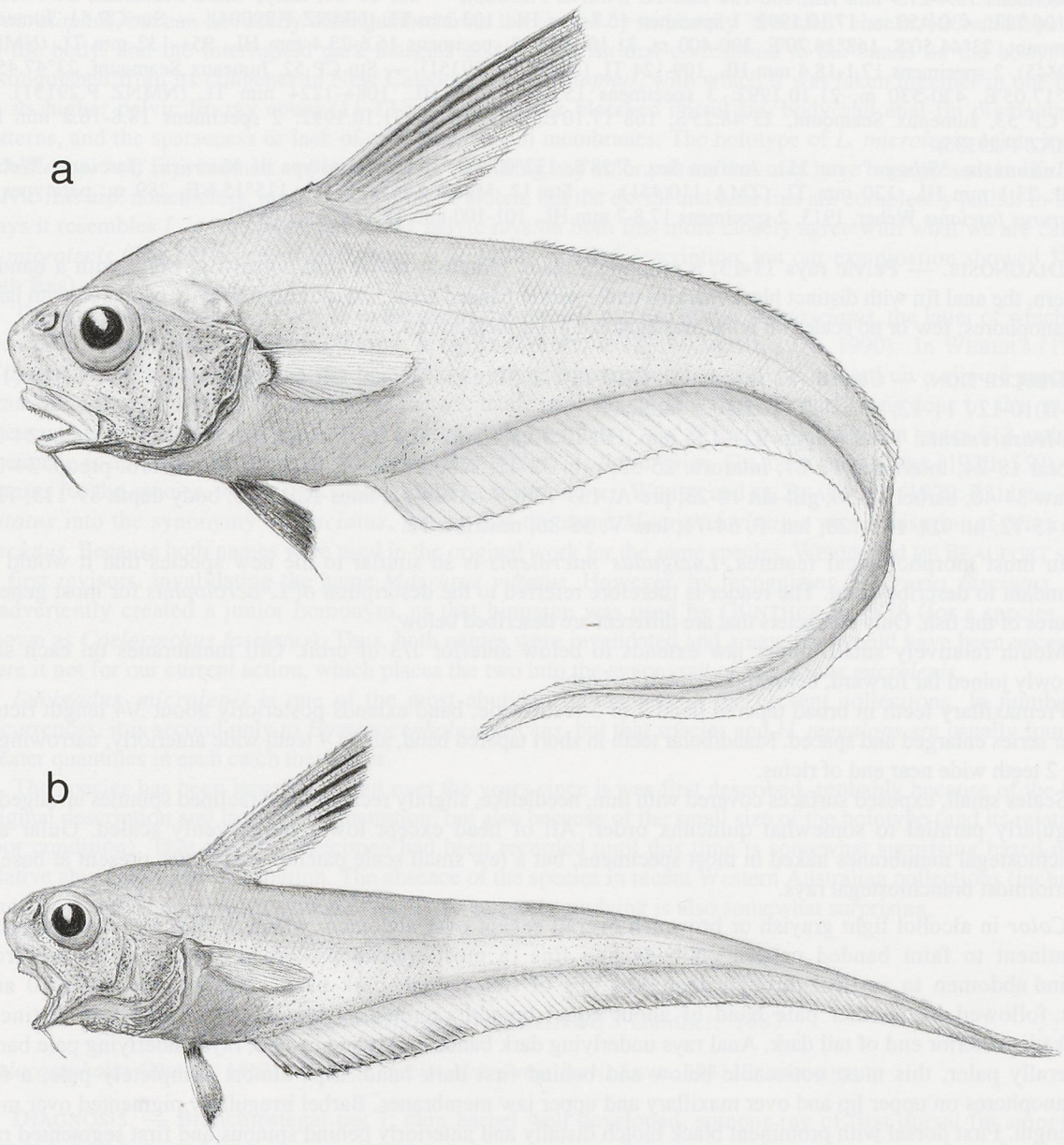


FIG. 24. — **a**, *Lucigadus acrolophus* sp. nov., 28.9 mm HL, holotype (MNHN 1994-957), New Caledonia, MUSORSTOM 4, stn CP 180, 450 m. — **b**, *Lucigadus microlepis* (Günther), 21 mm HL (MNHN 1994-943), Norfolk Ridge, CHALCAL 2, stn CC 1, 500-580 m.

CHALCAL 2: stn CC 1, 24°54.96'S, 168°21.91'E, 500-580 m, 28.10.1986: 12 specimens 15-21 mm HL (MNHN 1994-943), 3 specimens (CAS 82182), 3 specimens (BMNH 1996.7.19:58-60). — Stn CC 3, 23°39.03'S, 167°43.11'E, 424 m, 30.10.1986: 2 specimens 21.0-25.4 mm HL, 120-155 mm TL (MNHN 1994-938). — Stn CP 25, 23°38.60'S, 167°43.12'E, 418 m, 30.10.1986: 2 specimens 17-22 mm HL (MNHN 1994-939).

AZTEQUE: stn 7, Azteque Seamount, 23°37.5'S, 167°42.1'E, 460 m, 14.02.1990: 1 specimen 22 mm HL, 135 mm TL (ORSTOM-Nouméa).

BERYX 11: stn CP 7, Seamount B, 24°54.75'S, 168°21.30'E, 510-550 m, 15.10.1992: 7 specimens 13-23 mm HL, 76+-135 mm TL (NMNZ P.29212). — Stn CP 8, Seamount B, 24°53.65'S, 168°21.60'E, 540-570 m, 15.10.1992:

2 specimens 15.4-21.9 mm HL, 100-130 mm TL (NMNZ P.29062). — Stn CP 21, Kaiyo Maru Seamount, 24°44.35'S, 168°06.72'E, 430-450 m, 17.10.1992: 1 specimen 15.8 mm HL, 102 mm TL (NMNZ P.29004). — Stn CP 51, Jumeaux Seamount, 23°44.50'S, 168°16.70'E, 390-400 m, 21.10.1992: 2 specimens 16.6-23.4 mm HL, 95+-132 mm TL (NMNZ P.29345), 2 specimens 17.1-18.4 mm HL, 109-124 TL (NMNZ P. 29351). — Stn CP 52, Jumeaux Seamount, 23°47.45'S, 168°17.05'E, 430-530 m, 21.10.1992: 3 specimens 15.3-21.3 mm HL, 108+-122+ mm TL (NMNZ P.29131). — Stn CP 53, Jumeaux Seamount, 23°48.25'S, 168°17.10'E, 540-950 m, 21.10.1992: 2 specimens 18.8-16.3 mm HL (NMNZ P.29335).

Indonesia. *"Siboga"*: stn 251, Arafura Sea, 5°28'S, 132°00.2'E, 204 m: lectotype of *Macrurus fasciatus* Weber, 1913, 23.1 mm HL, 130 mm TL (ZMA 110.451). — Stn 12, Madura Sea, 7°15'S, 115°15.6'E, 289 m: paratypes of *Macrurus fasciatus* Weber, 1913, 2 specimens 17.8-? mm HL, 101-100 mm TL (ZMA 110.452).

DIAGNOSIS. — Pelvic rays 11-13; a prominent black blotch at tip of first dorsal fin; body with a banded pattern, the anal fin with distinct black margins under darkly banded areas; sides of head heavily peppered with large melanophores; few or no scales on branchiostegal and gular membranes.

DESCRIPTION. — *Counts* (12 spec.): 1D. II,10-11 (12); P. i20-25; total GR-I (outer/inner) 8-10 / 11-12 (14), GR-II 10-12 / 11-12; scales 2D. 8.5-10.5, lat.line 37-40.

Measurements: Total lengths 92+-155 mm; HL 13.3-25.4 mm. The following in percent of HL: snout 24-31; preoral 18-24; internasal 19-27; interorb. 25-33; orb. 32-42; suborb. 12-16; postorb. 37-43; orb.-preop. 34-38; up.jaw 34-40; barbel 18-30; gill-slit 18-23; pre-A. 139-178; V.-A. 34-58; anus-A. 12-36; body depth 89-113; 1D.-2D. 45-72; ht. 1D. 102-128; len. P. 54-71; len. V. 55-86; nostril 6-12.

In most morphological features, *Lucigadus microlepis* is so similar to the new species that it would be redundant to describe them. The reader is therefore referred to the description of *L. acrolophus* for most general features of the fish. Only characters that are different are described below.

Mouth relatively small, upper jaw extends to below anterior 1/3 of orbit. Gill membranes on each side narrowly joined far forward, below posterior 1/3 of orbit.

Premaxillary teeth in broad tapered band 4 or 5 teeth wide; band extends posteriorly about 3/4 length rictus; outer series enlarged and spaced. Mandibular teeth in short tapered band, about 4 teeth wide anteriorly, narrowing to 1 or 2 teeth wide near end of rictus.

Scales small, exposed surfaces covered with thin, needlelike, slightly recurved and reclined spinules arranged in irregularly parallel to somewhat quincunx order. All of head except lower jaws evenly scaled. Gular and branchiostegal membranes naked in most specimens, but a few small scale patches sometimes present at base of anteriormost branchiostegal rays.

Color in alcohol light grayish or brownish overall except over abdomen, which is dark bluish to purplish. Prominent to faint banded pattern on body and fins in most specimens; broad pale band on tail from behind abdomen to vertical through depressed tips of first dorsal; dark band extends over about 10 anal rays, followed by another pale band of about equal breadth; remaining bands shorter and less distinctly marked; posterior end of tail dark. Anal rays underlying dark bands darkly pigmented; rays underlying pale bands generally paler, this most noticeable below and behind first dark band. Lips almost completely pale; a few melanophores on upper lip and over maxillary and upper jaw membranes. Barbel irregularly pigmented over most of length. First dorsal with prominent black blotch distally and anteriorly behind spinous and first segmented ray; anterior rays of fin otherwise dark dusky, posteriorly pale to light dusky. Pectorals dusky; pelvics dark with tips and base black, but heavily punctate otherwise except for paler outermost ray. Anal fin pale to light dusky overall, but thin black distal margin anteriorly, fading to blackish posteriorly; base of posteriormost rays with small black spots. Large melanophores liberally sprinkled over sides of head and on gular and branchiostegal membranes. Gill arches and rakers dark; gill cavity rather darkly punctate except anteriorly; oral cavity pale; gullet dark. Periproct black.

SIZE. — To 25.4 mm HL and about 16 cm TL.

DISTRIBUTION. — North Fiji Basin, Wallis and Futuna Islands, Norfolk Ridge, New Caledonia, in 418-600 m; Arafura and Madura seas, in 204-289 m.

REMARKS AND COMPARISONS. — This species is closely similar to *Lucigadus nigromarginatus* and *L. acrolophus*, but can be readily distinguished from the former by its heavily "freckled" cheeks, its banded pattern on the body, and the interrupted dark margins on the anal fin that correspond to the bands on the body. It is distinguished from its congener in New Caledonia, *L. acrolophus*, with which it was taken together in one haul, by its higher pelvic fin ray count (11-13 vs. 9-10), black blotched dorsal fin, body and anal-fin pigmentation patterns, and the sparseness or lack of scales on the gill membranes. The holotype of *L. microlepis*, taken by the *"Challenger"* off Fiji, is small and badly faded, obscuring any color pattern that may have been present in life. The pelvic fins are, nonetheless, marked with a black blotch, but the dorsal and anal fins are completely pallid. In these ways it resembles *L. acrolophus*, but the 11 pelvic rays on both fins more closely agree with what we are calling *L. microlepis* (The pelvic count was given as 10 in the original description, but our examination showed 11 on both fins).

There has been some confusion as to the use of the specific names *vittatus* and *fasciatus*, the latter of which has been used by most recent authors (WEBER & DE BEAUFORT, 1929; IWAMOTO, 1979, 1990). In WEBER's (1913) *"Siboga"* Expedition report, the heading for the original description has *vittatus* printed on a slip of paper (in a matching type-style) pasted on after the generic name in a manner that suggests that it was done by the printer. The name is also used in the legend for the original figure (plate 1, fig. 5) and in the tables on pages 618 and 642. The name is not listed, however, in the index, but *fasciatus* is listed twice. GILBERT and HUBBS (1920: 559) used *vittatus* for the species, which they placed in the genus *Lionurus*. WEBER and DE BEAUFORT (1929: 73) later sunk *vittatus* into the synonymy of *fasciatus*, stating that the name *Macrurus vittatus* was a misprint of *Macrurus fasciatus*. Because both names were used in the original work for the same species, WEBER and DE BEAUFORT serve as first revisors, invalidating the name *Macrurus vittatus*. However, by recognizing *Macrurus fasciatus*, they inadvertently created a junior homonym, as that binomen was used by GÜNTHER in 1878 (for a species now known as *Caelorinchus fasciatus*). Thus, both names were invalidated and a new one would have been necessary were it not for our current action, which places the two into the synonymy of *Lucigadus microlepis*.

Lucigadus microlepis is one of the most abundant grenadiers in the present collections. In number of occurrences, it is second only to *Hymenocephalus nascens*, but that species and *H. megalops* are usually found in greater quantities in each catch they occur.

The species has been largely ignored over the years since it was first described, probably because of the brief original description and lack of an illustration, but also because of the small size of the holotype (and its relatively poor condition). That no other specimen had been recorded until this time is somewhat surprising based on its relative abundance and distribution. The absence of the species in recent Western Australian collections (including some from the Arafura Sea) that one of us (TI) is currently studying is also somewhat surprising.

Genus *MALACOCEPHALUS* Günther, 1887

Malacocephalus Günther, 1862: 396 (type species *Macrourus laevis* Lowe, 1843, by monotypy).

DIAGNOSIS. — Branchiostegal ray 7; chin barbel well developed; spinous ray of first dorsal fin smooth or serrated; anus removed from anal fin, closer to pelvic insertions; light organ well developed, two dermal windows, one immediately before anus, the second between bases of pelvic fins; head uniformly covered with small unmodified scales, with no sharp ridges, no enlarged terminal snout scute, lower branchiostegals scaled; lower jaw teeth enlarged, spaced, in single row, premaxillary teeth reaching beyond posterior edge of maxillary process.

REMARKS. — The ubiquitous *Malacocephalus laevis* is represented in the collection by only five specimens, two taken on the Pacific Plate to the north of Fiji, one off the Chesterfield and Bellona Plateau, and two to the south of New Caledonia. It was the only member of the genus taken. The number of valid species in *Malacocephalus* is still uncertain, although SAZONOV and IWAMOTO (1992: 68) provide a current update on the status of some of the seven nominal species. Relationships of the group are probably closest to *Lucigadus* and *Ventrifossa*.

Malacocephalus laevis (Lowe, 1843)

Fig. 25

Macrourus laevis Lowe, 1843: 92 (off Madeira).

MATERIAL EXAMINED. — 5 specimens.

Wallis and Futuna Islands. MUSORSTOM 7: stn number lost: 1 specimen 51 mm HL (MNHN 1994-958). — Stn CP 550, 12°14.8'S, 177°28.0'W, 800-810 m, 18.05.1992: 1 specimen 57 mm HL (MNHN 1994-959).

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CC 383, 19°40.85'S, 158°46.10'E, 615-600 m, 21.10.1986: 1 specimen 78 mm HL, 375+ mm TL (CAS 86470).

Norfolk Ridge and the Loyalties. BERYX 2: stn 18, Seamount B, south of New Caledonia, 24°54.55'S, 168°21.28'E, 540-575 m, 30.10.1991: 1 specimen 61 mm HL, 360+ mm TL (NMNZ P.27492).

Norfolk Ridge. BERYX 11: stn CP 60, Azteque Seamount, 23°19.00'S, 168°00.37'E, 580-600 m, 22.10.1992: 1 specimen 71 mm HL, 412 mm TL (NMNZ P.29012).

DIAGNOSIS. — Seven branchiostegal rays, lowermost scaled at base; gular membrane may or may not be scaled. First dorsal fin with smooth spinous second ray; pelvic rays 9. A prominent bean-shaped fossa in front of elongated periproct, which is well removed from anal fin. Premaxillary teeth in 2 rows, the outer distinctly enlarged; mandibular teeth in 1 row, enlarged and wide spaced. Snout smoothly rounded; no stout, coarsely scaled head ridges. Scales all small, finely spinulated, giving smooth, velvety texture to body and head surfaces. Total mesial gill rakers on first arch 11-14.

REMARKS. —The reader is referred to MARSHALL (1973) for references to descriptions and illustrations. The Chesterfield and Bellona Plateau specimen differed from others in being paler overall and having a black-edged anal fin, and black-tipped pelvic and first dorsal fins. In other specimens, these fins were completely dark, almost black.

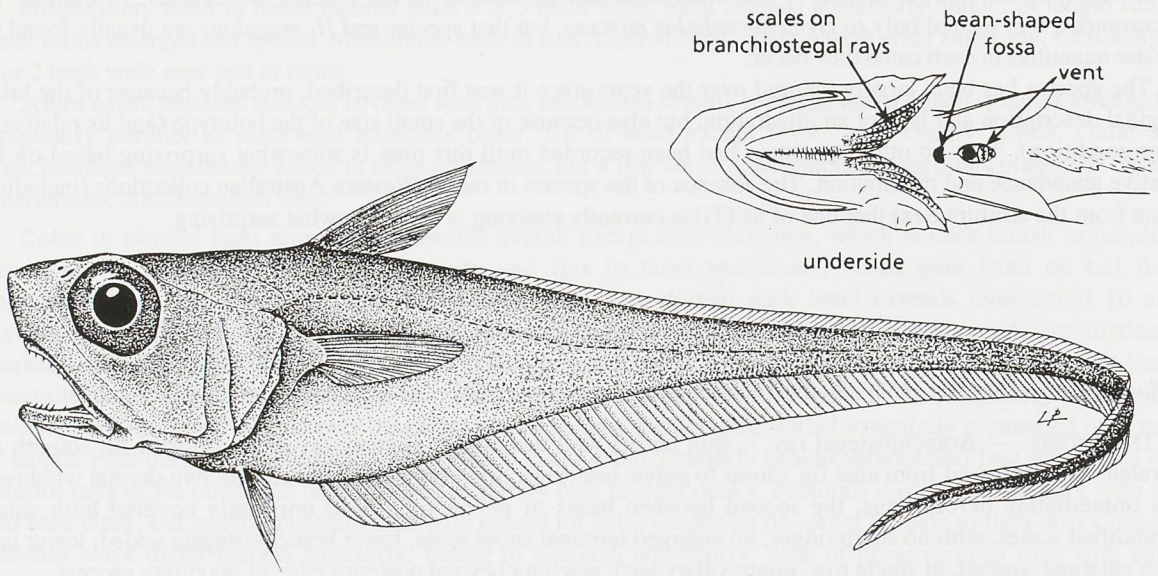


FIG. 25. — *Malacocephalus laevis* (Lowe) (From IWAMOTO, 1990, fig. 545).

Genus *MATAEOCEPHALUS* Berg, 1898

Mataeocephalus Berg, 1898: 43 (type species *Coelocephalus acipenserinus* Gilbert & Cramer, 1897, by being a replacement name).

Coelocephalus Gilbert & Cramer, 1897 (preoccupied by *Coelocephalus* Clark, 1860, in Coleoptera).

DIAGNOSIS. — Branchiostegal ray 6 or 7; chin barbel present; spinous ray of first dorsal fin serrated or smooth; anus in middle of broad or narrow periproct, usually removed from anal fin; a small dermal window of light organ in one or more species; underside of snout usually with naked areas; suborbital shelf formed of two rows of stout, coarse, modified scales, snout tipped with 2 adjoined tubercular scales; teeth in cardiform bands in both jaws, bands notably short and broad in some species, long and tapered in others.

REMARKS. — The genus was represented in the collections by two species, one of which is being described in a revision of the genus by our Russian colleagues, Y. I. SAZONOV and Y. N. SHCHERBACHEV. The second species is identified as *Mataeocephalus acipenserinus*, a species known originally from the Hawaiian Islands. IWAMOTO (1990: 245) recognized five species of *Mataeocephalus*, but that number is expected to change with a revision of the genus. The two New Caledonian species can be separated by the following key:

1. Branchiostegal rays 6; V. 7; underside of head almost entirely scaled; height 1D. 70-115% HL ..... ***Mataeocephalus* sp.**
— Branchiostegal rays 7; V. 8-9; underside of head almost entirely naked; height 1D. 55-64% HL ..... ***M. acipenserinus***

Mataeocephalus acipenserinus (Gilbert & Cramer, 1897)

Fig. 26

Coelocephalus acipenserinus Gilbert & Cramer, 1897: 422-423, pl. 42, fig. 1 (holotype USNM 47721; Hawaiian Islands).

MATERIAL EXAMINED. — 11 specimens.

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CC 367, 19°36.80'S, 158°53.20'E, 855-830 m, 19.10.1986: 2 specimens 42-47 mm HL (MNHN 1994-963).

Loyalty Islands. BIOGEOCAL: stn CP 232, 21°33.81'S, 166°27.07'E, 760-790 m, 12.04.1987: 1 specimen 53.4 mm HL, 253+ mm TL (CAS 86463).

