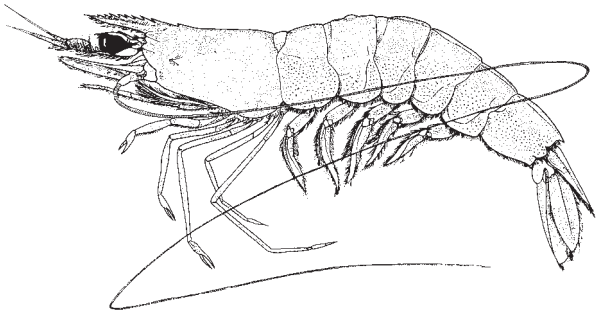
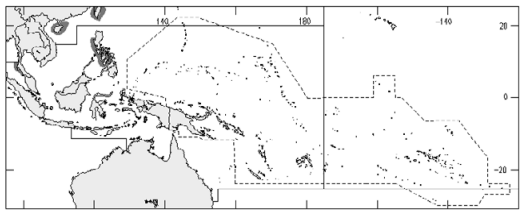
Trachypenaeus longipes (Paulson, 1875)

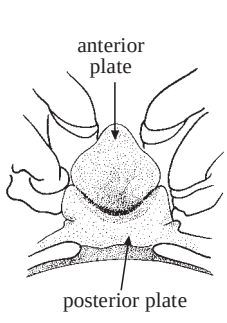
En - Longlegged rough shrimp.

Maximum body length 10.5 cm (females) and 8 cm (males). Found from nearshore waters to depths of about 220 m, usually between 40 and 60 m. Taken mainly by trawls. This species is often confused with *Trachypenaeus curvirostris* (sometimes under the name *T. asper*), and therefore its actual distribution and occurrence in the area is unclear. Probably not very common and of limited or no commercial importance. Indo-West Pacific from the Red Sea to Japan and the Philippines.

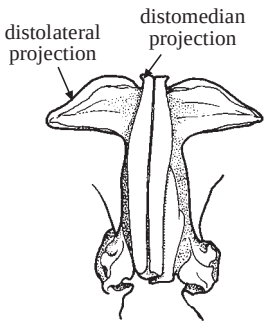


(after Motoh and Buri, 1984)





thelycum



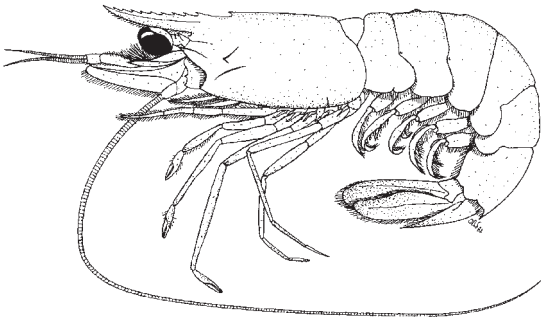
petasma (ventral view)

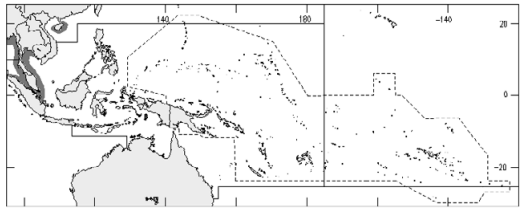
(after Hayashi, 1992)

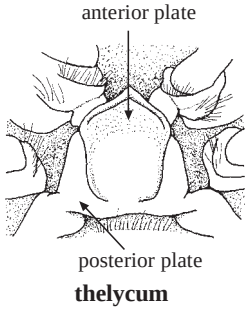
Trachypenaeus sedili Hall, 1961

En - Singapore rough shrimp. (the FAO names previously used for this species are now used for *Trachypenaeus malaiana*)

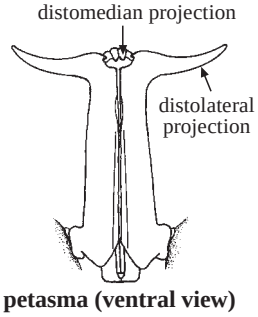
Maximum body length 8.8 cm (females) and 5.1 cm (males), commonly between 6 and 8 cm. Found on mud or sand bottom, from nearshore waters to depths of about 45 m. Taken by trawls and artisanal gear. Probably not a common species in the area and without commercial importance. Indo-West Pacific from India (perhaps Somalia) to the Malay Peninsula and South China Sea.







thelycum

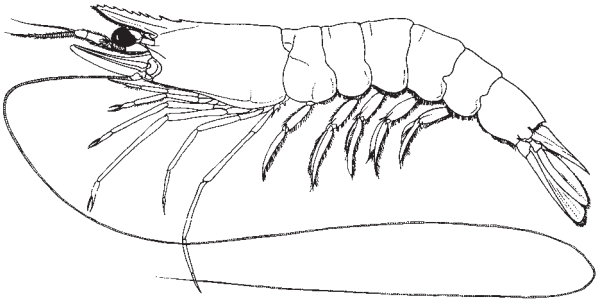


petasma (ventral view)

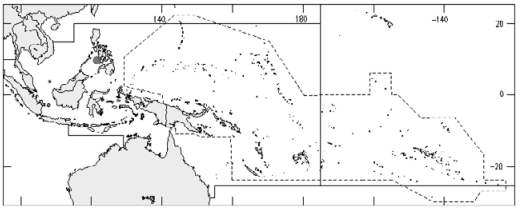
Trachypenaeus villaluzi Muthu and Motoh, 1979

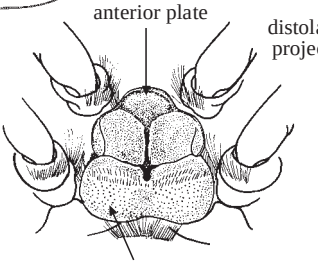
En - Philippines rough shrimp.

Maximum body length 7.3 cm (females) and 5.3 cm (males). Caught by otter trawls at a depth of about 7 m, on mud bottom. Probably not common and without commercial importance. So far only known from the Philippines.

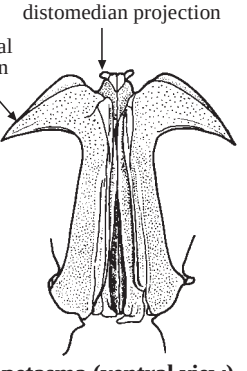


(after Motoh and Buri, 1984)





thelycum

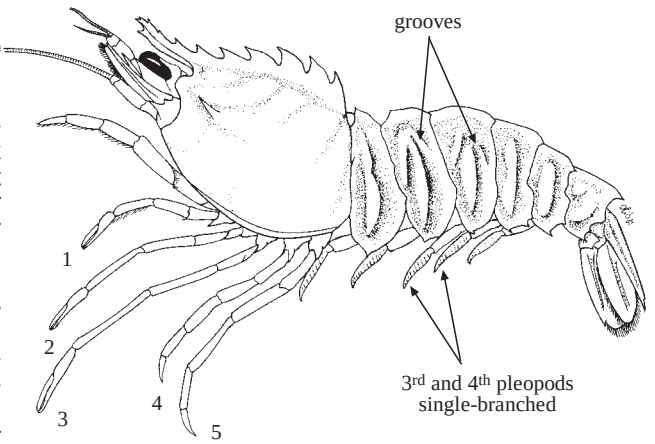


petasma (ventral view)

click for next page

SICYONIIDAE

Rock shrimps



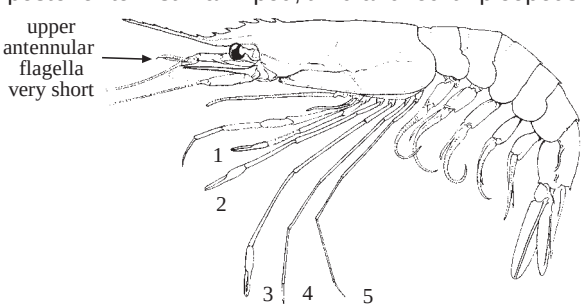
Diagnostic characters: Body generally robust, with shell very hard, of "stony" appearance; abdomen often with deep grooves and numerous tubercles. Rostrum well developed and extending beyond eyes, always bearing more than 3 upper teeth (including those on carapace); base of eyestalk with styliform projection on inner surface, but without tubercle on inner border. Both upper and lower antennular flagella of similar length, attached to tip of antennular peduncle. **Carapace lacks both postorbital and postantennal spines, cervical groove indistinct or absent. Exopod present only on first maxilliped**. All 5 pairs of legs well developed, fourth leg bearing a single well-developed arthrobranch (hidden beneath carapace). In males, endopod of second pair of pleopods (abdominal appendages) with appendix masculina only. **Third and fourth pleopods single-branched**. Telson generally armed with a pair of fixed lateral spines. **Colour:** body colour varies from dark brown to reddish; **often with distinct spots or colour markings on carapace and/or abdomen - such colour markings are specific and very useful in distinguishing the species**.

Habitat, biology, and fisheries: All members of this family are marine and can be found from shallow to deep waters (to depths of more than 400 m). They are all benthic and occur on both soft and hard bottoms. Their sizes are generally small, about 2 to 8 cm, but some species can reach a body length over 15 cm. The sexes are easily distinguished by the presence of a large copulatory organ (petasma) on the first pair of pleopods of males, while the females have the posterior thoracic sternites modified into a large sperm receptacle process (thelycum) which holds the spermatophores or sperm sacs (usually whitish or yellowish in colour) after mating. The shape of the petasma and thelycum is often specific and very useful for species identification. The eggs are small and numerous, and are released directly into the water and not retained on the female abdomen. The larvae are planktonic and have the nauplius stage. This family contains a single genus only and at present about 14 species are recorded from the Western Central Pacific. However, the taxonomic status and relationships of these species are generally unclear. Moreover, none of them are large enough or abundant enough to be of commercial importance in the area. Therefore, no identification key is provided here, and a species account is given for *Sicyonia lancifera* only, the most common representative of this family in the Western Central Pacific.

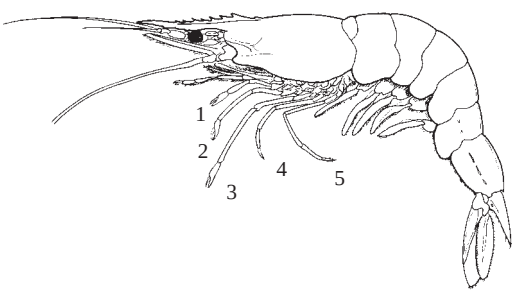
Similar families occurring in the area

Aristeidae: body not "stony" in appearance, abdomen without deep grooves or tubercles; either rostrum very short, armed with 1 or 2 upper teeth only, or upper antennular flagellum very short, not attached to tip of antennular peduncle; third and fourth pleopods divided into 2 branches; telson without fixed lateral spine.

Penaeidae: body not "stony" in appearance, abdomen without deep grooves or tubercles; exopod present posterior to first maxilliped; third and fourth pleopods divided into 2 branches.



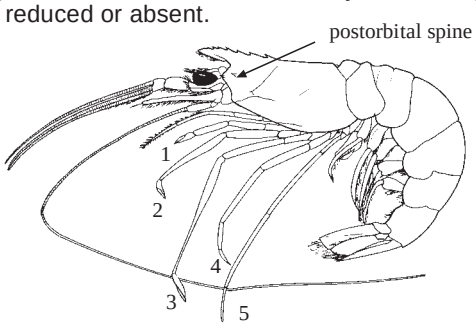
Aristeidae



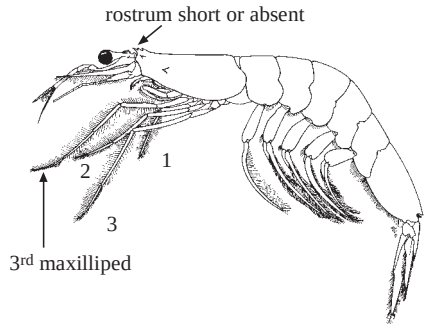
Penaeidae

Solenoceridae: body not “stony” in appearance, abdomen without deep grooves or tubercles; carapace either with postorbital or postantennal spine; cervical groove distinct, extending to about dorsal carapace; third and fourth pleopods divided into 2 branches.

Sergestidae: size small; rostrum very short; body strongly compressed laterally; shell soft; last 2 pairs of legs reduced or absent.



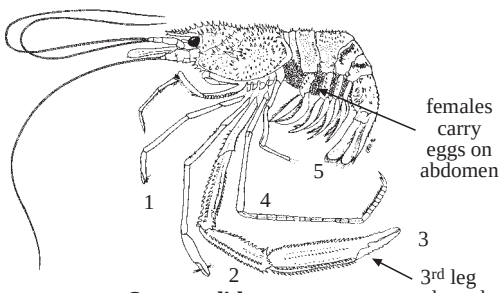
Solenoceridae



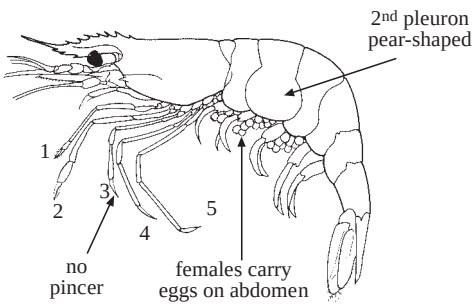
Sergestoidae

Stenopodidae: third pincer extraordinary large and massive; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.

Shrimps of the infraorder Caridea: third leg without pincer; second abdominal pleuron (lateral plate) greatly expanded, overlapping posterior part of first pleuron and anterior part of third pleuron; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.



Stenopodidae



Caridea

List of species occurring in the area

The symbol is given when species accounts are included.

Sicyonia benthophila De Man, 1907
Sicyonia bispinosa (De Haan, 1844)
Sicyonia curvirostris Balss, 1914
Sicyonia fallax De Man, 1907
Sicyonia furcata Miers, 1878
Sicyonia inflexa (Kubo, 1949)
Sicyonia laevis Bate, 1881
Sicyonia lancifera (Olivier, 1811)
Sicyonia nebulosa Kubo, 1949
Sicyonia ocellata Stimpson, 1860
Sicyonia ommanneyi Hall, 1961
Sicyonia parvula (De Haan, 1850)
Sicyonia rectirostris De Man, 1907
Sicyonia trispinosa De Man, 1907

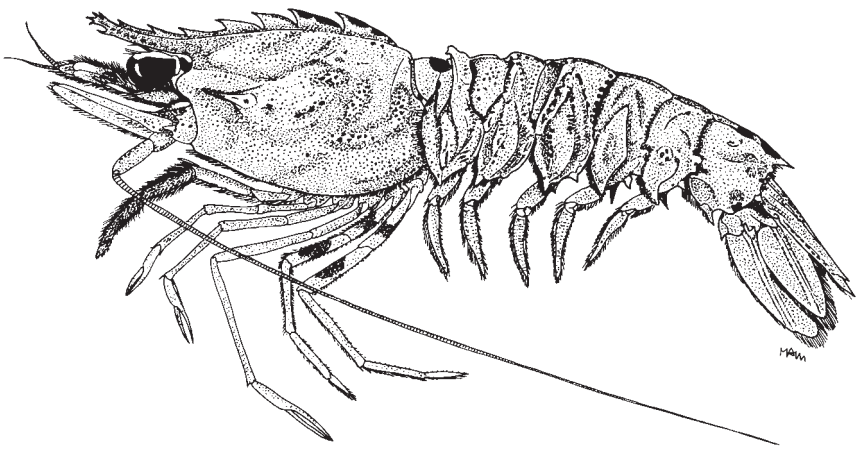
References

Chan, T.Y. and H.P. Yu. 1985. On the rock shrimps of the family Sicyoniidae (Crustacea: Decapoda) from Taiwan, with description of one new species. *Asian Mar. Biol.*, 2:93-106.

Sicyonia lancifera (Olivier, 1811)

Frequent synonyms / misidentifications: *Sicyonia cristata* (De Haan, 1844) / None.

FAO names: En - Knight rock shrimp; **Fr** - Boucot chevalier; **Sp** - Camarón de piedra lanzón.

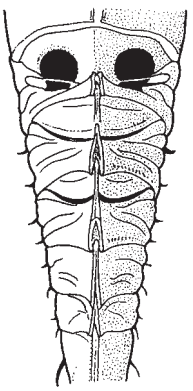


(after Motoh and Buri, 1984)

Diagnostic characters: Body robust, with **shell very hard, of "stony" appearance. Rostrum nearly straight,** with 3 to 6 upper teeth and 1 to 3 apical teeth, lower border usually bearing 1 tooth only. **Carapace armed with 3 to 5 large, crest-like postrostral teeth as well as a very strong hepatic spine. Abdomen heavily sculptured and with each pleura ending in 2 or 3 sharp spines. Pleopods with a single branch only. Colour:** body brownish, with a complicated pattern of white stripes and black dots; ventral surface somewhat reddish brown; **dorsal surface of first abdominal segment whitish, with a pair of large black spots;** eyes light brown; antennal flagella and thoracic appendages covered with white and brown bands; tail fan with a thick white band near base.

Size: Maximum body length 8 cm (females larger), commonly between 3 and 5 cm.

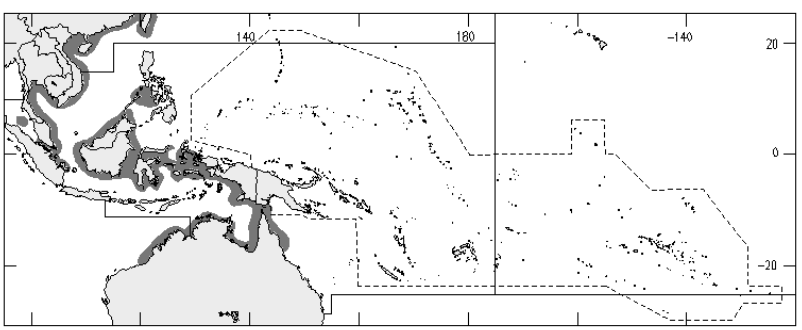
Habitat, biology, and fisheries: Found on sandy-mud bottoms, at depths from 25 to 350 m, usually less than 100 m. Probably burrows in sand during the daytime. When it comes out, often walks on the bottom with the abdomen strongly curved upward. Probably the most common species of the family in the area, but still few in numbers and only caught incidentally during prawn trawling operations. Without commercial value throughout its range because of its small size and low quantities.



abdomen (dorsal view)

(after Motoh and Buri, 1984)

Distribution: Widely distributed in the Indo-West Pacific from Mozambique to Japan and northern Australia.

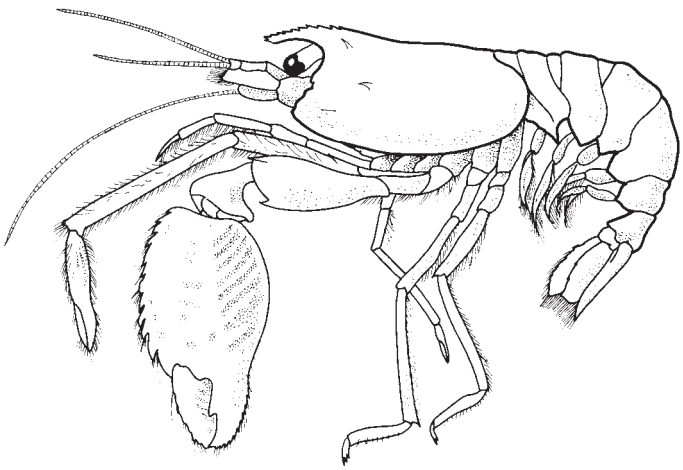


Infraorder STENOPODIDEA

Family STENOPODIDAE

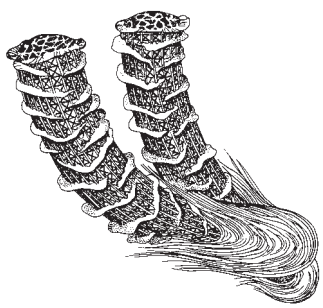
Stenopodid shrimps

Diagnostic characters: Usually small-sized, with a body length from 1 to 6 cm. All 5 pairs of legs well developed, **with first 3 pairs of legs forming a pincer, third pair huge and massive**. Abdomen with **posterior part of pleura covering anterior part of succeeding pleura. Males and females without large copulatory organ** on first pair of pleopods (abdominal appendages) or posterior thoracic sternites, respectively. **Females carry the eggs on the abdomen until hatching.**



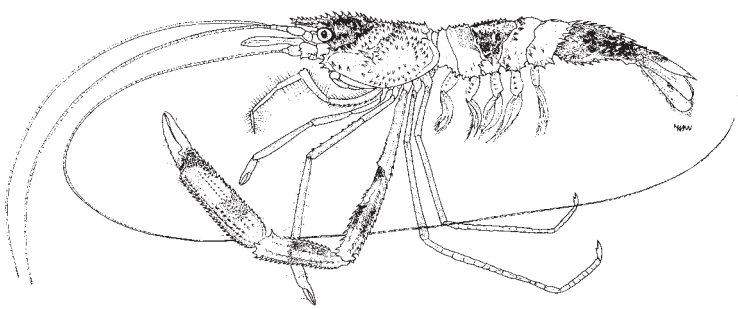
Spongicola venusta
(after Holthuis, 1993)

Habitat, biology, and fisheries: This infraorder contains a single family and about 60 species (divided into 2 families by some authors). Altogether, 7 genera and 19 species have been reported from the Western Central Pacific. All species are marine and benthic, and can be found from shallow coral reef areas to deep sea at depths of more than 800 m, with some species living in symbiosis with other invertebrates or fishes. Amongst these, the cleaner shrimps of the genus *Stenopus* and the venus shrimp *Spongicola venusta* are best known. *Stenopus* shrimps inhabit coral reefs and set up "cleaning stations" which are regularly visited by fishes which allow the shrimps to clean their wounds, skins, and mouths. *Spongicola venusta* lives in pairs inside the body of the deep-sea hextactinellid sponges (i.e. the Venus' flower basket). They enter the body of the sponges when they are in the postlarvae stage. As they grow, their size becomes too large and thus they cannot escape from the sponges where both the male and female spend the rest of their life.



Hextactinellid sponges (Venus' flower basket)
(after Tan et al., 1995)

Members of this infraorder are generally without any economic importance. Therefore, no species accounts are included here and no key is provided. For keys to the genera of this infraorder users can refer to L.B. Holthuis (1993), "The recent genera of the Caridean and Stenopodidean shrimps (Crustacea, Decapoda): with an appendix on the order Amphionidacea, C.H.J.M. Fransen and C. van Achterberg eds, Nationaal Natuurhistorisch Museum, Leiden." Only the cleaner shrimps of the genus *Stenopus* may sporadically enter the aquarium trade and have some commercial value. In the Western Central Pacific, the most commonly found species is *Stenopus hispidus* (Olivier, 1811). A key to species of *Stenopus* is given in J.W. Goy (1992, *J. Nat. Hist.*, 26:79-102), and good colour photos of this genus are included in H. Debelius and H.A. Baensch (1994, Marine Atlas: The joint aquarium care of invertebrates and tropical marine fishes, published by Mergus).



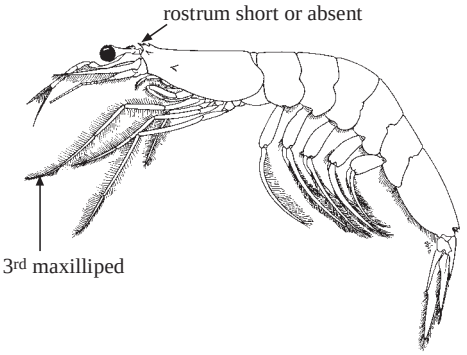
Stenopus hispidus

Other major groups of shrimps and prawns occurring in the area

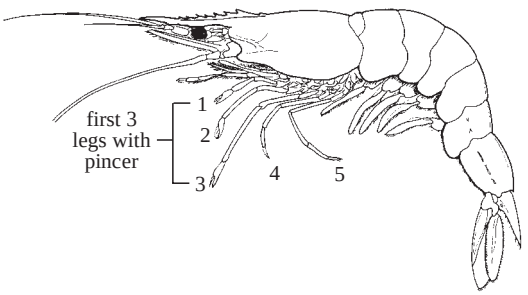
Sergestoidea: body strongly compressed laterally; shell soft; rostrum and last 2 pairs of legs reduced or absent; males with large copulatory organ on first abdominal appendage; eggs usually released directly into water, not retained by the female.

Penaeoidea: first 3 pairs of legs forming a pincer, none of them particularly large; with large copulatory organ, on first pair of pleopods in males, and on posterior thoracic sternites in females; eggs released directly into water, not retained by the female.

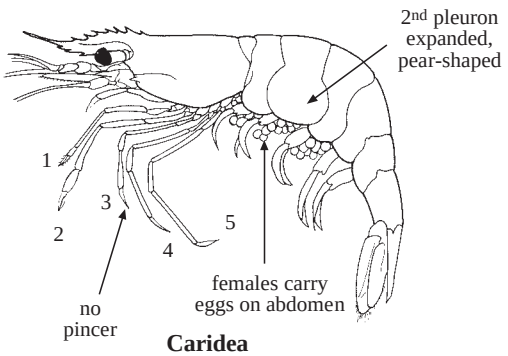
Caridea: third leg without pincer; pleuron of second abdominal segment greatly expanded and overlapping those of first and third segments.



Sergestoidea



Penaeoidea (after Liu, 1955)



Caridea

List of species occurring in the area

Engystenopus palmipes Alcock and Anderson, 1894
Engystenopus spinulatus Holthuis, 1946

Microprosthema scabricaudatum Richters, 1880
Microprosthema validum Stimpson, 1860

Odontozona ensifera (Danna, 1852)
Odontozona sculpticaudata Holthuis, 1946

Paraspongicola pusilla De Saint Laurent and Cleva, 1981

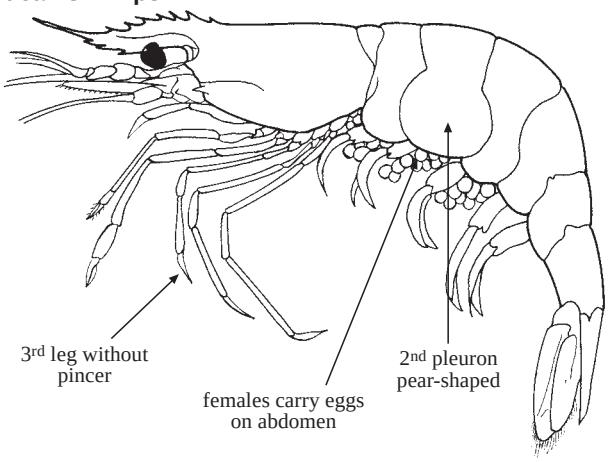
Spongicola henshawi Rathbun, 1906
Spongicola holthuisi De Saint Laurent and Cleva, 1981
Spongicola inflata De Saint Laurent and Cleva, 1981
Spongicola venusta De Haan, 1841

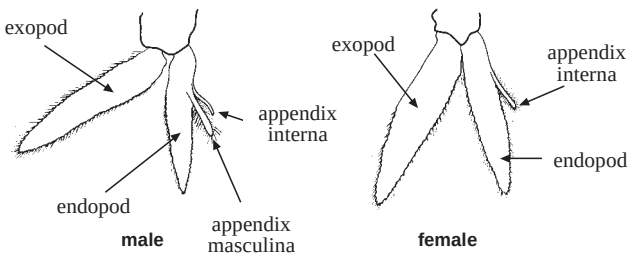
? *Spongicoloides japonica* (Kubo, 1942)

Stenopus chrysexanthus Goy, 1992
Stenopus cyanoscelis Goy, 1984
Stenopus devaneyi Goy and Randall, 1984
Stenopus hispidus (Olivier, 1811)
Stenopus pyronotus Goy and Davaney, 1980
Stenopus tenuirostris De Man, 1888
Stenopus zanzibaricus Bruce, 1976

Infraorder CARIDEA

Caridean shrimps





second abdominal leg (pleopod)

Diagnostic characters: Very small to large-sized, with a body length from 0.5 to 32 cm. All 5 pairs of legs well developed, the first 2 pairs with or without a pincer, **but third leg never bearing a pincer**. **Second abdominal pleuron (lateral plate) greatly expanded, pear-shaped and overlapping posterior part of first pleuron as well as anterior part of third pleuron. Males and females without large copulatory organ** on first pair of pleopods (abdominal appendages) or posterior thoracic sternites, respectively. **Females carry the eggs on the abdomen until hatching**.

Habitat, biology, and fisheries: This large infraorder contains at least 2 517 species in 28 families (the number of families in this infraorder is controversial among crustacean taxonomists). They can occur in all kinds of aquatic habitats such as high mountain streams (at altitudes of more than 2 500 m), lakes, caves, underground waters, rivers, estuaries, littoral zones, beaches, bays, coral reefs, continental shelves, and the deep sea (at depths of at least 6 364 m, perhaps even 10 912 m for a red "shrimp" sighted at a bathyscaphe at Challenger Deep, near Guam). A few species inhabit the upper littoral zone and are able to endure short periods of desiccation. Both benthic and/or pelagic (including epi- and bathypelagic) ways of life are found in members of this infraorder, and a large number of marine species live in symbiosis with other invertebrates or fishes. The sexes are generally separated, but certain species, such as some *Pandalus*, commonly first undergo a male phase and later transform into females. The gonopores are situated at the bases of fifth or third leg in males and females, respectively. However, as many caridean shrimps are of very small size, with the thoracic sternum being narrow, sexing caridean shrimps by observing the position of gonopores is often difficult. A more simple way to distinguish the sexes of caridean shrimps is to determine the presence or absence of the so-called appendix masculina on the second pleopods (or abdominal appendages; see figure above). In females, the endopod of the second pair of pleopods bears an appendix interna only. In males, the endopod of the second pleopods usually has an appendix interna as well, but additionally bears an appendix masculina, which, when observed under magnification, is distinct, even in juveniles. Besides, a remarkable sexual dimorphism (e.g. the size of the second pincer, the curvature of the rostrum, the shape of the abdominal pleura, etc.) is present in many species, but such a dimorphism is often specific and not necessarily the same in different species. The females of caridean shrimps carry the eggs on the abdomen. Their larvae leave the eggs in relatively advanced stages (i.e. lacking the nauplius stage) and some even directly as juveniles.

At present, 22 families of caridean shrimps are known to occur in the Western Central Pacific, but the exact number of species in the area is unclear. This is mainly due to fact that most of them are without any economic importance and therefore, have rarely been studied. However, recent extensive studies on carideans from the Philippines and adjacent areas have shown that 528 species are found in that region alone. Despite the large number of species, most caridean shrimps are small and do not occur in sufficient quantities to be actively fished, and/or live in very deep sea. Therefore, they are generally of no commercial importance in the Western Central Pacific. So far, only the giant river prawn *Macrobrachium rosenbergii* is both actively fished and extensively cultured in the area. It is mainly marketed live or fresh for local consumption, sometimes also exported. Several other fresh-water and coastal caridean shrimps in the area also have a relatively larger size or are easy to catch, and are likely to be used as food by natives in several countries. However, information on local use of caridean shrimps is mostly lacking and the exact identities of the species in question are often uncertain and/or confusing in literature. On the other hand, some deep-sea caridean shrimps, mostly belonging to the family Pandalidae

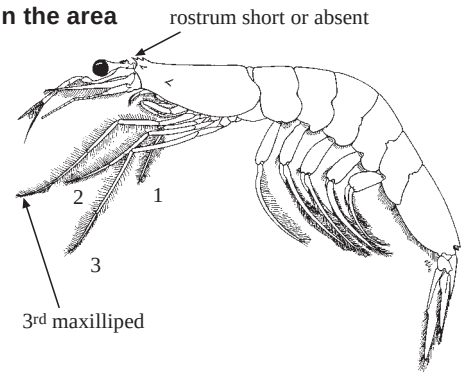
(particularly those of the genus *Heterocarpus*), are large in size and are often caught in great numbers during exploratory trawling operations. They are generally considered to have commercial potential with the development of a future deep-sea fishery in the area. Finally, it should be mentioned that some coral reef carideans (mainly members of the families Alpheidae, Gnathophyllidae, Hippolytidae, Hymenoceridae, Palaemonidae, and Rhynchocinetidae) have an attractive coloration and can be sporadically found in the aquarium trade, where those uncommon species often command a high price. Nevertheless, their supply are usually unstable and they are commercially much less important as marine coral fishes. Therefore, individual identification sheets are provided here for several selected species only, as representatives of the infraorder in the area. For keys to the families and genera of carideans, users may consult L.B. Holthuis (1993), "The recent genera of the Caridean and Stenopodidean shrimps (Crustacea, Decapoda): with an appendix on the order Amphionidacea, C.H.J.M. Fransen and C. van Achterberg (eds), Nationaal Natuurhistorisch Museum, Leiden." For the identification of species, users may refer to the keys published by F.A. Chace, Jr (1976-1997: *Smithson. Contrib. Zool.* 222, 277, 381, 384, 397, 411, 432, 466, 543, 587), or are encouraged to send the sample(s) to the author of the present contribution.

Other major groups of shrimps and prawns occurring in the area

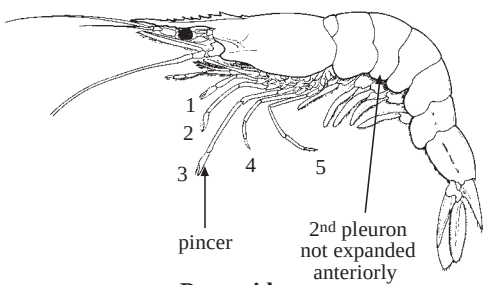
Sergestoidea: last 2 pairs of legs reduced or absent; anterior part of second abdominal pleuron not overlapping first abdominal pleuron; males with large copulatory organ on first pair of pleopods; eggs usually released directly into water, not retained by the female.

Penaeoidea: third leg with pincer; anterior part of second abdominal pleuron not overlapping first abdominal pleuron; with large copulatory organ, on first pair of pleopods in males, and on posterior thoracic sternites in females; eggs released directly into water, not retained by the female.

Stenopodidea: third leg bearing a very large pincer; anterior part of second abdominal pleuron not overlapping first abdominal pleuron.

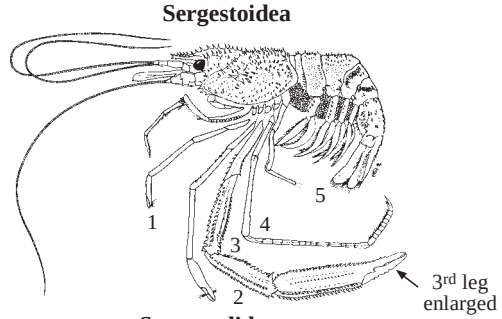


Sergestoidea



Penaeoidea

(after Liu, 1955)



Stenopodidea

List of families and species treated in this contribution

The symbol is given when species accounts are included.

Infraorder CARIDEA
Superfamily PASIPHAEOIDEA
PASIPHAEIDAE

Superfamily OPLOPHORIDEA
OPLOPHORIDAE

Superfamily ATYOIDEA
ATYIDAE
Atyopsis moluccensis (De Haan, 1849)
Atyopsis spinipes (Newport, 1847)

Caridina weberi De Man, 1892

Superfamily BRESILIOIDEA
BRESILIIDAE

Superfamily NEMATOCARCINOIDEA
EUGONATONOTIDAE
NEMATOCARCINIDAE
RHYNCHOCINETIDAE
Rhynchocinetes durbanensis Gordon, 1936

Superfamily PSALIDOPODOIDEA
PSALIDOPODIDAE

Superfamily STYLODACTYLOIDEA
STYLODACTYLIDAE

Superfamily CAMPYLONOTIDEA
BATHYPALAEMONELLIDAE

Superfamily PALAEMONOIDEA
ANCHISTIOIDIDAE
GNATHOPHYLLIDAE
HYMENOCERIDAE
Hymenocera picta Dana, 1852

PALAEMONIDAE
Exopalaemon styliferus (H. Milne Edwards, 1840)
Exopalaemon vietnamicus Nguyên, 1992

Leandrites indicus Holthuis, 1950

Leptocarpus potamiscus (Kemp, 1917)

Macrobrachium equidens (Dana, 1852)
Macrobrachium lar (Fabricius, 1798)
Macrobrachium mirabile (Kemp, 1917)
Macrobrachium rosenbergii (De Man, 1879)

Nematopalaemon tenuipes (Henderson, 1893)

Palaemon concinnus Dana, 1852

Superfamily ALPHEOIDEA
ALPHEIDAE
HIPPOLYTIDAE
Lysmata amboinensis (De Man, 1888)
Lysmata debelius Bruce, 1983

Saron neglectus De Man, 1902

OGYRIDIDAE

Superfamily PROCESSOIDEA
PROCESSIDAE

Superfamily PANDALOIDEA
PANDALIDAE
Heterocarpus hayashii Crosnier, 1988
Heterocarpus parvispina De Man, 1917
Heterocarpus sibogae De Man, 1917

THALASSOCARIDIDAE

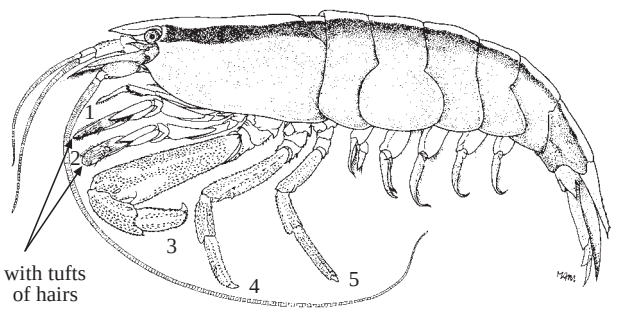
Superfamily CRANGONOIDEA
CRANGONIDAE
GLYPHOCRANGONIDAE

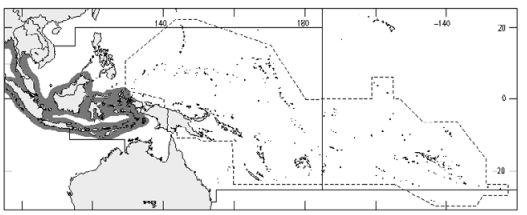
ATYIDAE

Atyopsis moluccensis (De Haan, 1849)

En - Moluccas brush shrimp.

Maximum total length 7.7 cm (occasionally 8.6 cm); males larger. Inhabits upper or middle parts of fast-flowing streams. Probably reproduce in brackish water and juveniles are tolerant of salt water. Abundance of this shrimp in the area is uncertain. Atyid shrimps are reported to be used as food or fertilizer in many parts of the area. Although the size of this species is large for atyids, its economic importance is probably still minor. Atyids are mainly marketed fresh or dry for local consumption. Recently, live specimens, probably originating from Indonesia, have been seen in the aquarium trade, for which this shrimp is a suitable candidate, due to the attractive bandings on the body and since it can easily be kept in captivity. Indo-West Pacific, and known with certainty from Sri Lanka to Thailand, Malaysia, Indonesia, and perhaps the Philippines. Often confused with *Atyopsis spinipes*.



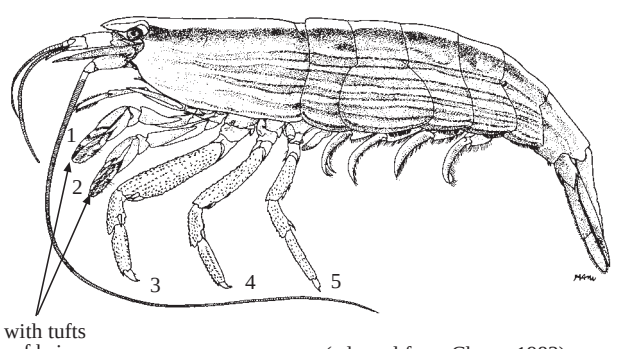


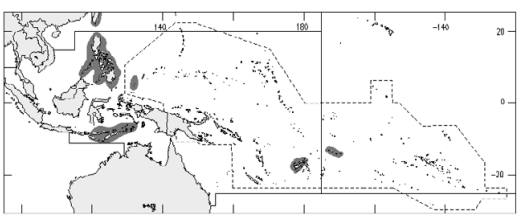
(adapted from Chace, 1983)

Atyopsis spinipes (Newport, 1847)

En - Soldier brush shrimp; **Fr** - Saltarelle soldat; **Sp** - Camarón soldado.

Maximum total length 7.1 cm, commonly between 4 and 5 cm (females larger). Adults mainly occcur in fresh water, in upper or middle parts of fast-flowing streams. Reproduce in brackish water. Abundance of this shrimp in the area is uncertain. Although atyid shrimps are reported to be used as food or fertilizer in many parts of the area and this species is relatively large amongst the atyids, its economic importance is probably only minor. Atyids are mainly marketed fresh or dry for local consumption. This shrimp has recently been introduced to the aquarium trade (place of origin probably Indonesia), because of the attractive bandings on the body and as it can easily be kept in captivity. Western Pacific, and known with certainty from Ryukyus, Taiwan Province of China, the Philippines, Lesser Sunda Islands, Palau, Fiji, and Samoa.



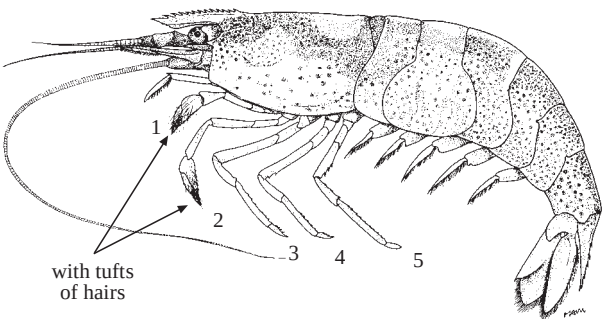


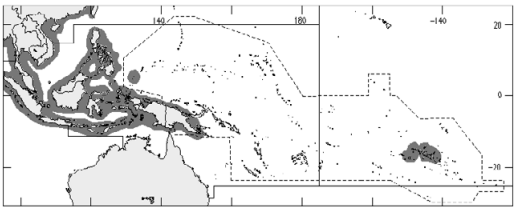
(adapted from Chace, 1983)

Caridina weberi De Man, 1892

En - Pugnose caridina; **Fr** - Saltarelle nez-camus; **Sp** - Camarón ñata.

Maximum total length about 3 cm, commonly between 1.5 and 2 cm (females usually larger). Inhabits mainly in middle or lower parts of rivers, often around heavy vegetation. Reproduce in brackish water and juveniles are tolerant of salt water. Abundance of this shrimp in the area is uncertain although it has been reported to be of some economic value in Indonesia. Considering their very small size, all species of Caridina probably have very limited, if any, commercial importance. Indo-West Pacific from India to Japan and Polynesia.





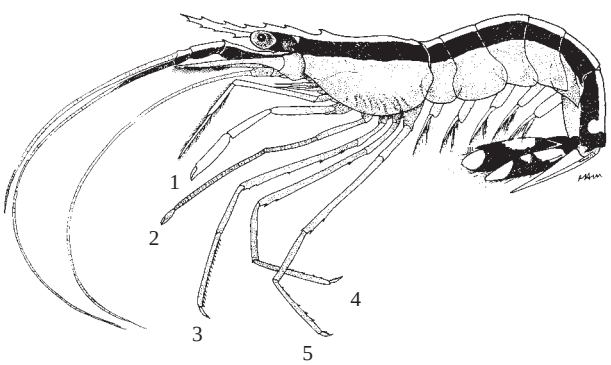
(adapted from Holthuis, 1993)

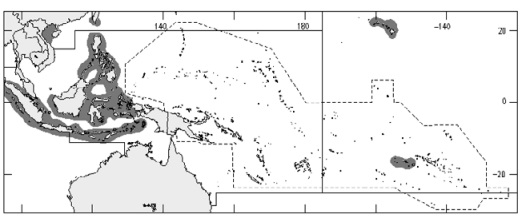
HIPPOLYTIDAE

Lysmata amboinensis (De Man, 1888)

En - Common cleaner shrimp.

Body length around 5 cm. Shallow marine reef areas. Well known for its fish cleaning behaviour and sometimes encountered in large groups. Popular and often seen in the marine aquarium trade where it is sold at moderate prices. Nevertheless, its unstable supply suggests that this shrimp is not abundant in its natural habitats. Widely distributed in the Indo-West Pacific from Kenya to Japan, French Polynesia, and Hawaii.



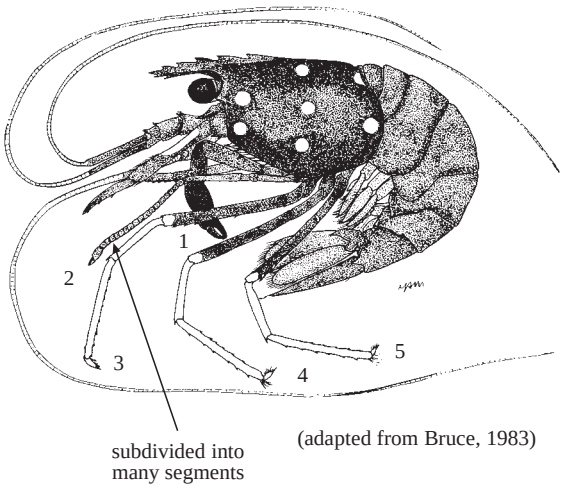


(adapted from Holthuis, 1947)

Lysmata debelius Bruce, 1983

En - Cardinal shrimp.

Body length around 4 to 5 cm. Marine reef areas in depths from 10 to 28 m. Normally found in pairs and behave as fish cleaners. A popular shrimp in the marine aquarium trade and sold at somewhat higher prices than most of the other marine aquarium shrimps. However, its supply is not large and unstable, indicating that this shrimp is not abundant in its natural habitats. Known with certainty from the Philippines, Indonesia, and Sri Lanka.



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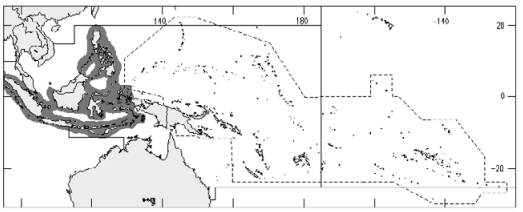
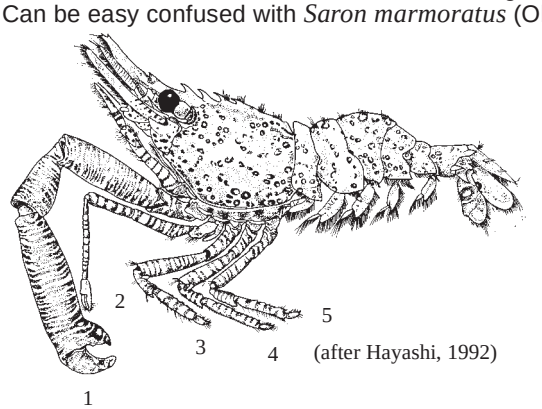


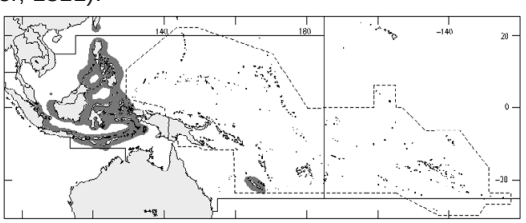
Saron neglectus De Man, 1902

En - Spotted marbled shrimp.

Body length around 2 to 4 cm. Shallow marine reef areas. Nocturnal and usually hiding under rocks and caves, no fish cleaning behaviour reported. Males with first leg greatly enlarged. Probably the most common species of the genus seen in the marine aquarium trade (live specimens originated probably mainly from Indonesia). Sold at moderate prices, due to its unstable supply. Widely distributed in the Indo-West Pacific from Madagascar to the Red Sea, Japan, and New Caledonia. Can be easy confused with *Saron marmoratus* (Olivier, 1811).



(after Hayashi, 1992)

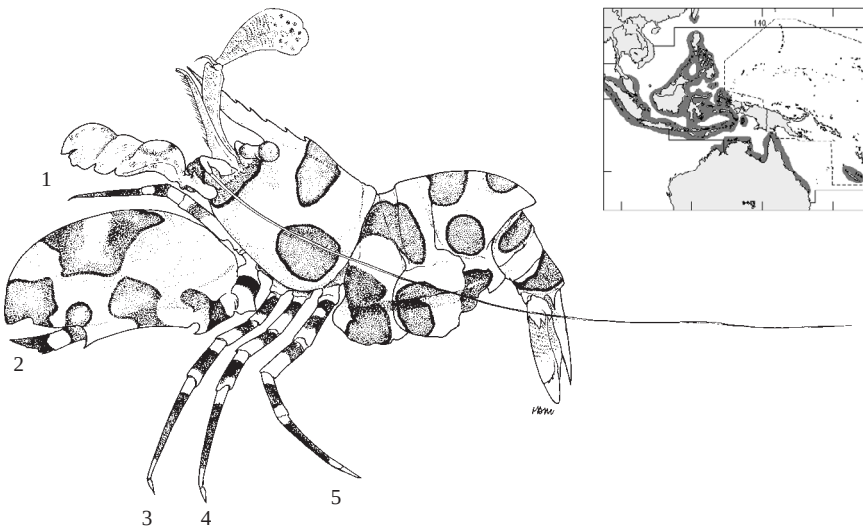


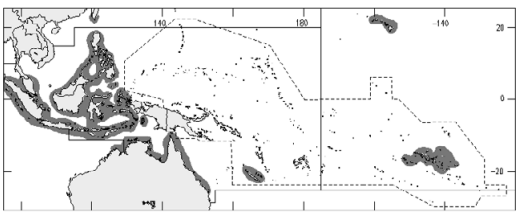
HYMENOCERIDAE

Hymenocera picta Dana, 1852

En - Painted harlequin shrimp.

Body length around 2 to 5 cm. Shallow marine reef areas in depths from 1 to 20 m. Usually live in pairs and reported to be strongly territorial. No fish cleaning behavior observed but reported to kill and feed on starfishes, at least under aquarium conditions. A popular shrimp in the aquarium trade because of its bizarre looking and amazing coloration. Sold at moderately high prices due to its rare supply, indicating that this shrimp is not commonly found in its natural habitats. Widely distributed in the Indo-West Pacific from eastern Africa to Japan, Hawaii, and French Polynesia.



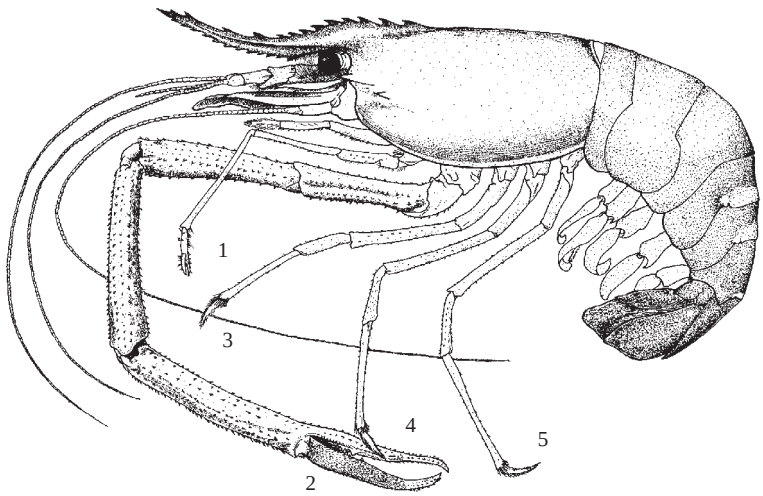


PALAEMONIDAE

Macrobrachium rosenbergii (De Man, 1879) PRF

Frequent synonyms / misidentifications: *Macrobrachium rosenbergii dacqueti* (Sunier, 1925) / *Macrobrachium carcinus* (Linnaeus, 1758).

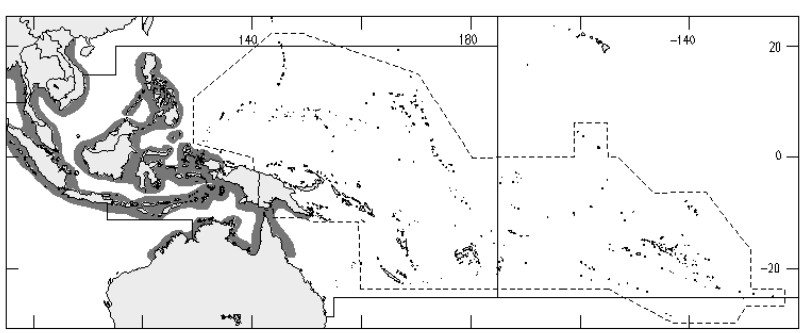
FAO names: En - Giant river prawn; **Fr** - Bouqet géant; **Sp** - Camarón gigante.



Diagnostic characters: Rostrum long, well extending beyond antennal scale; **forming a high basal crest above the eye**; armed with 11 to 14 upper teeth (including those on carapace and with distal teeth more widely spaced) and 8 to 14 lower teeth. **Hepatic spine situated distinctly below antennal spine. Second legs very large, robust and of same size, with carpus longer than merus; in adult males, entire second leg densely covered with spines and sharp tubercles, cutting edges of fingers bearing only 1 or 2 large basal teeth and without rows of tubercles on either side, movable finger very hairy except at tip, carpus shorter than pincer.** Telson tapering posteriorly, with tip exceeding posterolateral spines. **Colour:** body generally dark green to greyish blue, with longitudinal or irregular streaks of darker and lighter colour, **hinges of abdominal segments often orange**; eyes dark brown; antennal flagella dark blue to greyish; large pincer bluish to dark blue; eggs yellowish; youngs and berried females often with some longitudinal golden strips on the sides of body.

Size: The largest known caridean shrimp, maximum body length 34 cm (females) and 26 cm (males), commonly between 10 and 20 cm.

Habitat, biology, and fisheries: Inhabits mainly estuarine areas and rivers but sometimes also found at sea; requires brackish water for spawning and nursing up to postlarval stage, while juveniles are mainly found in fresh-water zones. An omnivorous, very large and common fresh-water shrimp that is extensively caught in the area. Taken by bamboo barriers, fish corrals, traps, set nets, cast nets, hook-and-line, and artisanal gear. Big catches are often linked to heavy rains. Also an important candidate for fresh-water aquaculture in many countries. In 1995, the harvest of this species reported from the area amounted to 9 732 t from capture fishery in Indonesia and Thailand, and 5 040 t from aquaculture in Thailand. Marketed live, fresh or frozen, mainly for local consumption but sometimes also for export.

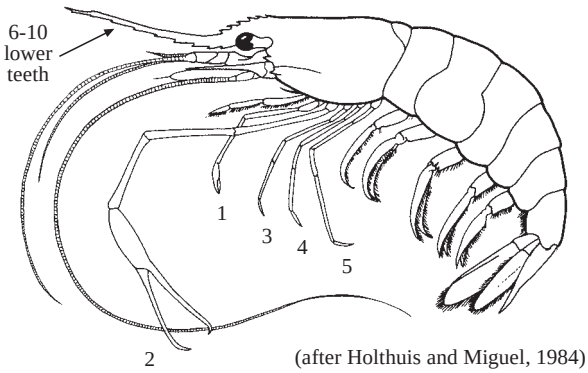


Distribution: Indo-West Pacific from Pakistan to Viet Nam, the Philippines, New Guinea, and northern Australia (the western form from India to Malaysia is sometimes treated as a different subspecies). This shrimp has been introduced to many parts of the world for use in aquaculture.

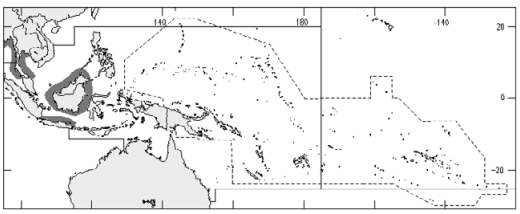
Exopalaemon styliferus (H. Milne Edwards, 1840)

En - Roshna prawn; **Fr** - Bouqet rosna; **Sp** - Camarón rosna.

Maximum total length for males 9 cm; egg-bearing females 6.8 to 8.6 cm. Inhabits shallow coastal waters, brackish or marine, occasionally also in fresh water. A small species, abundance in the area uncertain, probably without commercial importance and only caught incidentally in fisheries for other shrimps. Indo-West Pacific from Pakistan to Thailand and Borneo.



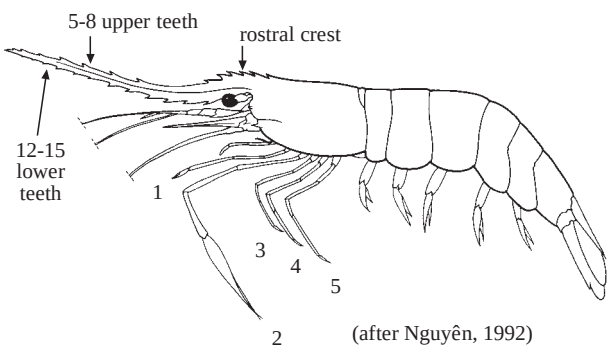
(after Holthuis and Miguel, 1984)



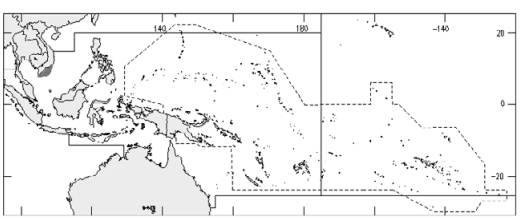
Exopalaemon vietnamicus Nguyên, 1992

En - Vietnamese crest prawn.

Maximum body length 7.7 cm; egg-bearing females more than 4 cm body length. Inhabits estuaries and shallow coastal mud flat areas near river mouths. Caught by conical set nets and push nets. Often occurs in large quantities in coastal rice shrimp farming areas and semi-extensive shrimp culture ponds. Sometimes too abundant, becoming a food competitor of cultured penaeid prawns. In certain areas it constitutes 40 to 50% of the total shrimp harvest at the end of the rainy season. Marketed dried or fresh and usually mixed with other small penaeids; an important food source for local consumption. Restricted to southeastern Viet Nam near Ho Chi Min City.



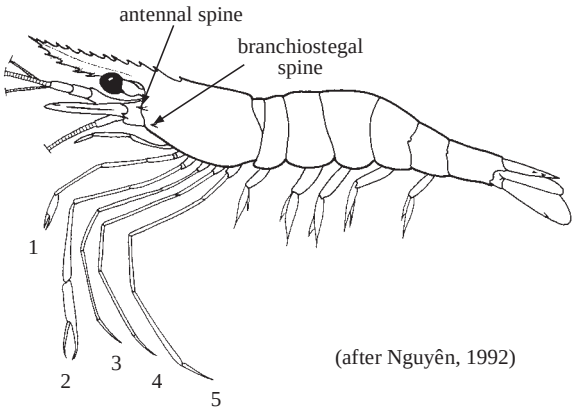
(after Nguyên, 1992)



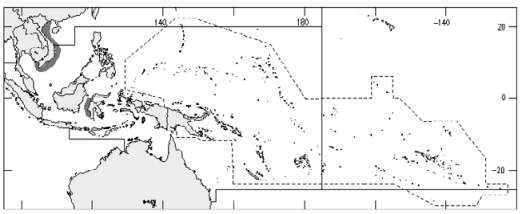
Leandrites indicus Holthuis, 1950

En - Indian small prawn.

Maximum total length about 3 cm. Inhabits brackish water in mangrove areas. A bycatch of fisheries for *Acetes* species, caught by conical set nets and push nets. In certain parts of Viet Nam, this small species is very abundant and constitutes a good food source for local consumption. Sometimes also enters penaeid culture ponds. Marketed fresh and mixed with *Acetes* species, also used in the processing of native shrimp paste. Western Pacific, and so far only recorded from Makasar (Celebes) and Viet Nam.



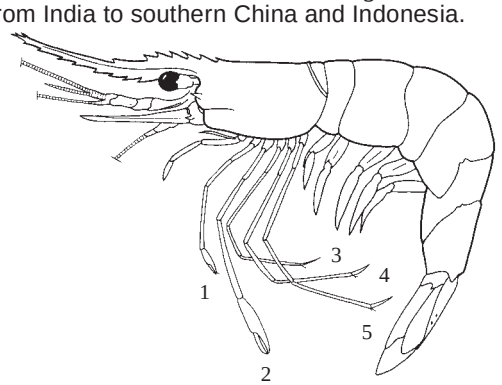
(after Nguyên, 1992)



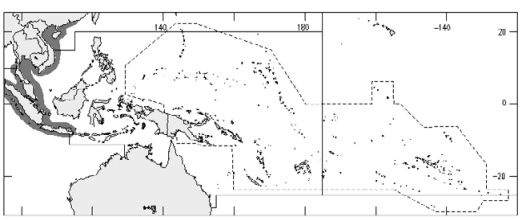
Leptocarpus potamiscus (Kemp, 1917)

En - Bombay prawn; **Fr** - Bouqet bombay; **Sp** - Camarón de Bombay.

Maximum total length about 6 cm (females) and 4.5 cm (males). Inhabits fresh to brackish water. In Viet Nam, this shrimp is reported to occur in great quantities in the irrigation ditches designed for culture of *Macrobrachium rosenbergii* and is a valuable species for local fisheries. Indo-West Pacific from India to southern China and Indonesia.



(after Nguyên, 1992)



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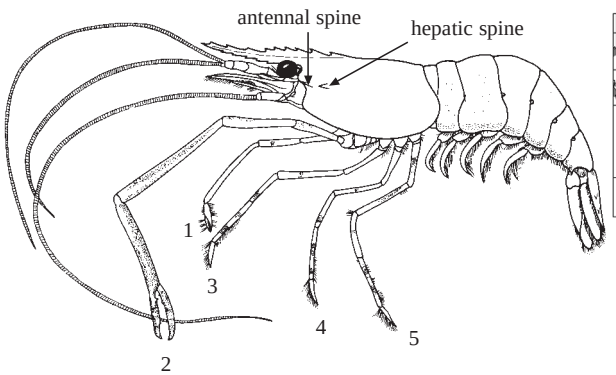
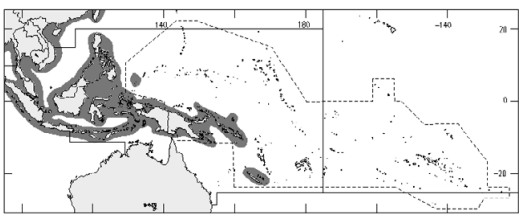
Macrobrachium equidens (Dana, 1852)

En - Rough river prawn; **Fr** - Bouqet chagrin; **Sp** - Camarón lija.

Maximum total length 9.8 cm (males usually larger). Inhabits lower parts of streams, river mouths, estuaries, and brackish waters of high salinity; rarely found in pure fresh water but often in sea water (near river mouths) to a depth of at least 30 m. Reproduce in brackish and sea water, larvae have about 11 stages and transform into postlarvae in 43 days. A common species in the area but nowhere abundant. Similarly to other small to medium-sized species of the genus, it is frequently found in mixed catches of fresh-water shrimps. Since this shrimp also occurs in pure sea water, it is often caught incidentally in penaeid fisheries. Marketed mainly live or fresh, generally sold at low prices and consumed locally. Widely distributed in the Indo-West Pacific from eastern Africa to the Ryukyu Islands, New Caledonia, and Solomon Islands, also introduced to Nigeria.