Wallis and Futuna Islands. MUSORSTOM 7: stn CP 550, 12°14.8'S, 177°28.0'W, 800-810 m, 18.05.1992: 1 specimen 48.5 mm HL (MNHN 1994-962). — Stn CP 551, 12°15.3'S, 177°28.1'W, 791-795 m, 18.05.1992: 1 specimen 46.5 mm HL (MNHN 1994-965). — Stn CC 553, 12°16.8'S, 177°28.1'W, 780-794 m, 18.05.1992: 1 specimen 50.5 mm HL (BMNH 1996.7.19:26). — Stn CP 562, 11°48.1'S, 178°22.1'W, 775-777 m, 19.05.1992:

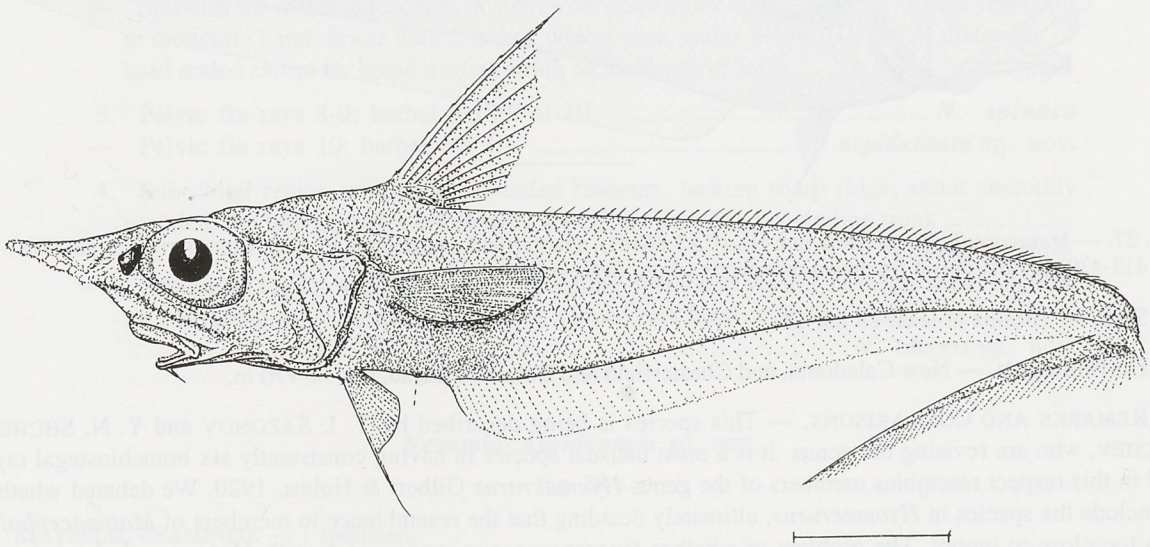


FIG. 26. — *Mataeocephalus acipenserinus* (Gilbert & Cramer) (Adapted from IWAMOTO, 1990, fig. 555). Scale = 25 mm.

2 specimens 36.0-46.1 mm HL, 152-183 mm TL (CAS 82175). — Stn CP 565, 11°47.4'S, 178°27.3'W, 900 m, 20.05.1992: 3 specimens 44.0-49.0 mm HL (MNHN 1994-964).

DIAGNOSIS. — Underside of snout naked (except for scales overlapping along leading edge); pelvic rays usually 8; denticulations on spinous dorsal ray well developed; teeth in both jaws in short patches, confined to anterior end; periproct region rather broad, with anterior dermal window present; usually 7-9 scale rows below origin of second dorsal.

REMARKS. — This species appears to be widespread in the Pacific, having been recorded in the southeastern Pacific (SAZONOV & IWAMOTO, 1992), Hawaii (GILBERT & CRAMER, 1897), and now the New Caledonian region. See the account of SAZONOV and IWAMOTO (1992: 70-71) for a detailed description of the species. IWAMOTO (1990: 246) provides a description and illustration.

Mataeocephalus sp. Sazonov & Shcherbachev MS

Fig. 27

MATERIAL EXAMINED. — 6 specimens.

Loyalty Islands. BIOGEOCAL: stn CP 232, 21°33.81'S, 166°27.07'E, 760-790 m, 12.04.1987: 2 specimens 40.5-54 mm HL (MNHN 1994-961), 1 specimen 51.5 mm HL (BMNH 1996.7.19:27).

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CP 324, 21°15.01'S, 157°51.33'E, 970 m, 14.10.1986: 1 specimen 56 mm HL, 225+ mm TL (MNHN 1994-960). — Stn DW 337, 19°53.80'S, 158°38.00'E, 412-430 m, 15.10.1986: 2 specimens 45.5-48.2 mm HL, 205+-214+ mm TL (CAS 86481).

DIAGNOSIS. — Six branchiostegal rays; pelvic rays 7; underside of snout mostly scaled; periproct removed from anal fin, anus closer to pelvic insertions than to anal fin; premaxillary teeth in broad short band, spanning about half rictus length.

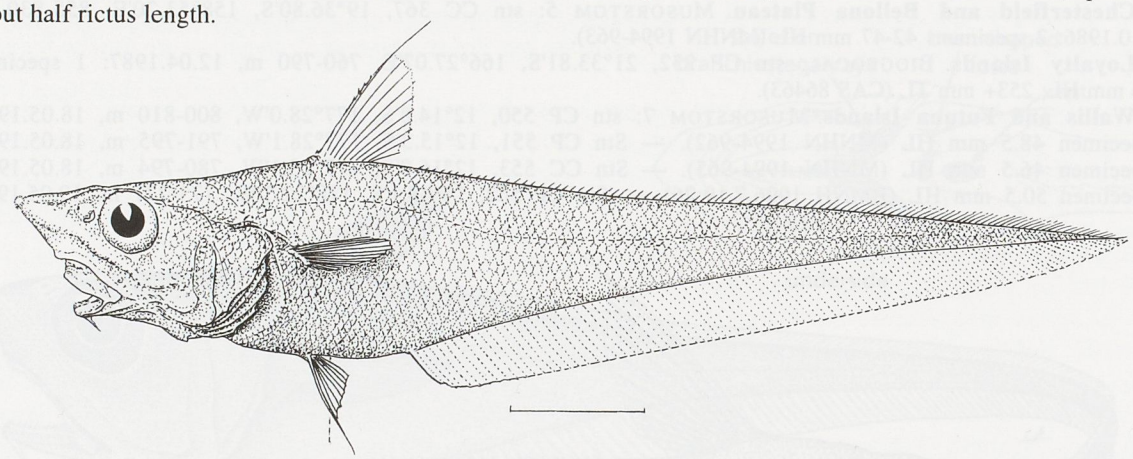


FIG. 27. — *Mataeocephalus* sp., 48.2 mm HL (CAS 86481), Chesterfield and Bellona Plateau, MUSORSTOM 5, stn DW 337, 412-430 m. First dorsal fin drawn incorrectly, short. Scale = 25 mm.

SIZE. — Attains at least 23 cm TL.

DISTRIBUTION. — New Caledonia, and Chesterfield and Bellona Plateau, in 412-970 m.

REMARKS AND COMPARISONS. — This species is being described by Y. I. SAZONOV and Y. N. SHCHERBACHEV, who are revising the genus. It is a most unusual species in having consistently six branchiostegal rays, and in this respect resembles members of the genus *Hyomacrurus* Gilbert & Hubbs, 1920. We debated whether to include the species in *Hyomacrurus*, ultimately deciding that the resemblance to members of *Mataeocephalus* was too close to ignore. The problem of whether *Hyomacrurus* is synonymous with *Mataeocephalus* is yet to be determined. *Hyomacrurus hyostomus* (Smith & Radcliffe, 1912), the type species of the genus, is

distinguishable from *M.* sp. by the higher pelvic ray count (8 or 9 cf. 7) and more scales below the second dorsal fin (5-7.5 cf. 4.5-5.5).

Genus *NEZUMIA* Jordan, 1904

Nezumia Jordan *in* JORDAN & STARKS, 1904: 620 (type species *Nezumia condylura* Jordan & Gilbert, 1904, by original designation).

DIAGNOSIS. — Branchiostegal rays 7; chin barbel well developed; spinous ray of first dorsal fin serrated; anus removed from anal fin, closer to pelvic insertions; periproct tear-drop shaped, connected to dermal window of light organ between pelvic fins; underside of snout usually with naked areas, suborbital shelf formed of two rows of stout, coarse, modified scales, snout tipped with 2 adjoined tubercular scales; teeth small, in bands in both jaws, premaxillary teeth not reaching beyond posterior edge of maxillary process; pyloric caeca usually less than 30 (more in few species).

REMARKS. — The collections contained five species of the genus, but none of them was abundant. In fact, the three new species here described were represented by only one or two specimens each, and the other two species by three (*N. spinosa*) and 10 (*N. propinqua*) individuals. The genus appears to reach its greatest abundance in temperate to subtropical waters such as the North Atlantic, where we have witnessed numerous trawls in which the genus constituted a high percentage of the biomass as well as individuals captured. Collections from Australia also show an abundance of specimens in temperate to subtropical waters, and a paucity in tropical waters. More than 40 species are known to us, including several from the Indian Ocean and Australian coast that have yet to be described.

Key to species of *Nezumia* of New Caledonia and adjoining waters

1. Pelvic fin rays 13-15; 1D. distinctly black tipped ..... ***N. propinqua***
— Pelvic fin rays 12 or fewer; 1D. variously black to dusky but not tipped with black ... **2**

2. Spinules on scales needlelike, in parallel to somewhat convergent rows; V. 8-10; lower-jaw teeth in notably broad band, 6 or more teeth across; scales below 1D. 10-13; underside of head almost completely naked **3**
— Spinules on scales lanceolate, in somewhat convergent rows; V. 11-12; lower-jaw teeth in moderate band, fewer than 6 across widest part; scales below 1D. 9-9.5; underside of head scaled except for broad median swath on underside of snout **4**

3. Pelvic fin rays 8-9; barbel 9-18% of HL ..... ***N. spinosa***
— Pelvic fin rays 10; barbel 6% HL ..... ***N. aspidentata*** sp. nov.

4. Suborbital region with gently rounded contours, lacking sharp ridge; snout smoothly rounded, the lateral angles not sharply set off; no dark band encircling trunk ..... ***N. coheni*** sp. nov.
— Suborbital region with sharp ridge separating dorsal and ventral surfaces; snout angular, tip and lateral angles notably prominent; a broad dark band encircling trunk ..... ***N. cliveri*** sp. nov.

Nezumia aspidentata sp. nov.

Fig. 28 a

MATERIAL EXAMINED. — 1 specimen.

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CP 359, 19°39.00'S, 158°49.0'E, 700-720 m, 18.10.1986: holotype female 33.9 mm HL, 205 mm TL (MNHN 1996-958).

DIAGNOSIS. — Pelvic rays 10. Height first dorsal greater than head length. Underside of snout, suborbital and all of mandibular rami naked; prominent open pores on lower jaws and ventral margin of suborbital region. Spinules on body scales needlelike, in subparallel to convergent rows; about 38 lateral-line scales over distance equal to predorsal length. Snout conical, bluntly pointed, about 34% of HL. Mouth small, upper jaw 26% of HL. Teeth in notably broad, short, cardiform bands in both jaws. No dark band encircling trunk; first dorsal fin dusky overall. Anterior dermal window of light organ between pelvic bases, in advance of insertions. Barbel small, more than 3 into orbit, about 6% of HL; preoral length 28%; postorbital length 38%; orb.-preop. 30%.

DESCRIPTION. — *Counts*: 1D. II,8; P. i17/21; GR-I (outer/inner) 8/10, GR-II 10/10; scales 1D. about 13, midbase 1D. 8.5.

Measurements: The following in millimeters, percent of HL in parentheses: internasal 6.8 (20); interorb. 7.0 (21); orb. 11.0 (32); suborb. 4.3 (13); gill slit 3.3 (10); snout-anus 47 (139); pre-A. 55 (162); V.-A. 13.5 (40); body depth 28 (83); 1D.-2D. 13 (39); ht. 1D. 35 (104); len. P. 19 (56); len. V. 24 (71); post. nostril 2.9 (9).

Head relatively shallow, depth at hind edge of orbit less than postrostral length of head. Body depth at vent about equal to length of head behind posterior nostril; tail compressed, width behind abdomen less than orbit, depth at vertical 2 head lengths behind snout tip equal to length of head behind midorbit. Contours of head gently rounded; suborbital ridge low, not sharply separating dorsal and ventral surfaces. Snout bluntly pointed, terminal scute large but smoothly blending in with contours of snout. Orbit oval, long axis at a shallow diagonal. Dorsal profile of head rising from snout tip to above nostrils, leveling somewhat over orbit, then rising slightly over nape, before abruptly rising to first dorsal. Base of first dorsal steep, leveling abruptly behind fin to end of tail. Mouth subinferior, maxilla extending to below midorbit. Chin barbel about equal to greatest diameter of posterior nostril, about 2 times into least suborbital width.

Tooth band in upper jaw 7 or more teeth across widest (anterior) end; band tapering rapidly and extending only about 3/4 length of rictus; outer series slightly enlarged. Mandibular band similar to premaxillary band, about 6 teeth wide anteriorly, narrowing abruptly laterally, falling well short of end of rictus.

Two stout tuberclelike scales at tip of snout, not distinctly set off from adjacent scales. A narrow naked transverse groove behind leading edge of snout. Suborbital with slightly modified scales in 2 rows over narrowest part of suborbital shelf. Other head ridges not marked by modified scales. Body scales covered with long, slender, extremely fine-tipped, slightly recurved, greatly reclined spinules; those below interspace of dorsal fins with about 12 rows. Underside of head entirely naked except above posterior end of lower jaws and posteroventral corner of preopercle and interopercle; head otherwise completely scaled.

First dorsal fin with 16 strong, widely spaced denticles along leading edge of second spinous ray; rays posterior to 1st segmented ray abruptly decrease in height. Pelvic fins well developed, outer ray prolonged, extending well past anal origin to about 10th anal ray. Anal fin well developed; second dorsal rudimentary over most of length, rays long only near end of tail. Dorsal flexure of head affects relative position of fin origins, but first dorsal origin slightly behind that of pectoral, slightly in front of that of pelvic. Anal origin well behind vertical of hind end of first dorsal; second dorsal origin above 3rd to 5th anal ray.

Periproct region somewhat pear-shaped, relatively large, its greatest width about 2.5 times, its greatest length about 1.4 times, into orbit diameter. Narrow anterior end formed by anterior dermal window of light organ. Holotype a female with some eggs extruded from urogenital opening.

Color in alcohol overall straw; slight ivory cast over opercles and shoulder girdle; bluish over abdomen; blackish around periproct and area around base of pelvic fins. Branchiostegal membrane dark, somewhat paler along distal margins. Upper jaw membranes dusky; lips, gums, barbel, and lower jaw pale. First dorsal fin light dusky. Pectoral fin light dusky over dorsal rays, pale ventrally. Pelvic fin dark at proximal end, dusky over mesial rays, pale over lateral rays. Anal and second dorsal fins overall pale. Mouth dark but not black; walls of gill cavity dark posteriorly but pale over anterior and ventral walls; gill rakers and arches dark, but filaments pale.

SIZE. — To more than 20 cm TL.

ETYMOLOGY. — From the Latin *asper*, rough, and *dentatus*, toothed, in reference to the prominent cardiform bands of teeth in the jaws.

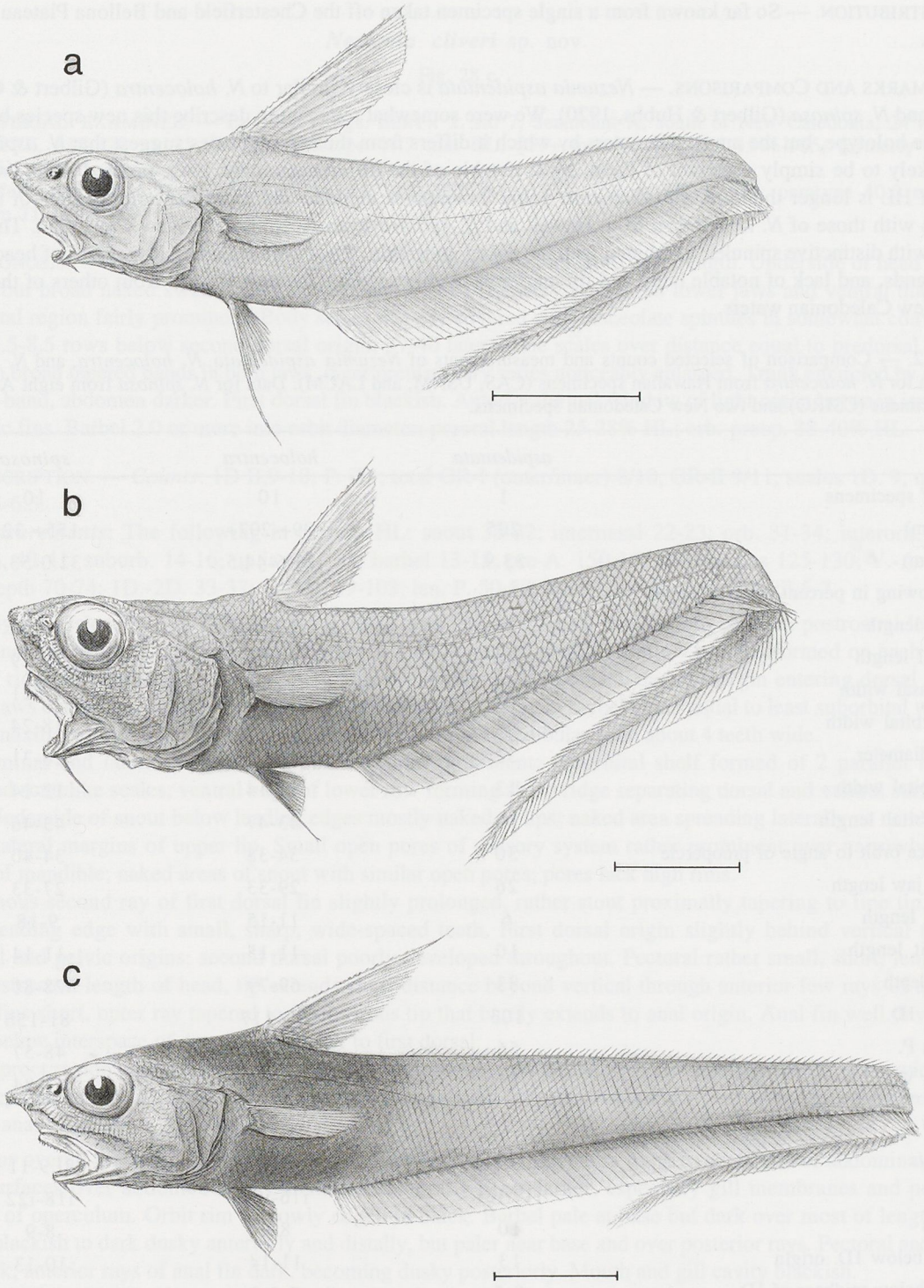


FIG. 28. — **a**, *Nezumia aspidentata* sp. nov., 33.9 mm HL, holotype (MNHN 1996-958), from Chesterfield and Bellona Plateau, MUSORSTOM 5, stn CP 359, 700-720 m. — **b**, *Nezumia coheni* sp. nov., 45.2 mm HL, holotype (MNHN 1996-960), New Caledonia, BIOCAL, stn CP 34, 710 m. — **c**, *Nezumia cliveri* sp. nov., 44.7 mm HL, holotype (MNHN 1996-365), Seamount K, south of New Caledonia, BERYX 2, stn 7, 802-833 m. Scales = 25 mm.

DISTRIBUTION. — So far known from a single specimen taken off the Chesterfield and Bellona Plateau in 700-720 m.

REMARKS AND COMPARISONS. — *Nezumia aspidentata* is closely similar to *N. holocentra* (Gilbert & Cramer, 1897) and *N. spinosa* (Gilbert & Hubbs, 1920). We were somewhat reluctant to describe this new species based on only the holotype, but the ample characters by which it differs from those two species suggest that *N. aspidentata* is unlikely to be simply a variant of them. Most notable of the differences is the long, pointed snout, which at 34% of HL is longer than the orbit diameter. Table 2 compares meristic and morphometric features of the new species with those of *N. holocentra* from Hawaii and *N. spinosa* from Australia and New Caledonia. The small scales with distinctive spinules, combined with the naked underside of head, short barbel, low ridges of head, broad teeth bands, and lack of notable body and fin markings readily separate the new species from others of the genus from New Caledonian waters.

TABLE 2. — Comparison of selected counts and measurements of *Nezumia aspidentata*, *N. holocentra*, and *N. spinosa*. Data for *N. holocentra* from Hawaiian specimens (CAS, USNM, and LACM). Data for *N. spinosa* from eight Australian specimens (CSIRO) and two New Caledonian specimens.

	aspidentata	*holocentra*	*spinosa*
No. of specimens	1	10	10
TL (mm)	205	99+-207+	155+-321
HL (mm)	33.9	25.6-44.5	32.0-53.6
Following in percent of head length			
Snout length	34	27-30	28-32
Preoral length	28	18-24	18-29
Internasal width	20	15-18	17-21
Interorbital width	21	17-20	18-24
Orbit diameter	32	27-34	26-31
Suborbital width	13	11-14	12-14
Postorbital length	38	43-47	43-46
Distance orbit to angle of preopercle	30	34-38	34-40
Upper jaw length	26	29-33	27-33
Barbel length	6	11-15	9-18
Gill-slit length	10	11-15	11-14
Body depth	83	69-79	78-81
Height 1D.	103	93-117	81-156
Length P.	56	56-86	48-57
Length V.	71	71-80	61-84
Counts			
1D. rays	II,8	II,9-11	II,9-11
P. rays	i17-i21	i16-i22	i18-i22
V. rays	10	8-9	8-9
Scales below 1D. origin	13	11-14	10-13
Scales below midbase of 1D.	8.5	7-9.5	6.5-9
Scales below 2D. origin	9.5	8-9.5	7.5-11
Lateral line scales over distance equal to predorsal length	38	37-43	34-40

Nezumia cliveri sp. nov.

Fig. 28 c

MATERIAL EXAMINED. — **Loyalty Ridge**. BERYX 2: stn 7, Seamount K, south of New Caledonia, 24°41.70'S, 170°06.82'E, 815-820 m, 25.10.1991: holotype 44.7 mm HL, 257+ mm TL (MNHN 1996-365, formerly NMNZ P.27466).

Norfolk Ridge. HALIPRO 2: stn BT 42, 25°34'S, 167°25'E, 1132-1160 m, 15.11.1996: paratype 40.0 mm HL, 228+ mm TL (CAS 90751).

DIAGNOSIS. — Pelvic fin rays 11-12. Height first dorsal about equal to head length. Underside of head mostly scaled, but broad naked swath below snout; open pores of sensory system on lower jaws and ventral margin of suborbital region fairly prominent. Body scales densely covered with lanceolate spinules in somewhat convergent rows; 7.5-8.5 rows below second dorsal origin; 37-40 lateral-line scales over distance equal to predorsal length. Teeth in broad tapered bands in both jaws, outer premaxillary series noticeably enlarged. Trunk encircled by a broad darkish band, abdomen darker. First dorsal fin blackish. Anterior dermal window of light organ between insertions of pelvic fins. Barbel 2.0 or more into orbit diameter; preoral length 25-28% HL; orb.-preop. 38-40% HL.

DESCRIPTION. — *Counts*: 1D II,9-10; P. i21; total GR-I (outer/inner) 8/10, GR-II 9/11; scales 1D. 9, midbase 1D. 5.5-6.5.

Measurements: The following in percent HL: snout 30-32; internasal 22-23; orb. 31-34; interorb. 23-23; postorb. 40-41; suborb. 14-16; up.jaw 31-31; barbel 13-15; pre-A. 150-153; snout-anus 125-130; V.-A. 30-47; body depth 70-74; 1D.-2D. 33-37; ht. 1D. 89-103; len. P. 50-50; len. V. 49-50; post. nostril 5-7.

Body long, slender, total length 5.7-5.9 times head length; greatest depth about equal to postrostral length of head. Snout acute in lateral view, not gently rounded in ventral profile; shallow troughs formed on each side of median ridge. Interorbital space shallowly concave. Orbits oval to oblate, dorsal margin entering dorsal profile. Upper jaws extend to vertical slightly beyond midorbit. Slender chin barbel about equal to least suborbital width.

Premaxillary tooth band 4-6 teeth across wider portions, mandibular band about 4 teeth wide.

Terminal and lateral snout scutes coarse, stout, prominent; suborbital shelf formed of 2 parallel rows of modified scutelike scales, ventral edge of lower row forming sharp ridge separating dorsal and ventral surfaces of head. Underside of snout below leading edges mostly naked to lips; naked area spreading laterally as narrow strip above lateral margins of upper lip. Small open pores of sensory system rather prominent over narrowly scaled ramus of mandible; naked areas of snout with similar open pores; pores lack high rims.

Spinous second ray of first dorsal fin slightly prolonged, rather stout proximally tapering to fine tip, armed along leading edge with small, sharp, wide-spaced teeth. First dorsal origin slightly behind vertical through pectoral and pelvic origins; second dorsal poorly developed throughout. Pectoral rather small, short, length less than postrostral length of head, tip extends short distance beyond vertical through anterior few rays of anal fin. Pelvic fins short, outer ray tapered to filamentous tip that barely extends to anal origin. Anal fin well developed, origin below interspace of dorsals, but closer to first dorsal.

Periproct region elongate, somewhat teardrop shaped; anterior dermal window small, inconspicuous, wider than long, separated short distance from periproct but connected by narrow isthmus. Vent closer to pelvic insertions than to anal origin.

Color overall grayish brown, with broad darkish band encircling entire trunk to about end of abdominal cavity; most surfaces over abdomen with bluish cast; ventrally head darker, especially gill membranes and posterior aspects of operculum. Orbit rim narrowly edged in black. Barbel pale at base but dark over most of length. First dorsal blackish to dark dusky anteriorly and distally, but paler near base and over posterior rays. Pectoral and pelvic fins dark; anterior rays of anal fin dark, becoming dusky posteriorly. Mouth and gill cavity blackish.

SIZE. — To at least 26 cm TL.

ETYMOLOGY. — Named for Clive D. ROBERTS (NMNZ), who collected the holotype and many other grenadiers, and made them available for our study.

DISTRIBUTION. — So far known only from two specimens from regions south of New Caledonia, in 815-1160 m.

REMARKS AND COMPARISONS. — *Nezumia cliveri* closely agrees with *N. coheni* in almost all meristic and morphometric features, as well as scale spinulation. The two species are notably different in overall physiognomy of the head, however, with *N. coheni* having more rounded features without sharp ridges on the suborbital and supranarial, and the preopercle ridge is not as sharply defined. The suborbital space is rounded in *N. coheni*, but rather sharply divided into dorsal and ventral portions in *N. cliveri*. The terminal and lateral snout scutes are similar in size in both species, but those in *N. cliveri* protrude more, especially the lateral scutes, and give that species a sharper snout profile. Other differences include a more elongated, somewhat oblate, orbit in *N. cliveri* (compared with more round in *N. coheni*), naked area on underside of snout more extensive, a slightly shorter barbel (13-15% HL cf. 15-20% in *N. coheni*), and slightly shorter dorsal interspace (33-37% HL cf. 39-44%). *Nezumia cliveri* differs from *N. aspidentata*, with which it has been taken, in dentition pattern (teeth bands not as broad), preoral length (longer), pelvic ray count (higher), and body scales (larger, with lanceolate rather than conical spinules). *Nezumia namatahi* McCann & McKnight, 1980, from New Zealand and Australian waters, is much darker overall with a generally black trunk girdle, has a more posteriorly placed anterior dermal window, more prominent sensory pores on underside of head (those on ventral margin of suborbital with raised rims), and 9 or 10 pelvic finrays. An undescribed species from Australia also has a more posteriorly placed anterior dermal window, an overall black first dorsal fin, and a stouter long spinous dorsal ray. A second undescribed species from southern and western Australia is very similar in most respects including position of dermal window, pelvic ray count, scale spinules, scale-row counts, and gill-raker counts, but the trunk is encircled by a faint girdle (or lacking), spinules on body scales are less dense, premaxillary outer teeth are not as prominent, and pores on the underside of the head are smaller.

Nezumia coheni sp. nov.

Fig. 28 b

MATERIAL EXAMINED. — 20 specimens.

New Caledonia. BIOCAL: stn CP 34, 23°11.88'S, 167°11.30'E, 710 m, 29.08.1985: holotype 45.2 mm HL, 250+ mm TL (MNHN 1996-960).

Norfolk Ridge. HALIPRO 2: stn BT 75, 24°13'S, 167°36'E, 1128-1150 m, 21.11.1996: paratype 51.8 mm HL, 305+ mm TL (CAS 90614).

Loyalty Ridge. HALIPRO 2: stn BT 104, 25°23'S, 162°35'E, 1118-1124 m, 27.11.1996: paratype 72.4 mm HL, 400 mm TL (CAS 90668).

Kermadec Islands. *"Challenger"*: stn 170A, 29°55'S, 178°14'W, 1152 m, 14.07.1874: paratype 51.3 mm HL, 274+ mm TL [also paralectotype of *Macrurus rudis* Günther, 1878](BMNH 1887.12.7.75).

Australia. *"Kapala"*: New South Wales, east of Seal Rocks, 32°31'S, 152°59'E, 1006-1052 m, 15.08.1989: 1 paratype 47.5 mm HL, 265+ mm TL (AMS I.29754-002). — Off Port Stephens, 32°38'S, 152°57'E, 896-969 m, 29.06.1989: 2 paratypes 33.0-35.7 mm HL, 172+-195+ mm TL (AMS I.29823-013). — East of Broken Bay, 33°32'S, 151°45'E, 21.04.1986: 2 paratypes 57.4-66.8 mm HL, 323+-339+ mm TL (AMS I.29751-002). — East of Broken Bay, 33°37'S, 152°07'E, 1005 m, 1979: 2 paratypes 42.4-56.0 mm HL, 215+-303+ mm TL (AMS I.21724-026). — East of Broken Bay, 33°38'S, 152°07'E, 1024-1243 m, 11.11.1984: 3 paratypes 45.7-63.1 mm HL, 243+-327+ mm TL (AMS I.25264-003). — Off Broken Bay, 33°43'S, 152°03'E, 1043-1070 m, 4.09.1984: 4 paratypes 57.2-66.6 mm HL, 353+-370+ mm TL (AMS I.24993-007). — Off Sydney, 33°45'S, 152 03'E, 1120-1170 m, 30.06.1989: 1 paratype 49.8 mm HL (AMS I.29340-007). — East of Shoalhaven Heads, 34°47'S, 151°16'E, 10.10.1983: 1 paratype 64.7 mm HL, 335 mm TL (AMS I.25127-002). — Off Shoalhaven Bight, 34°56'S, 151°13'E, 1115 m, 16.10.1983: 1 paratype 61.6 mm HL, 332 mm TL (AMS I.24173-006). — East of Bawley Point, 35°27'S, 150°53'E, 935-960 m, 16.12.1987: 1 paratype 60.3 mm HL, 355 mm TL (AMS I.29741-004).

DIAGNOSIS. — Pelvic rays usually 11 (rarely 10 or 12). Underside of head mostly scaled, but a median-ventral naked swath below snout tip; pores of sensory system on head relatively small. Scales densely covered with narrowly to broadly lanceolate spinules in somewhat convergent rows; 7.0-8.5 rows below second dorsal origin; 34-40 lateral-line scales over distance equal to predorsal length. First dorsal fin dusky to black. Anterior dermal window of light organ between insertions of pelvic fins. Barbel 1.8-2.0 into orbit diameter, 15-20% of HL; preoral length 23-28%; orb.-preop. 38-44%.

DESCRIPTION. — *Counts*: 1D. II,9-10; P. i20-i22; total GR-I (outer/inner) 6-9/9-11, GR-II 8-10/10-11; scales 1D. 7-10, midbase 1D. 5.5-7.5.

Measurements of holotype, followed by those of paratypes, in percent of HL: snout 30, 30-34; internasal 24, 20-25; interorb. 22, 20-26; orb. 32, 29-34; suborb. 16, 15-16; postorb. 42, 39-45; up.jaw 32, 30-34; gill slit 15, 12-14; pre-A. 168, 143-166; snout-anus 144, 121-142; V.-A 44, 38-53; anus-A. 28, 17-33; body depth 80, 70-86; 1D.-2D. 41, 26-53; ht. 1D. 78-95; len. P. 55, 46-61; len. V. 42-65; post. nostril 5, 4-8.

Snout conical; suborbital ridge not sharply demarcated, infraorbital region gently rounded, almost vertical; orbit round, diameter slightly greater than snout length, about 1.2 into postorbital length; interorbital region flat, about 1.2 to 1.6 into orbit. Upper jaw extends to below midorbit; barbel slender, length greater than suborbital width, about 1.6-2.0 into orbit.

Premaxillary teeth in broad, short, tapered band, outer series slightly enlarged; band falls well short of end of rictus. Mandibular teeth in rather wide tapered band, extending to end of rictus; no teeth enlarged.

Scales densely cover most of head and body. A broad naked swath on ventromedian surface, spreading laterally along narrow ventral margin over upper lips. Head surfaces not covered with prominent open pores, but liberally dotted with sensory papillae. Suborbital shelf composed of 2 rows of scales along narrowest part, lower row of scales strengthened and forming relatively inconspicuous demarcation between upper and lower head surfaces. Spinules on body scales imbricate but not adjoined; posteriorly, marginal spinules on each scale slightly overlap edge.

First dorsal fin relatively high, much greater than postrostral length, almost equal to head; long second spinous ray stout, armed along leading edge with short, sharp denticles. Outer pelvic ray slightly prolonged, extending about to anal origin.

Color in alcohol gray-brown on head, dark ventrally and over operculum, lower jaws, and lips. Branchiostegal membranes blackish; abdomen dark, bluish, dark color extending completely around trunk to form broad, relatively inconspicuous girdle, probably not noticeable in completely scaled individuals. Naked ventral strip on underside of snout blackish. Tail sections with scales missing brown; scaled areas more grayish. First dorsal fin lacking prominent blotches or darker color ventrally or dorsally; pectoral and pelvic fins dusky, with blackish areas near base; anal fin dusky, but darker anteriorly.

SIZE. — To more than 40 cm TL.

ETYMOLOGY. — Named for Daniel M. COHEN (LACM), our esteemed colleague and fellow student of deep-sea fishes.

DISTRIBUTION. — So far known only from off New Caledonia, the Kermadecs, and eastern Australia, in 710-1032 m.

REMARKS AND COMPARISONS. — The relatively smoothly conical snout, the limited naked area on underside of head, the location of the anterior dermal window, the rather long barbel, and the lack of a prominent encircling trunk band distinguish *N. coheni* from other members of the genus with similar pelvic ray counts. It is similar in many respects to *N. brevibarbata* Barnard, 1925 from southern Africa, but differs in the above characters and the narrowly lanceolate spinules.

?Nezumia propinqua (Gilbert & Cramer, 1897)

Fig. 29 a

Macrourus propinqua Gilbert & Cramer, 1897: 424-425, pl. 42, fig. 2 (holotype, USNM 47741, from off Hawaii).

MATERIAL EXAMINED. — 21 specimens.

New Caledonia. BIOCAL: stn CP 31, 23°07.26'S, 166°50.45'E, 850 m, 29.08.1985: 2 specimens 20.0-21.0 mm HL (MNHN 1994-966). — Stn CP 32, 23°06.98'S, 166°51.20'E, 825 m, 29.08.1985: 1 specimen 20.1 mm HL, 120 mm TL (CAS 89739). — Stn CP 52, 23°05.79'S, 167°46.54'E, 31.08.1985: 1 specimen 28.3 mm HL, 163 mm TL (CAS 86460).

Norfolk Ridge and the Loyalties. BERYX 2: stn 9, Seamount K, 24°44.55'S, 170°07.00'E, 790-825 m, 26.10.1991: 1 specimen 22.5 mm HL, 140+ mm TL (NMNZ P.27531).

Norfolk Ridge. BERYX 11: stn CP 54, Jumeaux Seamount, 23°44.80'S, 168°16.85'E, 390-420 m, 21.10.1992: 2 specimens 22.0-22.3 mm HL, 131+-135+ mm TL (NMNZ P.29054). — Stn CP 60, Azteque Seamount, 23°19.00'S, 168°00.37'E, 580-600 m, 22.10.1992: 3 specimens 25.2-25.5 mm HL, 155+-158+ mm TL (NMNZ P.29078).

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CC 384, 19°42.40'S, 158°50.80'E, 772-756 m, 21.10.1986: 7 specimens 17.5-26.0 mm HL (MNHN 1994-967). — Stn CC 390, 21°00.90'S, 160°50.30'E, 745-825 m, 22.10.1986: 3 specimens (BMNH 1996.7.19:50-52).

Wallis and Futuna Islands. MUSORSTOM 7: stn CP 592, 12°32.4'S, 174°22.0'W, 775-730 m, 24.05.1992: 1 specimen 29.0 mm HL (MNHN 1994-968).

DIAGNOSIS. — Pelvic rays 13-15. First dorsal fin black tipped, with widely spaced denticles on spinous second ray. Undersides of snout and mandibular rami naked; pores on lower jaw large. Body scales small, 12-13 below origin of second dorsal fin, covered with needlelike spinules in 5-10 parallel rows. Chin barbel relatively long, usually 2 or fewer times into orbit, 16-22% of HL.

DESCRIPTION. — *Counts* (from 7 New Caledonian specimens): 1D. II,10-12; P. i18-i21; total GR-I (outer/inner) 7-9/8-11, GR-II 8-9/9-10; scales 1D. 12-16; midbase 1D. 8.5-13, lat.line 43-48.

Measurements: Total lengths 131+-163 mm; 22.0-28.3 mm HL. Measurements in percent HL: snout 29-33; preoral 23-26; internasal 22-26; interorb. 22-27; orb. 32-36; suborb. 14-16; postorb. 39-43; orb.-preop. 34-38; up.jaw 31-35; gill slit 12-14; pre-A. 148-161; snout-anus 127-136; V.-A 36-51; anus-A. 16-33; body depth 73-87; 1D.-2D. 21-42; ht. 1D. 85-99; len. P. 47-55; len. V. 60-79; post. nostril 6-10.

See SAZONOV and IWAMOTO (1992) for a detailed description and illustration of the species.

SIZE. — Probably not much larger than about 18-20 cm TL. A ripe female with large eggs measured 163 mm TL (CAS 86460).

DISTRIBUTION. — Probably extremely widespread in tropical to subtropical waters of the Pacific and Indian Oceans. Depth range in New Caledonian waters 390-811 m.

REMARKS AND COMPARISONS. — *Nezumia condylura* Jordan & Gilbert, 1904, *N. propinqua*, and *N. evides* (Gilbert & Hubbs, 1920) constitute a small but widely distributed complex of species that have posed difficult identification problems. All three species have a notably high pelvic finray count, usually numbering between 13 and 18, which distinguishes them from most other members of the genus. Characters used to distinguish the three species have been subjective, overlapping, or subject to ontogenetic and individual variation. We tentatively assign our specimens to *N. propinqua*, the oldest name available, recognizing that name changes may be forthcoming when the taxonomy of the complex has been adequately resolved.

Nezumia spinosa (Gilbert & Hubbs, 1916)

Fig. 29 b

Lionurus spinosus Gilbert & Hubbs, 1916: 199, pl. 10, fig. 2 (Japan); 1920: 554 (4 spec., off Luzon, Philippines).
Nezumia spinosa - IWAMOTO & ANDERSON, 1994: 18-19 (22 spec., Natal, South Africa and Mozambique).

MATERIAL EXAMINED. — 8 specimens.

Norfolk Ridge and the Loyalties. BERYX 2: stn 7, Seamount K, south of New Caledonia, 24°41.70'S, 170°06.82'E, 815-820 m, 25.10.1991: 1 specimen 43.0 mm HL, 245+ mm TL (NMNZ P.33502). — Stn 9, Seamount B, south of New Caledonia, 24°44.55'S, 170°07.00'E, 790-825 m, 26.10.1991: 1 specimen 54.2 mm HL, 319 mm TL (NMNZ P.27511).

Wallis and Futuna Islands. MUSORSTOM 7: stn CC 553, 12°16.8'S, 177°28.1'W, 780-794 m, 18.05.1992: 1 specimen (MNHN 1994-971). — Stn CC 554, 12°13.8'S, 177°28.0'W, 820-795 m, 18.05.1992: 1 specimen (MNHN 1994-969). — Stn CC 565, 11°47.4'S, 178°25.3'W, 900 m, 20.05.1992: 1 specimen (MNHN 1994-970).

Japan. *"Albatross"*: stn 4915, 31°31'00"N, 129°25'30"E, 781 m, 12.08.1906: holotype 46.5 mm HL, 280 mm TL (USNM 76868). — Stn 4918, southwest of Kyushu, 30°22'00"N, 129°08'30"E, 660 m, 13.08.1906: 1 specimen 20 mm HL, 133 mm TL (CAS-SU 22941).

South China Sea. *"Cape St. Mary"*, Cruise 1/64: stn 26, MacClesfield Bank, 19°22.5'N, 114°07.5'E, 60-795 m: 1 specimen 44.8 mm HL, 150+ mm TL (USNM uncat.).

Australia. (Other specimens from Australia examined but not listed at AMS, CSIRO, and QM).

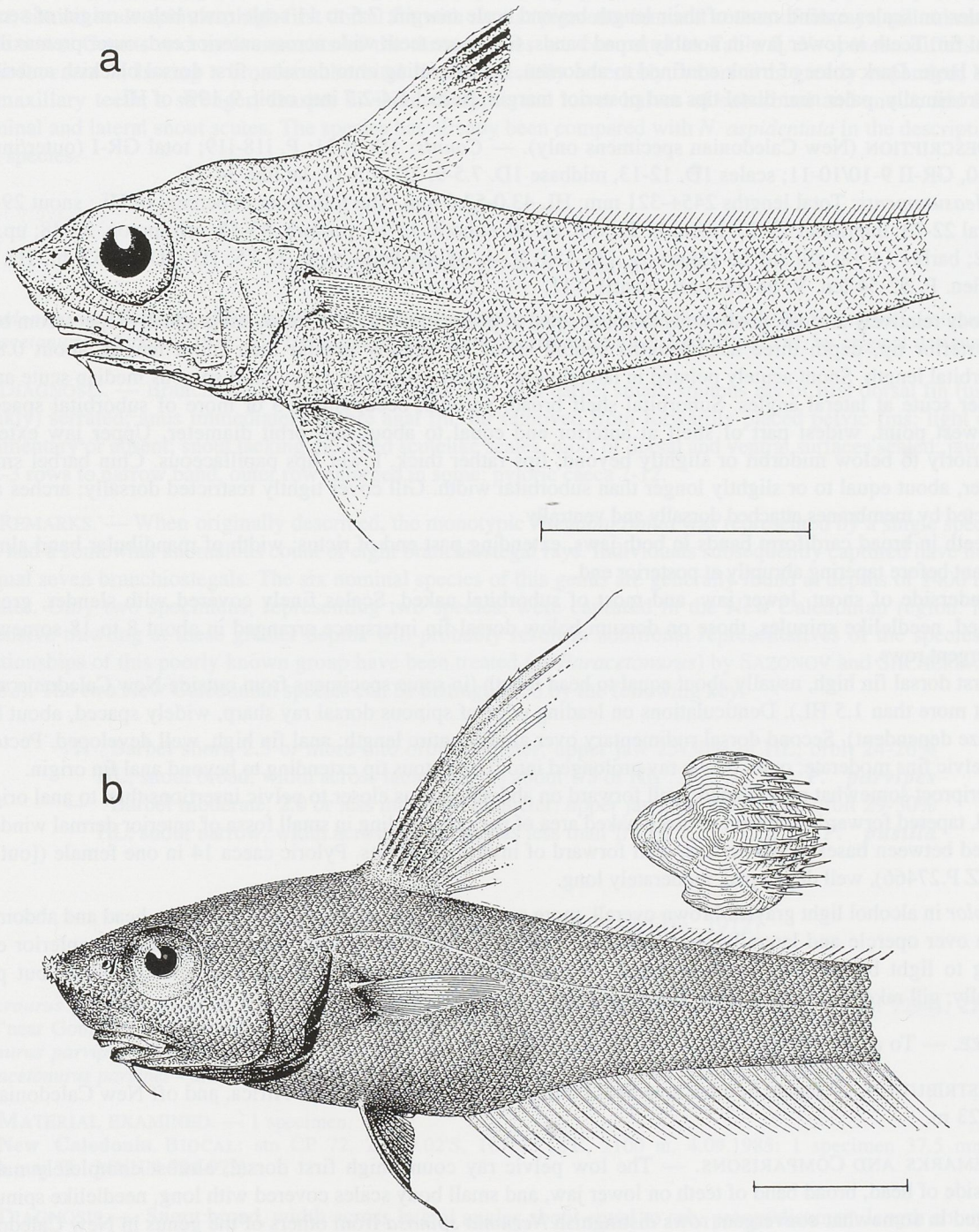


FIG. 29. — **a**, *Nezumia propinqua* (Gilbert & Cramer), 28.3 mm HL (CAS 86460), New Caledonia, BIOCAL, stn CP 52, 600 m. — **b**, *Nezumia spinosa* (Gilbert & Hubbs) (From GILBERT & HUBBS, 1916, pl. 10, fig. 2). Scales = 25 mm.