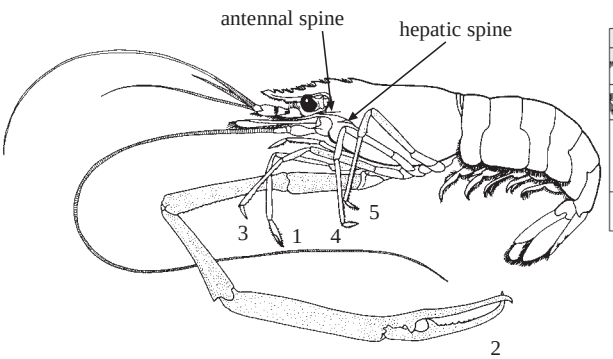


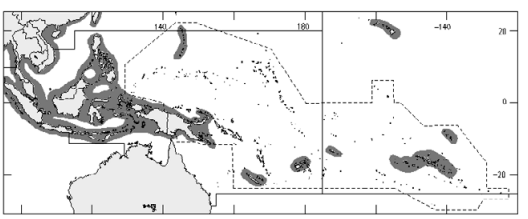
(after Holthuis and Miguel, 1984)

Macrobrachium lar (Fabricius, 1798)

En - Monkey river prawn; **Fr** - Bouqet singe; **Sp** - Camarón mono.

Maximum total length 18.1 cm (males usually much larger). Adults occur in fresh water, mainly in upper and middle parts of rivers; able to endure short time of desiccation and occasionally observed to crawl on land during heavy rainfall. Migrate to the river mouth or estuary for reproduction, with juvenile stages in brackish and sometimes also in salt water. Fished throughout its range. Caught by traps and artisanal gear. A large species, but nowhere very abundant and marketed mainly locally, live or fresh. In the Philippines, this shrimp is not always available in the fish markets, sold at about half the price of *Macrobrachium rosenbergii*. Aquaculture experiments have been carried out by many countries but were so far unsuccessful, due to the very long larval stage in this species (at least 100 days). Widely distributed in the Indo-West Pacific, from eastern Africa to Ryukyu Islands and the Marquesas Islands; probably not indigenous (i.e. introduced) in Hawaii.



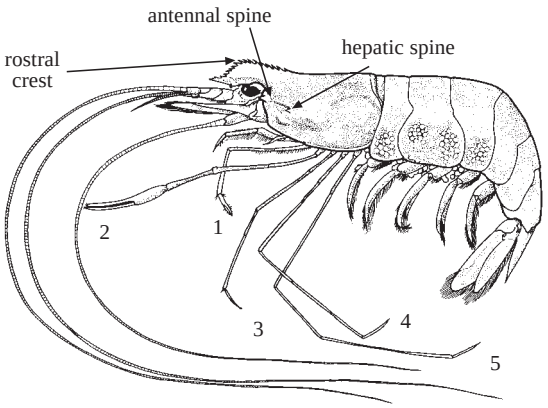


(after Holthuis, 1993)

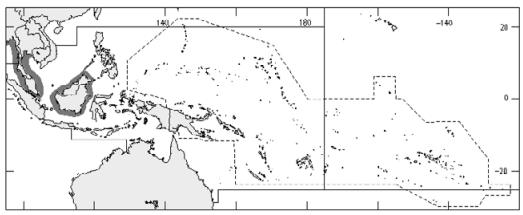
Macrobrachium mirabile (Kemp, 1917)

En - Shortleg river prawn; **Fr** - Bouqet tipattes; **Sp** - Camarón patojo.

Maximum total length 6 cm (females) and 4 cm (males). Inhabits fresh and brackish water. Similarly to the other small species of the genus, its fishery in the area is unclear, probably caught incidentally with other fresh-water shrimps and used as food whenever available. Indo-West Pacific, and recorded from eastern India, Bangladesh, Myanmar, Thailand, Malaysia, and Borneo.



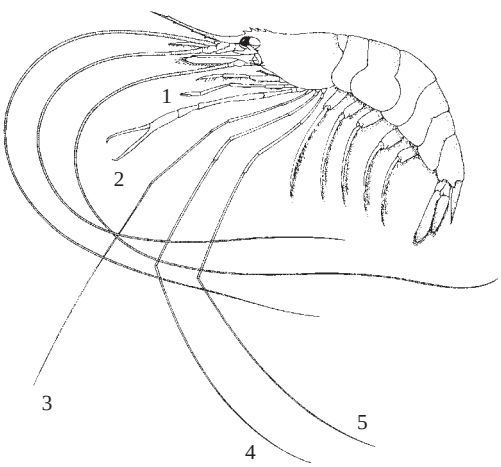
(after Kemp, 1917)

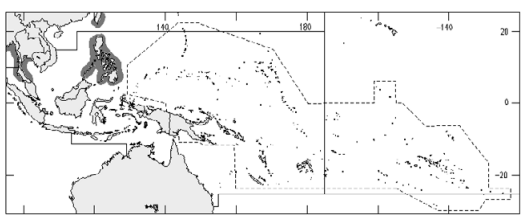


Nematopalaemon tenuipes (Henderson, 1893)

En - Spider prawn; **Fr** - Bouqet araignée; **Sp** - Camarón araña.

Maximum total length 8 cm. Inhabits shallow coastal waters to depths of about 20 m, and also found in estuarine and brackish waters. Abundance of this species in the area is unclear, but it has been reported to be used as food in the Philippines. Marketed dried or salted for local consumption. Widely distributed in the Indo-West Pacific from eastern Africa to Taiwan Province of China and the Philippines, probably also from New Zealand.

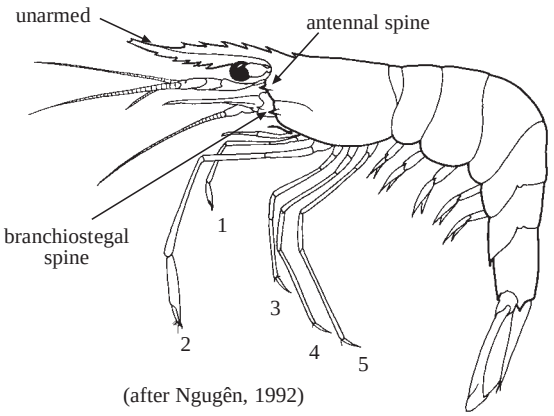




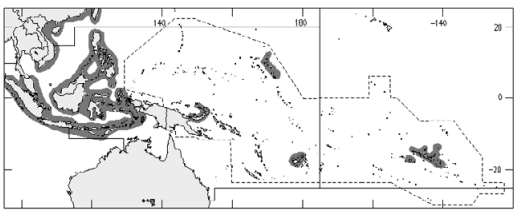
Palaemon concinnus Dana, 1852

En - Mangrove prawn; **Fr** - Bouqet mangrove; **Sp** - Camarón de manglar.

Maximum total length 7 cm (females), smallest egg-bearing females 4.9 cm. Restricted to brackish water in the lower part of rivers, rarely found in pure fresh or sea water. In Viet Nam, this shrimp forms a bycatch of fisheries for *Macrobrachium* species and is offered for sale in local markets. Probably also used as food in the Philippines. Widely distributed in the Indo-West Pacific, from eastern Africa to Taiwan Province of China and Polynesia.



(after Ngugên, 1992)

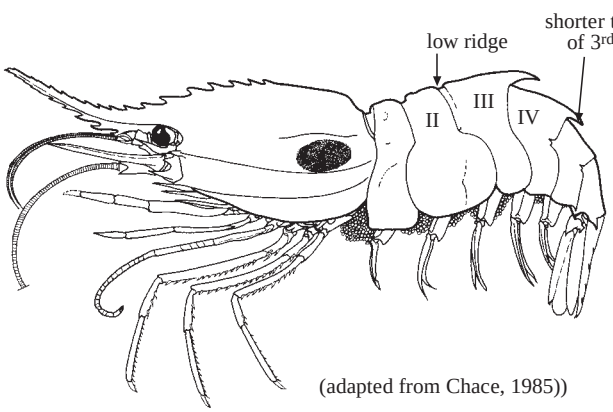


PANDALIDAE

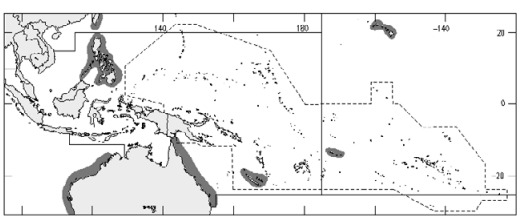
Heterocarpus hayashii Crosnier, 1988

En - Japanese nylon shrimp.

Maximum body length about 11 cm (females larger), commonly between 6 and 10 cm. Found on bottoms of sand and mud, at depths from 150 to 625 m, usually around 200 m, or deeper. So far not fished commercially but sometimes caught in large quantities on the basis of exploratory deep-water trawling. The moderate size of this shrimp and the fact it is found in not very deep water suggests that it may have commercial potential with the development of a deep-sea fishery in the area. Western Pacific, reported from Japan, Taiwan Province of China, the Philippines, Australia, New Caledonia, Chesterfield Islands, and Hawaii. Often confused with *Heterocarpus ensifer* A. Milne Edwards, 1881, *H. parvispina*, and *H. sibogae*.



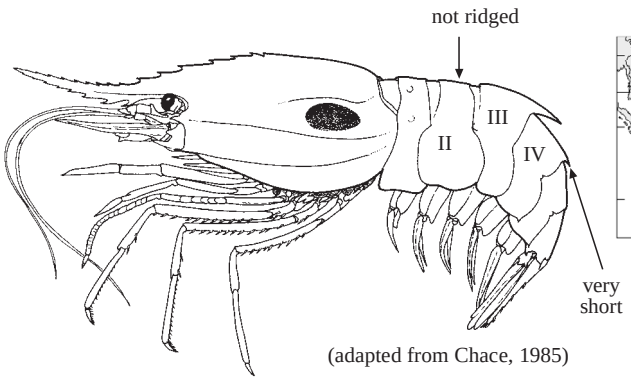
(adapted from Chace, 1985))

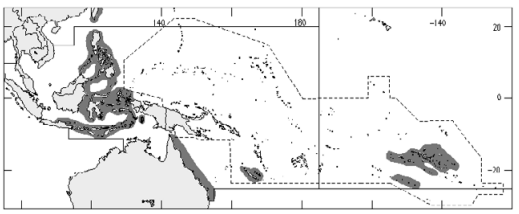


Heterocarpus parvispina De Man, 1917

En - Short-spined nylon shrimp.

Maximum body length about 9 cm (females larger), commonly between 6 and 8 cm. Found on sandy-mud bottoms, at depths from 230 to 815 m, mostly less than 600 m. Not fished commercially at present. Occasionally caught in large quantities on the basis of exploratory deep-water trawling (more abundant from 350 m depth downward) and may have commercial potential with the development of deep-sea fisheries in the area. Western and southern Pacific from Taiwan Province of China to Indonesia, Australia, and French Polynesia. Often confused with *Heterocarpus ensifer* A. Milne Edwards, 1881, *H. hayashii*, and *H. sibogae*.



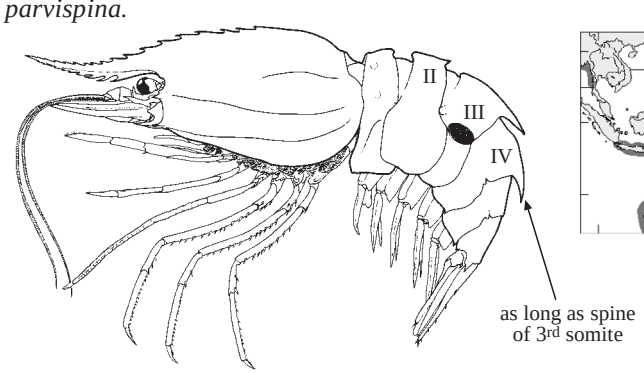


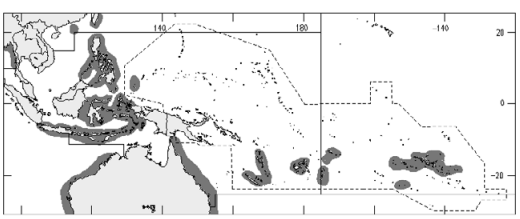
(adapted from Chace, 1985)

Heterocarpus sibogae De Man, 1917

En - Mino nylon shrimp; **Fr** - Crevette nylon mino; **Sp** - Camarón nailón mino.

Maximum body length about 11 cm (females larger), commonly between 6 and 10 cm. Found on bottoms of sand and mud from depths of about 150 to 950 m. Although at present not commercially fished, it is the most common caridean shrimp caught during exploratory deep-water trawling operations in the area. Often caught in large quantities from moderate depths (about 200 m downward) in the area (e.g. the Philippines, Indonesia, Australia, New Caledonia, Fiji, Vanuatu, Samoa, Tonga, French Polynesia, and probably also Palau) and therefore has a very high commercial potential. Widely distributed in the Indo-West Pacific from Madagascar to Japan and French Polynesia. Often confused with *Heterocarpus ensifer* A. Milne Edwards, 1881, *H. hayashii*, and *H. parvispina.*





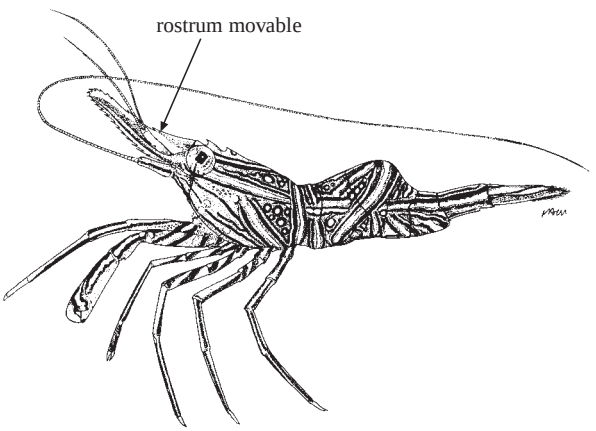
(adapted from Chace, 1984)

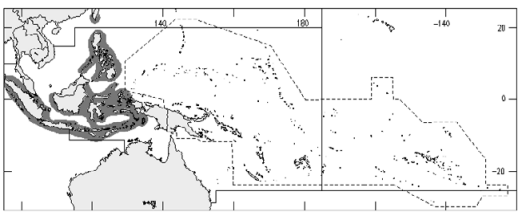
RHYNCHOCINETIDAE

Rhynchocinetes durbanensis Gordon, 1936

En - Striped hinge-beak shrimp.

Body length around 3 to 4 cm. Shallow marine reef areas. Gregarious and usually hiding under rocks and caves, also active during the daytime (afternoon); no fish cleaning behavior reported. Probably the most common shrimp in the area seen in the marine aquarium trade (with live specimens originating from Sri Lanka, the Philippines, and Indonesia), where it is regularly offered for sale. Very popular for its attractive coloration and as it easily adapts to captivity; sold at inexpensive prices. Widely distributed in the Indo-West Pacific from the eastern coast of South Africa to the Ryukyu Islands and Indonesia. Previously often confused with *Rhynchocinetes uritai* Kubo, 1942.





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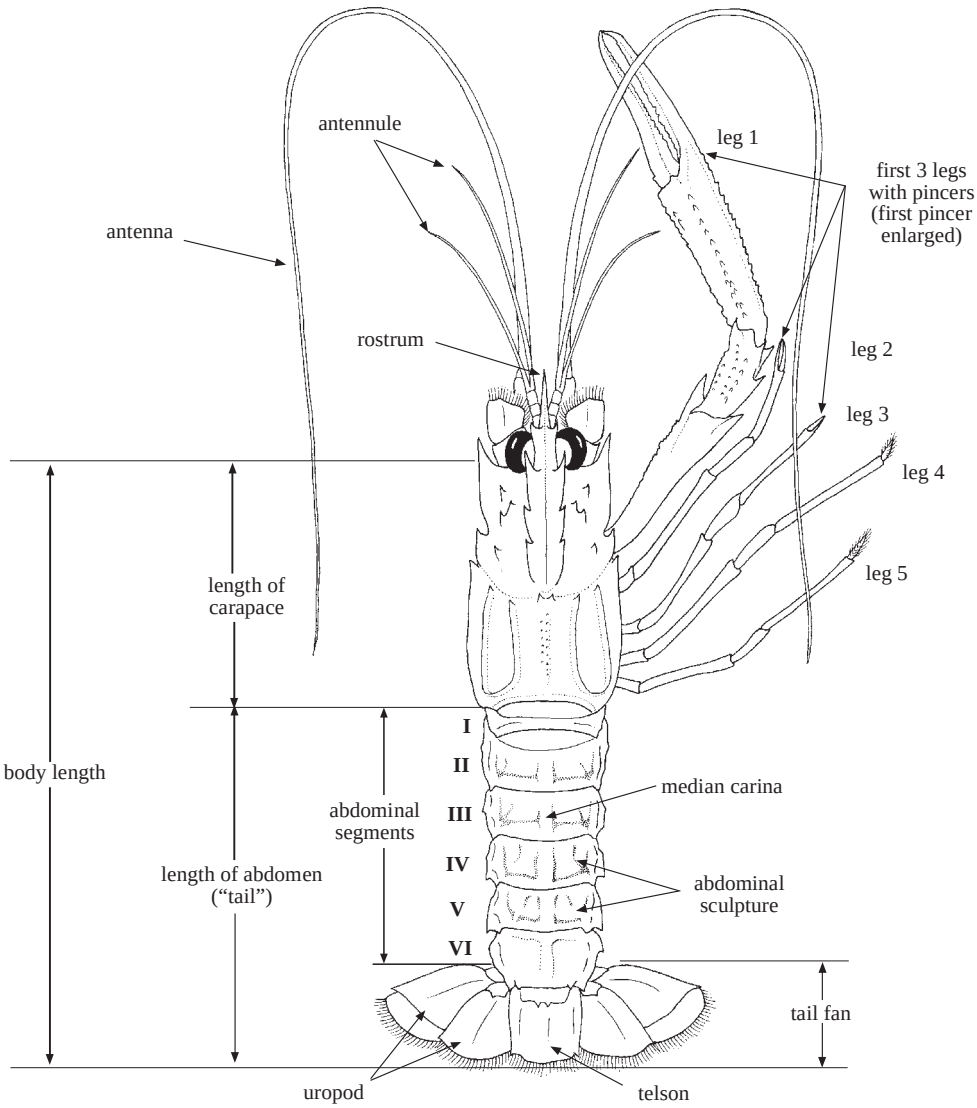
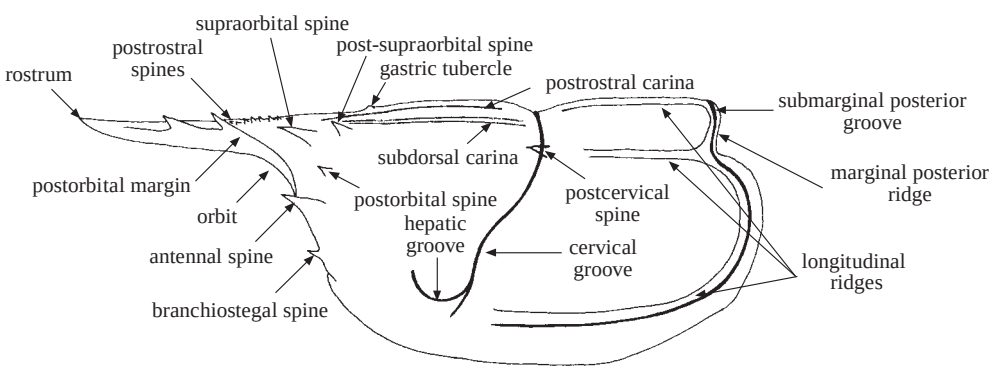
LOBSTERS

by T.Y. Chan

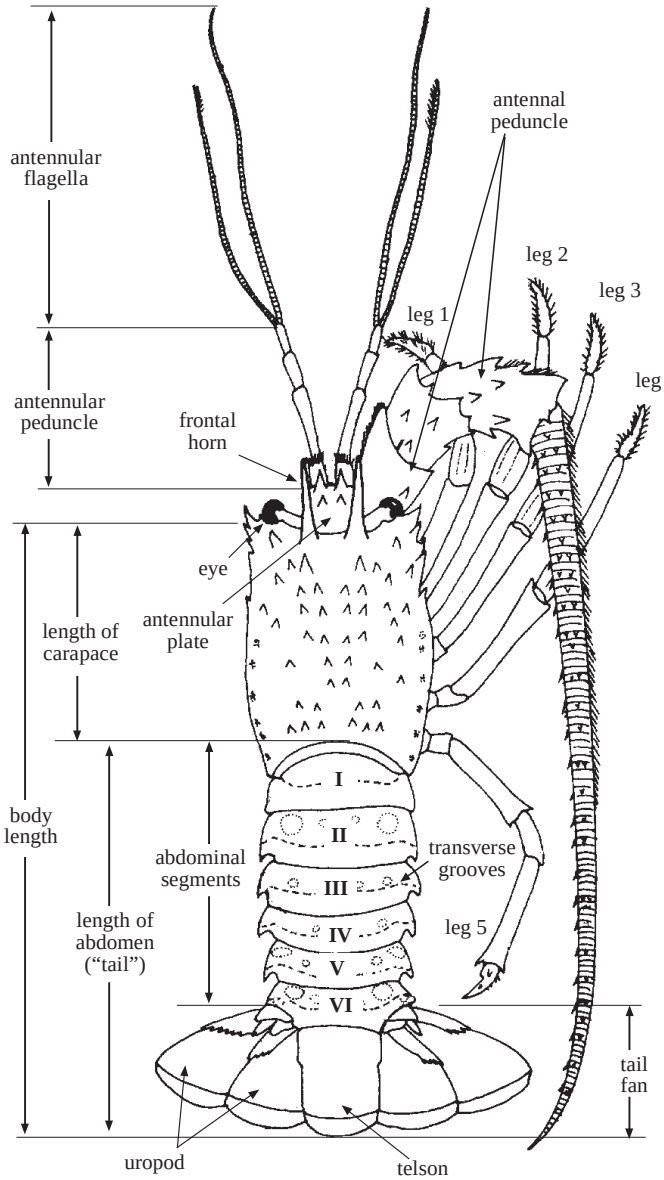
TECHNICAL TERMS AND MEASUREMENTS



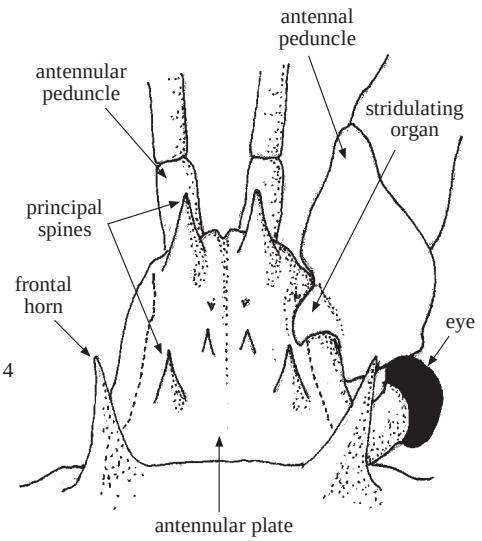
general shape (dorsal view) of a true lobster (*Metanephros* spp.)



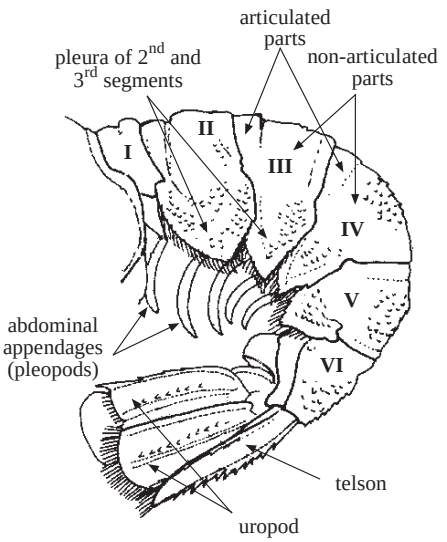
carapace of a true lobster (lateral view)



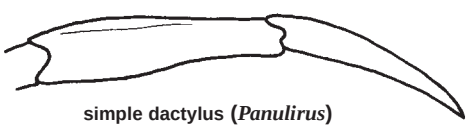
general shape (dorsal view) of a spiny lobster (*Panulirus* spp.: no rostrum, no pincers)



antennular somite of a spiny lobster (left antenna and eye omitted)

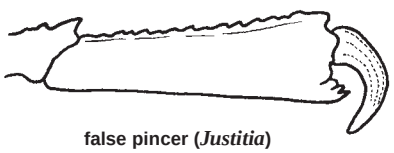


tail (abdomen) in lateral view

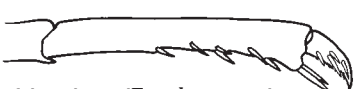


simple dactylus (*Panulirus*)

true pincer (*Metanephrops*)



false pincer (*Justitia*)

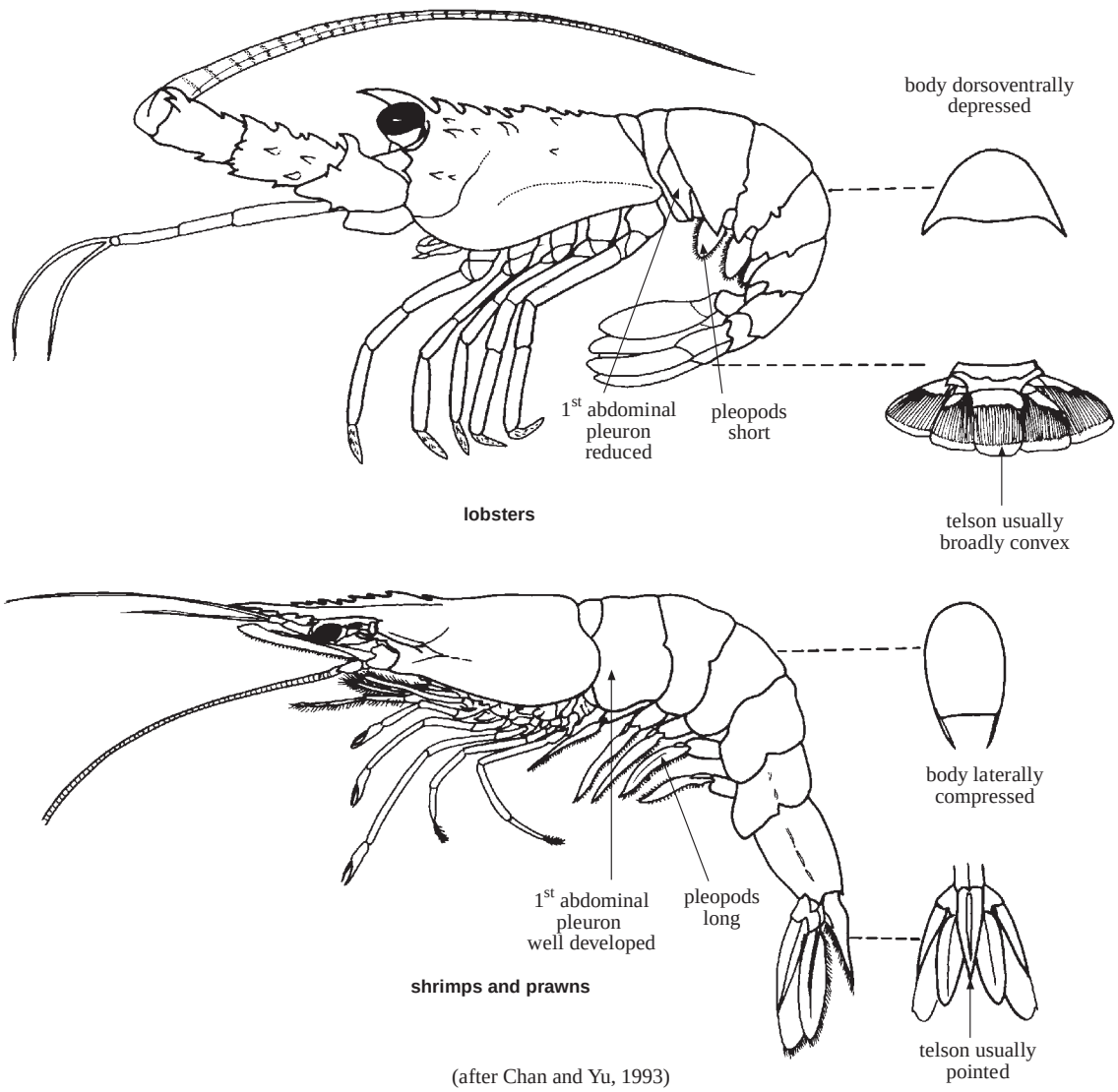


false pincer (*Enoplometopus*)

types of terminal segments of legs

GENERAL REMARKS

Lobsters are generally large-sized crustaceans with a body length (measured dorsally from the orbital margin to the end of the tail, excluding the rostrum and any of the appendages) from a few to more than 60 cm. Like shrimps and prawns, lobsters have a well-developed and extended abdomen or "tail". In addition to their usually thicker shell, lobsters generally differ from shrimps and prawns by having the body more dorsoventrally depressed (particularly at posterior abdominal segments), the pleopods (i.e. legs of the abdomen) less developed, the thoracic sternum wide and distinct, the first abdominal pleuron considerably more reduced than the posterior pleura, and the posterior margin of the telson usually broadly convex or truncate. Certain other lobster-like crustaceans, such as the "squat lobsters" (Galatheoidea), "mud lobsters" (Thalassinidea: Thalassinidae), "mud shrimps" (Thalassinidea: Upogebiidae), and "ghost shrimps" (Thalassinidea: Callianassidae) are taxonomically not "true" lobsters. These groups are of no or only very minor importance to fisheries in the Western Central Pacific and therefore not included in this field guide.



(after Chan and Yu, 1993)

conspicuous morphological differences between lobsters and shrimps

In the Western Central Pacific, the lobsters are represented by 8 families, 22 genera and about 89 species. Although the production of most of the species is not very large, many of them are of moderate importance to fisheries because of their large size and high market value.

Most spiny and slipper lobsters (Palinuridae and Scyllaridae, respectively), and the families Synaxidae and Enoplometopidae, inhabit shallow waters of rocky and reef bottoms or bottoms with coarse sediments. Among these, the genera *Panulirus*, *Scyllarides* and *Parribacus* are actively fished throughout the area because of their large size. On the other hand, juveniles of *Panulirus* species and the rare Enoplometopidae and Synaxidae are often highly valued in the aquarium trade. These shallow-water lobsters are mainly taken by hand while diving or by spears during night fishing, but sometimes also taken by tangle nets, lobster pots, or traps.

Most Nephropidae, Thaumastochelidae, Glypheidae, Polychelidae, a few Palinuridae, and Scyllaridae are found in deeper waters on soft bottoms with sand and/or mud. They are usually caught by trawlers. At present, only the two shallow-water genera *Ibacus* and *Thenus* (both belonging to the family Scyllaridae) are landed in larger amounts and are of moderate commercial importance. However, exploratory fishing indicates that several deep-water species of the genera *Metanephrops*, *Nephropsis*, *Acanthacaris*, *Linuparus* and *Puerulus* (the first 3 genera belonging to the family Nephropidae, while the latter 2 belong to the family Palinuridae) are large and occasionally abundant and may eventually be of commercial interest. Species of the other 3 families (Thaumastochelidae, Glypheidae, and Polychelidae) are generally rare and of no interest to fisheries in the area, and are not treated here in separate family or species accounts.