DIAGNOSIS (from all specimens). — Pelvic rays 8 or 9 (usually 8). Height first dorsal fin usually greater than head length. Underside of head almost completely naked, pocketed with rather prominent pores along mandible and ventral margin of suborbital region. Terminal and lateral snout scutes large, prominently protruding from outline of snout. Scales densely covered with long needlelike spinules in parallel to convergent rows, posteriormost spinules on scales extend most of their length beyond scale margin; 7.5 to 11 scale rows below origin of second dorsal fin. Teeth in lower jaw in notably broad bands, 6 or more teeth wide across anterior end; outer premaxillary series large. Dark color of trunk confined to abdomen, not extending onto dorsum; first dorsal blackish anteriorly and proximally, paler near distal tips and posterior margin. Barbel 1.4-2.7 into orbit, 9-19% of HL.

DESCRIPTION (New Caledonian specimens only). — *Counts*: 1D. II,11; P. i18-i19; total GR-I (outer/inner) 8/9-10, GR-II 9-10/10-11; scales 1D. 12-13, midbase 1D. 7.5-9, 2D. 7.5-11, lat.line 34-35.

Measurements: Total lengths 245+-321 mm; HL 43.0-53.6 mm. The following in percent of HL: snout 29-30; preoral 22-23; internasal 19-20; interorb. 22; orb. 26-30; suborb. 13-14; postorb. 43-45; orb.-preop. 37-48; up.jaw 30-32; barbel 14-18; gill slit 12-13; pre-A. 138-150; V.-A. 38-49; body depth 72-75; 1D.-2D. 34-52; ht. 1D. 81-104; len. P. 52-54 len. V. 58-59; post. nostril 7-11.

Body relatively slender, greatest depth about equal to postrostral length of head; tail gradually tapers from belly to posterior tip, depth three head lengths behind snout tip slightly greater than snout length, about 0.8 of postorbital length. Snout acutely pointed in lateral view, tipped with large, stout, bifid spinous median scute and a smaller scute at lateral angles. Suborbital shelf broad, vertical, occupying 2/3 or more of suborbital space at narrowest point, widest part of shelf at anterior end equal to about half orbit diameter. Upper jaw extends posteriorly to below midorbit or slightly beyond; lips rather thick, lower lips papillaceous. Chin barbel small, slender, about equal to or slightly longer than suborbital width. Gill cover tightly restricted dorsally; arches also restricted by membranes attached dorsally and ventrally.

Teeth in broad cardiform bands in both jaws, extending past end of rictus; width of mandibular band almost constant before tapering abruptly at posterior end.

Underside of snout, lower jaw, and most of suborbital naked. Scales finely covered with slender, greatly reclined, needlelike spinules, those on dorsum below dorsal-fin interspace arranged in about 8 to 18 somewhat convergent rows.

First dorsal fin high, usually about equal to head length (in some specimens from outside New Caledonia area, height more than 1.5 HL). Denticulations on leading edge of spinous dorsal ray sharp, widely spaced, about 8 to 16 (size dependent). Second dorsal rudimentary over almost entire length; anal fin high, well developed. Pectoral and pelvic fins moderate; outer pelvic ray prolonged into filamentous tip extending to beyond anal fin origin.

Periproct somewhat pear shaped, well forward on abdomen, anus closer to pelvic insertions than to anal origin. Broad, tapered forward extension of black naked area of periproct ending in small fossa of anterior dermal window, situated between bases of pelvic fins, well forward of insertions of fins. Pyloric caeca 14 in one female ([out of] NMNZ P.27466), well developed, moderately long.

Color in alcohol light grayish-brown overall, more swarthy over head; blackish ventrally on head and abdomen, bluish over opercle and laterally over abdomen. Paired fins blackish overall. Anal fin blackish at anterior end, fading to light brown over most of length. Mouth and lips blackish; gill chamber mostly black, but pale ventrally; gill rakers and arches dark, filaments pale.

SIZE. — To at least 26 cm TL.

DISTRIBUTION. — Japan, South China Sea, Philippines, Australia, southern Africa, and off New Caledonia, in 787-823 m.

REMARKS AND COMPARISONS. — The low pelvic ray count, high first dorsal, almost completely naked underside of head, broad band of teeth on lower jaw, and small body scales covered with long, needlelike spinules arranged in somewhat convergent rows distinguish *Nezumia spinosa* from others of the genus in New Caledonia waters. The specimen (CAS-SU 22941) from the East China Sea off the southwestern coast of Kyushu, Japan, was erroneously recorded by GILBERT and HUBBS (1916: 201-202) as *N. proxima* (Smith & Radcliffe, 1912), but

that species is readily differentiated by its lanceolate scale spinules, narrower naked region on underside of snout, and scaled mandibular rami.

Nezumia spinosa is closely similar to *N. holocentra* from Hawaiian waters and *N. aspidentata*, sharing most diagnostic features such as naked underside of snout with large pores, teeth bands in both jaws very broad and short, similar scale spinules, high first dorsal fin with similar pigmentation, and counts of fin rays, gill rakers, and scale rows. Counts and measurements of the three species are compared in Table 2. *N. spinosa* differs from *N. holocentra* in having a broader suborbital shelf, especially anteriorly, where it is greatly expanded; larger premaxillary teeth; a stronger, sharper division of upper and lower halves of suborbital and snout; and larger terminal and lateral snout scutes. The species has already been compared with *N. aspidentata* in the description of that species.

Genus ***PSEUDONEZUMIA*** Okamura, 1970

Pseudonezumia Okamura, 1970: 38-39 (type-species *Pseudonezumia japonicus* Okamura, 1970, by original designation).
Paracetonurus Marshall, 1973: 615 (type-species *Macrourus parvipes* Smith & Radcliffe, 1913, by original designation).

DIAGNOSIS. — Branchiostegal ray 7; pelvic rays 5-7; chin barbel small; spinous ray of first dorsal fin (usually weakly) serrated; anus immediately before anal fin, far removed from forwardly placed pelvic fins; light organ rudimentary or absent; snout lacking modified scutelike scales, most of dorsal and ventral surfaces scaled; jaw teeth in 2-3 rows to narrow band, outer row enlarged in some; pyloric caeca 7-12.

REMARKS. — When originally described, the monotypic *Pseudonezumia* was represented by a single specimen that had a somewhat anomalous count of eight branchiostegal rays. Individuals subsequently captured have had the normal seven branchiostegals. The six nominal species of this genus are generally found at depths of 1400 m and greater. Only two specimens, representing two species, were captured in the New Caledonian region. More-extensive trawling at these greater depths will probably result in additional representatives of the species. The relationships of this poorly known group have been treated (as *Paracetonurus*) by SAZONOV and SHCHERBACHEV (1982). The two New Caledonian species can be distinguished by the following key:

1. Barbel short, 2.5 or more into orbit diameter; upper jaw 25-30% of HL; orbit 24-26% HL; snout broad, width across lateral angles about 1/3 of HL ..... ***P. parvipes***
— Barbel moderate, 2.0 or less into orbit diameter; upper jaw 30-39% of HL; orbit 29-30% HL; snout narrow, width across lateral angles less than 1/3 HL ..... ***P. pusilla***

Pseudonezumia parvipes (Smith & Radcliffe, 1912)

Fig. 30 a

Macrourus parvipes Smith & Radcliffe, *in* RADCLIFFE, 1912: 124-125, pl. 28, fig. 1 (holotype USNM 72941, 22.8 cm, "near Gomomo Is., Dutch East Indies," 1°55'00"S, 127°42'30"E, 2308 m).
Lionurus parvipes - GILBERT & HUBBS, 1916: 202, 205; 1920: 562-563.
Paracetonurus parvipes - SAZONOV & SHCHERBACHEV, 1982: 11.

MATERIAL EXAMINED. — 1 specimen.
New Caledonia. BIOCAL: stn CP 72, 22°09.02'S, 167°33.18'E, 2100 m, 4.09.1985: 1 specimen 37.5 mm HL, 200+ mm TL (MNHN 994-972).

DIAGNOSIS. — Snout broad, width across lateral angles about equal to orb.-preop. distance; length about 37% HL; protruding more than 2/3 orbit diameter beyond mouth; suborbital angular, distinct ridge formed; interorbital width 32% HL, upper jaw 30%, barbel 9%.

DESCRIPTION. — *Counts*: 1D. II,8; P. i19/i19; V. 6/6; GR-I (outer/inner) 9/2+10, GR-II 1+1+9/2+9; scales 1D. ca. 12, mid-base 1D. 8, 2D. 11, lat.line 61.

Measurements: The following in millimeters, percent of HL in parentheses: postrostral 25.1 (67); snout 13.7 (37); preoral 10.1 (27); internasal 10.7 (29); orb. 9.1 (24); suborb. 6.3 (17); postorb. 16.3 (44); gill-slit 4.5 (12); pre-A. 48 (128); isthm.-anus 19.5 (52); V.-A. 12 (32); body depth 27 (72); ht. 1D. 25 (67); len. P. 21 (56); len. V. 10 (27); post. nostril 3 (8).

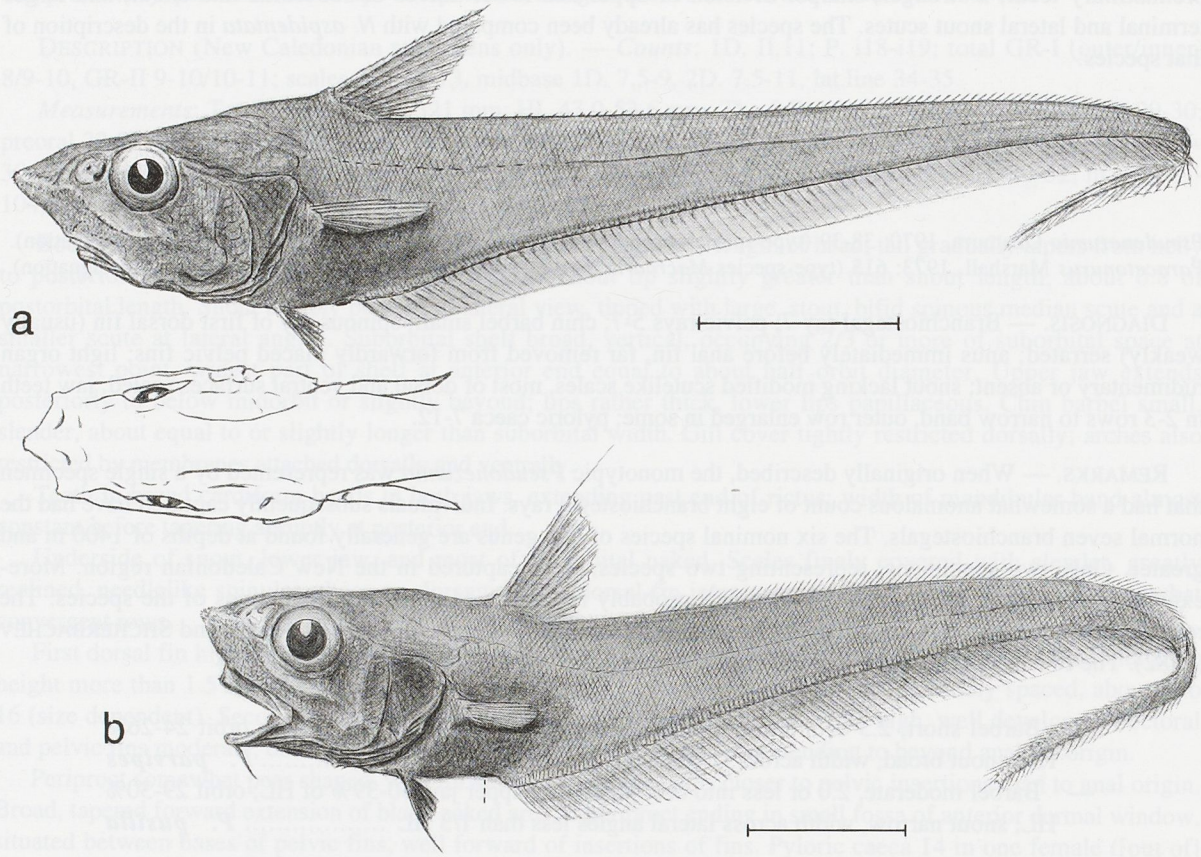


FIG. 30. — **a**, *Pseudonezumia parvipes* (Smith & Radcliffe), 37.5 mm HL (MNHN 1994-972), New Caledonia, BIOCAL, stn CP 72, 2100 m. — **b**, *Pseudonezumia pusilla* (Sazonov & Shcherbachev), 40.3 mm HL (MNHN 1996-964), off Loyalty Islands, BIOGEOCAL, stn CP 265, 1760-1870 m. Scales = 25 mm.

Head more than 5 in total length, broad, width about equal to height at hind edge of orbit. Trunk short, length of abdominal cavity much shorter than postrostral length of head. Snout broad, pointed, extending about 2/3 orbit diameter beyond mouth, width across lateral angles about equal to distance orbit to preopercle angle. Suborbital region angular, sharply demarcating dorsal and ventral surfaces of head; shelf and ridge lacking modified scales. Interorbital broad, much greater than orbit diameter, somewhat concave in preserved specimen but possibly convexly rounded in life. Mouth moderate in size, posterior end of maxilla below hind margin of pupil. Chin barbel small, slender, more than 2.5 times into orbit diameter. Lateral line interrupted along most of its course into series of dashed grooves.

Teeth short, slender, conical, slightly recurved, in short, narrow, tapered band in premaxillary, anterior teeth somewhat longer than those more lateral and medial. Mandibular teeth in 2 or 3 irregular rows, narrower posteriorly. Teeth in both jaws extend about 60% length of rictus; smooth toothless gum surface at posterior end of premaxillary.

Scales small, densely covering almost all of head and body and giving somewhat velvety feel to body surfaces. No enlarged scales along margins of dorsal or anal fins. Naked areas confined to narrow midventral strip under snout and along front of mouth, margins of lower jaw, gill membranes, nasal fossa, and broad periproct region. Scales armed with slender, conical, relatively short, slightly recurved and reclined spinules arranged in rather irregular rows, sometimes in quincunx pattern. None of spinules enlarged. No stout scutelike scales at tip and lateral angles of snout nor along head ridges.

Fins rather weakly developed. Spinous second ray of first dorsal narrowly triangular in cross section near base, tapering into a fine distal tip; leading edge armed with 14 widely spaced denticulations. Pectoral fin narrow based, relatively low on side of trunk, upper margin of base distinctly below midlateral line of body. Pelvic fin small, fine rays scarcely extending to level of anus; fin location far forward below operculum, well in advance of pectoral fin, which is slightly anterior to first dorsal. Anal fin far forward, origin below anterior half of first dorsal, well developed over most of length. Second dorsal rudimentary over almost entire length.

Periproct region large, broad, subtending about 1/3 distance between anal and pelvic fins, situated immediately in advance of anal fin; vent slightly posterior to center of periproct.

Color in alcohol overall dark brownish to swarthy; regions under snout, over opercles and abdominal cavity blackish; fins uniformly blackish.

SIZE. — To about 30 cm TL.

DISTRIBUTION. — Previously known from four *"Albatross"* collections in Indonesia, but now recorded off New Caledonia. Depth range 1992-2308 m.

REMARKS AND COMPARISONS. — *Pseudonezumia parvipes* is close to, if not conspecific with, *P. cetonuropsis* (Gilbert & Hubbs, 1916), which is known from only two *"Albatross"* specimens collected off Japan in 1679 m. Differences between the two are slight and may prove to be insufficient for continued recognition of the latter species. *Pseudonezumia pusilla* (Sazonov & Shcherbachev, 1982) differs from *P. parvipes* in having a longer barbel (14-23% HL), larger orbit (29-38%), and slightly shorter snout (31-35%). We are uncertain as to the differences between *P. parvipes* and *P. japonica*. *P. flagellicauda* (Koefoed, 1927) from the eastern North Atlantic appears to have a much broader head (interorbital width 47-47% HL), longer barbel (13-15%) and longer distance orbit to preopercle (41-45%).

Pseudonezumia pusilla (Sazonov & Shcherbachev, 1982)

Fig. 30 b

Paracetonurus pusillus Sazonov & Shcherbachev, 1982: 12-14, fig. 4 (holotype, ZMMGU P15306, 219+ mm TL; Indian Ocean, Ninety-East Ridge; 11°24.3'S, 88°50.0'E; 1500-1600 m).

MATERIAL EXAMINED. — 1 specimen.

Loyalty Islands. BIOGEOCAL: stn CP 265, 21°04.09'S, 167°00.40'E, 1760-1870 m, 18.04.1987: 1 specimen 40.3 mm HL, 210+ mm TL (MNHN 1996-964).

DIAGNOSIS. — Snout narrow, width of snout across lateral angles about 1.5 into orb.-preop. distance; length about 32% HL, protruding a distance less than pupil diameter beyond mouth; suborbital relatively flat, without angular ridge; interorbital about 33% HL, upper jaw 34%, barbel 15%.

DESCRIPTION. — *Counts*: 1D. II,9; P. i20/i18; V. 6/6; GR-I (outer/inner) 9/2+9, GR-II 1+9/2+10; scales 1D. ca. 9, mid-base 1D. 10, 2D. 11, lat.line 62.

Measurements: The following in millimeters, percent HL in parentheses: postrostral 28.4 (70); preoral 8.5 (21); internasal 8.8 (22); orb. 12.0 (30); suborb. 5.2 (13); postorb. 16.6 (41); gill-slit 7.2 (18); pre-A. 55 (136); isthm.-anus 25 (62); V.-A. 16 (40); body depth 28 (69); ht. 1D. 29 (72); nostril 6.0 (15).

Head more than 5 in total length, relatively narrow, greatest width about equal to postorbital length. Trunk short, length of abdominal cavity shorter than postrostral length of head. Snout narrow, bluntly pointed, extending

less than pupil diameter beyond mouth, width across lateral angles about 1.3 into interorbital, about 1.5 into distance orbit to preopercle angle. Suborbital region relatively flat, almost vertical, not forming a sharp division between dorsal and ventral surfaces of head; shelf and ridge lacking modified scales. Interorbital concave in holotype but probably flat to slightly convex in life, width about equal to orbit diameter. Mouth moderate in size, posterior end of maxilla below midorbit. Chin barbel small, fine, length about half orbit diameter. Lateral line interrupted along most of its course into series of dashed grooves. Sensory papillae on underside of snout, but no enlarged sensory pores apparent on head. Posterior nostril large, diameter about equal to that of eye lens.

Teeth short, slender, conical, slightly recurved. Premaxillary teeth mostly in 2 rows (irregularly 3 at anterior end), occupying about 2/3 rictus length; outer series scarcely enlarged. Mandibular teeth in 2 or 3 irregular rows, narrowing to 1 posteriorly, extending about 2/3 length of rictus.

Scales small, densely covering all of head (including underside of snout and along mandibular rami) and body, giving somewhat velvety feel to body surfaces. No enlarged scales along margins of dorsal or anal fins. Gill membranes, nasal fossa, and small periproct region naked. Scales armed with slender, weak, relatively erect, needlelike spinules, usually around 10-12 spinules per scale. None of spinules enlarged. No stout scutelike scales at tip and lateral angles of snout nor along head ridges.

Fins rather weakly developed. Spinous second ray of first dorsal tapering into a fine filamentous tip; leading edge armed with about 9 irregularly spaced denticulation. Pectoral fin narrow based, relatively low on side of trunk, upper margin of base distinctly below midlateral line of body. Pelvic fin small, fine rays scarcely extending to level of anus; fin location far forward below subopercle, well in advance of pectoral fin, which is anterior to first dorsal. Anal fin origin below midbase of first dorsal, well developed over most of length. Second dorsal rudimentary over almost entire length.

Periproct region relatively small, subtending about 1/3 distance between anal and pelvic fins, situated immediately in advance of anal fin; anus slightly posterior to center of periproct.

Color in alcohol overall brownish; head dark, including all of jaws, gill membranes, mouth, and gill cavity. Nape, dorsally on trunk, and all of tail medium brown. Fins medium brown, but pelvics darker.

SIZE. — To more than 24 cm TL.

DISTRIBUTION. — Widespread in the tropical Indo-West Pacific, in depths of 1380-2000 m (SAZONOV & SHCHERBACHEV, 1982: 13).

REMARKS AND COMPARISONS. — The relatively narrow snout of this species distinguishes it from all other members of *Pseudonezumia*, so far as we know, and the barbel is longer than in all but *P. flagellicauda.* The New Caledonian specimen has a somewhat narrower suborbital width than recorded for the species, and the general outline of the head appears somewhat different from that illustrated for the holotype and for a specimen from the western Indian Ocean (BMNH 1995.8.5:1, 34.5 mm HL, Mascarene Ridge, *"Vityaz"* cruise 17, stn 2815, 1520-1720 m) that was used for comparisons. All other characters agree closely, however.

Genus ***SPHAGEMACRURUS*** Fowler, 1925

Sphagemacrurus Fowler, 1925: 3 (as subgenus of *Macruroplus*; type species *Macrurus hirundo* Collett, 1896, by original designation).
Grenurus Parr, 1946: 46 (type species *Grenurus grenadae* Parr, 1946).

DIAGNOSIS. — Branchiostegal rays 7; pelvic fin origin anterior to pectoral base, spinous ray of first dorsal serrated; anus in middle of broad periproct, closer to anal fin than pelvic fin bases; jaws at oblique angle; snout shorter than orbit, with terminal and lateral scutes, underside partially naked; coarse, modified scales forming suborbital ridge; jaw teeth small, in narrow bands.

REMARKS. — This is a problematic genus in which six species are currently recognized (IWAMOTO, 1990: 287). Our Russian colleague, Yuri I. SAZONOV (ZMMGU), informs us that half of the species are of doubtful

validity and that what we have treated as *S. pumiliceps* may be another species or a mixture of two. A thorough study of this group is needed.

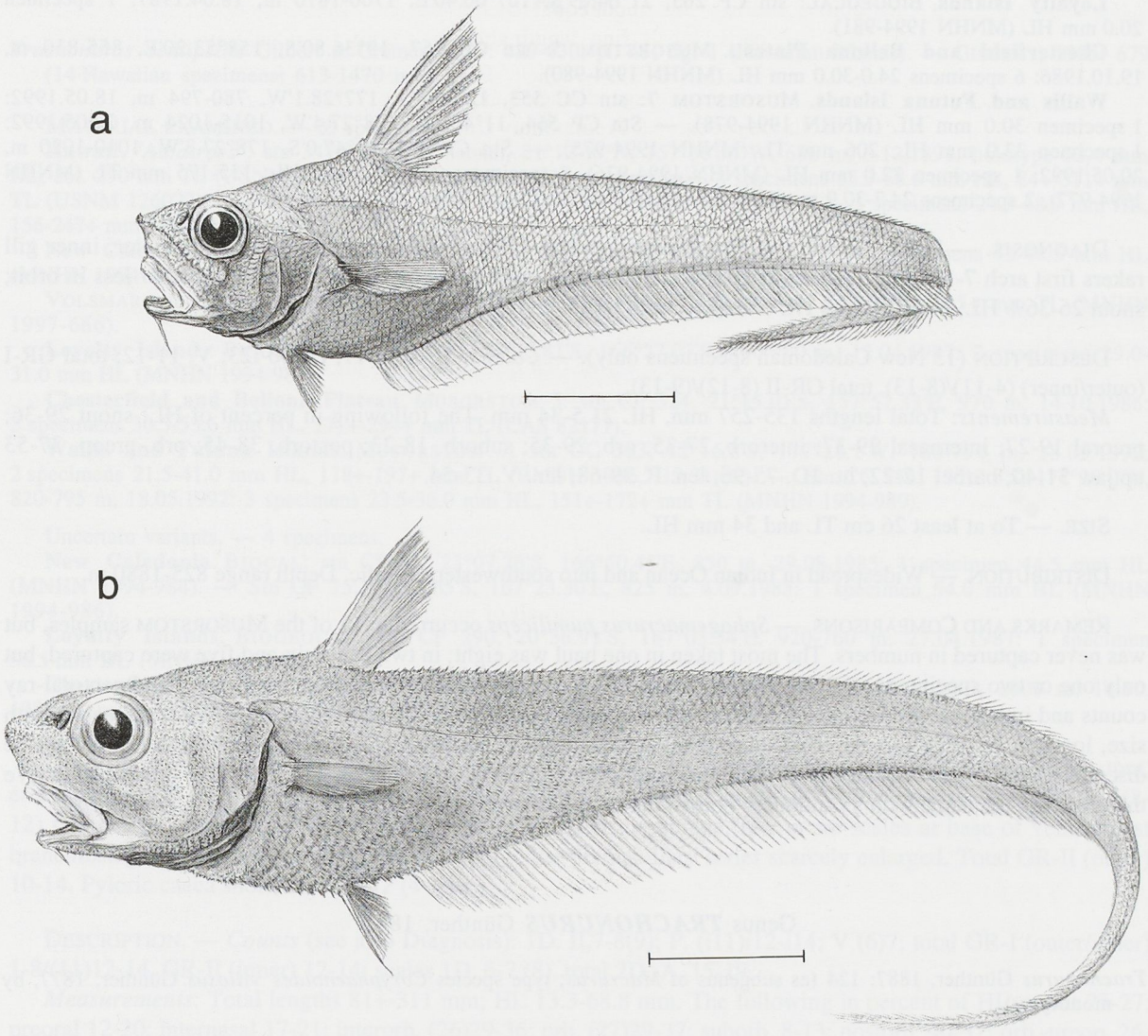


FIG. 31. — **a**, *Sphagemacrurus pumiliceps* (Alcock), 32.3 mm HL (CAS 86461), New Caledonia, BIOCAL, stn CP 57, 825 m. — **b**, *Trachonurus sentipellis* (Gilbert & Cramer), 47.5 mm HL (MNHN 1996-666), New Caledonia, VOLSMAR, stn CP 26, 980 m. Scales = 25 mm.

Sphagemacrurus pumiliceps (Alcock, 1894)?

Fig. 31 a

Macrurus pumiliceps Alcock, 1894a: 125 (lectotype ZSI 13562, Laccadive Sea, 1315 m; lectotype designation by MARSHALL & IWAMOTO *in* MARSHALL, 1973: 627).

MATERIAL EXAMINED. — 28 specimens.

New Caledonia. BIOCAL: stn CP 31, 23°07.26'S, 166°50.45'E, 850 m, 29.08.1985: 6 specimens 12.5-32.0 mm HL (MNHN 1994-979), 3 specimens (BMNH 1996.7.19:28-30). — Stn CP 32, 23°06.98'S, 166°51.20'E, 825 m, 29.08.1985: 1 specimen 26.0 mm HL (MNHN 1994-974). — Stn CP 60, 24°01.45'S, 167°08.43'E, 1530 m, 2.09.1985:

1 specimen 34.0 mm HL, 257 mm TL (MNHN 1994-973). — Stn CP 68, 24°00.37'S, 168°07.03'E, 1430 m, 3.09.1985: 1 specimen 34.0 mm HL (MNHN 1994-982). — Stn CP 75, 22°18.65'S, 167°23.30'E, 825 m, 4.09.1985: 2 specimens 32.3-35.4 mm HL, 185+-190+ mm TL (CAS 86461).

Loyalty Islands. BIOGEOCAL: stn CP 265, 21°04.09'S, 167°00.40'E, 1760-1870 m, 18.04.1987: 1 specimen 20.0 mm HL (MNHN 1994-981).

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CP 367, 19°36.80'S, 158°53.20'E, 855-830 m, 19.10.1986: 6 specimens 24.0-30.0 mm HL (MNHN 1994-980).

Wallis and Futuna Islands. MUSORSTOM 7: stn CC 553, 12°16.8'S, 177°28.1'W, 780-794 m, 18.05.1992: 1 specimen 30.0 mm HL (MNHN 1994-978). — Stn CP 564, 11°46.1'S, 178°27.4'W, 1015-1024 m, 20.05.1992: 1 specimen 33.0 mm HL, 206 mm TL (MNHN 1994-975). — Stn CP 567, 11°47.0'S, 178°27.3'W, 1010-1020 m, 20.05.1992: 1 specimen 32.0 mm HL (MNHN 1994-976), 3 specimens 21.5-32.5 mm HL, 135-175 mm TL (MNHN 1994-977), 2 specimens 24.7-30.9 mm HL, 160+-163+ mm TL (CAS 82176).

DIAGNOSIS. — Pelvic rays 11-14; first dorsal rays II,9-12; barbel 0.5 or more of orbit diameter; inner gill rakers first arch 7-13; pyloric caeca very short, stubby, 9-12; orbit-preopercle distance 1.2 times or less in orbit; snout 26-36% HL; orbit 29-36% HL (Adapted from IWAMOTO & ANDERSON, 1994: 22).

DESCRIPTION (13 New Caledonian specimens only). — *Counts*: 1D. II,9-11; P. i16-i23; V. 11-12; total GR-I (outer/inner) (4-11)/(8-13), total GR-II (8-12)/(9-13).

Measurements: Total lengths 135-257 mm, HL 21.5-34 mm. The following in percent of HL: snout 29-36; preoral 19-27; internasal 29-37; interorb. 27-35; orb. 29-35; suborb. 18-23; postorb. 38-45; orb.-preop. 37-53 up.jaw 31-40; barbel 12-22; ht. 1D. 75-96; len. P. 39-68; len. V. 33-54.

SIZE. — To at least 26 cm TL and 34 mm HL.

DISTRIBUTION. — Widespread in Indian Ocean and into southwestern Pacific. Depth range 825-1880 m.

REMARKS AND COMPARISONS. — *Sphagemacrurus pumiliceps* occurred in 11 of the MUSORSTOM samples, but was never captured in numbers. The most taken in one haul was eight; in two hauls six and five were captured, but only one or two specimens were in the other hauls. We found considerable variation in gill-raker and pectoral-ray counts and in several proportional measurements but were unable to find any correlation of these characters with size, locality, or other factors. That more than one species may be represented in our study material cannot be discounted, but a more-detailed study with much additional material will be necessary to resolve this question. We therefore use the name with a cautionary note to our readers that the species may not represent *S. pumiliceps*.

Genus ***TRACHONURUS*** Günther, 1887

Trachonurus Günther, 1887: 124 (as subgenus of *Macrurus*; type species *Coryphaenoides villosus* Günther, 1877, by monotypy).

DIAGNOSIS. — Branchiostegal rays 7; pelvic rays 6 or 7, rarely 8; spinous ray of first dorsal smooth; anus in middle of broad periproct, which spans most of short space between pelvic and anal fins; pelvic fins under first dorsal; snout rounded, head ridges absent; scales uniformly cover all of head and body, no modified scutelike scales or ridges on head; scales below second dorsal and along anal often enlarged and vertically elongated; branchiostegal and gular membrane heavily scaled in some species; color mostly dark brown, gray, or black.

REMARKS. — This is an enigmatic genus of five nominal species, with one other from the Philippines currently being described (by TI, manuscript submitted). Two or more additional species are known from the Australian coast, and it seems likely that more will be discovered when adequate material becomes available from poorly collected areas of the world's oceans. The species are all very similar in appearance and have consequently been difficult to characterize. We identify the *Trachonurus* from the New Caledonian region with a species known previously only from Hawaii. A few specimens did not fully agree with our concept of the species; they were not accorded separate taxonomic status but treated as variants.

Trachonurus sentipellis Gilbert & Cramer, 1897

Fig. 31 b

Trachonurus sentipellis Gilbert & Cramer, 1897: 429-430, pl. 45, fig. 1 (Hawaiian Islands). — Gilbert, 1905: 679 (14 Hawaiian specimens; 613-1470 m).

Material examined. — 29 specimens.

Hawaii. *"Albatross"*: stn 3474, Kaiwi Channel, 21°12'00"N, 157°38'30"W, 686 m, 6.12.1891: holotype 53.4 mm HL, abt. 290 mm TL (USNM 47980). — Stn "off Hawaii" [no other data]: 4 specimens 15.3-68.6 mm HL, 84+-311+ mm TL (USNM 126072), 6 specimens 13.3-28.7 mm HL, 81+-178+ mm TL (USNM 55257), 3 specimens 24.3-48.9 mm HL, 156-247+ mm TL (CAS-SU 8530).

New Caledonia. Biocal: stn CP 31, 23°07.26'S, 166°50.45'E, 850 m, 29.08.1985: 2 specimens 43-44.5 mm HL (MNHN 1994-984), 2 specimens 22.0-23.0 mm HL, 140-144+ mm TL (MNHN 1994-988).

Volsmar: stn CP 26, 22°22.8'S, 171°21.4'E, 980 m, 4.06.1989: 1 specimen 47.5 mm HL, 265+ mm TL (MNHN 1997-666).

Loyalty Islands. Biogeocal: stn CP 232, 21°33.81'S, 166°27.07'E, 760-790 m, 12.04.1987: 2 specimens 29.0-31.0 mm HL (MNHN 1994-987).

Chesterfield and Bellona Plateau. Musorstom 5: stn CP 324, 21°15.01'S, 157°51.33'E, 970 m, 14.10.1986: 3 specimens 30.5-53.6 mm HL, 171+-294+ mm TL (CAS 82177).

Wallis and Futuna Islands. Musorstom 7: stn CC 553, 12°16.8'S, 177°28.1'W, 780-794 m, 18.05.1992: 2 specimens 21.5-41.0 mm HL, 118+-197+ mm TL (BMNH 1996.7.19:31-32). — Stn CC 554, 12°13.8'S, 177°28.0'W, 820-795 m, 18.05.1992: 3 specimens 23.5-36.0 mm HL, 151+-172+ mm TL (MNHN 1994-989).

Uncertain variants. — 4 specimens.

New Caledonia. Biocal: stn CP 31, 23°07.26'S, 166°50.45'E, 850 m, 29.08.1985: 1 specimen 44.5 mm HL (MNHN 1994-984). — Stn CP 75, 22°18.65'S, 167°23.30'E, 825 m, 4.09.1985: 1 specimen 54.0 mm HL (MNHN 1994-986).

Loyalty Islands. Biogeocal: stn CP 290, 20°36.91'S, 167°03.34'E, 920-760 m, 27.04.1987: 1 specimen 56.5 mm HL (MNHN 1994-985).

Chesterfield and Bellona Plateau. Musorstom 5: stn DC 321, 21°20.40'S, 158°02.20'E, 1000 m, 14.10. 1986: 1 specimen 69.0 mm HL (MNHN 1994-983).

Diagnosis. — Grooved lateral line well developed; body scales relatively large, coarsely covered with stout, erect spinules, 30-37 lateral-line scales over distance equal to predorsal length, 4-7 below midbase 1D., (5-7)+1+(8-12) below 2D. origin; small scale patch or none on gular membrane, few or no scales at base of ventralmost branchiostegal rays. Teeth in both jaws all small, outer premaxillary series scarcely enlarged. Total GR-II (outer) 10-14. Pyloric caeca short, thick, 9-12 (4 spec.).

Description. — *Counts* (see also Diagnosis): 1D. II,7-8(9); P. (i11)i12-i14; V (6)7; total GR-I (outer/inner) 1-8/(11)12-14, GR-II (inner) 12-14; scales 1D. 6-7 (8), total 2D.-A. 15-19.

Measurements: Total lengths 81+-311 mm; HL 13.3-68.8 mm. The following in percent of HL: snout 23-27; preoral 12-20; internasal 17-21; interorb. (26)29-36; orb. (27)29-37; suborb. 8-13; postorb. 40-52; orb.-preop. 26-34; up.jaw (28)31-35(37); barbel 8-14; gill-slit 12-17; pre-A. 134-165; V.-A. 25-37; body depth 69-87; 1D.-2D. 17-52; ht. 1D. 48-64; len. P. 40-51; len. V. 30-48; nostril 5-11.

Head 5-6 in total length; greatest head width 1.7-1.8 into its length; body gradually tapering behind first dorsal fin, depth at 3 head lengths behind snout tip about 1.1-1.5 orbit diameter. Snout conically pointed in lateral view, bluntly obtuse viewed dorsally, protruding about 0.5-1.0 pupil diameter beyond mouth. Nasal bones strong, not easily distorted; internasal width about 1.5-1.7 into interorbital. Anterodorsal corner of orbit somewhat expanded laterally; anterior margin slightly depressed, together forming "viewing channel" directed anteroventrally. Suborbital region vertical and flat. Jaws subterminal, extending posteriorly to below midorbit or slightly beyond. Chin barbel small, slender, length about equal to least suborbital width. Preopercle posterior margin forming broad curve, opercle and subopercle forming deep, irregular, inverted triangle. Interopercle broadly exposed and scaled along ventral and posterior margins. Grooved lateral line prominent, well developed, broken in spots into closely spaced segments in some specimens.

Teeth fine, short, in narrow bands in both jaws, extending almost to end of rictus. Premaxillary band about 4 or 5 teeth wide, tapering to 2 irregular series, then to 1 row near posterior end; outer series scarcely enlarged. Mandibular teeth about 3 or 4 teeth wide anteriorly, becoming 2 irregular series, then 1 near posterior end; inner teeth slightly larger than outer.

Scales with 12-22 (size variable) short, erect spinules with low buttresses on larger scales dorsally on trunk. Enlarged, vertically elongated scales along anal fin base; these armed with stouter spinules with large interconnected buttresses forming high ridges. Scales along each side of second dorsal also somewhat enlarged, with larger spinules recurved and somewhat reclined. Scales over dorsal surfaces of preopercle and opercle platelike and enlarged; those along posterior margin of orbit stoutly elongated, other scales of head much smaller. About 6 scale rows across narrowest part of suborbital. Gular and branchiostegal membranes usually sparsely scaled or almost naked; but patch of small scales on gular membrane, and base of anteriormost branchiostegal rays with narrow series or isolated patches of small scales in others.

Fins all relatively small, with weak fin rays, tips broken in almost all fins. First dorsal origin slightly behind pectoral origin; pelvic origin below or anterior to middle portion of first dorsal base; anal fin below interspace between dorsals. Rays of pelvic fins scarcely reaching anal origin in our specimens, but GILBERT (1905:279) states that "all but the innermost ventral rays reach beyond origin of anal fin".

Periproct region typical of genus, very large round to somewhat oval with posterior margin close before anal fin; entire span between anal origin and inner rays of pelvic fins naked; anus about midway between or slightly closer to anal fin.

Color in alcohol medium brown overall; swarthy over abdomen, operculum, and laterally and ventrally on head. GILBERT (1905: 279) notes that "some young specimens are uniformly black". Branchiostegal and gular membranes dark gray to blackish; branchial cavity black, mouth, lips, jaws dark gray to black; barbel dark brown; peritoneal membranes black. Rays of first and second dorsal fins dusky, pectoral and anal usually darker, pelvic fins blackish.

SIZE. — To at least 31 cm TL.

DISTRIBUTION. — So far known from the Hawaiian Islands and the New Caledonian region, but probably more widespread. Capture depths off New Caledonian region 760-980 m.

REMARKS AND COMPARISONS. — Our New Caledonian specimens agree closely with Hawaiian specimens of *Trachonurus sentipellis* we examined. The species is distinctive among the genus in having a prominent lateral line coupled with large scales that are covered with short stout spinules, a relatively pale overall color, only small patches of scales or virtually none on gular and branchiostegal membranes, and small jaw teeth. It is very similar in almost all features to what appear to be two undescribed Australian species, both of which have somewhat larger teeth, and one of which lacks a grooved lateral line. *Trachonurus gagates* Iwamoto & McMillan, 1997, and *T. villosus* (Günther, 1877) differ from the new species in having smaller scales, a darker overall color, and larger teeth; the first lacks a lateral line, but the second has a grooved lateral line.

One of the specimens here included (CAS 82177; 30.5 mm HL) lacks a grooved lateral line, but in all other features it appears to be the same as its two larger congeners from the same station. It seems improbable that it could represent another species, although we have noted what seems to be species pairs, where one "species" has a well-developed grooved lateral line while the other "species" completely lacks this feature, and all other characters of the two agree. *Trachonurus gagates* and *T. villosus* appear to represent one of these pairs. A second pair is found in Australian waters, both undescribed large-scaled, large-toothed, pale "species," one having, the other lacking a grooved lateral line.

Four specimens from New Caledonian waters were closely similar to *T. sentipellis*, but they had somewhat higher scale row counts over the lateral line (39-43), slightly lower gill raker counts (GR-I 9-11 inner, GR-II 9-10 inner), slightly longer snout lengths (28-32% HL), and somewhat wider internasal (22-24%) and suborbital (13-14%) widths. Their teeth also appeared to be slightly larger. These may represent a closely related species or the same as an undescribed species from Australia, mentioned above, that one of us (TI) is currently studying. Because we are uncertain about their status, we list them as uncertain variants and do not include them in our description.

Genus *VENTRIFOSSA* Gilbert & Hubbs, 1920

Ventrifossa Gilbert & Hubbs, 1920: 543 (type species *Coryphaenoides garmani* Jordan & Gilbert, 1904, by original designation).

DIAGNOSIS. — Branchiostegal rays 7; chin barbel well developed; spinous ray of first dorsal fin smooth or serrated; anus removed from anal fin, closer to pelvic insertions; light organ well developed, two small dermal windows, one immediately before anus, the second between bases of pelvic fins; head uniformly covered with small unmodified scales, with no sharp ridges, terminal snout scute single or absent; gular and branchiostegals rays naked; lower jaw teeth small, in 2-3 rows or in narrow band, premaxillary teeth in band, reaching beyond posterior edge of maxillary process, outer row usually slightly enlarged; pyloric caeca about 30-75.