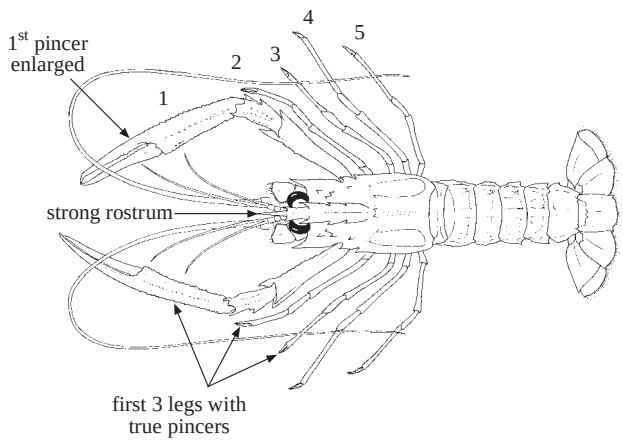
Lobsters in the Western Central Pacific are generally locally consumed and marketed fresh or live. In certain countries, such as the Philippines and Indonesia, a fair amount of lobsters are exported (live, fresh, cooked whole, or tailed).

GUIDE TO FAMILIES OCCURRING IN THE AREA

NEPHROPIDAE **Page 982**

True lobsters and lobsterettes

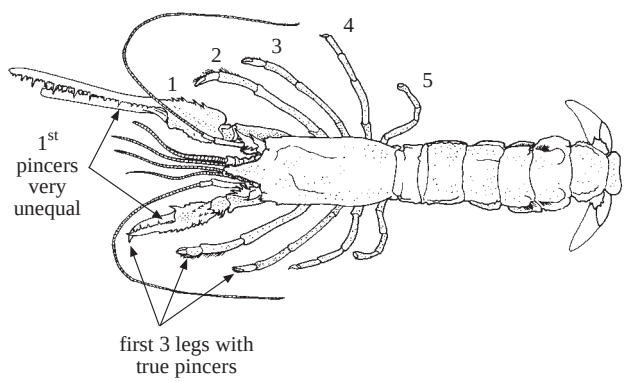
Body tubular, surfaces almost naked or covered with thick fur; rostrum well developed; antennae long and thread-like; antennal scale, if present, with inner margin unarmed and curved; first 3 pairs of legs with true pincers, first pair much larger than others; abdominal pleura ending in acute ventral tooth; tail fan entirely hardened, telson armed with fixed spines and with posterior margin broadly convex.



THAUMASTOCHELIDAE

Pincer lobsters

Body slightly depressed dorsoventrally; eyes strongly reduced, cornea lacking pigmentation; rostrum well developed; antennae long and thread-like, antennal scale bearing several large teeth along inner margin; first 3 pairs of legs (occasionally also fifth legs) with true pincers, first pair large but very unequal; abdominal pleura short, quadrangular and without large ventral tooth; tail fan entirely hardened, telson quadrangular and unarmed. Only 2 deep-water species known from the area, very rare and of no interest to fisheries.

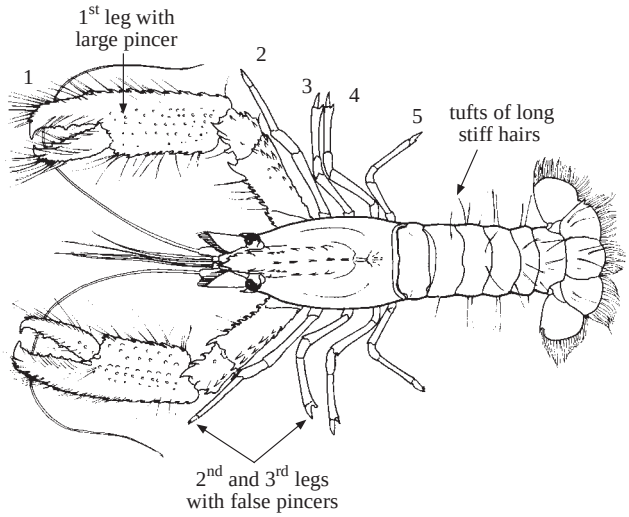


ENOPLOMETOPIDAE

Page 995

Reef lobsters

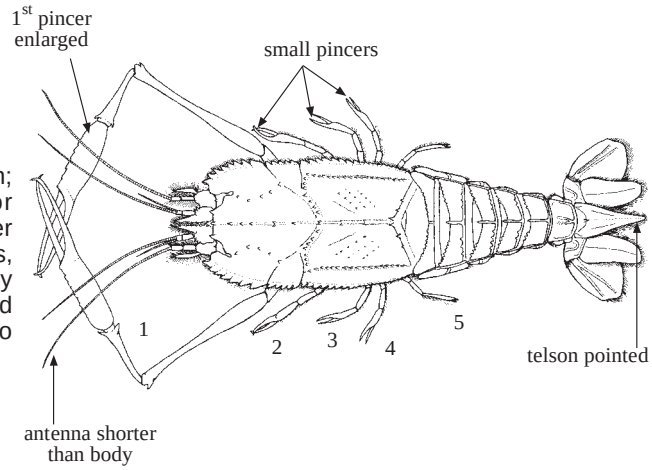
Body tubular and distributed with tufts of long stiff hairs; carapace with a well-developed rostrum; antennae long and thread-like, antennal scale with inner margin unarmed and curved; first pair of legs as large pincer, second and third legs slender and forming false pincers; abdominal pleura more or less rounded and sometimes ending in a strong ventral tooth; tail fan entirely hardened, telson bearing movable spines and with posterior margin broadly convex.



POLYCHELIDAE

Blind lobsters

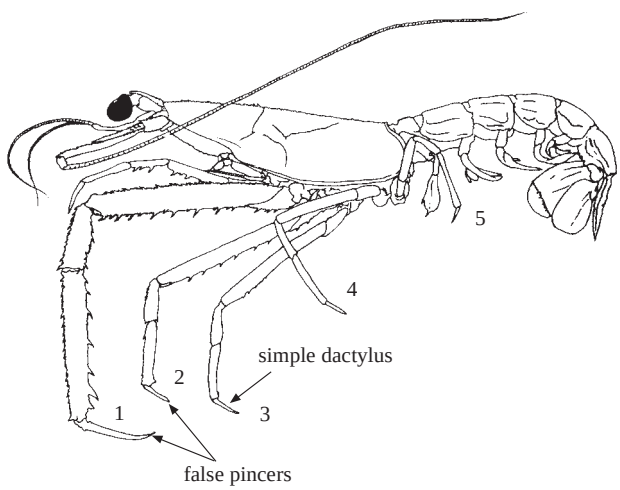
Eyes small, cornea lacking pigmentation; carapace box-like, rostrum absent or rudimentary; antennae thread-like, shorter than body; first 4 or all legs with true pincers, first pair long and slender; tail fan entirely hardened, telson pointed. All species found in very deep waters and of no interest to fisheries in the area.



GLYPHEIDAE

Fenix lobsters

Body somewhat flattened dorsoventrally; eyes large and black, inserted on a median elevation of cephalon; carapace with a well-developed rostrum; antennae long and thread-like; first 2 legs forming false pincers, first pair very strong; uropods of tail fan entirely hardened. A single deep-water species, rare and of no commercial importance.

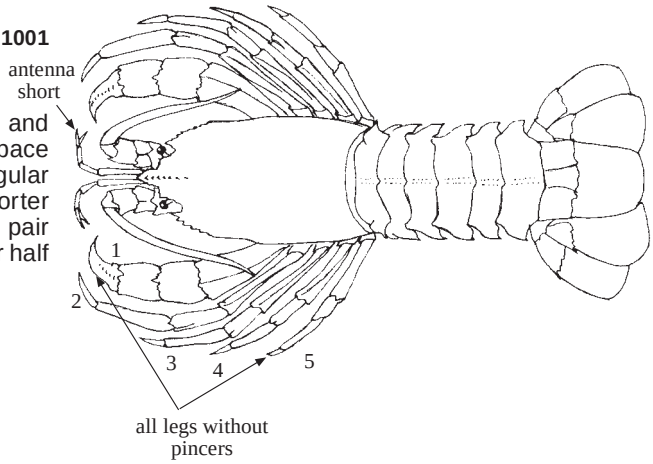


SYNAXIDAE

Page 1001

Furry lobsters

Body somewhat flattened dorsoventrally and very hairy, without enlarged spines; carapace laterally angular, with a broad and flat triangular or rounded rostrum; antennae whip-like, shorter than carapace; legs without pincers, first pair much more robust than the others; posterior half of tail fan soft and flexible.

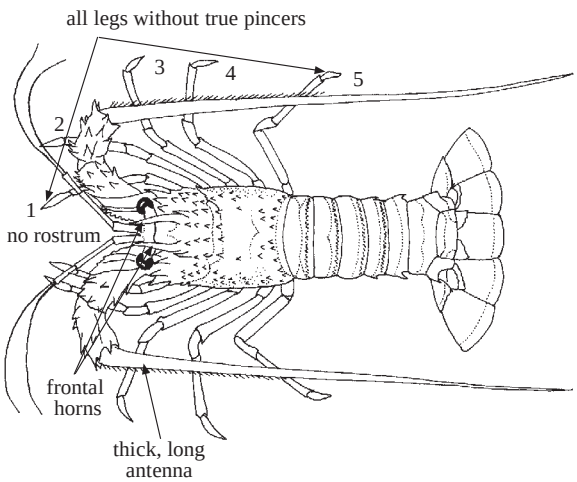


PALINURIDAE

Page 1005

Spiny lobsters, langoustes

Body tubular or slightly flattened dorsoventrally; hairs, if present, few and scattered; rostrum absent or reduced to a small spine; carapace subcylindrical or prismatic, laterally rounded or straight, surface spiny and with a pair of large frontal horns above eyes; antennae very long and rather thick, whip-like or spear-like; legs without true pincers and first pair (except in *Justitia*) not or only slightly longer than the following legs, but often somewhat more robust; posterior half of tail fan soft and flexible.

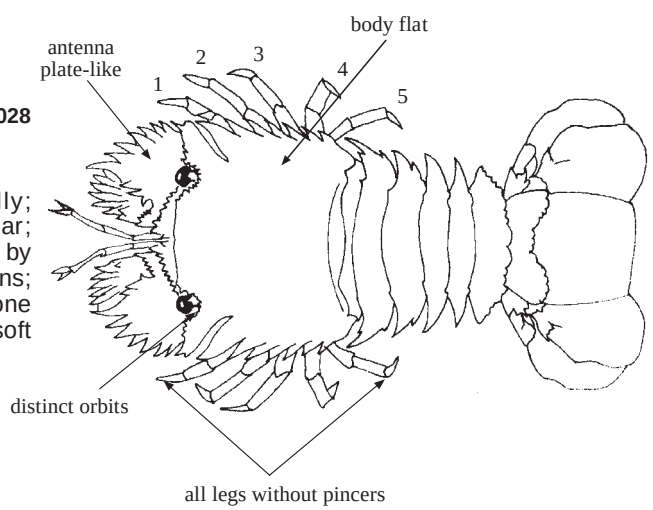


SCYLLARIDAE

Page 1028

Slipper lobsters

Body strongly flattened dorsoventrally; carapace depressed and laterally angular; rostrum absent or minute; eyes enclosed by distinct orbits and without large frontal horns; antennae plate-like; legs without pincers, none of them enlarged; posterior half of tail fan soft and flexible.



LIST OF FAMILIES AND SPECIES OCCURRING IN THE AREA

The symbol 🦐 is given when species accounts are included.

NEPHROPIDAE

🦐 *Acanthacaris tenuimana* Bate, 1888

🦐 *Metanephrops andamanicus* (Wood-Mason, 1891)
🦐 *Metanephrops arafurensis* ((De Man, 1905)
🦐 *Metanephrops australiensis* (Bruce, 1966)
🦐 *Metanephrops neptunus* (Bruce, 1965)
🦐 *Metanephrops sibogae* (De Man, 1916)
🦐 *Metanephrops sinensis* (Bruce, 1966)
🦐 *Metanephrops thomsoni* (Bate, 1888)
🦐 *Metanephrops velutinus* Chan and Yu, 1991

Nephropsis acanthura Macpherson, 1990
Nephropsis ensirostris Alcock, 1901
Nephropsis holthuisi Macpherson, 1993
Nephropsis serrata Macpherson, 1993
🦐 *Nephropsis stewarti* Wood-Mason, 1873
Nephropsis suhmi Bate, 1888
Nephropsis sulcata Macpherson, 1990

THAUMASTOCHELIDAE

Thaumastocheles japonicus Calman, 1913

Thaumastochelopsis wardi Bruce, 1988

ENOPLOMETOPIDAE

Enoplometopus chacei Kensley and Child, 1986
🦐 *Enoplometopus daumi* Holthuis, 1983
🦐 *Enoplometopus debelius* Holthuis, 1983
Enoplometopus gracilipes (De Saint Laurent, 1988)
🦐 *Enoplometopus holthuisi* Gordon, 1968
🦐 *Enoplometopus occidentalis* (Randall, 1840)

POLYCHELIDAE

Polycheles baccatus Bate, 1878
Polycheles carpenteri (Alcock, 1894)
Polycheles enthrix (Bate, 1878)
Polycheles gracilis (Bate, 1888)
Polycheles laevis (Bate, 1878)
Polycheles obscurus (Bate, 1878)
Polycheles typhlops Heller, 1862

Stereomastis andamanensis (Alcock, 1894)
Stereomastis auriculata (Bate, 1878)
Stereomastis helleri (Bate, 1878)
Stereomastis phosphoreus (Alcock, 1894)
Stereomastis sculpta (S.I. Smith, 1880)
Stereomastis trispinosa (De Man, 1905)

GLYPHEIDAE

Neoglyphea inopinata Forest and De Saint Laurent, 1975

SYNAXIDAE

🦐 *Palibythus magnificus* Davie, 1990

🦐 *Palinurellus wieneckii* (De Man, 1881)

PALINURIDAE
- *Justitia chani* Poupin, 1994
- *Justitia japonica* (Kubo, 1955)
- *Justitia longimanus* (H. Milne Edwards, 1837)
- *Justitia vericeli* Poupin, 1994

- *Linuparus sordidus* Bruce, 1965
- *Linuparus trigonus* (Von Siebold, 1824)

- *Palinustus unicornutus* Berry, 1963
- *Palinustus waguensis* Kubo, 1963

- *Panulirus albiflagellum* Chan and Chu, 1996
- *Panulirus homarus* (Linnaeus, 1758)
- *Panulirus longipes* (A. Milne Edwards, 1868)
- *Panulirus ornatus* (Fabricius, 1798)
- *Panulirus pascuensis* Reed, 1954
- *Panulirus penicillatus* (Olivier, 1791)
- *Panulirus polyphagus* ((Herbst, 1793)
- *Panulirus stimpsoni* Holthuis, 1963
- *Panulirus versicolor* (Latreille, 1804)

- *Puerulus angulatus* (Bate, 1888)
- *Puerulus velutinus* Holthuis, 1963

SCYLLARIDAE
- *Arctides regalis* Holthuis, 1963

Ibacus brevipes Bate, 1888
Ibacus brucei Holthuis, 1977
- *Ibacus ciliatus* (Von Siebold, 1824)
- *Ibacus novemdentatus* Gibbes, 1850

Ibacus peronii Leach, 1815
- *Ibacus pubescens* Holthuis, 1960

- *Parribacus antarcticus* (Lund, 1793)
- *Parribacus caledonicus* Holthuis, 1960
- *Parribacus holthuisi* Forest, 1954
- *Parribacus scarlatinus* Holthuis, 1960

- *Scyllarides haanii* (De Haan, 1841)
- *Scyllarides squammosus* (H. Milne Edwards, 1837)

Scyllarus aesopius Holthuis, 1960
Scyllarus aureus Holthuis, 1963
Scyllarus aurora Holthuis, 1982
Scyllarus batei Holthuis, 1946
- *Scyllarus bertholdii* Paulson, 1875

Scyllarus bicuspidatus (De Man, 1905)
Scyllarus cultrifer (Ortmann, 1897)
Scyllarus demani Holthuis, 1946
Scyllarus gibberosus (De Man, 1905)
Scyllarus martensii Pfeffer, 1881
Scyllarus rapanus Holthuis, 1993
- *Scyllarus rugosus* H. Milne Edwards, 1837

Scyllarus sordidus (Stimpson, 1860)
Scyllarus timidus Holthuis, 1960
Scyllarus umbilicatus Holthuis, 1963
Scyllarus vitiensis (Dana, 1852)

- *Thenus orientalis* (Lund, 1793)

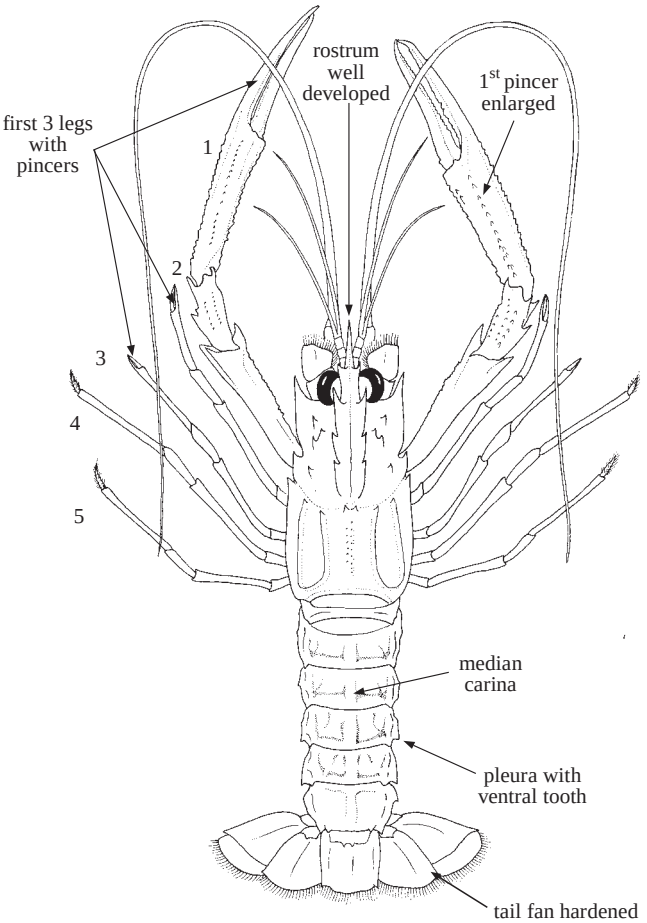
click for next page

click for previous page

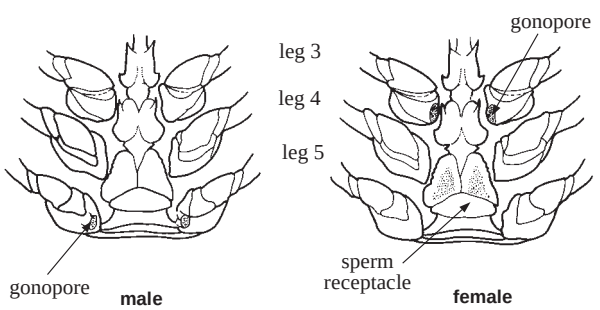
NEPHROPIDAE

True lobsters and lobsterettes

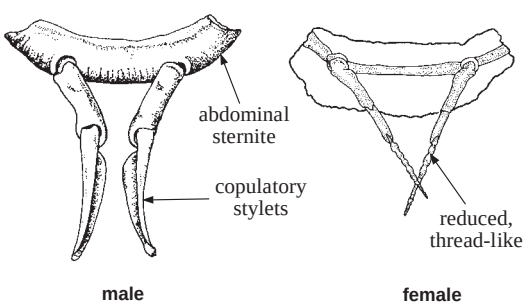
Diagnostic characters: Moderate to large-sized crustaceans. Body tubular, surface almost naked or covered with thick fur. Carapace (or "head") **with a well-developed rostrum**, ornamented with spines or nodules, occasionally smooth. Eyes usually well developed and black, or small and lacking pigmentation, or even absent. Antennae very long and thread-like; **antennal scale, if present, with inner margin unarmed and curved. First 3 pairs of legs forming true pincers, with the first pair greatly enlarged and long.** Both abdomen and tail fan well developed and powerful. Abdomen smooth or variously sculptured, **pleura ending in acute ventral tooth. Tail fan entirely hardened, telson with fixed spines and posterior margin broadly convex. Colour:** with the typical coloration of deep-sea crustaceans - from white to pink or red, some species with special markings (usually red and/or white) on body; setae or hairs, if present, are light brown.



Habitat, biology, and fisheries: All species are deep-sea forms and found at depths from 150 to more than 1 893 m. Their adult sizes are ranging from 5 cm to over 40 cm. They are bottom-dwellers with a preference for soft substrate. Some species are known to live in self-made burrows. The sexes are easily distinguished by the position of the gonopores, which are situated at the bases of the third and fifth legs in the females and males, respectively. In addition, the first pleopods ("legs" of the abdomen) of males are transformed into a strong and rigid pen-like copulatory organ while they are reduced and thread-like in females. The females bear large and colourful eggs (white, blue or red, and other colours) on the ventral side of the abdomen. They seem to have a long incubation period, but a short larval development. At present, none of the species of this family is of significant commercial importance in the Western Central Pacific. However, the large size of several species and the fact that some of them are commonly caught on the basis of exploratory trawling suggest that they may have some commercial potential with the development of deep-sea fisheries. This is especially the case with members of the genus *Metanephrops*, which are treated here in separate species accounts.



bases of last 3 legs in nephropids



first pleopods of nephropids

Similar families occurring in the area

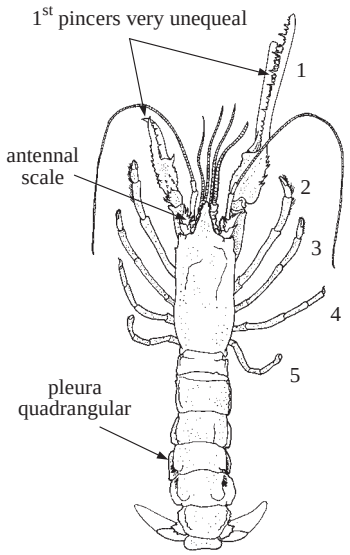
Thaumastochelidae: body somewhat flattened dorsoventrally; antennal scale with several large teeth along inner margin; first pair of pincers very unequal; abdominal pleura short, quadrangular and not ending in a point; telson unarmed.

Enoplometopidae: body distributed with tufts of long stiff hairs; second and third legs forming false pincers; telson bearing movable spines.

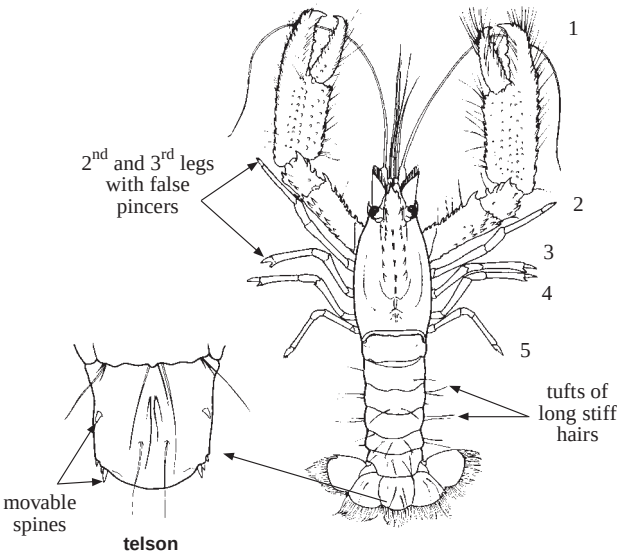
Polychelidae: carapace box-like, rostrum absent or rudimentary; first 4 or all legs with pincers, first pair long but slender; telson pointed.

Glypheidae: body somewhat flattened dorsoventrally; eyes inserted on a median elevation of cephalon; first 2 legs forming false pincers.

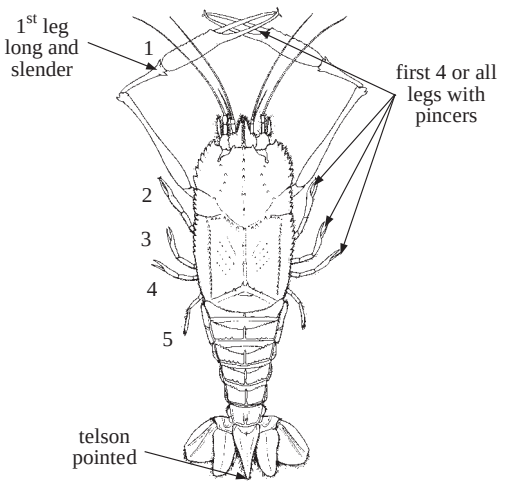
Synaxidae: body somewhat flattened dorsoventrally and hairy; all legs simple and without pincers, the first pair heavier than the others; antennae whip-like and shorter than carapace; posterior half of tail fan soft and flexible.



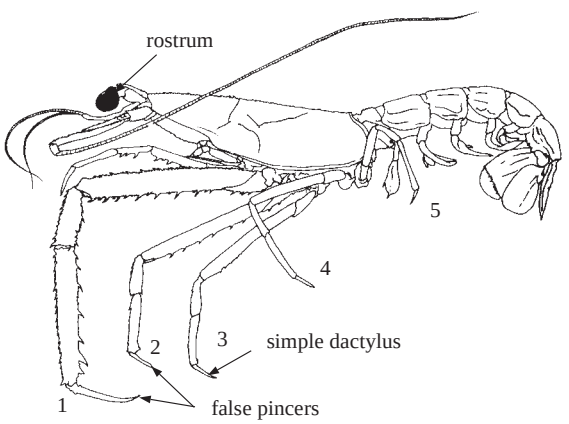
Thaumastochelidae



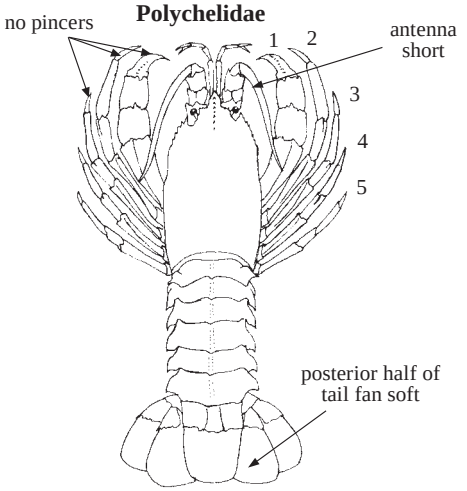
Enoplometopidae



Polychelidae



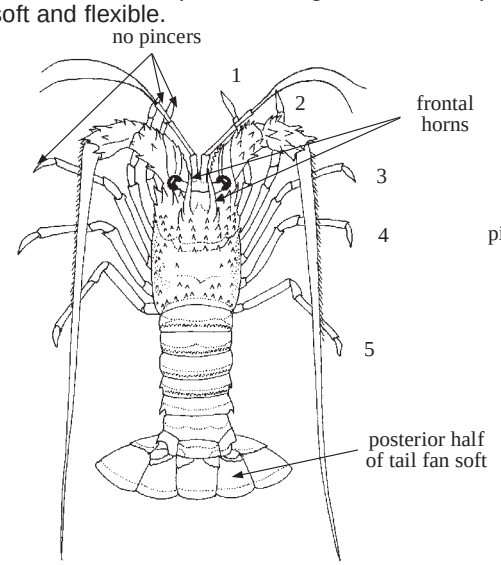
Glypheidae



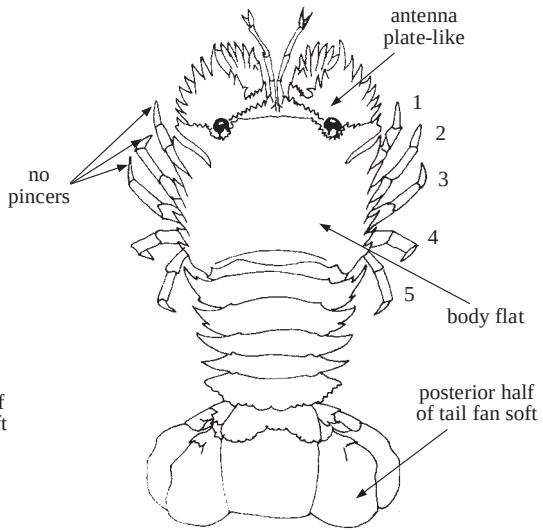
Synaxidae

Palinuridae: carapace without rostrum or with rostrum reduced to a small spine, but with a pair of large frontal horns over the eyes; antennae very long and thick, whip-like or spear-like; legs without true pincers and first pair generally not enlarged (except in *Justitia*); posterior half of tail fan soft and flexible.

Scyllaridae: body strongly flattened dorsoventrally; rostrum absent or rudimentary; eyes enclosed by distinct orbits; antennae plate-like; legs without true pincers and none of them enlarged; posterior half of tail fan soft and flexible.