REMARKS. — *Ventrifossa* is well represented in the collections with seven species, one of which is here described as new and two others probably new but left unnamed. Several of the species in this genus are so closely similar that they pose problems in distinguishing one from the other. *Ventrifossa nigrodorsalis* is one of those species — within the New Caledonian collections we have been able to sort out at least three separate groups based on minor differences in color, counts and measurements, and shape of various head parts. These differences are generally associated with their distributions, with one group from the Pacific Plate north of Fiji, another group from the Chesterfield and Bellona Plateau, and the third from the general offings of New Caledonia. Of particular distributional note is the record of *V. macropogon*; it is a species formerly known only from the subtropical to tropical western North Atlantic. The species from the area can be identified by use of the following key:

1. Dorsal spine smooth; total gill-rakers on inner side of first arch 16-20; preoral length 8-14% HL ..... ***V. atherodon***
— Dorsal spine serrated; total gill-raker on inner side of first arch 13-18; preoral length 12-22% HL **2**

2. Body scales very small, about 65-70 along lateral line over distance equal to predorsal length; suborbital shelf extremely narrow anteriorly, broadening posteriorly; total gill rakers on outer side of second arch 10-13 ..... ***V. johnboborum***
— Body scales moderate, fewer than 50 along lateral line over distance equal to predorsal length; suborbital shelf not especially narrow anteriorly; total gill rakers on outer side of second arch 12-16 ..... **3**

3. Mouth mostly blackish; snout prominently pointed and protruding, preoral length 19-25% of HL; body shallow, greatest depth about 65-72% of HL; scale rows below 1D. 7-8, below 2D. about 5.5-6.0 ..... ***V. vinolenta*** sp. nov.
— Mouth entirely pale or with small blackish areas over oral valves; snout blunt to pointed, preoral length 12-22% of HL; body depth 71-101% HL; scale rows below 1D. 8.5-12, below 2D. 6.5-9.5 ..... **4**

4. Median nasal ridge lacking a blackish streak; a faint to intense midlateral black blotch on first dorsal fin, with base and tip of fin pale to light dusky (Figs 32a-b)..... .....***V. nigrodorsalis***
— Median nasal ridge with prominent blackish streak (Figs 35, 37c'); first dorsal fin blackish over proximal half or so, paler distally (and sometimes also base), or uniformly dusky to blackish (Figs 32c-d) **5**

5. Barbel thick, long, about equal to or slightly longer than orbit diameter, 31-37% HL ....***V. macropogon***
— Barbel slender, about 2/3-3/4 orbit diameter, 15-30% HL **6**

6. Snout narrow, internasal width 15-20% HL; orbit diameter 31-36% HL; suborbital 10-13%; orbit to preopercle 37-42%; upper jaw 42-47% ..... ***V.* species indet.**
— Snout 28-31% HL; orbit 28-32%; suborbital 14-16%; orbit to preopercle 43-47%; upper jaw 48-51%. ..... ***V.* species** (NSW)

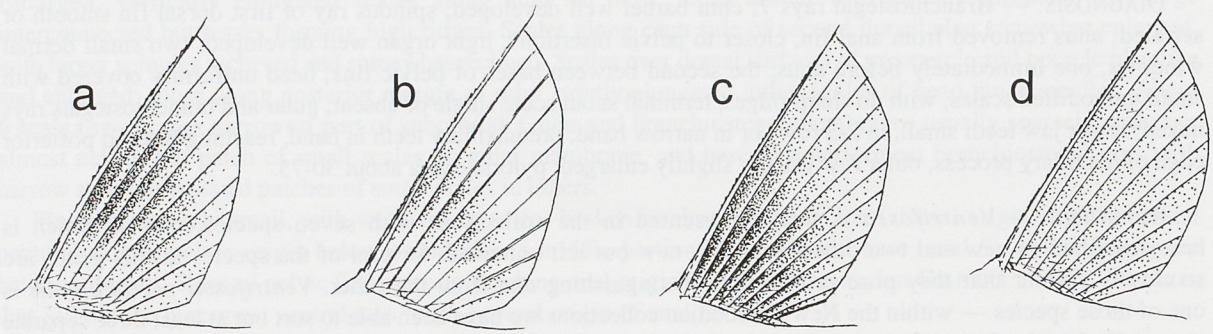


FIG. 32. — First dorsal fin of: **a**, *V. nigrodorsalis* Gilbert & Hubbs showing prominent black blotch; **b**, *V. nigrodorsalis*, uncertain variant, showing faint midlateral blackish streak; **c**, *V. macropogon* Marshall showing dark proximal region, fading distally; **d**, *V.* sp. (not named) showing overall dusky rays.

Ventrifossa atherodon (Gilbert & Cramer, 1897)

Fig. 33 a

Optonurus atherodon Gilbert & Cramer, 1897: 431, pl. 46, fig. 1 (Kaiwi Channel, Hawaiian Islands, 686 m).
Lionurus (Nezumia) atherodon - GILBERT & HUBBS, 1916: 145.
Ventrifossa (Atherodus) atherodon - GILBERT & HUBBS, 1920: 544.

MATERIAL EXAMINED. — 27 specimens.

New Caledonia. BIOCAL: stn CP 32, 23°06.98'S, 166°51.20'E, 825 m, 29.08.1985: 1 specimen (MNHN 1994-993).

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CC 365, 19°42.82'S, 158°48.00'E, 710 m, 19.10.1986: 2 specimens 36.7-49.8 mm HL, 200+-267+ mm TL (MNHN 1994-995). — Stn CC 366, 19°45.40'S, 158°45.62'E, 650 m, 19.10.1986: 2 specimens 46.5-54.1 mm HL, 240-285 mm TL (CAS 86471). — Stn DC 376, 19°51.10'S, 158°29.80'E, 280 m, 20.10.1986: 2 specimens (MNHN 1994-990). — Stn CC 384, 19°42.40'S, 158°50.80'E, 772-756 m, 21.10.1986: 1 specimen 62.0 mm HL, 326+ mm TL (CAS 82178). — Stn CC 390, 21°00.90'S, 160°50.30'E, 745-825 m, 22.10.1986: 4 specimens 24.0-47.4 mm HL, 125+-245 mm TL (MNHN 1994-992), 1 specimen 68.5 mm HL, 366+ mm TL (MNHN 1994-991), 3 specimens (BMNH 1996.7.19:40-42).

Norfolk Ridge and the Loyalties. BERYX 2: stn 9, Seamount K, south of New Caledonia, 24°44.55'S, 170°07.00'E, 790-825 m, 26.10.1991: 1 specimen 34.5 mm HL, 162+ mm TL (NMNZ P.27532), 1 specimen 51.9 mm HL, 283+ mm TL (NMNZ P.33503).

Loyalty Ridge. MUSORSTOM 6: stn CP 438, 20°23.00'S, 166°20.10'E, 780 m, 18.02.1989: 3 specimens 31.0-68.5 mm HL, 155+-352+ mm TL (MNHN 1994-994).

Wallis and Futuna Islands. MUSORSTOM 7: stn DW 539, 12°27.3'S, 177°27.3'W, 700 m, 17.05.1992: 1 specimen 49.6 mm HL, 245+ mm TL (MNHN 1994-996). — Stn CP 551, 12°15.3'S, 177°28.1'W, 791-795 m, 18.05.1992: 1 specimen 71.0 mm HL, 365+ mm TL (MNHN 1994-997). — Stn CP 552, 12°15.7'S, 177°27.8'W, 786-800 m, 18.05.1992: 1 specimen 67.0 mm HL, 350+ mm TL (MNHN 1994-998). — Stn CP 553, 12°16.8'S, 177°28.1'W, 780-794 m, 18.05.1992: 2 specimens 58.7-67.7 mm HL, 310+-343+ mm TL (BMNH 1996.7.19:33-34). — Stn CP 627, 11°54.2'S, 179°31.4'W, 597-600 m, 29.05.1992: 1 specimen (MNHN 1994-999). — Stn CP 632, 11°54.0'S, 179°31.5'W, 600-595 m, 29.05.1992: 1 specimen (MNHN 1994-1000).

DIAGNOSIS. — No serrated spinous dorsal ray; first dorsal fin generally dusky but darker near base. Pelvic rays 9-11; total inner gill rakers on first arch 16-20. Barbel 13-23% of HL; preoral length 8-15%; pectoral fin length 51-68%. Black margins along leading edge of snout, along supranarial ridge, and over median nasal ridge prominent. No enlarged spinules on scales below second dorsal fin.

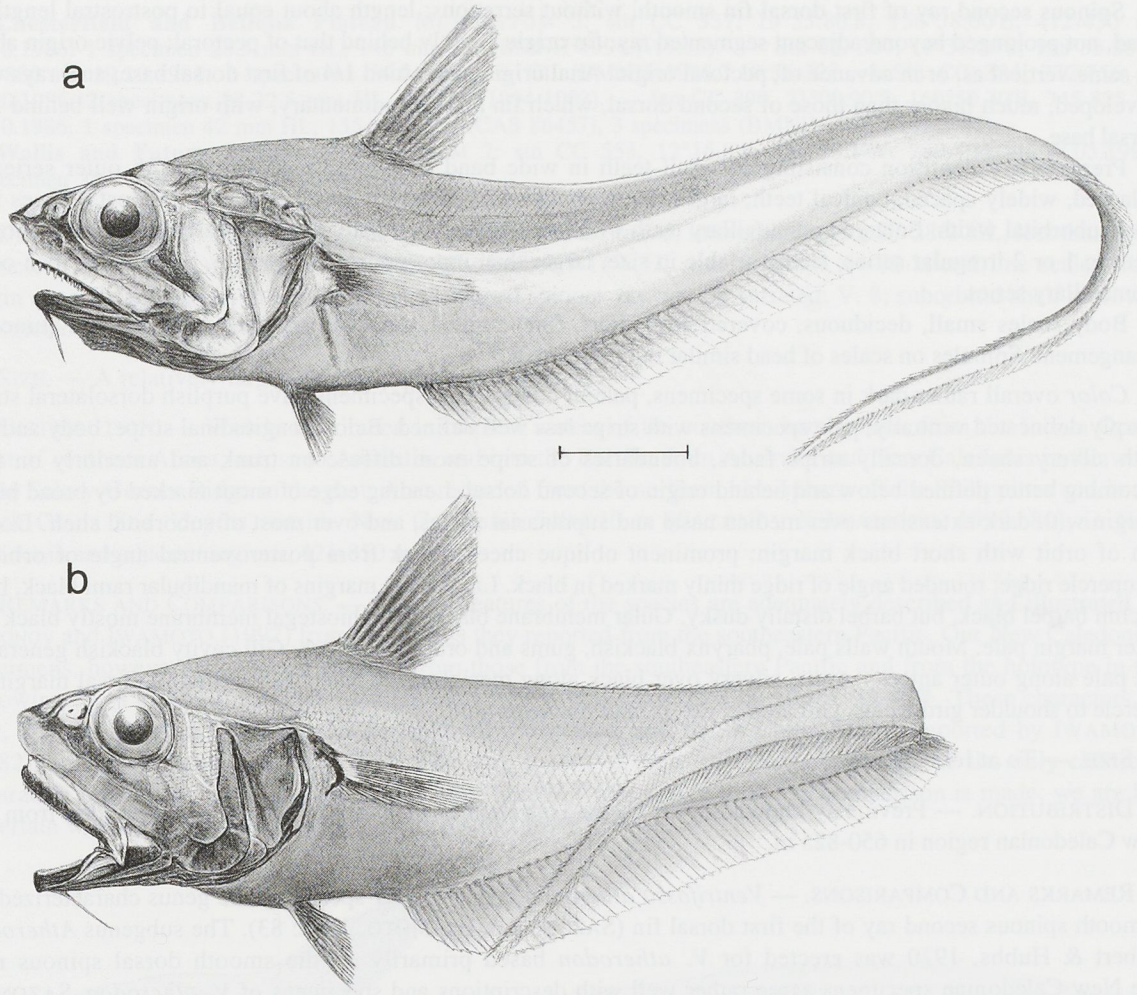


FIG. 33. — **a**, *Ventrifossa atherodon* (Gilbert & Cramer), 62 mm HL (CAS 82178), Chesterfield and Bellona Plateau, MUSORSTOM 5, stn CC 384, 772-756 m. — **b**, *Ventrifossa* sp. (not named), 56.4 mm HL (CAS 86476), New Caledonia, BIOCAL, stn CP 31, 850 m. Scale = 25 mm.

DESCRIPTION (of current specimens only). — *Counts*: 1D. II,9-11; P. i19-i23; total (outer/inner) GR-I 10-14 (usually 10-12)/16-20, GR-II 15-21 (usually 16-19)/16-19; scales 2D. 8.5-10.5 (n=5), lat.line 47-52 (n=5).

Measurements: Total lengths 125+-366+ mm; HL 24.0-68.5 mm. The following in percent of HL (smallest specimen, 24 mm HL, excluded); snout 25-29 (32); internasal 17-21; interorb. 21-26; orb. 29-35; suborb. 10-14; postorb. 43-48; orb.-preop. 40-46(49); up.jaw 47-50; gill slit 22-29; pre-A. 120-155; pre-anus 104-137; V.-A. 24-36; anus-A. 15-23; body depth 66-88; 1D.-2D. 46-71; ht. 1D. 56-66; len. V. 34-60 (n=6); post. nostril 3-6.

Snout low, minimally protruding beyond mouth, gently rounded in dorsal view in well-preserved specimens. Head moderately compressed, greatest width somewhat more than postorbital length of head; greatest body depth about equal to or greater than postrostral length. Dorsal profile rising in smooth gentle curve from snout tip to first dorsal fin, behind low base of first dorsal, profile levels off to end of tail. Ventral profile smoothly and gently rising from vent to end of tail. Mouth large, upper jaw extends to below posterior 1/4 of orbit. Chin barbel slender, relatively short for genus, somewhat more than half orbit diameter. Lower edge of suborbital shelf distinctly marked, but blends into rounded ventral surfaces of suborbital region; shelf gradually widens posteriorly to more than twice width at narrowest point. Posterior margin of preopercle inclined from vertical, but at a steep angle; ridge of preopercle sharply demarcated but blending smoothly in with head surface.

Spinous second ray of first dorsal fin smooth, without serrations; length about equal to postrostral length of head, not prolonged beyond adjacent segmented ray; fin origin slightly behind that of pectoral; pelvic origin about on same vertical as, or in advance of, pectoral origin. Anal origin under hind 1/4 of first dorsal base; anal rays well developed, much higher than those of second dorsal, which fin almost rudimentary, with origin well behind first dorsal base.

Premaxillary dentition consisting of small teeth in wide band 6 or more teeth wide, with outer series of enlarged, widely spaced, conical teeth; largest tooth about equal to length posterior nostril, almost 4 times into least suborbital width. Enlarged premaxillary teeth with low flanges, especially those laterally on jaw. Mandibular teeth in 1 or 2 irregular series; teeth variable in size, larger than inner premaxillary teeth, but smaller than outer premaxillary series.

Body scales small, deciduous, covered with short, fine, conical, recurved spinules in somewhat quincunx arrangement. Spinules on scales of head similar but more erect.

Color overall rather dark in some specimens, pale in others; dark specimens have purplish dorsolateral stripe sharply delineated ventrally; pale specimens with stripe less well defined. Below longitudinal stripe, body and tail with silvery sheen, dorsally stripe fades, boundaries of stripe more diffuse on trunk and anteriorly on tail, becoming better defined below and behind origin of second dorsal. Leading edge of snout marked by broad black margin with dark extensions over median nasal and supranarial ridges, and over most of suborbital shelf. Dorsal rim of orbit with short black margin; prominent oblique cheek streak from posteroventral angle of orbit to preopercle ridge; rounded angle of ridge thinly marked in black. Lips black, margins of mandibular rami black, base of chin barbel black, but barbel distally dusky. Gular membrane black; branchiostegal membrane mostly black but outer margin pale. Mouth walls pale, pharynx blackish, gums and oral valves dark. Gill cavity blackish generally, but pale along outer anterior walls, silvery over black along mesial walls. Membranes joining dorsal margin of opercle to shoulder girdle pale. Gill arches, rakers, and filaments pale.

SIZE. — To at least 37 cm TL.

DISTRIBUTION. — Previously known only from the Hawaiian Islands in 302-936 m, now recorded from the New Caledonian region in 650-825 m.

REMARKS AND COMPARISONS. — *Ventrifossa atherodon* is one of four species of the genus characterized by a smooth spinous second ray of the first dorsal fin (SAZONOV & IWAMOTO, 1992: 83). The subgenus *Atherodus* Gilbert & Hubbs, 1920 was erected for *V. atherodon* based primarily on the smooth dorsal spinous ray. The New Caledonian specimens agree rather well with descriptions and specimens of *V. atherodon*. SAZONOV & IWAMOTO (1992: 83), in their key to species of the complex, used gill-slit length as one of two characters for separating *V. atherodon* and *V. macrodon*, but measurements from our New Caledonian specimens overlap the two ranges so completely as to discount that as a usable character. A more-detailed study and comparisons are necessary to determine the validity of these taxa.

Ventrifossa johnboborum Iwamoto, 1982

Fig. 34

Ventrifossa johnboborum Iwamoto, 1982: 55-61, fig. 1 (Bismarck Sea).

MATERIAL EXAMINED. — 21 specimens.

New Caledonia. BIOCAL: stn CP 31, 23°07.26'S, 166°50.45'E, 850 m, 29.08.1985: 1 specimen 88.5 mm HL (MNHN 1994-1001), 1 specimen 28.5 mm HL (MNHN 1994-1004). — Stn CP 32, 23°06.98'S, 166°51.20'E, 825 m, 29.08.1985: 1 specimen 47.9 mm HL, 245+ mm TL (CAS 86488). — Stn CP 75, 22°18.65'S, 167°23.30'E, 825 m, 4.09.1985: 1 specimen 68.0 mm HL (MNHN 1994-1002).

Norfolk Ridge and the Loyalties. BERYX 2: stn 7, Seamount K, south of New Caledonia, 24°41.70'S, 170°06.82'E, 815-820 m, 25.10.1991: 1 specimen 92.5 mm HL, 450+ mm TL (NMNZ P. 27469). — Stn 9, Seamount K, south of New Caledonia, 24°44.55'S, 170°07.00'E, 790-825 m, 26.10.1991: 2 specimens 82.5-87.8 mm HL, 378+-431+ mm TL (NMNZ P.27513), 1 specimen 85.0 mm HL, 325+ mm TL (NMNZ P.27514), 1 specimen 38.5 mm HL, 157+ mm TL (NMNZ P.27533), 2 specimens 26-30 mm HL, 145+-145+ mm TL (NMNZ P.27534).

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CC 337, 19°53.80'S, 158°38.00'E, 412-430 m, 15.10.1986: 1 specimen 28.3 mm HL, 146 mm TL (BMNH 1996.7.19:35). — Stn CC 367, 19°36.80'S, 158°53.20'E, 855-830 m, 19.10.1986: 2 specimens 54.0-59.0 mm HL (BMNH 1996.7.19:36-37). — Stn CC 384, 772-756 m, 21.10.1986: 2 specimens 28-32.5 mm HL (MNHN 1994-1003). — Stn CC 390, 21°00.90'S, 160°50.30'E, 745-825 m, 22.10.1986: 1 specimen 42 mm HL, 155+ mm TL (CAS 86457), 3 specimens (BMNH 1996.7.19:43-45).
Wallis and Futuna Islands. MUSORSTORM 7: stn CC 553, 12°16.8'S, 177°28.1'W, 780-794 m, 18.05.1992: 1 specimen 35.0 mm HL (MNHN 1994-1005).

DIAGNOSIS (from 7 New Caledonian specimens). — Head broad, interorbital width 27-28% HL, less than orbit diameter (29-38% HL); upper jaw 35-39% HL; barbel 7-14% HL; scales small, 64-70 lateral line scales from origin over distance equal to predorsal length; dorsal spinous ray weakly serrated; V. 8; suborbital shelf narrowly constricted at anterior end; mouth blackish.

SIZE. — A relatively large species, attaining 47.5 cm TL.

DISTRIBUTION. — Widely distributed in tropical waters of the southern hemisphere, from the Indian Ocean coast of southern Africa, across to Australia, and into the Pacific, from Australia and New Caledonia in the west, to the Sala-y-Gomez Ridge in the east. Also recorded from the northern hemisphere off the Philippines and in the South China Sea. Depths outside New Caledonia 540-810 m (SAZONOV & IWAMOTO, 1992: 80); in New Caledonia and adjacent regions, 421-850 m.

REMARKS AND COMPARISONS. — General features of the species are adequately described and illustrated by SAZONOV and IWAMOTO (1992) from specimens they reported from the southeastern Pacific. Our New Caledonian specimens, however, showed differences from those from the southeastern Pacific and from the holotype in the following: V. 8 cf. 9-10, barbel 7-14% HL cf. 13-19%, upper jaw 35-39% HL cf. 39-45%. These characters, in fact, are similar to those in specimens from the Philippines and South China Sea, as reported by IWAMOTO (1982), and to *V. fusca* Okamura, 1982. The dark mouth of these specimens appear to be the only character separating them from *V. fusca*, which has a pale mouth. Until a more thorough comparison is made, we are left uncertain whether or not these specimens are distinct from *V. fusca*.

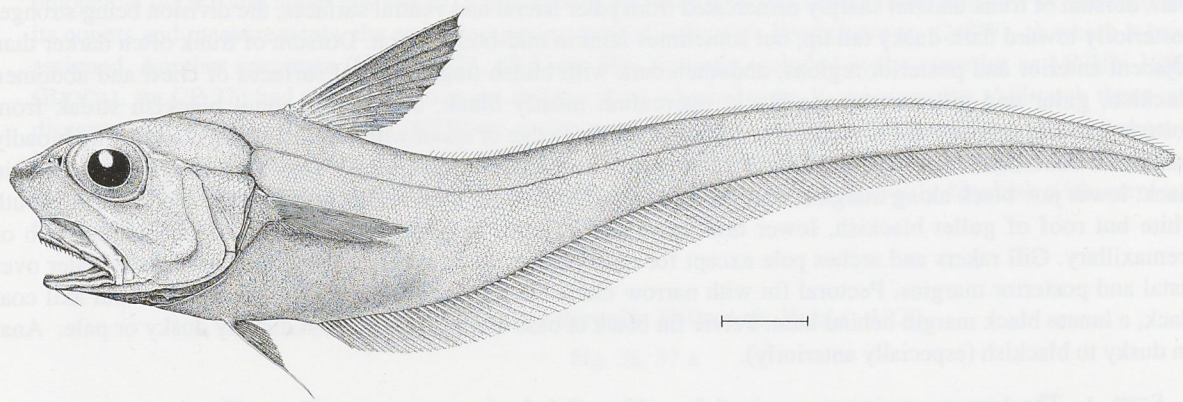


FIG. 34. — *Ventrifossa johnboborum* Iwamoto (From SAZONOV & IWAMOTO, 1992, fig. 30). Scale = 25 mm.

Ventrifossa macropogon Marshall, 1973

Fig. 35

Ventrifossa macropogon Marshall, 1973: 658-660, fig. 5 (holotype, USNM 198187, nw. Caribbean, 576 m).

MATERIAL EXAMINED. — 8 specimens.
New Caledonia. BIOCAL: stn CP 32, 23°06.98'S, 166°51.20'E, 825 m, 29.08.1985: 1 specimen 46.8 mm HL, 265+ mm TL (MNHN 1997-667). — Stn DW 33, 23°09.71'S, 167°10.27'E, 675 m, 29.08.1985: 1 specimen 40.3 mm HL, 230 mm TL (CAS 86474).

Loyalty Islands. BIOGEOCAL: stn 232, 21°33.81'S, 166°27.07'E, 760-790 m, 12.04.1987: (?)1 specimen in poor condition questionably identified (BMNH 1996.7.19:49).

Norfolk Ridge and the Loyalties. BERYX 2: stn 7, Seamount K, south of New Caledonia, 24°41.70'S, 170°06.82'E, 815-820 m, 25.10.1991: 3 specimens 52.7-55.3 mm HL, 259+-310+ mm TL (NMNZ P27465). — Stn 9, Seamount K, south of New Caledonia, 24°44.55'S, 170°07.00'E, 790-825 m, 26.10.1991: 3 specimens 49.6-59.1 mm HL, 266+-320+ mm TL (NMNZ P27512).

DIAGNOSIS. — Pelvic rays 9-10 (usually 9); snout bluntly pointed, little protruding beyond mouth, preoral length 14-17% HL; suborbital 13-15%; distance orbit to preopercle 40-45%; upper jaw 44-47%; barbel thick, long, 31-37% of HL; leading margins of snout and nasal ridges (including median nasal ridge) prominently marked in black; first dorsal fin dusky to blackish, with rays proximally often dark. Scale rows below mid-1D. 8.5-10.

DESCRIPTION. — *Counts* (8 spec.): 1D. II,10-11; P. i18-i22; total GR-I (outer/inner) 9-10 / 13-15, GR-II 13-15 / 13-15; scales below 1D. 10.5-11, below 2D. 8-10, lat.line scales abt. 42 (2 spec.).

Total lengths 230-320+ mm; HL 40.3-59.1 mm. The following in percent of HL: snout 30-32; internasal 21-23; interorb. 23-28; orb. 29-33; postorb. 42-46; gill-slit 24-28; pre-A. 130-149; V.-A. 29-40; body depth 83-95; 1D.-2D. 47-65; ht. 1D. 66-78; len. P. 53-65; len. V. 36-43; post. nostril 5-8.

Snout broadly rounded in dorsal view; width across lateral angles more than interorbital width, about equal to orbit diameter and snout length. Upper jaw extends to below posterior 1/4th of orbit; barbel long, relatively thick, about equal to or longer than orbit diameter.

Body scales densely covered with small, erect, conical spinules in more or less quincunx pattern; spinules black pigmented. Scales under margin of gill cover, beneath pectoral and pelvic fins, and a small patch behind first dorsal smooth.

Jaw teeth all small, in broad band 6-7 teeth wide in premaxilla with outer series slightly larger than inner band teeth; mandibular teeth small, conical in 2-4 rows (usually 3 irregular), none enlarged.

Leading edge of spinous second ray of first dorsal fin armed with small, closely spaced serrations, the ray not produced beyond adjacent segmented rays. Outer pelvic ray slightly prolonged, extending to 4th or 5th anal ray.

Color: Specimens variable in overall darkness, some with swarthy or dark areas more extensive than in others. Dark dorsum of trunk and tail sharply demarcated from paler lateral and ventral surfaces, the division being stronger posteriorly toward dark-dusky tail tip, but sometimes faint in mid-body region. Dorsum of trunk often darker than adjacent anterior and posterior regions; abdomen dark with bluish tinge. Ventral surfaces of chest and abdomen blackish; gular and gill membranes black; operculum mostly black; a broad diagonal blackish streak from posteroventral corner of orbit to angle of preopercle. Leading edge of snout with blackish margin extending broadly onto entire suborbital shelf, with dark streaks over median nasal and lateral nasal ridges. Lips sharply delineated in black; lower jaw black along margins, dark along ramus; barbel with base narrowly black but overall pale. Mouth white but roof of gullet blackish, lower oral valve black, gums grayish. A black spot on ascending limb of premaxillary. Gill rakers and arches pale except for light peppering on rakers. First dorsal fin usually paler over distal and posterior margins. Pectoral fin with narrow black basal margin, dark dusky overall; pectoral axil coal black, a lunate black margin behind base. Pelvic fin black at base and proximally, but distally dusky or pale. Anal fin dusky to blackish (especially anteriorly).

SIZE. — The largest specimen examined from New Caledonian waters was 32 cm TL, but in the western Atlantic, the species is known to exceed 45 cm (personal observations, TI).

DISTRIBUTION. — Originally recorded from temperate and tropical western North Atlantic, now recorded from New Caledonia and seamounts to the south. Depth range in New Caledonian region 675-833 m.

REMARKS AND COMPARISONS. — We compared our New Caledonian specimens with representatives from the western North Atlantic (including CAS 4547, 14549, 56871, 56920, 56931, 61138) and found no differences. The similarities were remarkable considering the vast geographical disjunction; we plan to cover this topic in a companion paper on distribution and ecology.

We are far from satisfied with our treatment of this species and three others that we are calling *V. nigrodorsalis*, *V.* species (NSW), and *Ventrifossa* sp. indet. We found substantial variation in our specimens of these species, and

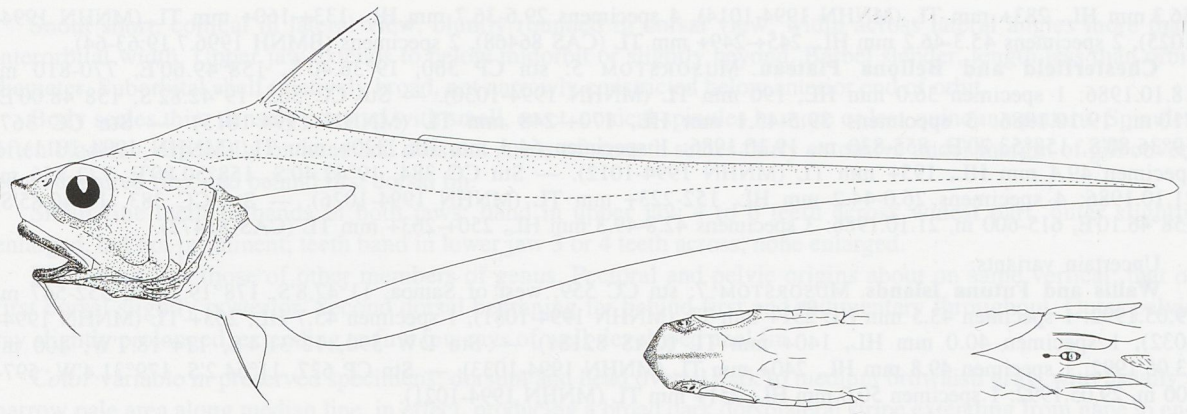


FIG. 35. — *Ventrifossa macropogon* Marshall (From IWAMOTO, 1990, fig. 680).

in our initial sort we included all specimens of the last species and some of the other two in the same group as our specimens of *V. macropogon*. Subsequently, however, after close analysis of our data, we were able to sort out what we considered to be distinct taxonomic entities, but there remain enough differences within our groupings that some specimens have had to be treated as uncertain variants. A more detailed study with many more specimens from throughout the area will be necessary before these perplexing problems can be adequately resolved.

Two *V. macropogon* specimens from BIOCAL stations CP 32 (MNHN 1997-667, 46.8 mm HL) and DW 33 (CAS 86474, 40.3 mm HL) had a blunter snout profile, and the fins and dorsal body parts were paler than the others. They also lacked the black spot on the ascending limbs of the premaxillary. A specimen from BIOCAL station CP 31 (CAS 86476, 56.4 mm HL), taken in the same general area as the two *V. macropogon*, appeared to be identical in its general features, but a closer look showed that it had a substantially shorter barbel (28% HL), higher gill-raker counts, and slightly greater dimensions of the interorbital (29% HL), suborbital (15%), orbit-preopercle (47%), and upper jaw (48%). It also lacked the black spot on the ascending limbs of the premaxillary. In its counts and measurements, the specimen agrees most closely with *Ventrifossa* sp. (NSW), to which it has been assigned. Another specimen (CAS 86473, 60.5 mm HL), initially included in the same lot as MNHN 1997-667 (BIOCAL stn CP 32) had too narrow a snout and too short a barbel to be *V. macropogon*. Although there is some disagreement with *Ventrifossa* sp. (NSW) in certain morphometric and meristic values (especially the short upper jaw, 44% HL, and orb.-preop. distance, 44%), we tentatively assign the specimen to that species because of its distinct median nasal snout streak and dark fins, the first dorsal of which is mostly blackish with narrow paler distal and proximal margins.

Ventrifossa nigrodorsalis Gilbert & Hubbs, 1920

Fig. 36, 37 a

Ventrifossa nigrodorsalis Gilbert & Hubbs, 1920: 546-549, fig. 36 (holotype, USNM 83627; Philippines off northern Mindanao in 391 m; numerous paratypes from Philippines and East Indies).

MATERIAL EXAMINED. — 38 specimens.

New Caledonia. MUSORSTROM 4: stn CP 169, 18°54.03'S, 163°11.20'E, 600 m, 17.09.1985: 2 specimens 41.2-44.2 mm HL, 223-232 mm TL (MNHN 1994-1029). — Stn CP 200, 18°53.80'S, 163°14.10'E, 545 m, 20.09.1985: 2 specimens 31.7-39.0 mm HL, 190+-230 mm TL (MNHN 1994-1028). — Stn CC 202, 18°58.00'S, 163°10.50'E, 580 m, 20.09.1985: 8 specimens 33.8-43.2 mm HL, 152+-244 mm TL (MNHN 1994-1027), 2 specimens 34.0-44.9 mm HL, 193+-260+ mm TL (CAS 82180).

Norfolk Ridge and the Loyalties. BERYX 2: stn 3, Seamount B, south of New Caledonia, 24°55.50'S, 168°21.25'E, 600-675 m, 24.10.1991: 2 specimens 41.3-43.6 mm HL, 250+-190+ mm TL (NMNZ P.27422).

Loyalty Island. MUSORSTOM 6: stn CP 427, 20°23.35'S, 166°20.00'E, 800 m, 17.02.1989: 1 specimen 59.6 mm HL, 275+ mm TL (MNHN 1994-1013). — Stn CP 438, 20°23.00'S, 166°20.10'E, 780 m, 18.02.1989: 1 specimen

56.3 mm HL, 283+ mm TL (MNHN 1994-1014), 4 specimens 29.6-36.7 mm HL, 133+-160+ mm TL (MNHN 1994-1025), 2 specimens 45.3-46.2 mm HL, 245+-249+ mm TL (CAS 86468), 2 specimens (BMNH 1996.7.19:63-64).

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CP 360, 19°36.40'S, 158°49.60'E, 770-810 m, 18.10.1986: 1 specimen 36.0 mm HL, 190 mm TL (MNHN 1994-1030). — Stn CC 365, 19°42.82'S, 158°48.00'E, 710 m, 19.10.1986: 3 specimens 39.5-45.1 mm HL, 170+-248 mm TL (MNHN 1994-1015). — Stn CC 367, 19°36.80'S, 158°53.20'E, 855-830 m, 19.10.1986: 1 specimen 64.4 mm HL, 320+ mm TL (MNHN 1994-1011), 1 specimen 49.4 mm HL, 195+ mm TL (MNHN 1994-1012). — Stn CC 384, 19°42.40'S, 158°50.80'E, 772-756 m, 21.10.1986: 4 specimens 26.0-44.2 mm HL, 152-223+ mm TL (MNHN 1994-1026). — Stn CC 383, 19°40.85'S, 158°46.10'E, 615-600 m, 21.10.1986: 3 specimens 42.8-49.3 mm HL, 250+-263+ mm TL (CAS 86472).

Uncertain variants:

Wallis and Futuna Islands. MUSORSTOM 7: stn CC 559, west of Samoa, 11°47.8'S, 178°19.11'W, 552-547 m, 19.05.1992: 1 specimen 43.5 mm HL 251+ mm TL (MNHN 1994-1031), 1 specimen 45.7 HL, 203+ TL (MNHN 1994-1032), 1 specimen 40.0 mm HL, 140+ mm TL (CAS 82181). — Stn DW 590, 12°31.4'S, 174°18.7'W, 400 m, 23.05.1992: 1 specimen 49.8 mm HL, 240+ mm TL (MNHN 1994-1033). — Stn CP 627, 11°54.2'S, 179°31.4'W, 597-600 m, 29.05.1992: 1 specimen 50.0 mm HL, 251+ mm TL (MNHN 1994-1021).

DIAGNOSIS (from current specimens only, but not including uncertain variants). — Pelvic rays 8-9 (usually 8); snout conically acute, protruding slightly beyond mouth, preoral length 16-21% HL; suborbital 12-14%; distance orbit to preopercle 38-42%; upper jaw 38-45%; barbel slender, 21-28% of HL; leading margins of snout and nasal ridges, but not median nasal ridge, marked with black; first dorsal fin with distinct black blotch or blackish streak. Scale rows below mid-1D. 5.5-7.5.

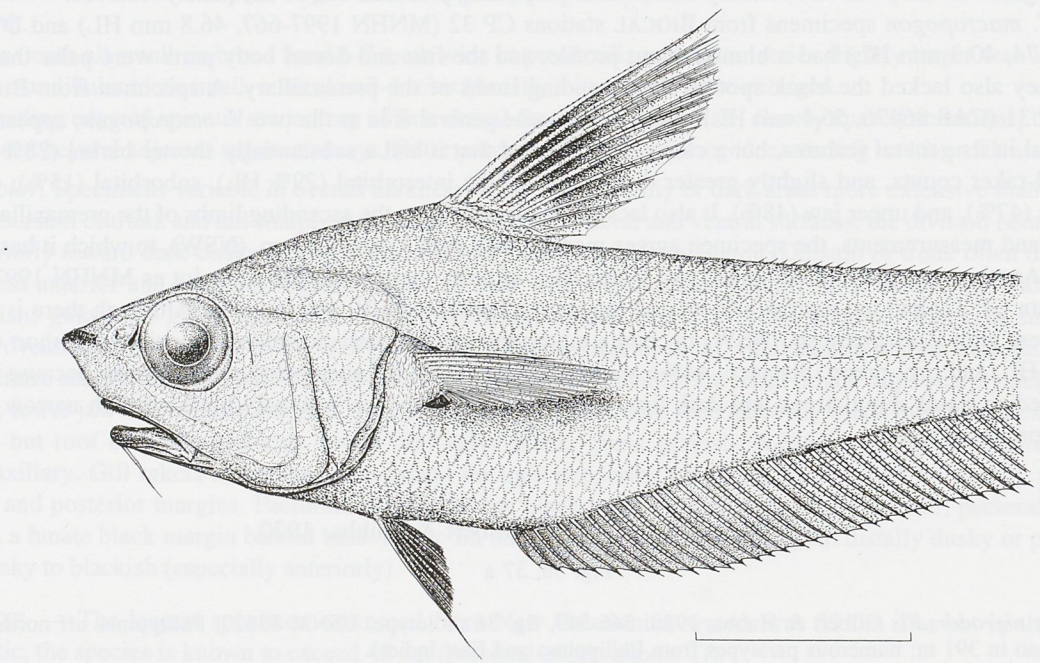


FIG. 36. — *Ventrifossa nigrodorsalis* Gilbert & Hubbs (From IWAMOTO, 1990, fig. 690). Scale = 25 mm.

DESCRIPTION (from current specimens only). — *Counts* (25 spec.): 1D. II,9-11; P. i17-i22; total GR-I (outer/inner) 8-12 / 12-15 (16), GR-II 12-15 (16) / 12-15 (16); scales below 1D. 9-12, below 2D. 6.5-8.5, lat.line 36-44.

Measurements: Total lengths 133-320+ mm; HL 29.6-64.3 mm. The following in percent of HL: snout 30-34; internasal 20-25; interorb. 24-29; orb. 30-37; postorb. 40-43; gill-slit 21-27; pre-A. 122-162; V.-A. 23-37; body depth 75-86; 1D.-2D. 47-69; ht. 1D. 61-90; len. P. 49-64; len. V. 33-42; nostril 4-7.

Snout short, conical in lateral view, bluntly rounded in dorsal view; width across lateral angles more than interorbital width. Upper jaw extends to below midorbit or slightly beyond. Barbel slender, length less than orbit diameter. Suborbital shelf relatively broad, not narrowly constricted below anterior end of orbit.

Body scales thin, densely covered with small, erect, conical spinules in more or less quincunx pattern. Spinules often blackish, especially on head and dorsum. Areas of smooth scales fairly extensive under margin of gill cover, beneath paired fins, and behind first dorsal fin.

Small fine teeth in bands in both jaws; band in upper jaw 4 to 6 teeth across widest part, outer slightly enlarged, but not prominent; teeth band in lower jaw 3 or 4 teeth across, none enlarged.

Fins about like those of other members of genus. Pectoral and pelvic origins about on same vertical; that of first dorsal slightly posterior. Second dorsal beginning far behind first and rudimentary throughout. Outer pelvic ray slightly prolonged, extending to first few rays of well-developed anal fin.

Color variable in preserved specimens; dorsum and head overall dark to medium brownish gray, with usually a narrow pale area along median line, in effect, producing a broad dark dorsolateral stripe extending from nape to end of tail; pale area often broken up by narrow vertical bands. Ventral aspects of tail variably pale to silvery; abdomen dark bluish laterally to blackish ventrally, but silvery in specimens still retaining silvery pigmentation. Leading edge of snout with broad black margin that joins intensely black suborbital shelf; supranarial ridges with some blackish margins, but only a trace over midorbit; a faint trace of median nasal streak in a few specimens, but dorsal snout surfaces between supranarial ridges usually translucent and without pigmentation. Lips black; mouth white, although upper oral valves often lightly peppered. Gums of upper and lower jaw dusky. Gill filaments and arches usually pale, but arches lightly to heavily peppered. Chin barbel dark at base, but free portion pale. Black blotch on first dorsal usually intense and small, limited to spinous ray and first 4 to 6 segmented rays, but in some specimens blotch extends across all rays as a broad horizontal streak, and in others (e.g., from Chesterfield and Bellona Plateau, MNHN 1994-1026, 1994-1011 and Loyalty Ridge, MNHN 1994-1014), blotch extensive and extends to just above base of fin. Pectoral fins black at base and proximally, but often much paler distally. Pelvic fins black at base and outer 2 or 3 rays, but pale distally over inner rays. Anal fin clear to light dusky, usually darker near anterior end.

SIZE. — To about 32 cm TL.

DISTRIBUTION. — Originally recorded from Philippines and East Indies, but subsequently found in Japan and Taiwan, and now in New Caledonian region. Depth range in region 545-855 m.

REMARKS AND COMPARISONS. — Our specimens of this species agreed reasonably well with type specimens from the Philippines, although specimens were often highly different in their condition of preservation. We found some variation in our study collections, however, which led us to much confusion. Specimens of *V. nigrodorsalis* were compared from the immediate vicinity of New Caledonia and seamounts to the south, the Wallis and Futuna Islands, the Chesterfield and Bellona Plateau, and the Loyalty Ridge. Those from the Chesterfield and Bellona Plateau and the Wallis and Futuna Islands were notably paler than those from the other two areas. This difference may have been a result of preservation; specimens from the Chesterfield and Bellona Plateau had more scales intact and they retained substantial areas of silvery pigmentation on their head and body. The Loyalty Ridge specimens had much more extensive areas of black on the first dorsal fin, with only the base and distal tips pale or dusky. Furthermore, near the terminal end of the tail, the dark dorsal area appeared to completely dominate the flanks. Other than those minor color differences, most specimens from one place or another were largely indistinguishable. One exception, however, was the specimens from the Wallis and Futuna Islands (Fig. 37a). They were generally very pale with faintly marked head and body regions, and for the most part lacked a prominent black blotch on the first dorsal fin. They also had a slightly broader interorbital space, a longer, more-protruding snout, and were somewhat shallower bodied. We had considered treating these specimens as a distinct species, but decided against doing so because of the apparent wide variability in characters inherent in a species with a broad distribution.

The absence of a dark median nasal streak and the distinctly black-blotched first dorsal fin distinguish *V. nigrodorsalis* from *V. macropogon* and *Ventrifossa* sp. (NSW). The longer barbel of *V. macropogon* and the longer jaws and outer gill slit and greater dimensions of the postorbital and orbit-to-preopercle distances of

Ventrifossa sp. (NSW) further separate these species. Other species of the genus are little likely to be misidentified with *V. nigrodorsalis* and can be readily distinguished from it by the key provided.

Ventrifossa vinolenta sp. nov.

Fig. 37 b, b'

MATERIAL EXAMINED. — 10 specimens.