Palinuridae



Scyllaridae

Key to the genera of Nephropidae occurring in the area

1a. Eyes large and black; antennal scale present; body provided with some spines but never uniformly spinulose (Fig. 1) . . . . . ***Metanephrops***

1b. Eyes minute, cornea lacking pigmentation . . . . . → ***2***

2a. Antennal scale present; body more or less uniformly spinulose and not covered with soft pubescence (Fig. 2) . . . . . ***Acanthacaris***
(a single species, *A. tenuimana*, in the area)

2b. Antennal scale absent; body not uniformly spinulose but covered with thick pubescence (Fig. 3) . . . . . ***Nephropsis***

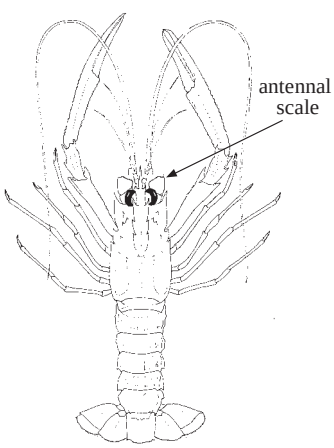


Fig. 1 ***Metanephrops***

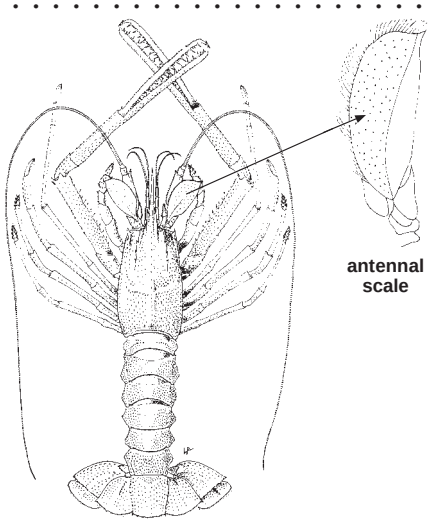


Fig. 2 ***Acanthacaris***

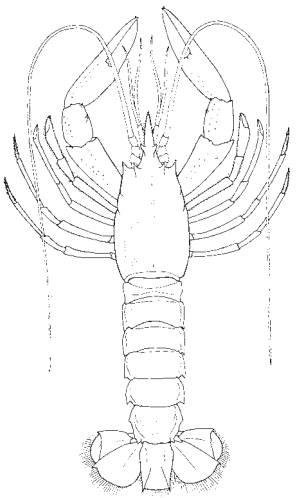
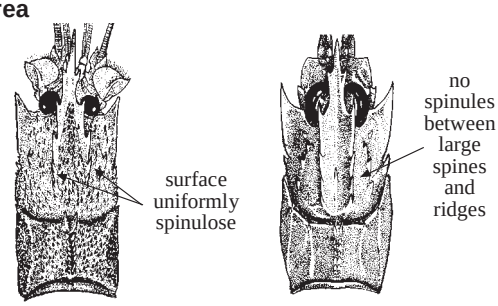


Fig. 3 ***Nephropsis***

Key to the species of *Metanephrops* occurring in the area

1a. Carapace rather uniformly spinulose (Fig. 4a); dorsal surface of uropods covered with spinules . . . . . → ***2***

1b. Carapace smooth between the ridges and large spines (Fig. 4b); uropods unarmed dorsally . . . . . → ***4***



a) ***Metanephrops neptunus*** b) ***Metanephrops sibogae***

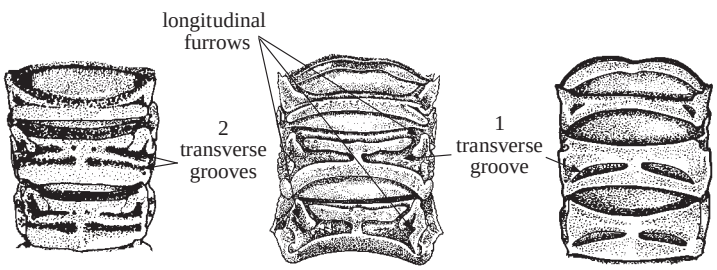
Fig. 4 carapace (dorsal view)

2a. Abdominal segments each with 2 transverse grooves (Fig. 5a); large pincer with finger distinctly longer than palm (Fig. 6a) . . . . . ***Metanephrops neptunus***

2b. Abdominal segments each with 1 transverse groove only (Fig. 5b, c); large pincer with finger shorter than palm (Fig. 6b) . . . . . → ***3***

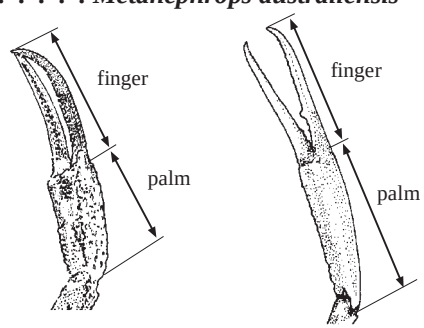
3a. Abdomen with deep longitudinal furrows (Fig. 5b); large pincer covered with sharp tubercles . . . . . ***Metanephrops arafurensis***

3b. Abdomen without distinct longitudinal furrows (Fig. 5c); large pincer finely granular to nearly smooth . . . . . ***Metanephrops australiensis***



a) ***Metanephrops neptunus*** b) ***Metanephrops arafurensis*** c) ***Metanephrops australiensis***

Fig. 5 first 3 abdominal segments (dorsal view)



a) ***Metanephrops neptunus*** b) ***Metanephrops australiensis***

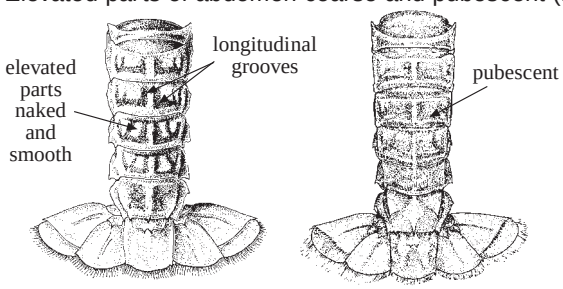
Fig. 6 large pincer

4a. Abdomen with distinct transverse and longitudinal grooves (Fig. 7); large pincers distinctly ridged (Fig. 8a), with outer border flat . . . . . → ***5***

4b. Abdomen smooth or with only narrow transverse grooves; large pincer smooth or weakly ridged (Fig. 8b), with outer border always angular. . . . . → ***6***

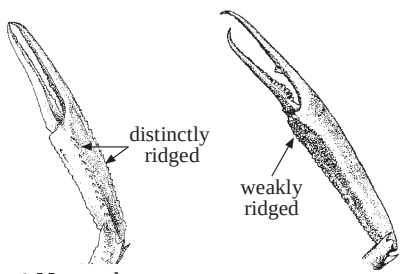
5a. Elevated parts of abdomen naked and smooth (Fig. 7a) . . . . . ***Metanephrops andamanicus***

5b. Elevated parts of abdomen coarse and pubescent (Fig. 7b) . . . . . ***Metanephrops velutinus***



a) ***Metanephrops andamanicus*** b) ***Metanephrops velutinus***

Fig. 7 abdomen (dorsal view)

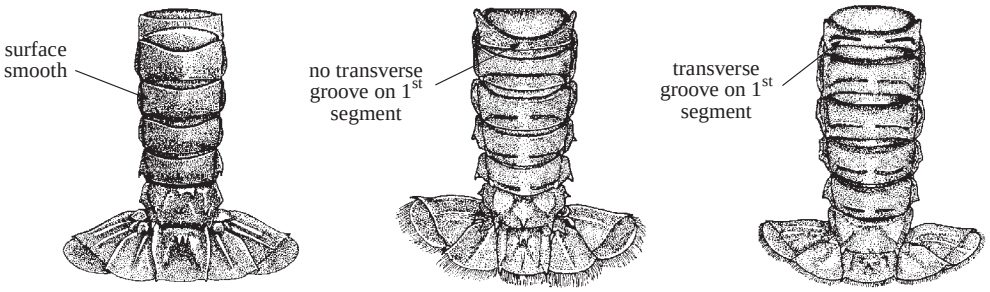


a) ***Metanephrops andamanicus*** b) ***Metanephrops sibogae***

Fig. 8 large pincer

6a. Abdomen smooth, without grooves (Fig. 9a) . . . . . ***Metanephrops sibogae***

6b. Abdomen with narrow transverse grooves (Fig. 9b, c) . . . . . → ***7***

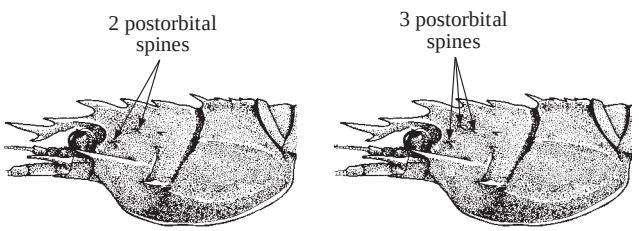


a) ***Metanephrops sibogae*** **b)** ***Metanephrops thomsoni*** **c)** ***Metanephrops sinensis***

Fig. 9 abdomen (dorsal view)

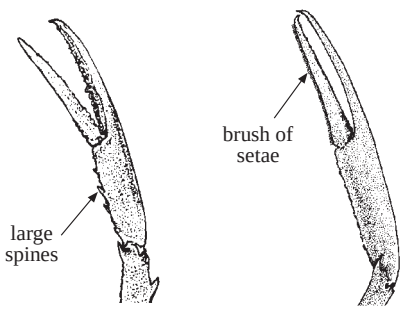
7a. Two postorbital spines present (Fig. 10a); large pincers with inner margin naked but often bearing some large spines (Fig. 11a); first abdominal segment generally without distinct transverse grooves (Fig. 9b) . . . . . ***Metanephrops thomsoni***

7b. Three postorbital spines present (Fig. 10b); large pincers without large spines along inner margin, lateral margin of movable fingers bearing a brush of setae (Fig. 11b); first abdominal segment usually with short, lateral, transverse grooves (Fig. 9c) . . . . . ***Metanephrops sinensis***



a) ***Metanephrops thomsoni*** **b)** ***Metanephrops sinensis***

Fig. 10 carapace (lateral view)



a) ***Metanephrops thomsoni*** **b)** ***Metanephrops sinensis***

Fig. 11 large pincer

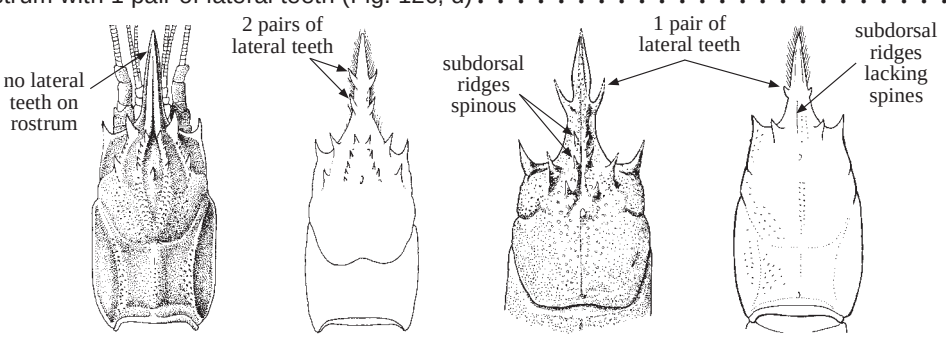
Key to the species of *Nephropsis* occurring in the area

1a. Rostrum without lateral teeth (Fig. 12a) . . . . . ***Nephropsis ensirostris***

1b. Rostrum with lateral teeth (Fig. 12b-d) . . . . . → ***2***

2a. Rostrum with 2 pairs of lateral teeth (Fig. 12b) . . . . . → ***3***

2b. Rostrum with 1 pair of lateral teeth (Fig. 12c, d) . . . . . → ***4***



a) ***Nephropsis ensirostris*** **b)** ***Nephropsis sulcata*** **c)** ***Nephropsis serrata*** **d)** ***Nephropsis stewarti***

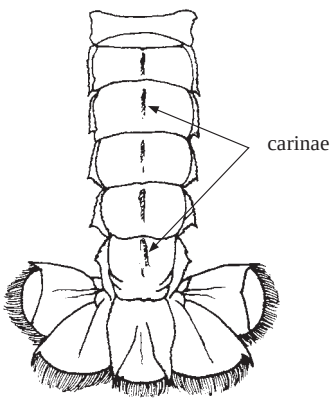
Fig. 12 carapace (dorsal view)

3a. Abdomen with a median longitudinal carina (Fig. 13) . . . . . ***Nephropsis sulcata***
3b. Abdomen without a median longitudinal carina . . . . . ***Nephropsis suhmi***

4a. Basal part of telson with an erect dorsal spine (Fig. 14a) . . . . . ***Nephropsis acanthura***
4b. Basal part of telson without an erect dorsal spine (Fig. 14b) . . . . . → ***5***

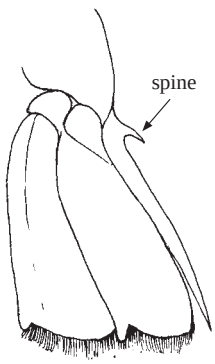
5a. Abdomen with a median longitudinal carina . . . . . ***Nephropsis holthuisi***
5b. Abdomen without a median longitudinal carina . . . . . → ***6***

6a. Subdorsal ridges of carapace spinose (Fig. 12c) . . . . . ***Nephropsis serrata***
6b. Subdorsal ridges of carapace lacking spines (Fig. 12d) . . . . . ***Nephropsis stewarti***

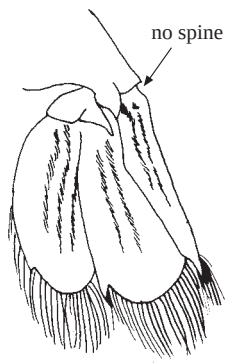


abdomen (dorsal view)

Fig. 13 ***Nephropsis sulcata***



a) ***Nephropsis acanthura***



b) ***Nephropsis holthuisi, N. serrata, N. stewarti***

Fig. 14 tail fan (lateral view)

List of species occurring in the area

The symbol 🦐 is given when species accounts are included.

🦐 *Acanthacaris tenuimana* Bate, 1888

🦐 *Metanephrops andamanicus* (Wood-Mason, 1891)
Metanephrops arafurensis (De Man, 1905)
🦐 *Metanephrops australiensis* (Bruce, 1966)
🦐 *Metanephrops neptunus* (Bruce, 1965)
🦐 *Metanephrops sibogae* (De Man, 1916)
🦐 *Metanephrops sinensis* (Bruce, 1966)
🦐 *Metanephrops thomsoni* (Bate, 1888)
🦐 *Metanephrops velutinus* Chan and Yu, 1991

Nephropsis acanthura Macpherson, 1990
Nephropsis ensirostris Alcock, 1901
Nephropsis holthuisi Macpherson, 1993
Nephropsis serrata Macpherson, 1993
🦐 *Nephropsis stewarti* Wood-Mason, 1873
Nephropsis suhmi Bate, 1888
Nephropsis sulcata Macpherson, 1990

References

Chan, T.Y. and H.P. Yu. 1993. *The Illustrated lobsters of Taiwan*. Taipei, SMC Publishing Inc., 248 p.

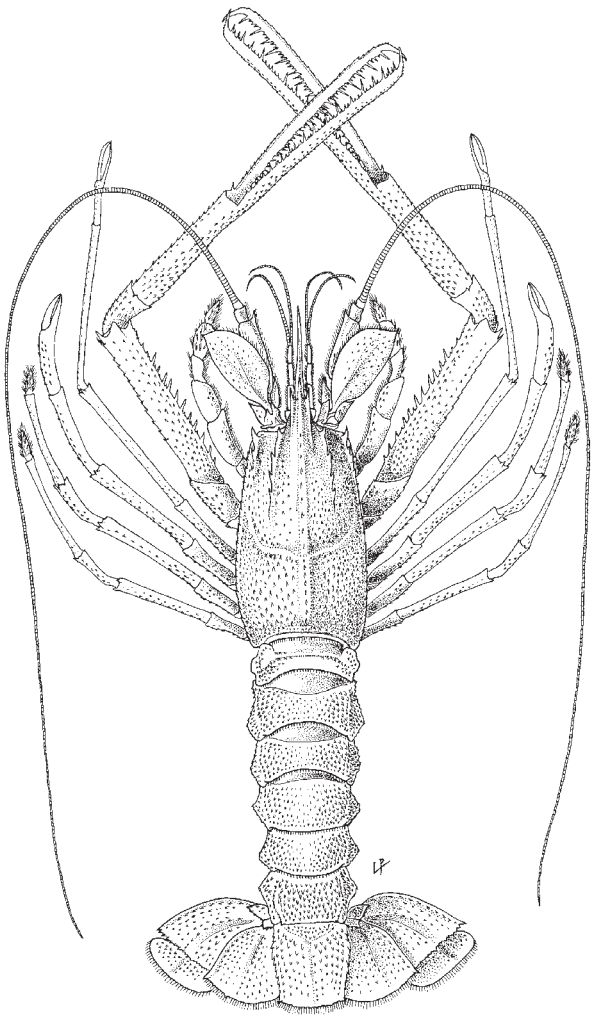
Holthuis, L.B. 1991. FAO species catalogue. Vol. 13. Marine lobsters of the world. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fish. Synop*., 125(13):1-292.

Acanthacaris tenuimana Bate, 1888

Frequent synonyms / misidentifications: *Phoberus tenuimanus* Bate, 1888; *P. caecus sublevis* Wood-Mason and Alcock, 1891; *Acanthacaris opipara* Burukovsky and Musy, 1976; *Phoberus brevirostris* Thung and Wang, 1985 / None.

FAO names: En - Prickly deep-sea lobster; **Fr** - Langoustine spinuleuse; **Sp** - Cigala raspa.

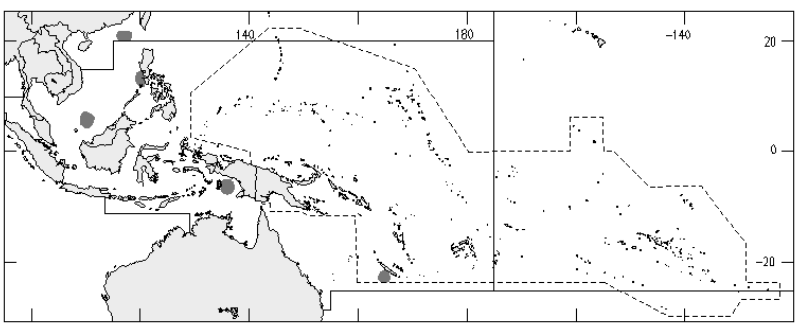
Diagnostic characters: A large lobster. Body tubular, **entirely covered with small spines and sharp tubercles, but not covered with soft pubescence**. Carapace with a well-developed rostrum. **Eyes minute, cornea lacking pigmentation**. Antennae long and thread-like, **antennal scale well developed. First 3 pairs of legs ending in pincers; first pair equal-sized, very slender and longer than body, with pincers bearing long teeth along cutting edges**; second pair of legs much longer but less spiny than third pair. Tail fan entirely hardened; posterior margin of telson truncate. **Colour:** uniform delicate pink.



Size: Maximum carapace length 21 cm (total length to 40 cm), ovigerous females between 11 and 19 cm carapace length.

Habitat, biology, and fisheries: Found in deep water at depths from 600 to 1 670 m on muddy bottoms where it lives in burrows. This species is occasionally taken during exploratory trawling operations in deep water, but only in very small quantities. Due to its large size it may have some fishery potential once suitable fishing grounds are found.

Distribution: Indo-West Pacific from the eastern coast of Africa to Japan, the East and South China Sea, Indonesia, and New Caledonia.



Metanephrops sibogae (De Man, 1916)

Frequent synonyms / misidentifications: *Nephrops sibogae* De Man, 1916 / None.

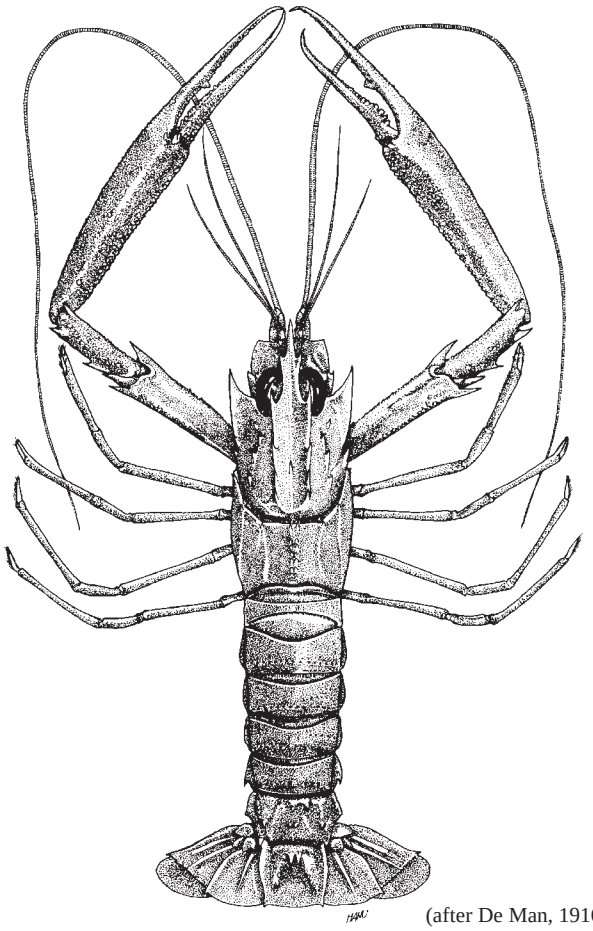
FAO names: En - Siboga lobster.

Diagnostic characters: A small to medium-sized lobster. Body cylindrical and naked. **Carapace spiny, but not uniformly so**; rostrum well developed, armed with lateral and ventral teeth only; **4 pairs of postrostral teeth and 3 postorbital spines present. Eyes large and pigmented**. Antennae long and thread-like, **antennal scale present**. First 3 pairs of legs ending in pincers; **first pair enlarged and long; pincers feebly ridged and finely granular, their inner margin without pubescence but occasionally bearing a few large spines. Abdomen naked and smooth, without distinct sculptures**. Tail fan entirely hardened; posterior margin of telson broadly convex. **Colour: body uniformly orange-pink**.

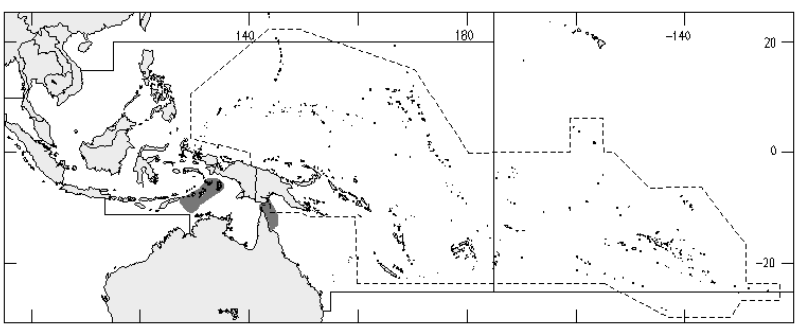
Size: Maximum body length 18 cm, commonly to about 13 cm.

Habitat, biology, and fisheries: At depths from 246 to 320 m on soft sandy sediment; probably lives in burrows. Of minor importance to fisheries in northern Australia, where it is trawled commercially during the northern prawn fishery closed seasons. Also taken in a fair amount during experimental trawling operations in southern Indonesia.

Distribution: Only known from southern Indonesia and northern Australia.



(after De Man, 1916)



Metanephrops thomsoni (Bate, 1888)

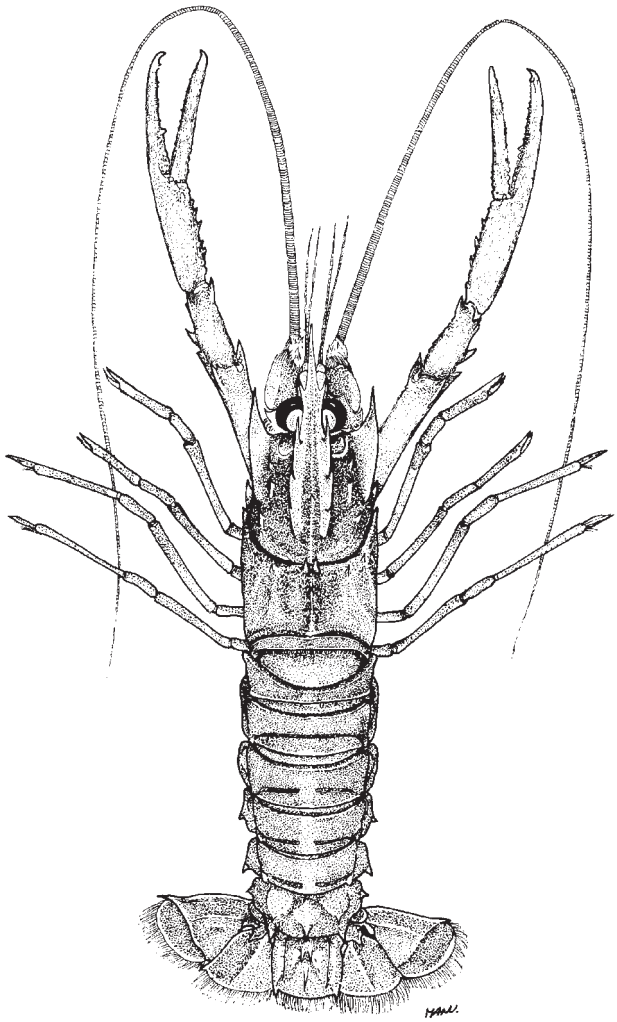
Frequent synonyms / misidentifications: *Nephrops thomsoni* Bate, 1888 / None.

FAO names: En - Red-banded lobster.

Diagnostic characters: A small to medium-sized lobster. Body cylindrical and naked. **Carapace spiny, but not uniformly so**; rostrum well developed, armed with lateral and ventral teeth only; **3 pairs of postrostral teeth and only 2 postorbital spines present. Eyes large and pigmented**. Antennae long and thread-like, **antennal scale present**. First 3 pairs of legs ending in pincers; **first pair enlarged and long; pincers feebly ridged and finely granular, inner margin without pubescence but often bearing some large spines. Abdomen without median longitudinal carina and weakly sculptured; transverse grooves very shallow (nearly absent on first segment) and broadly interrupted medially, longitudinal grooves absent**. Tail fan entirely hardened; posterior margin of telson broadly convex. **Colour: body almost uniformly orange-pink**; post-orbital margin, tips of fingers of large pincers, margins of abdominal pleura, and posterior margin of tail fan whitish. Eyes dark brown. **Eggs blue**, becoming dirty white when eye spots appear.

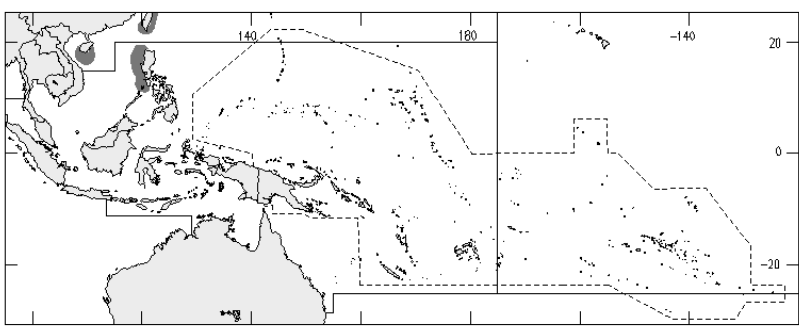
Size: Maximum body length 15 cm, commonly between 9 and 12 cm.

Habitat, biology, and fisheries: On sandy mud bottoms at depths from 50 to 509 m. Caught in the Philippines by lobster cages called "Panak", but not in large quantities and only occasionally sold in local fish markets. Often taken on the basis of exploratory deep-water trawling around the northwest coasts of the Philippines and may therefore have more fishery potential in the area.



(after Chan and Yu, 1988)

Distribution: Western Pacific from Japan, the Ryukyu Islands, the East and South China Sea, Taiwan Province of China, and the Philippines.



Remarks: The common name "Red-banded lobster" refers to the presence of red bands on the first pair of legs. However, specimens known from the area (i.e. the Philippines) differ from those found elsewhere in its range by the lack of these red bands.

Nephropsis stewarti Wood-Mason, 1873

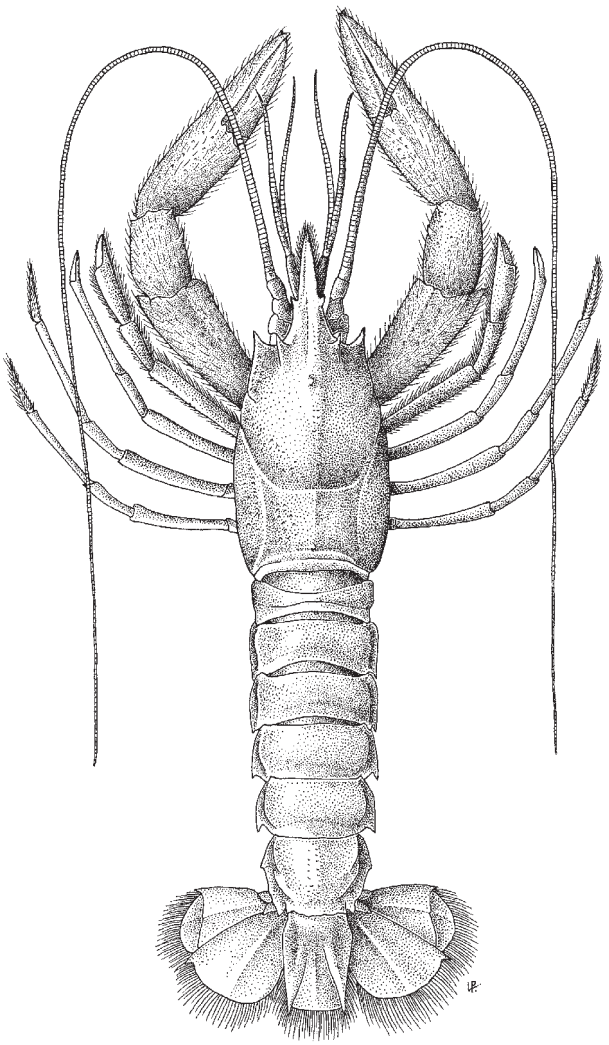
Frequent synonyms / misidentifications: None / None.

FAO names: En - Indian Ocean lobsterette; **Fr** - Langoustine indienne; **Sp** - Cigala del Oceano Indico.

Diagnostic characters: A small to medium-sized lobster. Body cylindrical, **covered with thick fur**. Carapace with a well-developed **rostrum armed with 1 pair of lateral spines; anterior carapace bearing only supraorbital and antennal spines; subdorsal ridges without spines. Eyes minute, cornea lacking pigmentation**. Antennae long and thread-like; **antennal scale absent**. First 3 pairs of legs ending in pincers; **first pair rather stout and very hairy. Abdomen without median longitudinal carina**, all pleura sharply pointed ventrally but **lacking spines on front edges**. Tail fan entirely hardened; **outer blade showing a transverse fissure; telson with a pair of fixed posterolateral spines but unarmed dorsally**. **Colour: body whitish and covered with thick grey fur**. Anterior carapace including rostrum, ventral surface, mouth parts and tail fan pink-red. Antennal and antennular flagella orange. Legs orange-pink, with distal segments reddish; large pincers sometimes slightly orange. Eggs white.

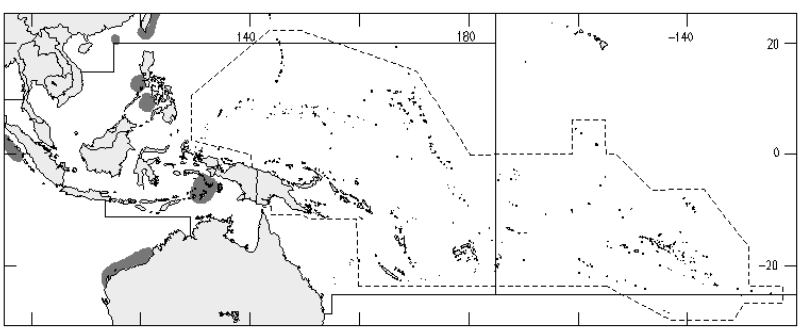
Size: Maximum known body length about 20 cm, commonly between 10 and 15 cm.

Habitat, biology, and fisheries: Deep sea at depths from 170 to 1 060 m, mostly between 500 and 750 m on soft muddy substrate. A common bycatch of deep-water trawling operations throughout its range. Although it is probably the largest and most common species of the genus, its quantities are at present too small for significant interest to fisheries.



(after Alcock and Anderson, 1896)

Distribution: Widely distributed in the Indo-West Pacific, from eastern Africa to Japan, the Philippines, Indonesia, and northwestern Australia.

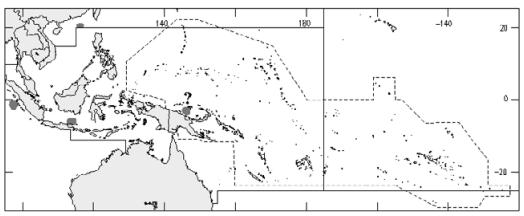


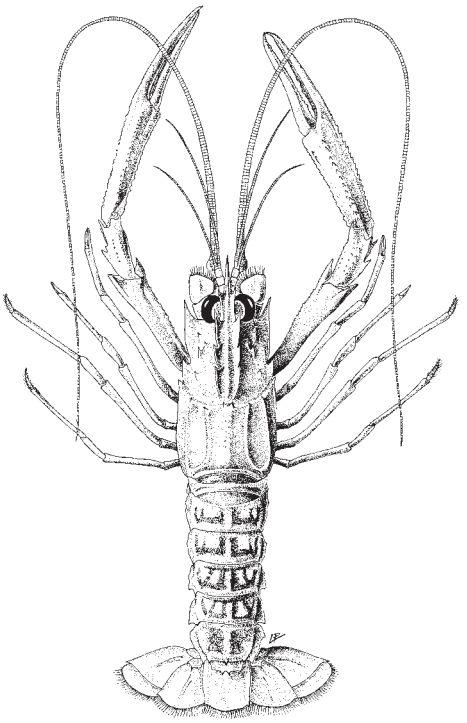
Metanephrops andamanicus (Wood-Mason, 1891)

NEA

En - Andaman lobster; **Fr** - Langoustine andamane; **Sp** - Cigala de Andamán.

Maximum total body length 20 cm, commonly between 15 and 18 cm. On hard mud in depths from 250 to 750 m, but mostly from 300 to 450 m; probably lives in burrows. In the Western Central Pacific, so far only taken in very small numbers during experimental deep-water trawling operations, but its high abundance just north of the Philippines in the South China Sea may indicate that it has some fishery potential in the area. Indo-West Pacific from eastern Africa to the Andaman Sea, the South China Sea, Indonesia, and perhaps also Papua New Guinea.



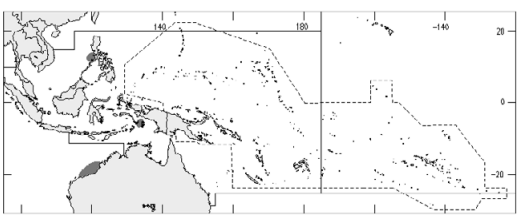


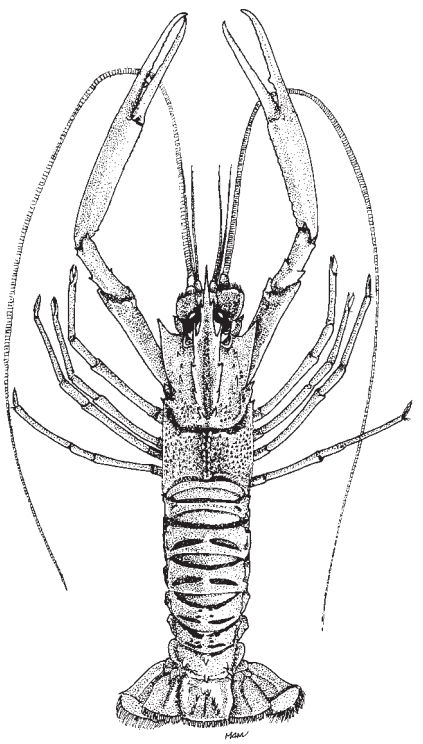
(after Alcock, 1894)

Metanephrops australiensis (Bruce, 1966)

En - Northwest lobster.

Maximum total body length 18 cm. At depths from 418 to 500 m, on firm sediments such as *Globigerina* ooze; probably lives in burrows. In the area, so far only taken in few numbers during experimental deep-water trawling operations. However, as this lobster is the main component of the commercial *Metanephrops* fishery in northwestern Australia, more knowledge of its fishing grounds may reveal that it has also some fishery potential elsewhere in the Western Central Pacific. Known from the Philippines, Indonesia, and northwestern Australia.



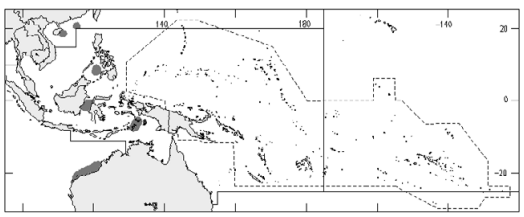


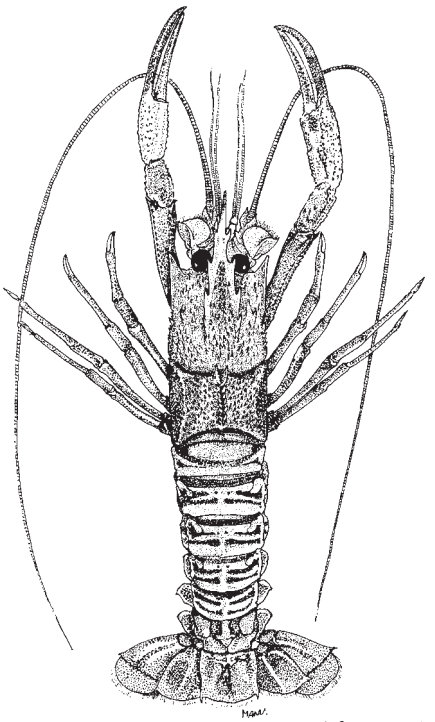
(after Bruce, 1966)

Metanephrops neptunus (Bruce, 1965)

En - Neptune lobster.

Maximum total body length 25 cm; probably the largest species of the genus. On soft bottoms at depths to 940 m, mostly more than 500 m; probably lives in burrows. Occasionally caught in rather small quantities during deep-water trawling operations. With the development of deep-sea fishing gear this lobster is potentially very attractive for fisheries, due to its large size. Western Pacific from the South China Sea to the Philippines, Indonesia, and northwestern Australia.



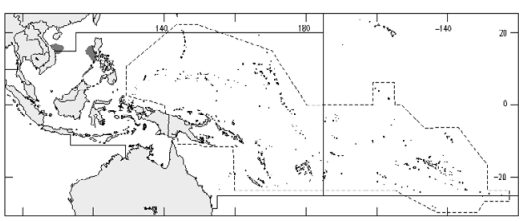


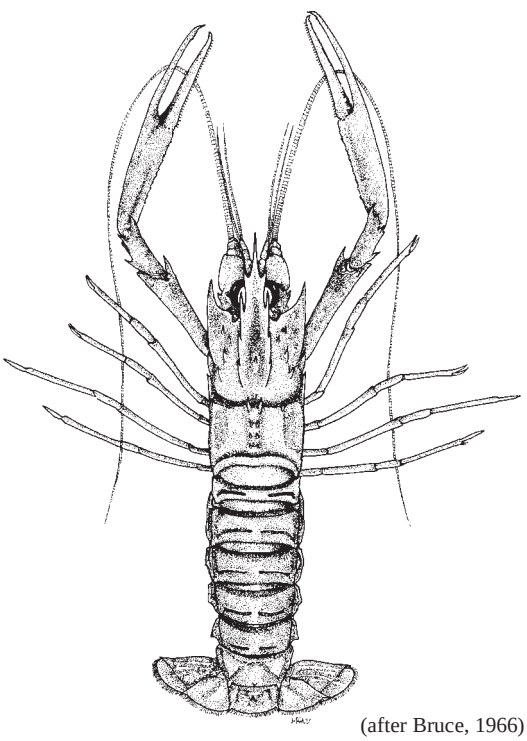
(after Bruce, 1965)

Metanephrops sinensis (Bruce, 1966)

En - China lobster.

Maximum total body length 15 cm. Found on muddy bottoms in deep water at depths from 203 to 407 m, sometimes with shells. Not fished commercially at present, but often caught in large numbers during experimental deep-water trawling operations around the Philippines and may therefore have some fishery potential in the area. So far only known from the South China Sea and the northwestern coast of the Philippines.



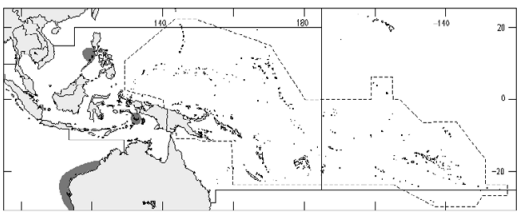


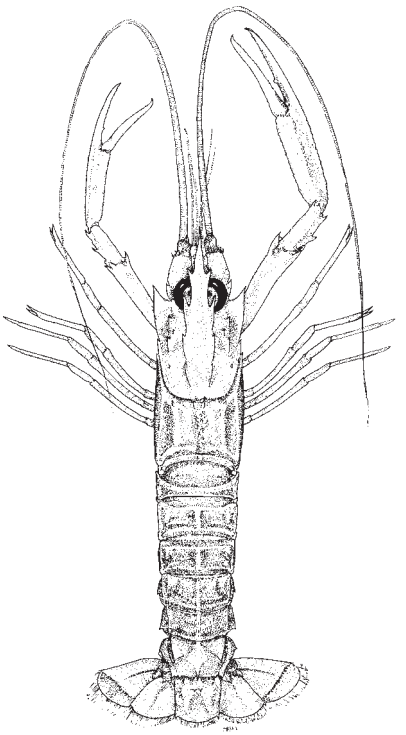
(after Bruce, 1966)

Metanephrops velutinus Chan and Yu, 1991

En - Velvet lobster.

Maximum carapace length 8.6 cm. In deep water at depths of 238 to 702 m, mostly between 350 and 450 m on hard muddy substrate. A commercial species in northwestern Australia, but not yet fished in the area. Often caught on the basis of exploratory deep-water trawling operations around the Philippines and Indonesia and may therefore also have some fishery potential in area. So far only found in the Philippines, Indonesia, and Western Australia.





(after Chan and Yu, 1991)

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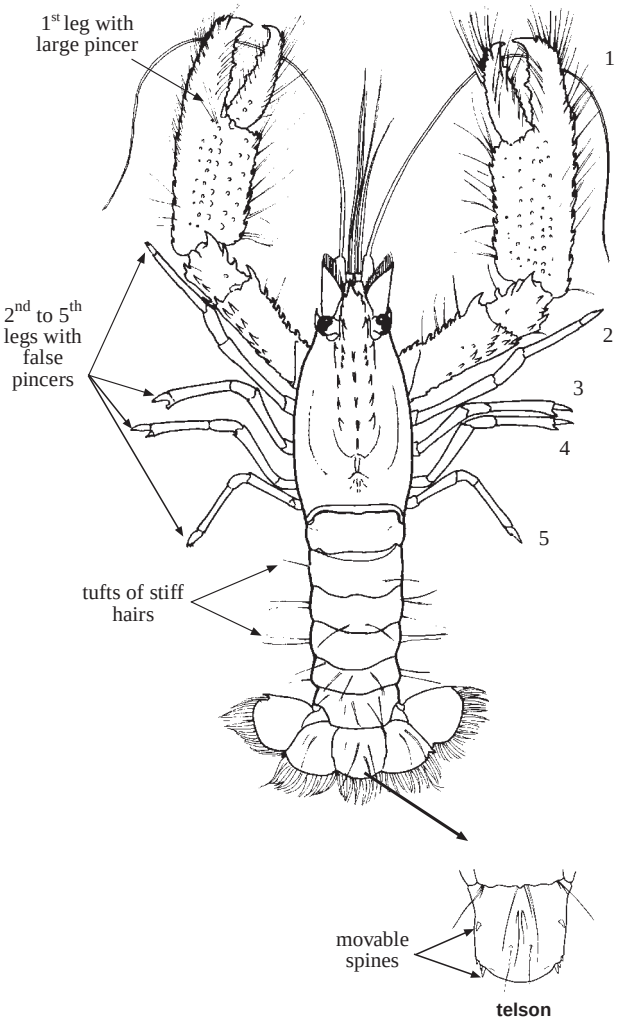
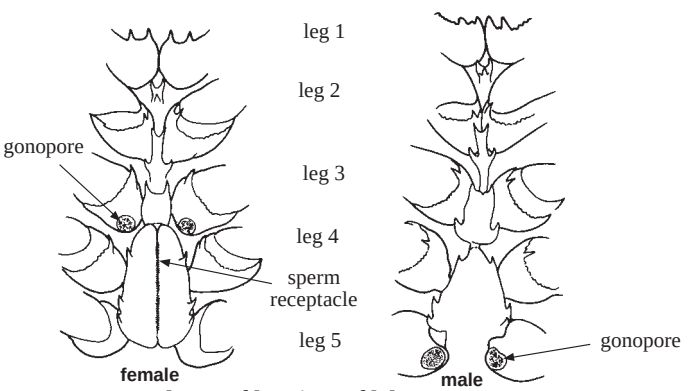
ENOPLOMETOPIDAE

Reef lobsters

Diagnostic characters: Moderate- to small-sized crustaceans. Body cylindrical, **distributed with tufts of long stiff hairs**. Carapace (or "head") with a well-developed rostrum. **Eyes well developed and black**. Antennae long and thread-like, **antennal scale with inner margin unarmed and curved. First pair of legs greatly enlarged and forming true pincers; second to fifth legs slender and ending in false pincers** (less distanct in posterior legs). Abdomen well developed and powerful, **pleura more or less rounded and sometimes bearing strong spines**. Tail fan entirely hardened; **telson bearing movable spines**, its posterior margin broadly convex. **Colour: brilliant and attractive** - orange-red, red, purple and/or white, **with conspicuous spots on body, sometimes also with stripes**.



Habitat, biology, and fisheries: Reef lobsters usually live in coral and rocky reefs or in deeper parts of reef slopes at depths of 30 cm to 300 m. As in nephropids, the sexes can be determined by the position of the gonopores at the bases of legs. In addition, the first pleopods ("legs" of the abdomen) of males are large and leaf-like (thin but rigid), while they are small and thread-like in females. A large sperm receptacle process is present on the thoracic sternum between the last 3 legs in females. The eggs are small (about 0.5 mm in diameter) and numerous. They hatch within a short time (about 6 days for *Enoplometopus debelius*) but the larvae are very difficult to rear. Since reef lobsters are nocturnal and shy, they are very difficult to catch. However, they are often highly valued in the aquarium trade for their attractive coloration. Reef lobsters presumably originating from Indonesia or the Philippines can be found in aquarium shops of other Asian countries, Europe, and the USA. Therefore, species accounts are provided here for the more common species.



bases of legs in reef lobsters

first pleopod of male (*Enoplometopus*)

Similar families occurring in the area

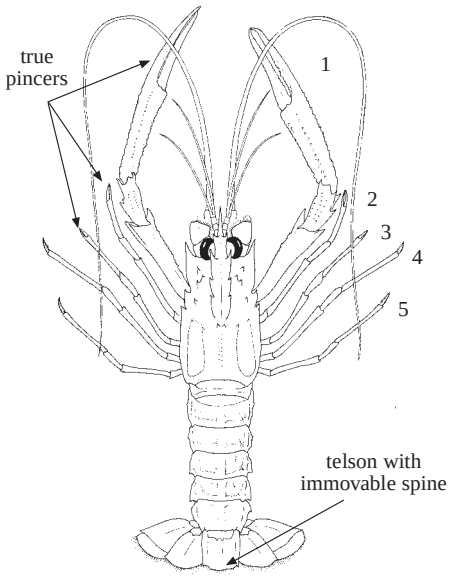
Nephropidae: body almost naked or covered with thick fur; first 3 pairs of legs ending in true pincers, with the first pair much larger than the others; telson only bearing immovable spines.

Thaumastochelidae: body slightly depressed dorsoventrally; eyes strongly reduced, cornea lacking pigmentation; antennal scale bearing several large teeth along inner margin; first 3 pairs of legs (occasionally also fifth legs) ending in true pincers, first pair large but very unequal; abdominal pleura short, quadrangular and without large ventral tooth; telson unarmed.

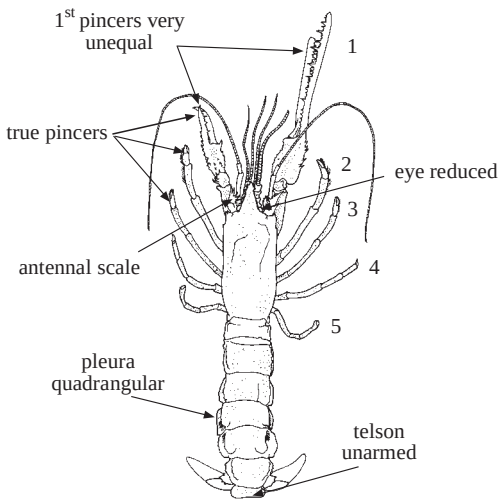
Polychelidae: eyes small, cornea lacking pigmentation; carapace box-like, rostrum absent or rudimentary; first 4 or all legs ending in true pincers, first pair long and slender; telson pointed.

Glypheidae: body somewhat flattened dorsoventrally; eyes inserted on a median elevation of cephalon; first 2 legs forming false pincers with first pair very strong, third leg simple.

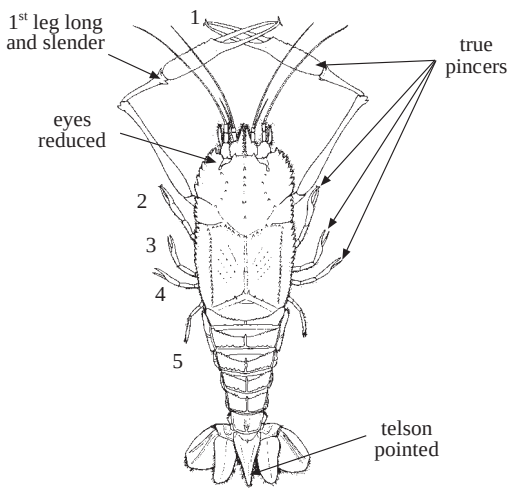
Synaxidae: body somewhat flattened dorsoventrally and uniformly hairy; legs simple and without pincers, first pair much more robust than others; antennae rather thick and whip-like, shorter than carapace; posterior half of tail fan soft and flexible.



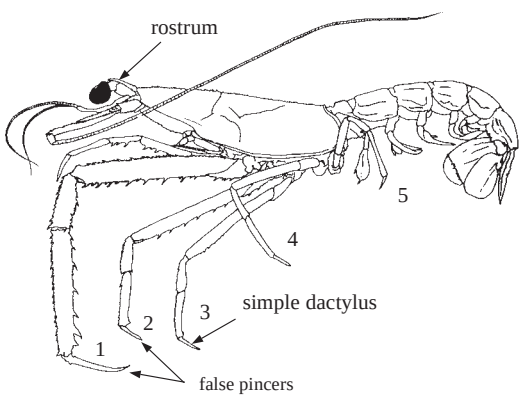
Nephropidae



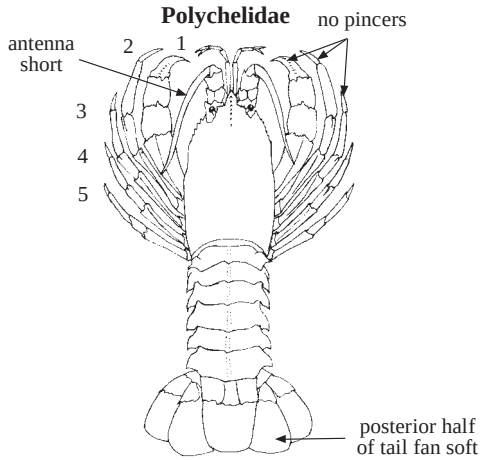
Thaumastochelidae



Polychelidae



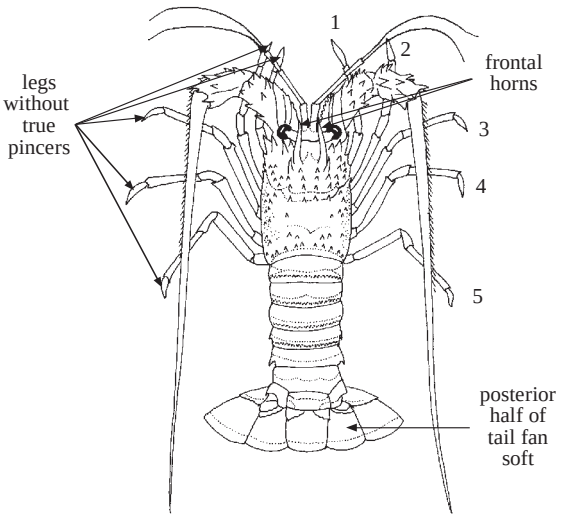
Glypheidae



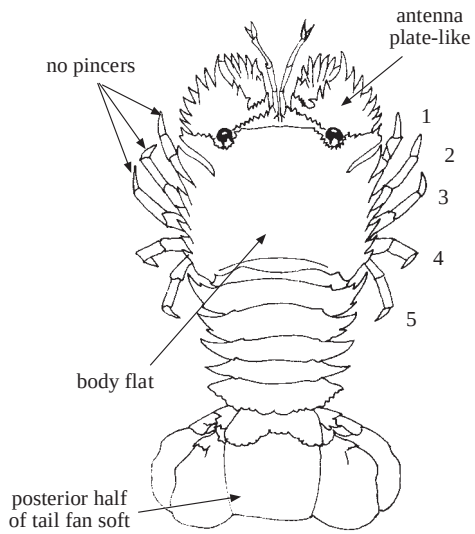
Synaxidae

Palinuridae: body tubular or slightly flattened dorsoventrally; rostrum absent or reduced to a small spine; carapace spiny and with a pair of large frontal horns above eyes; antennal flagella rather thick and very long, whip-like or spear-like; legs without true pincers and first pair generally not enlarged (except in *Justitia*); posterior half of tail fan soft and flexible.

Scyllaridae: body strongly flattened dorsoventrally; rostrum absent or minute; eyes enclosed by distinct orbits; legs without true pincers and none of them enlarged; antennae plate-like; posterior half of tail fan soft and flexible.



Palinuridae



Scyllaridae

Key to the species of Enoplometopidae occurring in the area

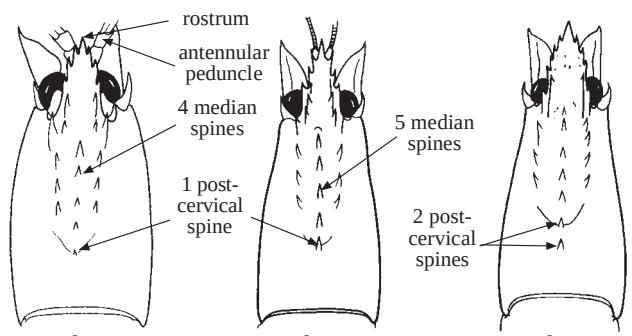
Note: since reef lobsters generally have particular colour patterns, live specimens of the various species are easily distinguished by their coloration.

1a. Carapace with or without 1 postcervical spine (Fig. 1a, b); abdominal pleura broadly convex, with a blunt posterolateral angle (Fig. 2a); lateral margins of telson armed with 1 pair of median spines (Fig. 3a) . . . . . → ***2***

1b. Carapace with 2 postcervical spines (Fig. 1c); abdominal pleura bearing a strong tooth (Fig. 2b); lateral margins of telson armed with 2 pairs of median spines (Fig. 3b) . . . . . → ***5***

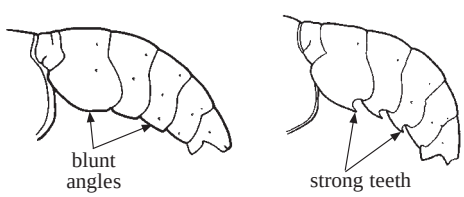
2a. Rostrum bearing 2 pairs of lateral teeth; body orange-red and with colour markings mainly limited to lower carapace and posterior margins of abdominal segments . . . . . ***Enoplometopus chacei***

2b. Rostrum bearing 3 or more pairs of lateral teeth; colour spots and/or stripes present on whole body . . . . . → ***3***



a) *Enoplometopus daumi* **b) *Enoplometopus occidentalis*** **c) *Enoplometopus holthuisi***

Fig. 1 carapace (dorsal view)

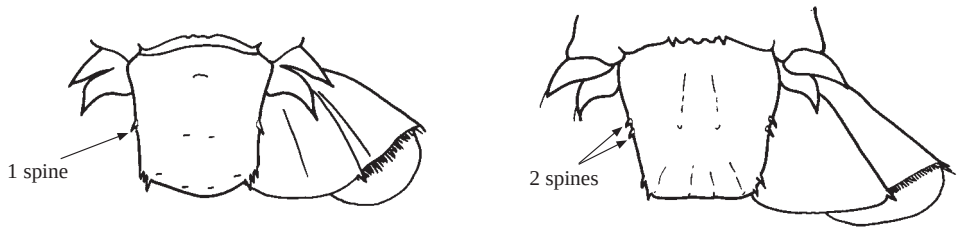


a) *Enoplometopus occidentalis* **b) *Enoplometopus holthuisi***

Fig. 2 abdomen (lateral view)

3a. Carapace with 5 median spines; rostrum reaching to or beyond antennular peduncle (Fig. 1b); colour orange-red with some conspicuous white spots on abdomen, fewer on carapace . . . . . ***Enoplometopus occidentalis***

3b. Carapace with 4 median spines; rostrum reaching to about middle of distal segment of antennular peduncle (Fig. 1a); colour mainly purplish . . . . . → ***4***



a) ***Enoplometopus occidentalis*** **b)** ***Enoplometopus holthuisi***

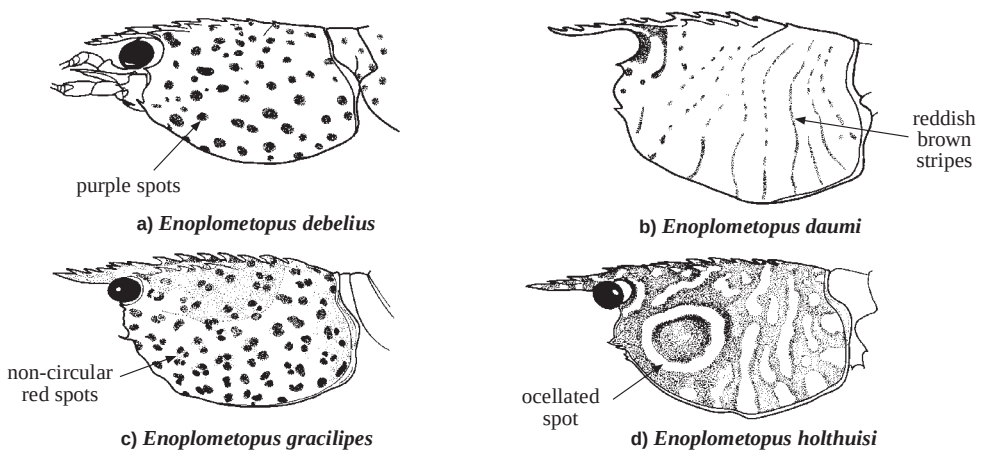
Fig. 3 tail fan (dorsal view)

4a. Postcervical tooth distinct; body whitish, almost uniformly covered with small purple dots (Fig. 4a) . . . . . ***Enoplometopus debelius***

4b. Postcervical tooth rather indistinct; carapace with vertical reddish brown stripes; abdomen provided with many white spots (Fig. 4b). . . . . ***Enoplometopus daumi***

5a. Body pale pink and almost uniformly covered with small non-circular red spots (Fig. 4c) . . . . . ***Enoplometopus gracilipes***

5b. Body reddish; lateral carapace with a large ocellated spot and some vertical white stripes (Fig. 4d); abdomen provided with many white spots . . . . . ***Enoplometopus holthuisi***



a) ***Enoplometopus debelius*** **b)** ***Enoplometopus daumi***

c) ***Enoplometopus gracilipes*** **d)** ***Enoplometopus holthuisi***

Fig. 4 carapace (lateral view)

List of species occurring in the area

The symbol ➽ is given when species accounts are included.

Enoplometopus chacei Kensley and Child, 1986
➽ *Enoplometopus daumi* Holthuis, 1983
➽ *Enoplometopus debelius* Holthuis, 1983
Enoplometopus gracilipes (De Saint Laurent, 1988)
➽ *Enoplometopus holthuisi* Gordon, 1968
➽ *Enoplometopus occidentalis* (Randall, 1840)

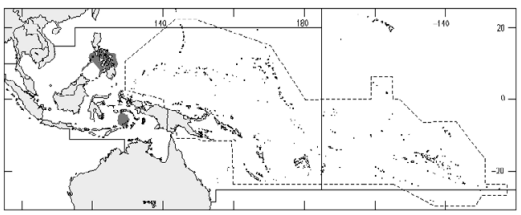
Reference

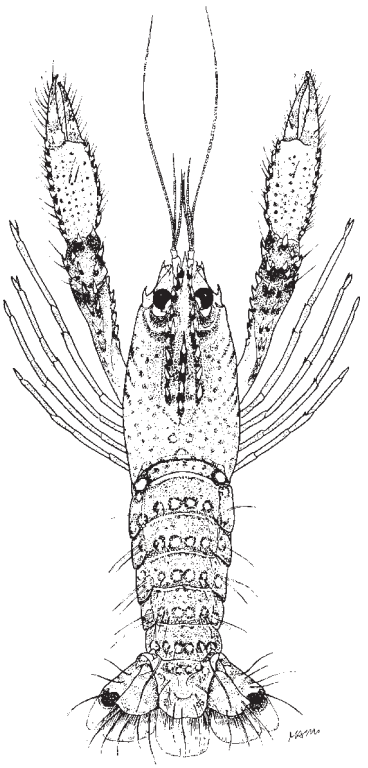
Holthuis, L.B. 1983. Notes on the genus *Enoplometopus*, with descriptions of a new subgenus and two new species (Crustacea Decapoda, Axiidae). *Zool. Med. Leiden*, 56(22):281-298.

Enoplometopus daumi Holthuis, 1983

En - Striped reef lobster.

Carapace length of adults between 1.3 and 2.6 cm, body length between 4 and 6 cm. Shallow coral reef areas. Shy, generally hide in rock cavities, often with only the pincers visible. Territorial and extremely aggressive against members of the same species except during mating. Collected by rotenone and probably also by divers. Not common, but a favourite for the aquarium trade because of its small size and special coloration. Live specimens are probably regularly exported from the Philippines and Indonesia. With certainty only known from Indonesia and the Philippines.

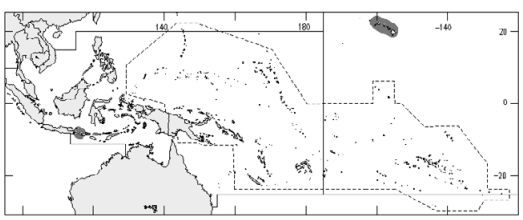


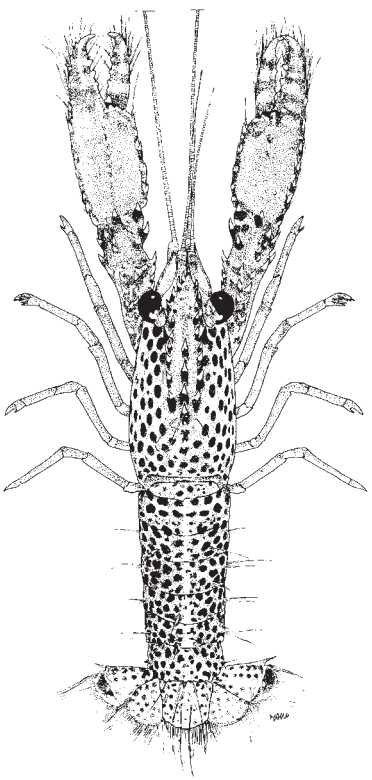


Enoplometopus debelius Holthuis, 1983

En - Violet-spotted reef lobster.

Carapace length of adults between 2.2 and 2.4 cm, body length reaching 5 cm or more. On reef slopes in depths from 15 to 25 m. Collected by hand net during night diving. Appears to be slightly less aggressive than other species of the genus. An uncommon species that is sold at high prices in the aquarium trade for its attractive coloration. Specimens are mostly exported from Indonesia. Western Pacific from Indonesia to Hawaii and possibly Japan.

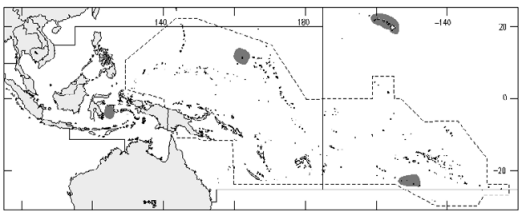


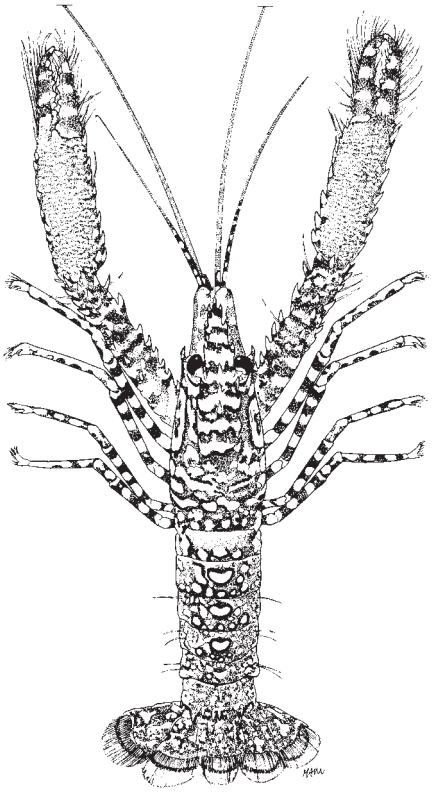


Enoplometopus holthuisi Gordon, 1968

En - Bullseye reef lobster.

Maximum body length about 12 cm. Lives on rocky reef slopes and deeper parts of reefs at depths of about 20 m to 80 m. Less shy and more aggressive than other species of the genus. Occasionally found in the aquarium trade and sold at a high price. Probably caught by night diving. Western Pacific from the Philippines, Indonesia, Eniwetok Atoll (Marshall Islands), Austral Islands, and Hawaii.