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CC 390, 21°00.90'S, 160°50.30'E, 745-825 m, 22.10.985: holotype 47.4 mm HL, 225+ mm TL (MNHN 1994-1006). — Stn CC 384, 19°42.40'S, 158°50.80'E, 772-756 m, 21.10.1986: 2 paratypes 33.7-38.8 mm HL, 160+-177+ mm TL (MNHN 1994-1008). — Stn CC 390, same data as for holotype: 3 paratypes 35.1-46.1 mm HL, 155+-213+ mm TL (MNHN 1994-1007), 3 paratypes 35.1-48.7 mm HL, 158+-193+ mm TL (CAS 86475), 1 paratype 25.5 mm HL, 214+ mm TL (BMNH 1996.7.19:39).

DIAGNOSIS. — Pelvic rays 8 (rarely 9); snout relatively long and pointed, 27-32% HL; preoral 19-25% HL, orbit diameter 32-36%, length upper jaw 37-38%; inner gill rakers first arch 12-14; dorsolateral dark streak extending from parietal region to end of tail, dorsum above dark streak distinctly pale; leading edge of snout with black margin, extending posteriorly over supranarial ridges and dorsal rim of orbits, no median snout streak; base of first dorsal pale, but rays proximally black, distally fading to pale; lips blackish, ascending process of premaxillary black; mouth mostly black but with pale areas; small species, probably less than 30 cm TL.

DESCRIPTION. — *Counts*: 1D. II,8-9; P. i17-i21; V. 8 (9 in one fin); total GR-I (outer) 9-12, GR-II (outer/inner) 11-14/12-15; scales 1D. 7-8, mid-1D. 4.5-6.6, 2D. 5.5-6.0.

Measurements: Total lengths of specimens 155+-225+ mm; HL 25.5-47.4 mm. The following in percent of HL: internasal 17-22; interorb. 22-26; suborb. 9-13; postorb. 37-41; orb.-preop. 35-41; barbel 17-21; gill slit 19-23; pre-A. 125-150; pre-anus 106-139; V.-A. 25-36; anus-A. 17-22; body depth 65-72; 1D.-2D. 42-72; ht. 1D. 57-59; len. P. 46-49; len. V. 28-30; nostril 4-7.

Head relatively broad, greatest width about equal to distance snout tip to midorbit. Trunk relatively shallow, greatest depth almost equal to postrostral length of head in larger specimens, less in smaller specimems. Dorsal profile smoothly and gently rising from snout tip to over nape, a steeper rise just before first dorsal, base of first dorsal low, profile gently descends to posterior end of base, then levels off and straightens to end of tail. Ventral profile rises moderately from vent to behind abdomen, thereafter rising gradually to tail tip. Snout conical in lateral profile, protruding beyond mouth a distance more than eye-lens diameter; viewed dorsally, snout forming an obtuse triangle, angle at apex approximately 100-110 degrees. Mouth wide, jaws long, length upper jaw about equal to greatest orbit diameter, maxillary extending to below posterior 1/3 of orbit. Orbit oval, ventral margin forming broader arch than dorsal margin, greatest diameter oblique. Interorbital space broad, about 1.5 into orbit diameter, almost flat, but probably slightly convex in life. Preopercle large, with shallow lobe formed at posteroventral angle; vertical and horizontal arms of ridge strongly demarcated. Chin barbel fairly stout proximally, tapering to fine tip; length about equal to or more than lens diameter.

First dorsal fin moderately developed, length spinous second ray less than postrostral length, origin slightly behind vertical through pectoral and pelvic origins, the latter slightly forward of former. Anal origin about under hind margin of first dorsal or somewhat posterior. Weakly developed second dorsal with origin far behind first dorsal base, slightly farther than tip of depressed longest first dorsal ray. Pectoral fin extends posteriorly well beyond point over origin of anal fin. Pelvic fins small, outer ray scarcely if at all prolonged, falling short of anal origin.

Premaxillary dentition consisting of a narrow to somewhat broad band of tiny, villiform teeth and an outer series of slightly larger teeth. Mandibular teeth all small, in a narrow band 2 or 3 teeth wide.

Scales weakly to moderately adherent, those on head surfaces generally covered with very short, erect, conical spinules. Tip of snout with a single, rather large, stout, scutelike scale, which, however, not distinctly set off from adjacent scales. Body scales covered with slender, conical, moderately reclined, only slightly recurved spinules in quincunx arrangement.

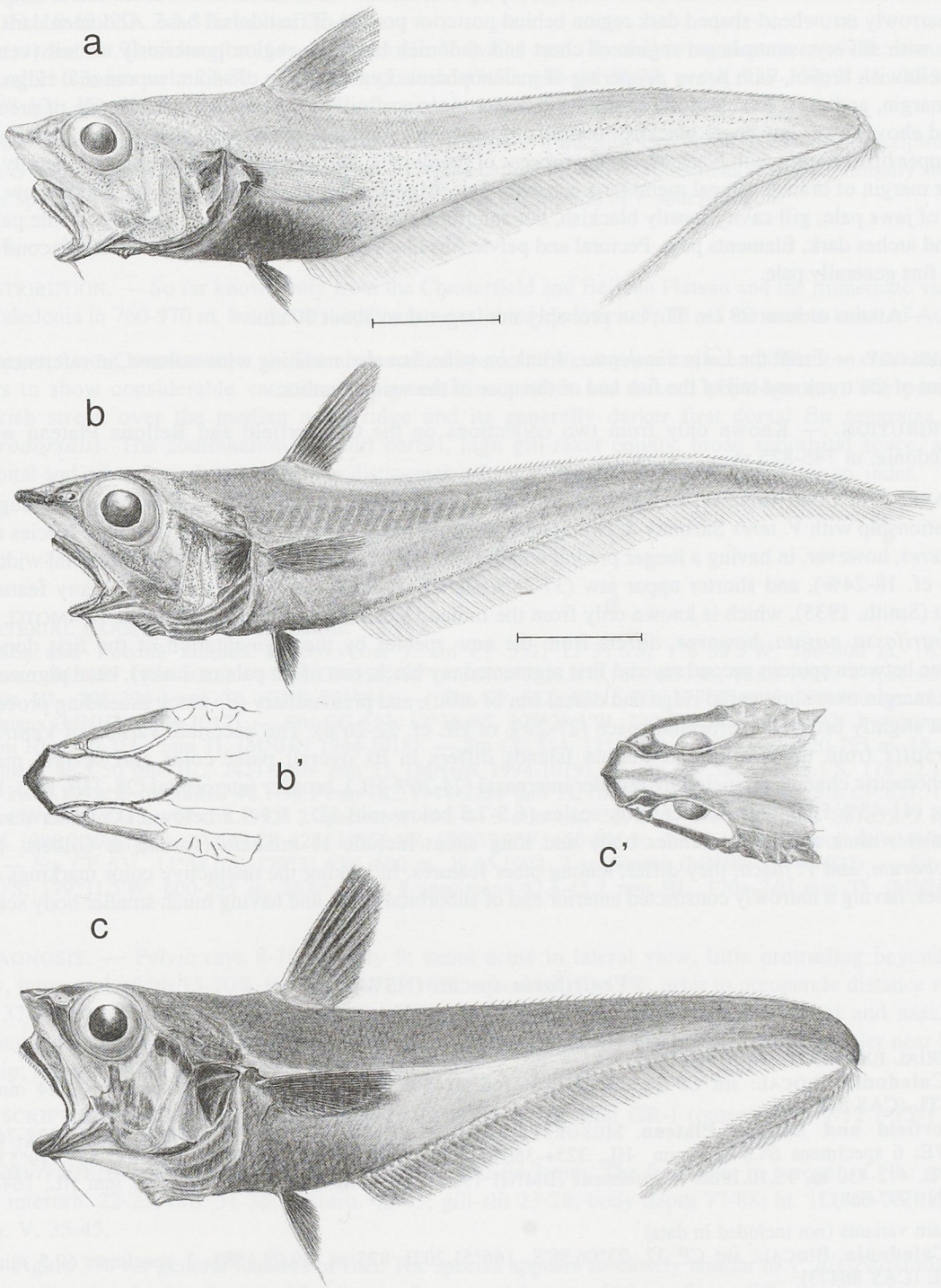


FIG. 37. — **a**, *Ventrifossa nigrodorsalis*, uncertain variant 40.0 mm HL (CAS 82181), Wallis and Futuna Islands, MUSORSTOM 7, stn CP 559, 552-547 m. — **b**, *Ventrifossa vinolenta* sp. nov., 48.7 mm HL, paratype (CAS 86475), Chesterfield and Bellona Plateau, MUSORSTOM 5, stn CC 390, 745-825 m; and **b'** dorsal view of head. — **c**, *Ventrifossa* sp. indet., 51 mm HL (CAS 82179), off Wallis and Futuna Islands, MUSORSTOM 7, stn CP 550, 800-810 m; and **c'** dorsal view of head. Scales = 25 mm.

Color in alcohol with trunk and tail overall dark purplish; narrow dorsal area above dorsolateral stripe pale, except narrowly arrowhead-shaped dark region behind posterior portion of first dorsal base. Abdomen dark bluish overlain with silvery; ventralmost region of chest and abdomen blackish; region posteriorly on tail (ventral to stripe) yellowish brown, with heavy peppering of melanophores. Leading edge of snout, supranarial ridge, upper orbital margin, and most of suborbital shelf black; upper margin of gill cover broadly black; angle of preopercle ridge and above lower jaw angle blackish; margins of subopercle and interopercle narrowly black; lips blackish, darker upper lip, merging with black ascending process of premaxilla; barbel pale; gill membranes generally black, but outer margin of branchiostegal membrane narrowly pale. Mouth generally black, but gums, and narrow region at angle of jaws pale; gill cavity mostly blackish, but anterior outer wall and region over shoulder girdle pale; gill rakers and arches dark, filaments pale. Pectoral and pelvic fins blackish overall, blacker proximally; second dorsal and anal fins generally pale.

SIZE. — Attains at least 23 cm TL, but probably not larger than about 30 cm.

ETYMOLOGY. — From the Latin *vinolentus*, drunk on wine, but also meaning wine-colored, in reference to the overall tint of the trunk and tail of the fish and of the nose of the second author.

DISTRIBUTION. — Known only from two collections on the Chesterfield and Bellona Plateau west of New Caledonia, in 745-825 m.

REMARKS AND COMPARISONS. — The relatively slender body and protruding snout of *V. vinolenta* suggest a close relationship with *V. teres* Sazonov & Iwamoto, 1992 from the Sala-y-Gomez Ridge. The new species differs from *V. teres*, however, in having a longer preoral length (19-25% HL cf. 11-18%), broader interorbital width (22-26% HL cf. 18-24%), and shorter upper jaw (37-38% HL cf. 39-45%). It is also similar in many features to *V. nasuta* (Smith, 1935), which is known only from the Indian Ocean off southern African (see IWAMOTO, 1990: 306). *Ventrifossa nasuta*, however, differs from the new species by the pigmentation of the first dorsal fin (membrane between spinous second ray and first segmented ray black, rest of fin pale or dusky), head pigmentation (no black margin over supranarial ridge and dorsal rim of orbit), and premaxillary (no black ascending process); it also has a slightly broader interorbital space (27-29% of HL cf. 22-26%). The uncertain variant of *Ventrifossa nigrodorsalis* from the Wallis and Futuna Islands differs in its overall paler color and several meristic and morphometric characters, including broader internasal (24-26% HL), broader interorbital (28-31% HL), longer upper jaw (41-45% HL), and smaller body scales (6.5-7.5 below mid-1D., 8.5-9.5 below 2D.) Other members of the genus with a relatively slender body and long snout include *V. misakia* (Jordan & Gilbert, 1904), *V. johnboborum*, and *V. fusca*; they differ, among other features, in lacking the distinctive color markings of the new species, having a narrowly constricted anterior end of suborbital shelf, and having much smaller body scales.

Ventrifossa species (NSW)

Fig. 33 b

MATERIAL EXAMINED. — 10 specimens.

New Caledonia. BIOCAL: stn CP 31, 23°07.26'S, 166°50.45'E, 850 m, 29.08.1985: 1 specimen 56.4 mm HL, 305+ mm TL (CAS 86476).

Chesterfield and Bellona Plateau. MUSORSTOM 5: stn CP 384, 19°42.40'S, 158°50.80'W, 772-756 m, 21.10.1.00'E: 6 specimens 64.8-82.1 mm HL, 325+-380 mm TL (MNHN 1994-1010). — Stn CC 337, 19°53.80'S, 158°38.00'E, 412-430 m, 15.10.1986: 4 specimens (BMNH 1996.7.19:38, 46-48), 1 specimen 33.2 mm HL, 164+ mm TL (MNHN 1997-668).

Uncertain variants (not included in data)

New Caledonia. BIOCAL: stn CP 32, 23°06.98'S, 166°51.20'E, 825 m, 29.08.1985: 1 specimen 60.5 mm HL, 307 mm TL (CAS 86473).

DIAGNOSIS. — Pelvic rays 9-10; snout bluntly pointed, little protruding beyond mouth, preoral length 12-16% of HL; suborbital 14-16%; distance orbit to preopercle 43-47; upper jaw 48-51%; barbel relatively short for genus, 15-28% of HL; black margins of snout and ridges prominent, median nasal ridge with black streak; first dorsal fin mostly blackish, but distal margin paler; scale rows below mid-1D. 5.5-7.5.

DESCRIPTION. — *Counts*: 1D. II,9-10; P. i20-i24; total GR-I (outer/inner) 10-12 / 15-17, GR-II 15-16 / 14-17; scales 1D. 10-12, 2D. 7.5-8.5, lat.line 37-43.

Measurements: Total lengths 164+-430 mm; HL 33.2-82.1 mm. The following in percent of HL: snout 28-37; internasal 21-23; interorb. 23-30; orb. 28-32; postorb. 43-50; gill-slit 28-33; pre-A. 117-157; V.-A. 30-38; body depth 78-101; 1D.-2D. 39-59; len. P. 55-62 (4 spec.); len. V. 33-44 (4 spec.); nostril 4-6.

Figure 33b provides a general view of one of the specimens from New Caledonia. A detailed description of the species is being withheld until specimens from Australia can be included. Specimens that were initially sorted out as other species are discussed in the Remarks section in the description of *V. macropogon*.

SIZE. — Attains at least 43 cm TL.

DISTRIBUTION. — So far known only from the Chesterfield and Bellona Plateau and the immediate vicinity of New Caledonia in 760-970 m, but the first author has examined specimens from off the eastern coast of Australia.

REMARKS AND COMPARISONS. — This undescribed species of *Ventrifossa* has been difficult to characterize as it appears to show considerable variation in pigmentation pattern and overall physiognomy. The presence of a blackish streak over the median nasal ridge and its generally darker first dorsal fin separates it from *V. nigrodorsalis*. The combination of short barbel, high gill-raker counts, broad suborbital space, and long postorbital and orb-preop. distances further distinguish it from *V. macropogon* and *Ventrifossa* sp. indet.

Ventrifossa sp. indet.

Fig. 37 c

MATERIAL EXAMINED. — 29 specimens.

Wallis and Futuna Islands. MUSORSTOM 7: stn CP 531, 12°31.6'S, 176°39.3'W, 580-600 m, 16.05.1992: 1 specimen (MNHN 1994-1016). — Stn CP 550, 12°14.8'S, 177°28.0'W, 800-810 m, 18.05.1992: 4 specimens, 49.8-58.1 mm HL, 208-296+ mm TL (CAS 821794). — Stn CP 552, 12°15.7'S, 177°27.8'W, 786-800 m, 18.05.1992: 6 specimens (MNHN 1994-1017). — Stn CC 553, 12°16.8'S, 177°28.1'W, 780-794 m, 18.05.1992: 3 specimens 44.3-64.3 mm HL, 220-316+ mm TL (MNHN 1994-1018). — Stn CC 554, 12°13.8'S, 177°28.0'W, 820-795 m, 18 .05.1992: 2 specimens 48.5-50 mm HL, 242+-250+ mm TL (MNHN 1994-1019). — Stn CP 562, 11°48.1'S, 178°22.1'W, 775-777 m, 19.05.1992: 2 specimens 48.1-56.1 mm HL, 174+-232+ mm TL (MNHN 1994-1020). — Stn CP 627, 11°53.4'S, 179°31.4'W, 597-600 m, 29 .05.1992: 2 specimens 40.2-44.3 mm HL, 200-225+ mm TL (CAS 82183), 2 specimens (BMNH 1996.7.19:61-62). — Stn CP 628, 11°53.4'S, 179°32.0'W, 650-625 m, 29.05.1992: 1 specimen (MNHN 1994-1024). — Stn CP 631, 11°54.0'S, 179°31.6'W, 600 m, 29.05.1992: 2 specimens (MNHN 1994-1022). — Stn CP 632, 11°54.0'S, 179°31.5'W, 600-595 m, 29.05.1992: 4 specimens 42.4-45.2 mm HL, 170+-240 mm TL (MNHN 1994-1023).

DIAGNOSIS. — Pelvic rays 8-10, usually 9; snout acute in lateral view, little protruding beyond mouth, narrow, internasal width 15-20% HL; preoral 11-16%; suborbital 10-13%; orbit to preopercle distance relatively short, 37-42%; upper jaw 42-47%; barbel slender, 23-30% HL; leading margins of snout and nasal ridges, including median nasal ridge) prominently black; first dorsal fin mostly black, but somewhat paler near base and distal tip; scale rows below mid-1D. 5.5-7.0.

DESCRIPTION. — *Counts*: 1D. II,(9)10-11; P. (i18)i19-i23; total GR-I (outer/inner) 9-12 / 15-17, GR-II 14-16 / 14-16; scales 1D. 9-11, 2D. 7.5-8.5, lat.line 38-45.

Measurements: Total lengths 170-316+ mm; HL 40.2-64.3 mm. The following in percent of HL: snout (25) 27-30; interorb. 22-25; orb. 31-36; postorb. 40-45; gill-slit 23-28; body depth 77-88; ht. 1D. 60-73; len. P. 51-64; len. V. 35-45.

See Figure 37c for general features of fish. The species appears so closely similar to *V. nigrodorsalis* that the reader is referred to the description of that species for general features. Only pertinent differences or characters to be emphasized will be described.

Snout appearing somewhat shorter and lower, suborbital shelf narrower than in *V. nigrodorsalis*. Areas of smooth scales behind first dorsal rather extensive. Premaxillary teeth band 6 to 8 teeth across widest part; outer teeth slightly enlarged and spaced, length about 1/4 that of least suborbital width.

Color: Dark markings on head and body very pronounced. Intensely black leading dorsal edge of snout splitting on each side into dorsal and ventral branches, with former continuing posteriorly and mostly laterally over supranarial ridges, fading over orbital rims, and ventral branch continuing broadly over suborbital shelf. Preopercle with broad dark streak running from posteroventral corner of orbit almost to preopercle ridge. A second broad black streak extends posteriorly from behind orbit along dorsal edge of preopercle, passing posteriorly to end of opercle. Opercle and subopercle bones black or very dark. Lips and margins of mandible black, as most of gular and branchiostegal membranes. Ascending processes of premaxillaries with limited black areas at dorsal tips. Chin barbel black at base but pale over free portion. Dorsal 1/2 to 1/3 of trunk and tail dark blackish-violet, but dorsalmost aspects somewhat paler, and distinct dark broad stripe apparent; about 2.5 head lengths behind head, the dark stripe completely encompassing tail. Abdomen blackish to dark violet. First dorsal fin very dark, black over most surfaces in most specimens, but slightly paler near base and distally, giving somewhat black-blotched appearance in other specimens. Pectoral fins black on base and proximally on fin, but dark over remainder. Pelvic fin entirely black to somewhat paler distally. Mouth white except dusky over gums and mandibles and thin black line of oral valves; gullet dark dorsally and laterally. Gill cavity black over lateral walls, blackish to pale over mesial and ventral walls. Gill filaments, arches and rakers generally pale.

REMARKS AND COMPARISONS. — These dark specimens from the Wallis and Futuna Islands on the Pacific Plate north of Fiji (MUSORSTOM 7 specimens) appear to lie somewhere between *V. macropogon* and *V. nigrodorsalis* in general characters. When compared with the NMNZ specimens of *V. macropogon* from Loyalty Islands, they are much darker, with markings on the head pronounced compared with the almost uniformly and smoothly gray to brownish-gray of the NMNZ specimens of *V. macropogon*. Even though the head scales in the NMNZ specimens remain, obscuring the dark markings of the nasal ridges, these markings are still not very prominent. Dorsally on the gill covers dark markings are hardly noticeable in the NMNZ specimens, whereas they are intensely black in the Wallis and Futuna specimens. The dorsum is dark and sharply delineated in the MUSORSTOM 7 specimens, but faint (though present) in the NMNZ specimens of *V. macropogon*. In the Wallis and Futuna specimens, the median-dorsal line is paler than immediately ventrally, producing the effect of a broad, dark, dorsolateral stripe, but in NMNZ specimens of *V. macropogon*, there is no hint of such a stripe. The pale translucency of the top of the head in the Wallis and Futuna specimens is not present in the NMNZ specimens, perhaps because of the complete scale covering in the latter, which gives the surface a brownish-gray color. The tip of the tail in the Wallis and Futuna specimens is very dark, entirely so towards the end, and violet to blackish-violet, but in NMNZ specimens of *V. macropogon*, the tip is dark dusky at most, without a violet hue, and the ventral portion is paler over most of the tail.

Whether this population from the Pacific Plate can be considered a distinct species or simply a variant of the widespread *V. nigrodorsalis* or *V. macropogon* remains unresolved. We are uncertain if the characters will maintain their integrity over a broader geographic range, but it seems that there is a uniqueness about the grenadier fauna of the Pacific Plate region as compared with those from further south and west on the Indo-Australian Plate. To that end, it would be of great interest to compare the situation with other organisms.

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