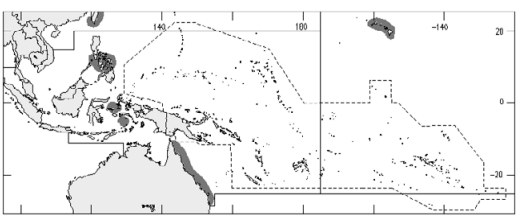


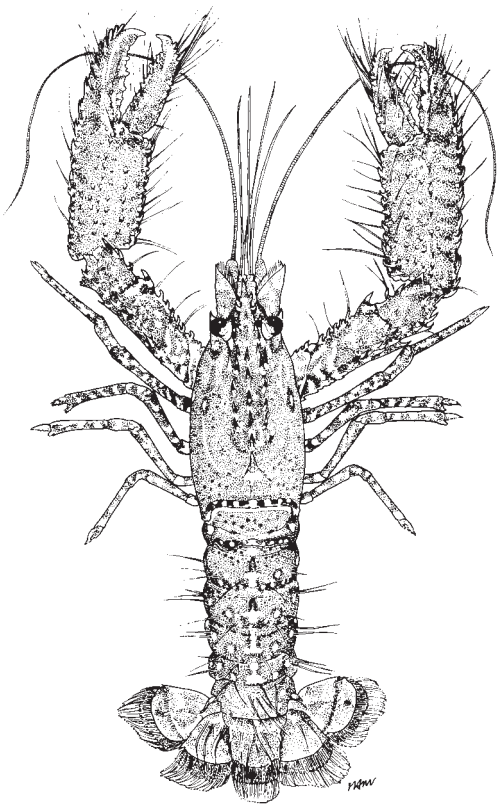


Enoplometopus occidentalis (Randall, 1840)

En - Red reef lobster.

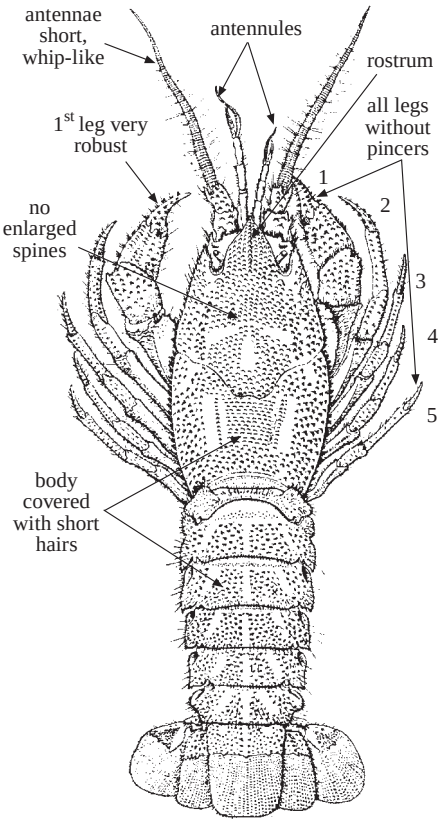
Body length between 4 and 14 cm. Inhabits coral or rocky reefs and often found in deeper areas at the fringe of reefs, at depths of a few meters to about 100 m. Nocturnal and shy, usually found hiding in crevices and rocks. Very aggressive against members of the same species except during mating. Probably the most common species of the genus but still rather rare and only occasionally caught by divers collecting spiny lobsters or aquarium fishes. Small specimens are occasionally found in the aquarium trade and sold at a high price. Indo-West Pacific from eastern Africa to Japan, eastern Australia, and Hawaii.





SYNAXIDAE

Furry lobsters



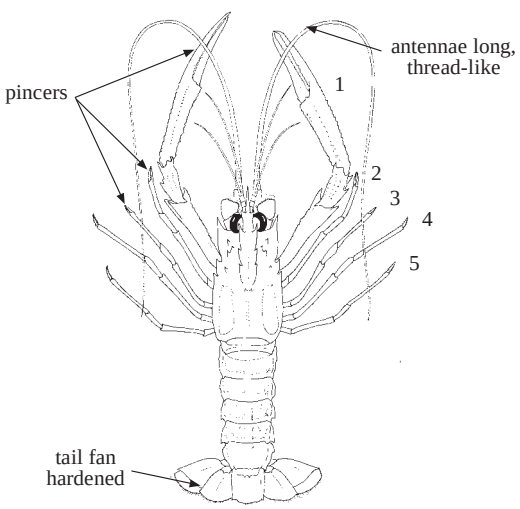
Diagnostic characters: Moderate- to small-sized crustaceans. Body somewhat flattened dorsoventrally and **covered with a dense fur of short hair. Carapace long and laterally angular**, covered with small rounded granules only, **without enlarged spines; rostrum broad and flat triangular or rounded. Eyes small but distinct. Antennae rather thick and whip-like, but shorter than carapace; antennulae with flagella shorter than peduncle**; stridulating organ sometimes present between bases of antennae and antennular plate. **Legs without pincers but first pair much heavier than others.** Both abdomen and tail fan well developed and powerful, **posterior half of tail fan soft and flexible; abdomen hairy, with a low smooth keel along dorsal midline, but without transverse grooves. Colour:** uniformly orange to bright orange or orange-red. Eyes black.

Habitat, biology, and fisheries: This family contains only 2 genera and a total of 2 species in the Western Central Pacific. The shallow water genus *Palinurellus* is smaller (maximum total length about 20 cm) than the slightly larger deep-water genus *Palibythus* (maximum total length 27 cm). Both genera live on hard bottom and are difficult to catch. Furry lobsters generally occur in few numbers and have therefore a very limited commercial potential. However, the "exotic" appearence and bright coloration of *Palinurellus* species has caught the attention of the tropical marine aquarium trade. Specimens presumably originating from the Philippines and Indonesia are occasionally sold for high prices in aquarium shops of other Asian countries, Europe, and the USA. The sexes of furry lobsters can be determined by the position of the gonopores as in the other families of lobsters. Furthermore, the first pair of pleopods ("legs" of the abdomen) is absent in males but present in females.

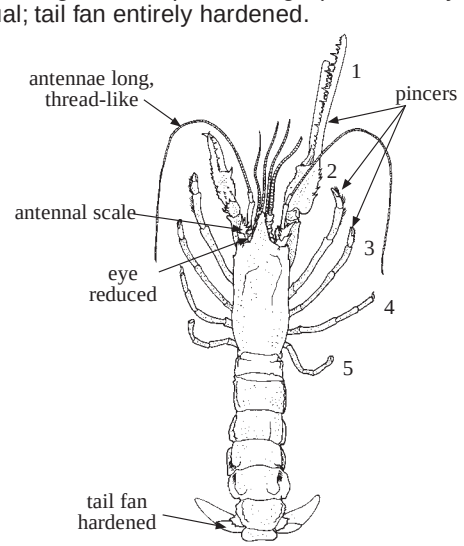
Similar families occurring in the area

Nephropidae: body tubular, almost naked or covered with thick fur; antennae very long and thread-like; first 3 pairs of legs ending in pincers, first pair greatly enlarged; tail fan entirely hardened.

Thaumastochelidae: eyes strongly reduced, cornea lacking pigmentation; antennae very long and thread-like, scale with several large teeth along inner margin; first 3 pairs of legs (occasionally also fifth legs) ending in pincers, first pair large but very unequal; tail fan entirely hardened.



Nephropidae



Thaumastochelidae

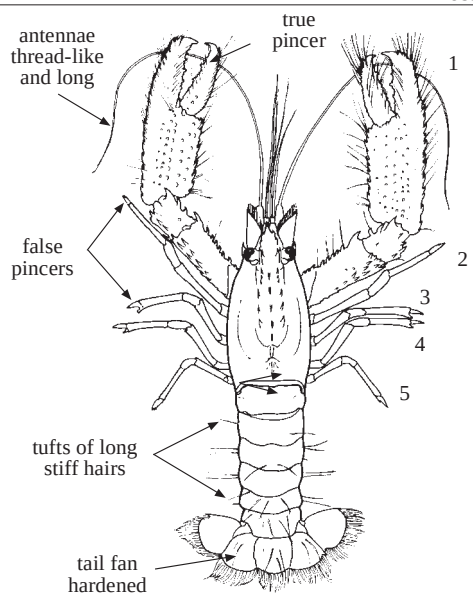
Enoplometopidae: body tubular, distributed with tufts of long stiff hairs; antennae very long and thread-like; first pair of legs enlarged and forming true pincer, second and third legs slender and ending in false pincers; tail fan entirely hardened.

Polychelidae: eyes small, cornea lacking pigmentation; rostrum absent or rudimentary; antennae thread-like and shorter than body; first 4 or all legs with pincers, first pair long and slender; tail fan entirely hardened, with telson pointed.

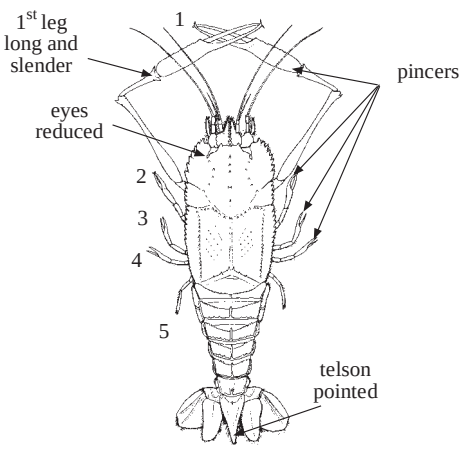
Glypheidae: eyes inserted on a median elevation of cephalon; antennae very long and thread-like; first 2 legs forming false pincers, with first pair very strong, third legs simple; uropods of tail fan entirely hardened.

Palinuridae: body naked or with few and scattered hairs; carapace spiny and with a pair of large frontal horns over eyes, but lacking a median rostrum or with rostrum greatly reduced; antennae very long and whip-like or spear-like; legs without pincers and first pair generally not enlarged (except in one species of *Justitia*).

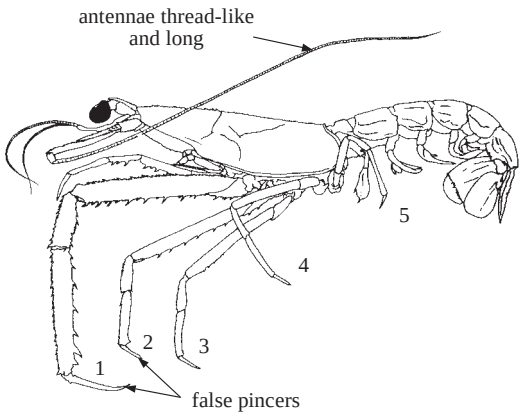
Scyllaridae: body strongly flattened dorsoventrally; rostrum absent or minute; antennae plate-like; legs without pincers and none of them enlarged.



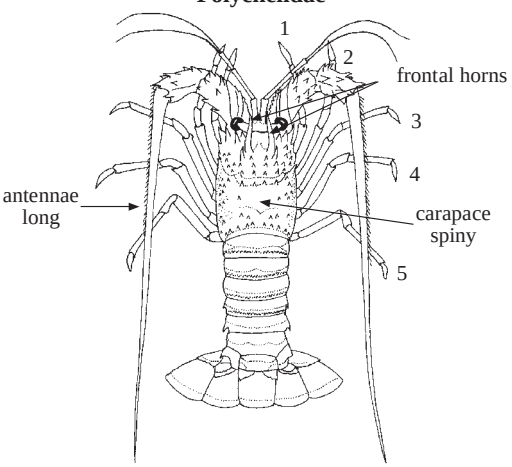
Enoplometopidae



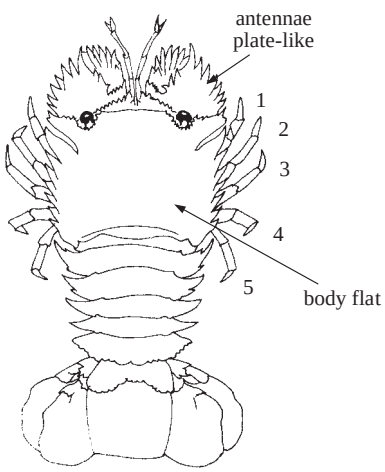
Polychelidae



Glypheidae



Palinuridae

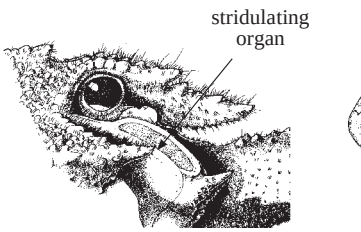


Scyllaridae

Key to the species of Synaxidae occurring in the area

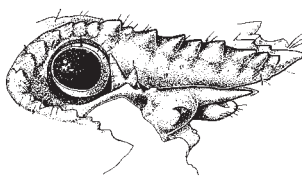
1a. Antennular plate with stridulating organ (Fig. 1a); rostrum transversely oval, wider than long; lateral margin of carapace with distinct teeth behind anterolateral tooth (Fig. 2a) . . . . . ***Palibythus magnificus***

1b. Antennular plate without stridulating organ (Fig. 1b); rostrum triangular, longer than wide; lateral margin of carapace without teeth behind anterolateral tooth (Fig. 2b) . . . . . ***Palinurellus wieneckii***



(from Davie, 1990)

a) *Palibythus magnificus*



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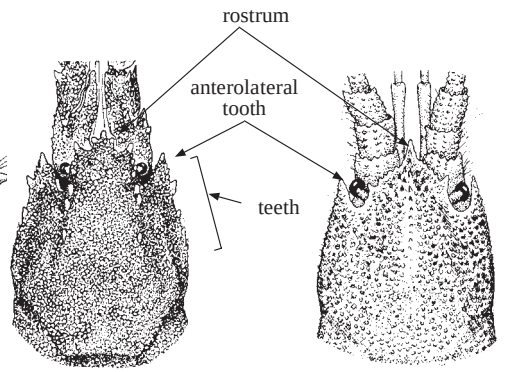
b) *Palinurellus wieneckii*

Fig. 1 lateral part of orbital region and antennular plate



(after Davie, 1990)

a) *Palibythus magnificus* **b) *Palinurellus wieneckii***

Fig. 2 anterior part of carapace

List of species occurring in the area

The symbol 🦐 is given when species accounts are included.

🦐 *Palibythus magnificus* Davie, 1990

🦐 *Palinurellus wieneckii* (De Man, 1881)

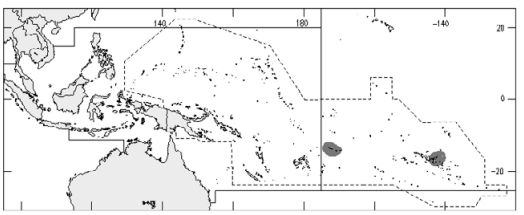
Reference

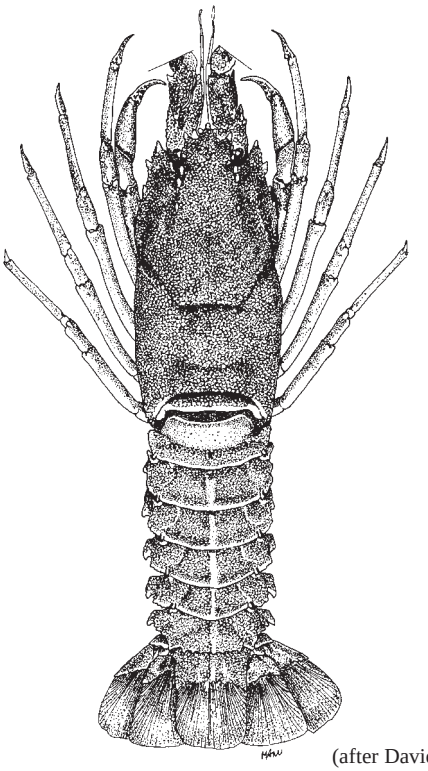
Holthuis, L.B. 1991. FAO species catalogue. Vol. 13. Marine lobsters of the world. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fish. Synop*., 125(13):1-292.

Palibythus magnificus Davie, 1990

En - Musical furry lobster.

Maximum body length about 27 cm. On rocky bottoms at depths between 90 and 300 m. Although this furry lobster is of a fair size, it is rare and so far only caught by experimental trapping. Only known from Western Samoa and Tuamotu Archipelago.



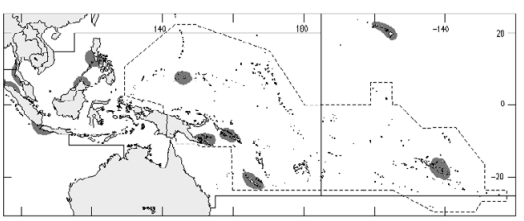


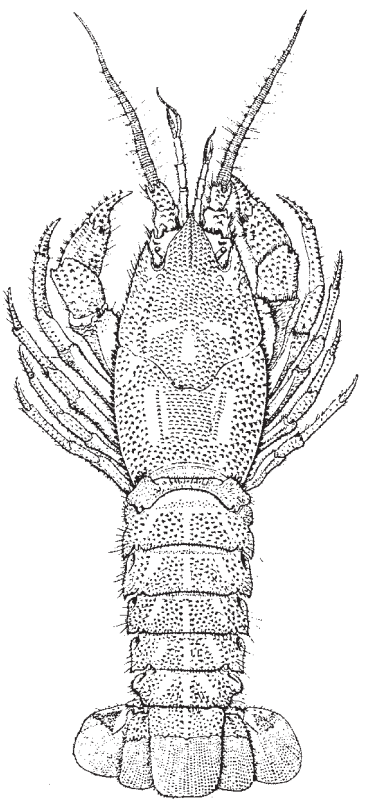
(after Davie, 1990)

Palinurellus wieneckii (De Man, 1881)

En - Indo-Pacific furry lobster; **Fr** - Cacahouète indopacifique; **Sp** - Langosta del Indo-Pacifico.

Maximum body length about 20 cm, commonly between 7 and 14 cm. In shallow waters on coral reefs at depths from 9 to 27 m. Probably nocturnal and often found in deep caves. Occasionally caught by divers (using hand) or gill nets. Too rare and small to be of significant importance as food, but highly valued in the aquarium trade for its bright colour and rarity. Specimens in the aquarium trade are presumably originated from the Philippines and Indonesia. Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Red Sea, southern Japan, New Caledonia, French Polynesia, and Hawaii.





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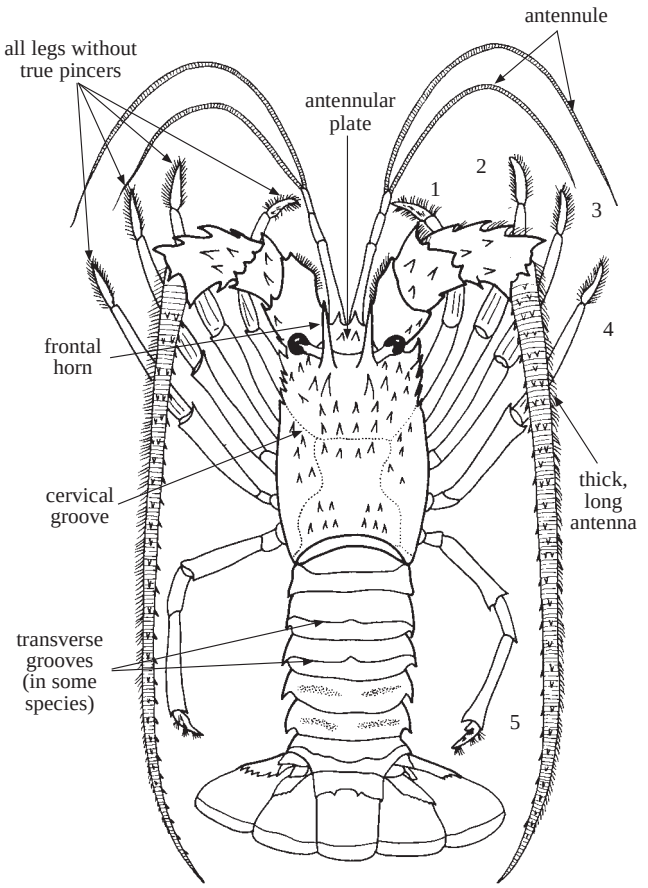
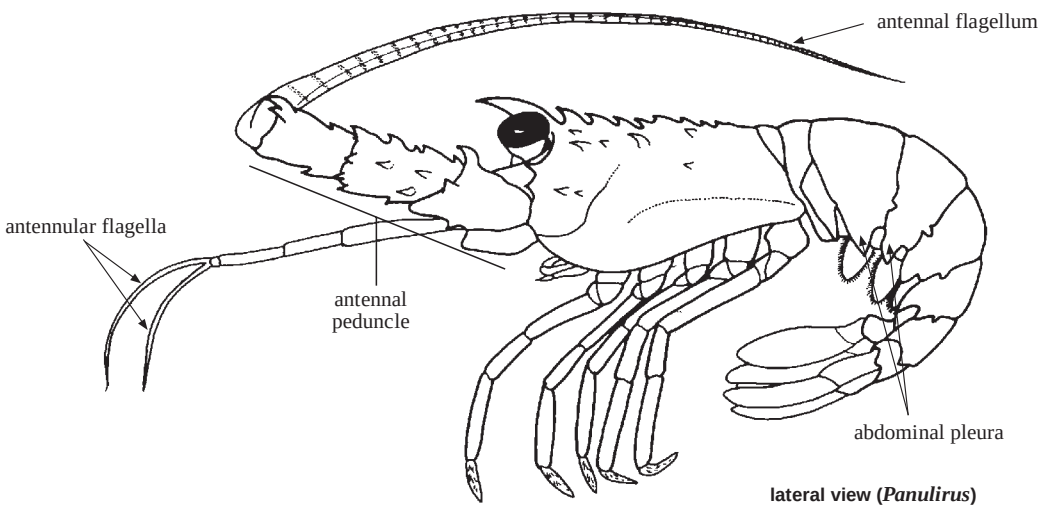
PALINURIDAE

Spiny lobsters, langoustes

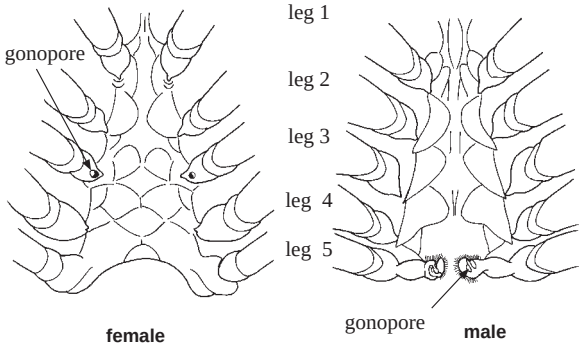
Diagnostic characters: Moderate- to large-sized crustaceans. Body tubular or slightly flattened dorsoventrally; hairs, if present, few and scattered. Carapace (or "head") subcylindrical or box-like, laterally rounded or straight, **without a well-developed rostrum, ornamented with spines and granules of various sizes, sometimes with scale-like sculpture (*Justitia*). Eyes well developed, each protected by a strong, spiny frontal projection of the carapace (frontal horns). Antennae rather thick and very long, whip-like or spear-like**; antennal scale absent; antennulae slender and each with 2 long or short flagella. **Bases of antennae often separated by a broad antennular plate usually bearing some spines**. In some genera a projection from the base of antenna is developed and forms with the rim of the antennal plate a stridulating organ which can produce a grating sound by movement of the antenna. **Legs generally simple, without true pincers; the first pair not or only slightly longer than the following legs (except in male of *Justitia longimanus*), but often somewhat more robust**. Both abdomen and tail fan well developed and powerful, **posterior half of tail fan soft and flexible**. Abdominal segments either smooth or each provided with 1 or more transverse grooves. **Colour:** mostly brightly coloured and provided with special markings, bands or spots, or uniformly coloured.



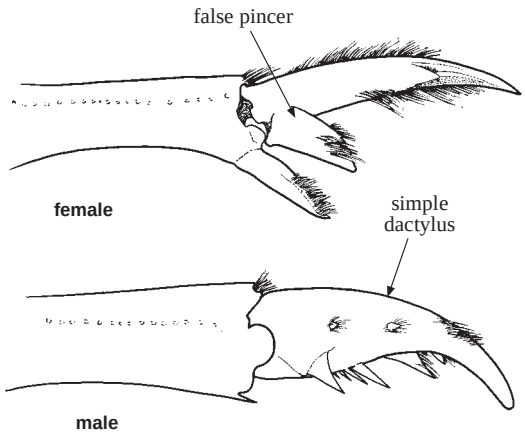
dorsal view (*Panulirus*)



lateral view (*Panulirus*)

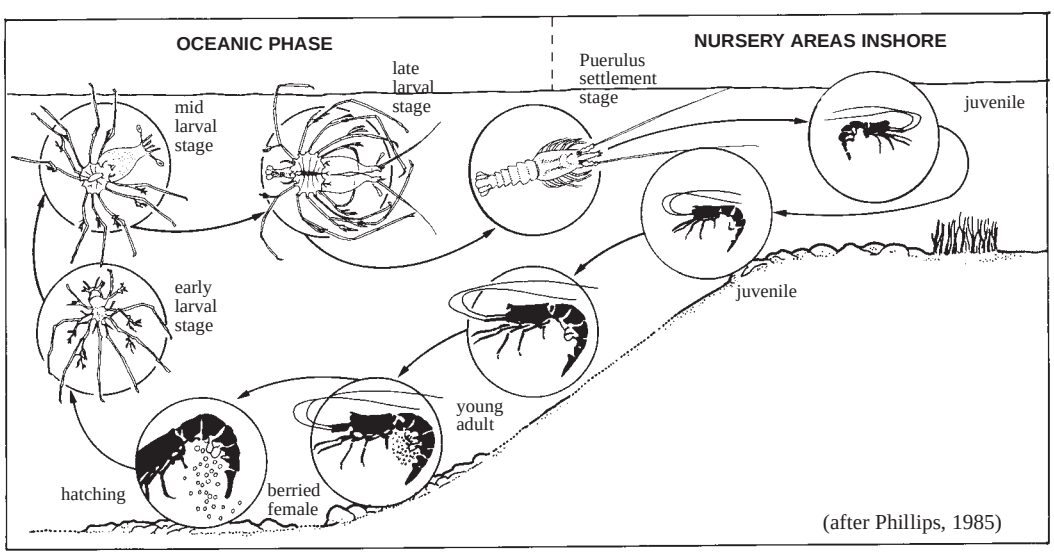


bases of legs in spiny lobsters



terminal segments of 5th leg in spiny lobsters

Habitat, biology, and fisheries: The maximum body length of species in the area ranges from about 14 cm to over 60 cm. The sexes are easily distinguished by the position of the gonopores which are situated at the bases of the third and fifth legs in females and males, respectively. Furthermore, the last leg forms a false (mostly) or true pincer in mature females, but is simple in mature males. Members of this family are characterized by the eggs (usually orange in colour) being very small and numerous, and by having a relatively shorter carrying time and very long planktonic larval stages (i.e. the phyllosoma). Spiny lobsters are all bottom-dwelling and can be found from very shallow water to a depth of 683 m. The shallow-water genus *Panulirus* comprises most of the species which are mainly nocturnal and live in coral or rocky reefs in depths less than 40 m. These are traditionally considered as excellent seafood and have a high economic value in the area. Juveniles are sometimes also seen in the aquarium trade. All species of *Panulirus* are actively fished throughout the area by divers (taken both by hand and spears), tangle nets, traps, or sometimes even by trawls, although they are not landed anywhere in large quantities. From 1990 to 1995, FAO's Yearbook of Fishery Statistics reports a range of yearly catch of *Panulirus* of 2 450 to 4126 t from the Western Central Pacific. The other 4 genera occurring in the area are more commonly found in deeper water, some of them living in rocky areas (e.g. *Justitia* and *Palinustus*) and others on soft substrate (e.g. *Linuparus* and *Puerulus*). All these deep-water species are not very abundant, some even rare, and so far only taken as bycatch. Nevertheless, the rarer species are also used for human consumption. Due to their rather large size, some species may have more commercial potential with the development of deep-sea fisheries. Therefore, all spiny lobsters occurring in the area are treated here in separate species accounts.



life cycle of spiny lobsters of the genus *Panulirus*

Similar families occurring in the area

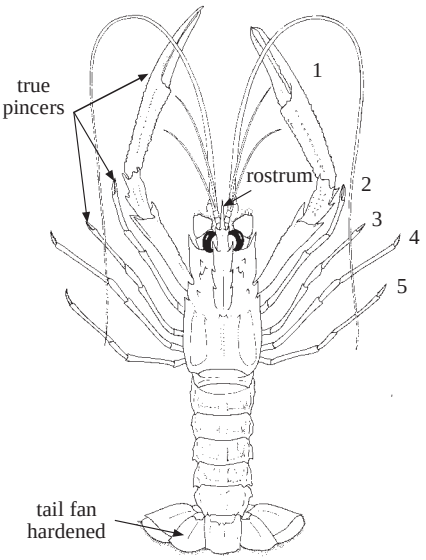
Nephropidae: body almost naked or covered with thick fur; rostrum well developed; antennae thin and thread-like; first 3 pairs of legs ending in pincers, first pair greatly enlarged; tail fan entirely hardened.

Thaumastochelidae: eyes strongly reduced, cornea lacking pigmentation; rostrum well developed; antennae thin and thread-like, scale with several large teeth along inner margin; first 3 pairs of legs (occasionally also fifth legs) forming pincers, first pair large but very unequal; tail fan entirely hardened.

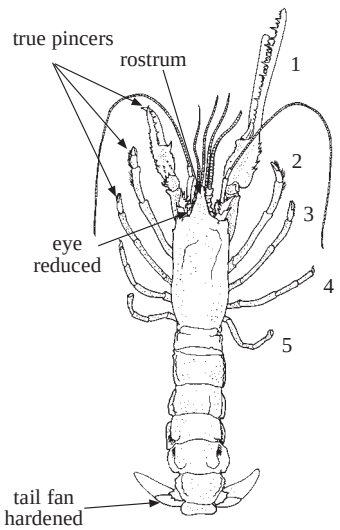
Enoplometopidae: body distributed with tufts of long stiff hairs; carapace with a well-developed rostrum; antennae thin and thread-like, antennal scale present; first pair of legs enlarged and forming true pincers, second and third legs ending in false pincers; tail fan entirely hardened.

Polychelidae: eyes small, cornea lacking pigmentation; antennae thin and thread-like, shorter than body; first 4 or all legs ending in pincers, with first pair long and slender; telson entirely hardened and with telson pointed.

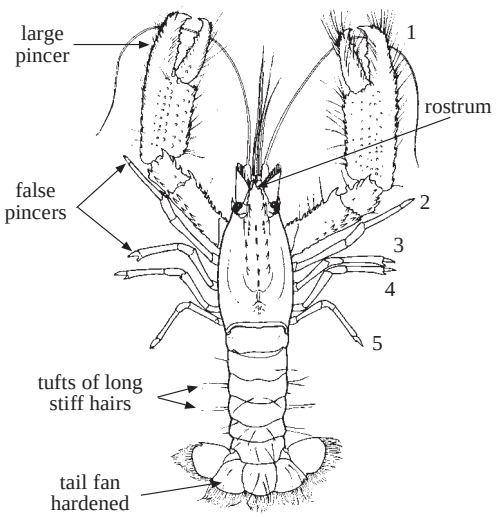
Glypheidae: eyes inserted on a median elevation of cephalon; carapace with a well-developed rostrum; antennae thin and thread-like; first 2 legs forming false pincers, the first pair very strong, third legs simple; uropods of tail fan entirely hardened.



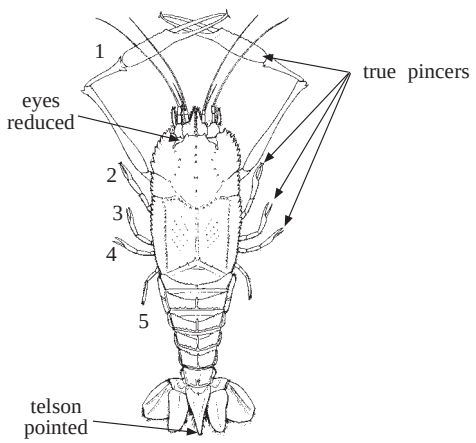
Nephropidae



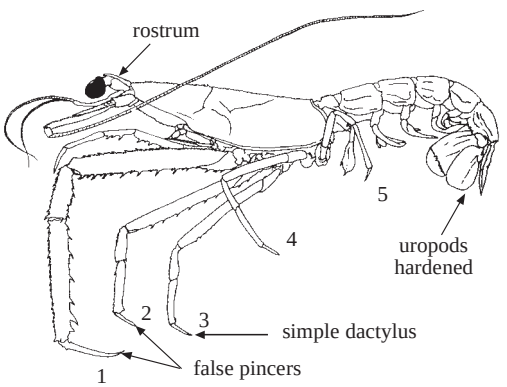
Thaumastochelidae



Enoplometopidae



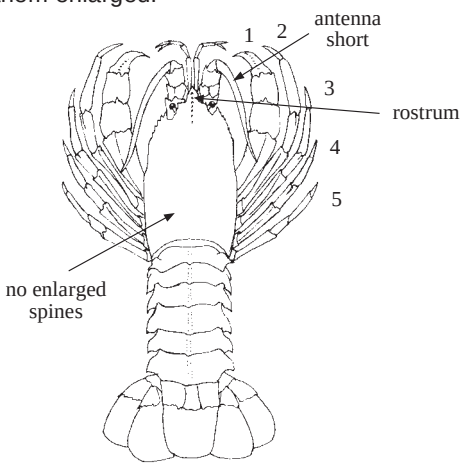
Polychelidae



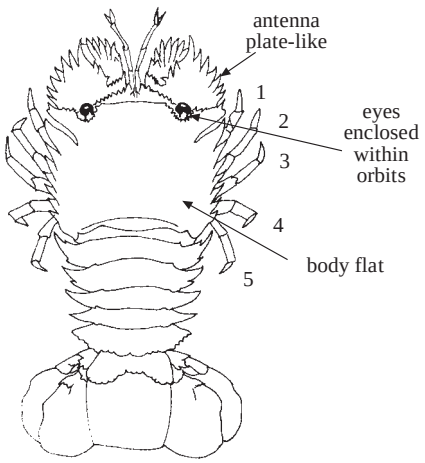
Glypheidae

Synaxidae: body very hairy; carapace laterally angular, with a broad and flat triangular or rounded rostrum, covered with small rounded granules but without enlarged spines; antennae whip-like but shorter than carapace; legs without pincers but first pair much heavier than others.

Scyllaridae: body strongly flattened dorsoventrally; carapace depressed and laterally angular; eyes enclosed by distinct orbits and lacking large frontal horns; antennae plate-like; legs without pincers and none of them enlarged.



Synaxidae



Scyllaridae

Key to the genera of Palinuridae occurring in the area

Note: members of this family, particularly those of the genus *Panulirus*, generally have distinctive colour markings on the body and live and fresh specimens of the various species are often easily distinguished by their coloration.

1a. Carapace covered with scale-like sculpture; each abdominal segments with 4 or more transverse grooves; first pair of legs sometimes enlarged and forming false pincers in males (Fig. 1) . . . . . ***Justitia***

1b. Carapace without scale-like sculpture; abdomen smooth or each segment at most with 2 transverse grooves; first pair of legs simple and never enlarged . . . . . → ***2***

2a. Frontal horns truncated; proximal segment of antennular peduncle longer than antennal peduncle; legs very spinous (Fig. 2) . . . . . ***Palinustus***

2b. Frontal horns pointed; proximal segment of antennular peduncle distinctly shorter than antennal peduncle; legs sparsely covered with spines . . . . . → ***3***

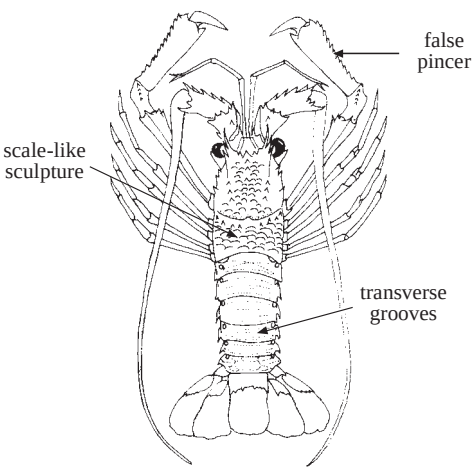


Fig. 1 ***Justitia***

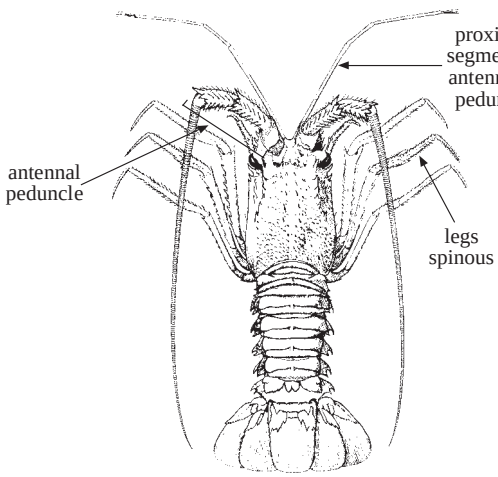


Fig. 2 ***Palinustus***

3a. Carapace subcylindrical, without median keel (Fig. 3); antennule with flagellum longer than peduncle (Fig. 4a); abdominal pleura ending in 1 strong tooth only (Fig. 5a) . . . . . ***Panulirus***

3b. Carapace box-like, with a median keel; antennule with flagellum much shorter than peduncle (Fig. 4b); abdominal pleura ending in 2 or more strong teeth . . . . . →***4***

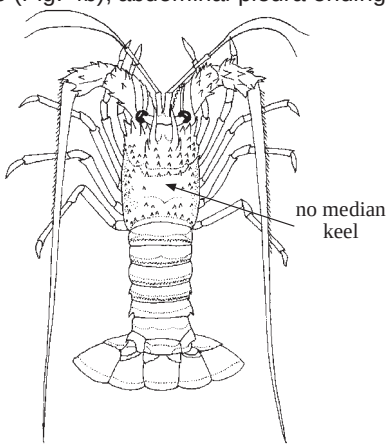


Fig. 3 ***Panulirus***

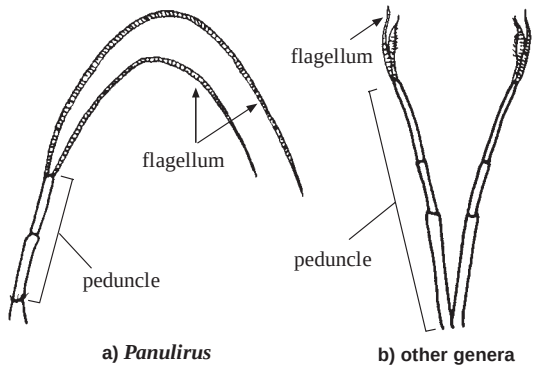


Fig. 4 antennule of spiny lobsters

4a. Frontal horns small and fused at the middle of anterior carapace (Fig. 6a); abdominal pleura ending in short teeth (Fig. 5b); antennae thick, inflexible and shorter than body length (Fig. 7) . . . . . ***Linuparus***

4b. Frontal horns large and widely separated (Fig. 6b); abdominal pleura ending in 2 long teeth (Fig. 5c); antennae slender and much longer than body length (Fig. 8) . . . . . ***Puerulus***

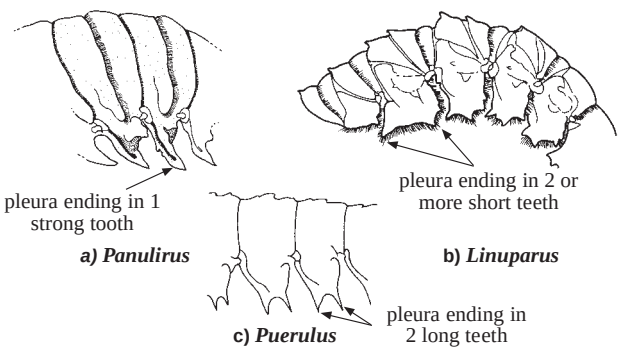


Fig. 5 abdomen (lateral view)

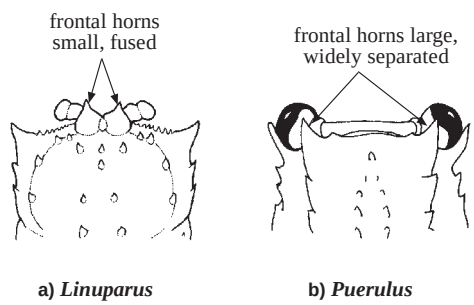


Fig. 6 anterior part of carapace (dorsal view)

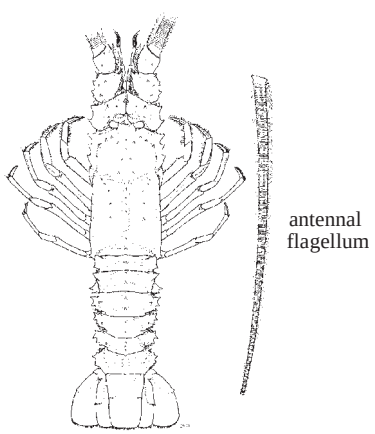


Fig. 7 ***Linuparus***

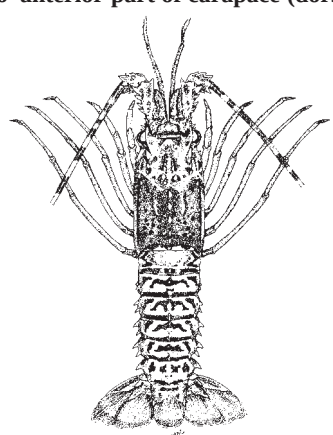


Fig. 8 ***Puerulus***

Key to the species of *Justitia* occurring in the area

1a. Median spine on anterior margin of carapace flanked by 2 to 3 pairs of spines (Fig. 9a); antennular peduncle distinctly exceeding antennal peduncle; first pair of legs of males extremely long and forming false pincers (Fig. 10); abdomen not banded . . . . ***Justitia longimanus***

1b. A single median spine present on anterior margin of carapace (Fig. 9b); antennular peduncle reaching as far as antennal peduncle; first pair of legs short and simple in both sexes; abdomen covered with red bands . . . . . → ***2***

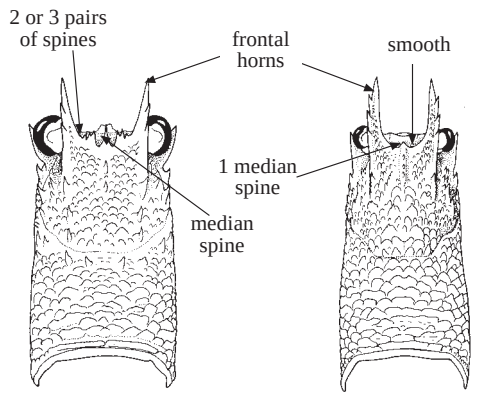


Fig. 9 carapace (dorsal view)

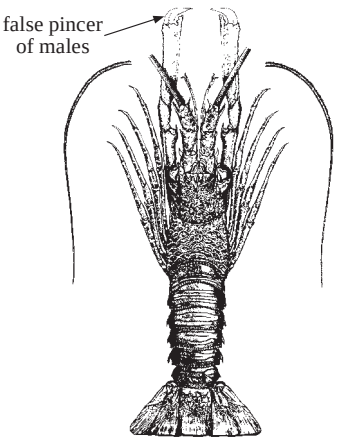


Fig. 10 *Justitia longimanus*

2a. Distal antennal segment with dorsal spine (Fig. 11a); frontal horns usually with 2 dorsal teeth; abdomen with intermediate grooves, usually interrupted and poorly defined, present between main grooves (Fig. 12a); red bands on abdomen located at posterior margin of each segment . . . . . ***Justitia chani***

2b. Distal antennal segment without dorsal spine; frontal horns usually with 3 dorsal teeth; abdominal grooves simple, without intermediate grooves; red bands on abdomen located at anterior margin of each segment . . . . . → ***3***

3a. Antennal peduncle with disto-outer spine much larger than disto-inner spine (Fig. 11b); third to fifth abdominal segments each with 7 transverse grooves (Fig. 12b); lateral carapace without special coloured patches . . . . . ***Justitia japonica***

3b. Disto-outer and disto-inner spines of antennal peduncle similar in length (Fig. 11c); third to fifth abdominal segments each with 5 transverse grooves (Fig. 12c); lateral carapace with 2 red patches . . . . . ***Justitia vericeli***

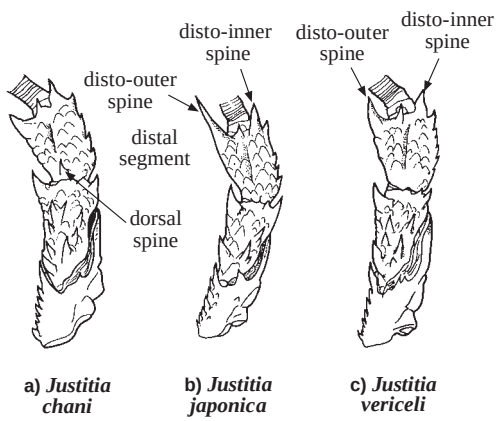


Fig. 11 right antennal peduncle (dorsal view)

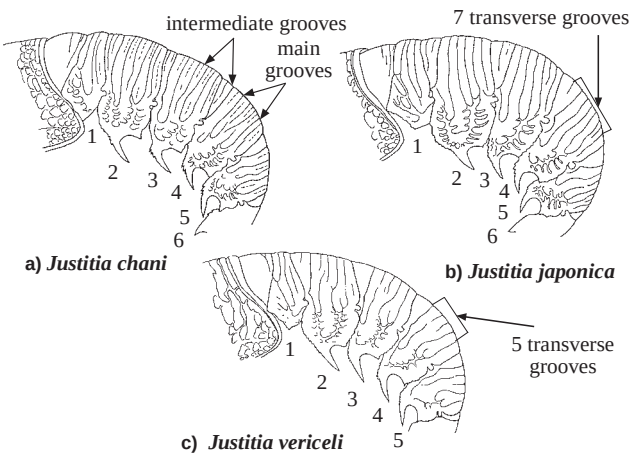
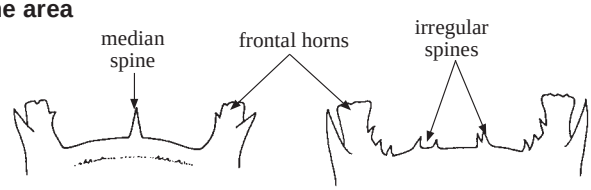


Fig. 12 abdomen (lateral view)
(from Poupin, 1994)

Key to the species of *Palinustus* occurring in the area

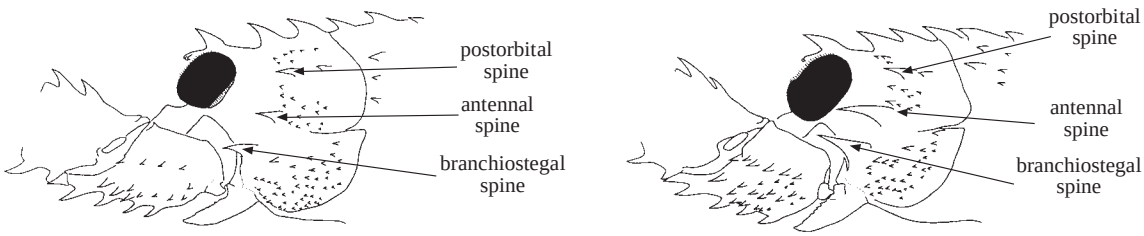
1a. Elevated parts of abdomen almost naked; anterior margin of carapace between frontal horns generally with a single median spine (Fig. 13a); postorbital, antennal and branchiostegal spines moderately long and similar in size (Fig. 14a); antennules uniformly orange-red and legs covered with broad pale bands . . . ***Palinustus unicornutus***



a) *Palinustus unicornutus* b) *Palinustus waguensis*

Fig. 13 anterior part of carapace (dorsal view)

1b. Elevated parts of abdomen distinctly pubescent; anterior margin of carapace between frontal horns provided with 1 to 8 irregularly arranged spines, or spines absent (Fig. 13b); postorbital spine distinctly shorter than antennal spine and branchiostegal spines (Fig. 14b); antennules banded and legs covered with dense narrow red rings . . . . . ***Palinustus waguensis***



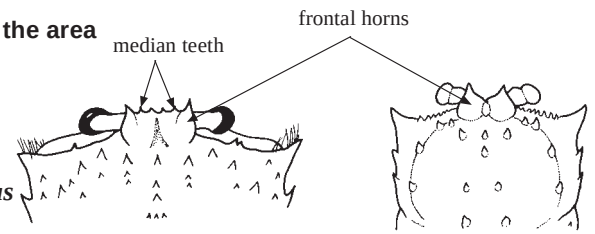
a) *Palinustus unicornutus* b) *Palinustus waguensis*

Fig. 14 anterior part of carapace (lateral view)

Key to the species of *Linuparus* occurring in the area

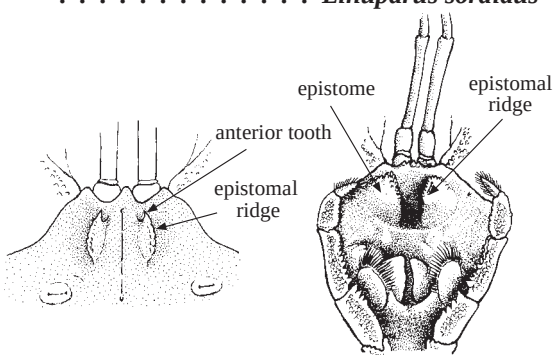
1a. Strong median teeth present between frontal horns (Fig. 15a); epistome ridges with strong anterior teeth (Fig. 16a); second and third abdominal pleura bearing basal teeth (Fig. 17) . . . . . ***Linuparus trigonus***

1b. No strong median teeth between frontal horns (Fig. 15b); epistome ridges without strong anterior teeth (Fig. 16b); second and third abdominal pleura without basal teeth . . . . . ***Linuparus sordidus***



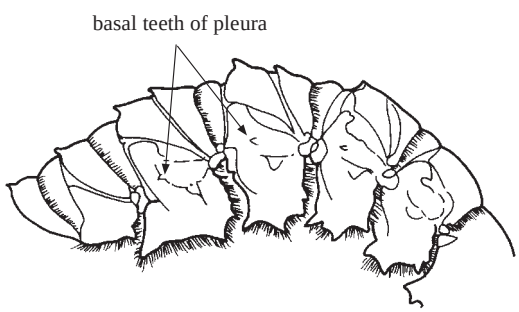
a) *Linuparus trigonus* b) *Linuparus sordidus*

Fig. 15 anterior part of carapace (dorsal view)



a) *Linuparus trigonus*: epistome b) *Linuparus sordidus*: anterior part of body (ventral view)

Fig. 16



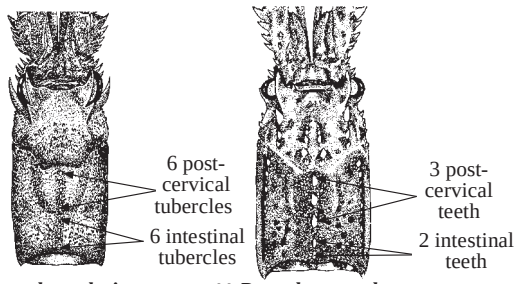
abdomen (lateral view)

Fig. 17 *Linuparus trigonus*

Key to the species of *Puerulus* occurring in the area

1a. Body heavily pubescent; postorbital spine present; median keel of carapace with 6 postcervical and 6 intestinal tubercles; eyes large, much broader than long (Fig. 18a) . . . . . ***Puerulus velutinus***

1b. Body only slightly pubescent; postorbital spine absent; median keel of carapace with 3 postcervical and 2 intestinal teeth; eyes smaller, longer than broad (Fig. 18b) . . . . . ***Puerulus angulatus***



a) ***Puerulus velutinus*** **b)** ***Puerulus angulatus***

Fig. 18 carapace (dorsal view)

Key to the species of *Panulirus* occurring in the area

1a. Abdomen provided with transverse grooves . . . . . → ***2***

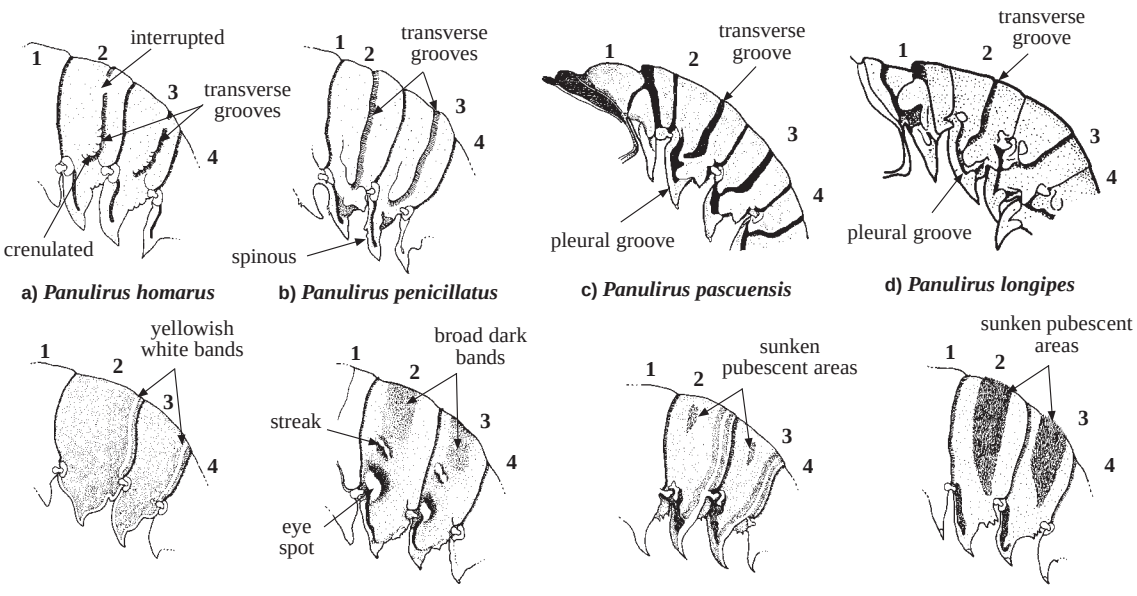
1b. Abdomen without transverse grooves or only with broad sunken pubescent areas . . . . . → ***6***

2a. Anterior margins of transverse grooves on abdomen crenulated, grooves incomplete or interrupted in the middle (Fig. 19a); antennular plate bearing 4 well-separated principal spines and some small spinules (Fig. 20a); body greenish to brown, regions between eyestalks with bright orange and blue markings; legs blotched . . . . . ***Panulirus homarus***

2b. Transverse grooves on abdomen with straight anterior margins, not crenulated . . . . . → ***3***

3a. Antennular plate armed with 4 close-set principal spines (Fig. 20b); anterior margin of third abdominal pleuron spinous (Fig. 19b); body dark blue and brown, membranes at outer bases of antennae light blue; legs striped . . . . . ***Panulirus penicillatus***

3b. Antennular plate with 2 principal spines (Fig. 20c); anterior margin of third abdominal pleuron not spinous . . . . . → ***4***



a) ***Panulirus homarus*** **b)** ***Panulirus penicillatus*** **c)** ***Panulirus pascuensis*** **d)** ***Panulirus longipes***

e) ***Panulirus polyphagus*** **f)** ***Panulirus ornatus*** **g)** ***Panulirus versicolor*** **h)** ***Panulirus stimpsoni***

Fig. 19 abdominal segments (lateral view)

4a. Transverse groove of second abdominal segment not joining corresponding pleural groove (Fig. 19c); body dark purple with some greenish, not speckled; irregular pale bands along posterior margin of abdominal segments, sometimes with whitish spots mixed in with them; spots on basis of tail fan; antennules not banded; legs striped . . . . . ***Panulirus pascuensis***

4b. Transverse groove of second abdominal segment joining corresponding pleural groove (Fig. 19d) . . . . → ***5***

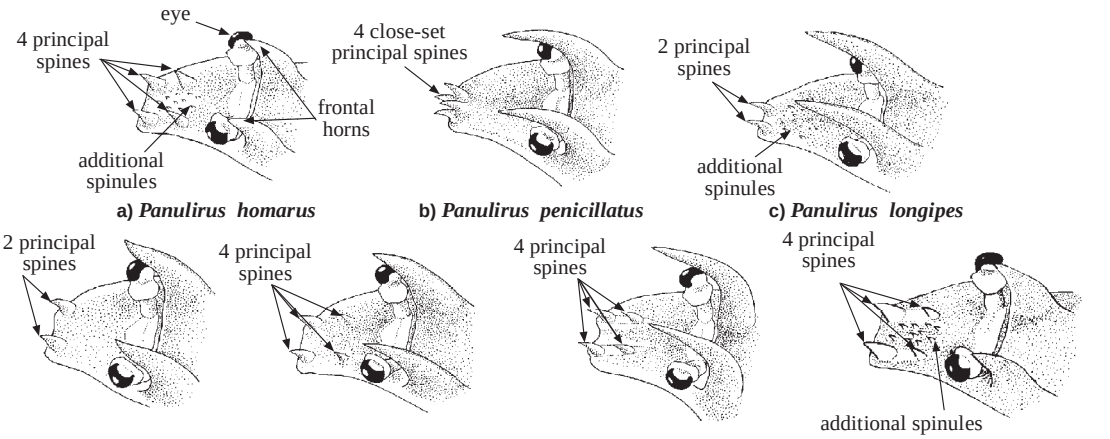


Fig. 20 antennular plate

5a. Median area at anterior carapace behind frontal horns usually bearing a longitudinal row of 3 spines only (Fig. 21a); ventral surfaces of distal 2 antennal segments each with 2 large spines only (Fig. 22a); thoracic sternum with 2 strong submedian protrusions (Fig. 23a); antennules with outer flagella dark brown and inner flagella entirely whitish; antennal peduncle including stridulating pad pinkish; lateral carapace with 2 complete longitudinal white strips extending along the entire carapace; legs striped . . . . . ***Panulirus albiflagellum***

5b. Median area at anterior carapace behind frontal horns always bearing some smaller, irregular spines in addition to the regular row of 3 spines (Fig. 21b); ventral surfaces of distal 2 antennal segments each with 1 large spine (sometimes also with several other scattered spinules, Fig. 22b); thoracic sternum without strong submedian protrusions (Fig. 23b); antennules alternated with dark brown and white bands; antennular peduncle brown to purple and with stridulating pad bright blue; lateral carapace with 1 short (upper) and 1 long (lower) longitudinal white stripes; legs striped or spotted . . . . . ***Panulirus longipes***

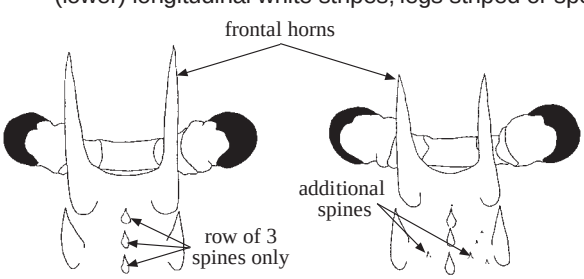


Fig. 21 anterior part of carapace

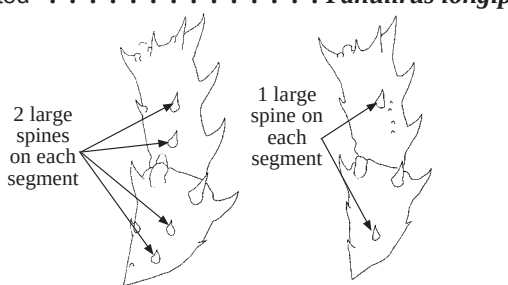


Fig. 22 distal 2 segments of antenna (ventral view)

6a. Abdomen naked and smooth (Fig. 19e, f); legs blotched . . . . . → ***7***

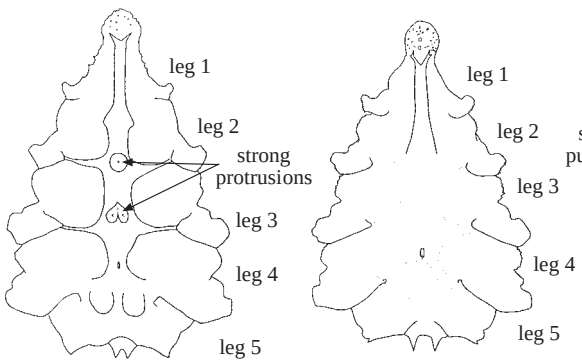
6b. At least second and third abdominal segments with broad sunken pubescent areas (Fig. 19g, h); legs striped . . . . . → ***8***

7a. Antennular plate armed with 1 pair of principal spines (Fig. 20d); body pale green and abdomen with narrow transverse yellowish white bands (Fig. 19e) . . . . . ***Panulirus polyphagus***

7b. Antennular plate armed with 2 pairs of principal spines (Fig. 20e); body greenish and abdomen with broad transverse dark bands (Fig. 19f), legs and antennules conspicuously ringed with light yellow and black . . . . . ***Panulirus ornatus***

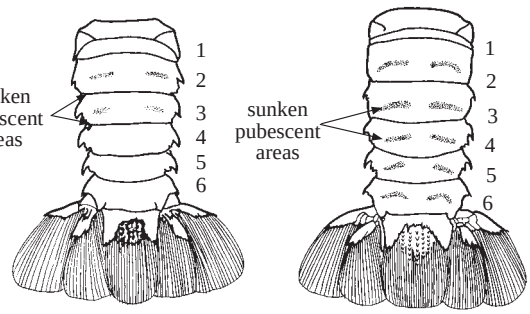
8a. Antennular plate armed with 2 pairs of principal spines only (Fig. 20f); fourth to sixth abdominal segments smooth (Fig. 24a); body deep blue and green, abdomen with narrow transverse white bands, antennal and antennular flagella whitish . . . . ***Panulirus versicolor***

8b. Antennular plate with many small spinules in additional to the 2 pairs of principal spines (Fig. 20g); sunken pubescent areas present on all abdominal segments (Fig. 24b); body greenish, region between eyestalks not brightly marked and abdomen not banded . . . . . ***Panulirus stimpsoni***



a) ***Panulirus albiflagellum*** b) ***Panulirus longipes***

Fig. 23 thoracic sternum (ventral view)



a) ***Panulirus versicolor*** b) ***PanulIrus stimpsoni***

Fig. 24 abdomen (dorsal view)

List of species occurring in the area

The symbol ➽ is given when species accounts are included.

➽ *Justitia chani* Poupin, 1994
➽ *Justitia japonica* (Kubo, 1955)
➽ *Justitia longimanus* (H. Milne Edwards, 1837)
➽ *Justitia vericeli* Poupin, 1994

➽ *Linuparus sordidus* Bruce, 1965
➽ *Linuparus trigonus* (Von Siebold, 1824)

➽ *Palinustus unicornutus* Berry, 1963
➽ *Palinustus waguensis* Kubo, 1963

➽ *Panulirus albiflagellum* Chan and Chu, 1996
➽ *Panulirus homarus* (Linnaeus, 1758)
➽ *Panulirus longipes* (A. Milne Edwards, 1868)
➽ *Panulirus ornatus* (Fabricius, 1798)
➽ *Panulirus pascuensis* Reed, 1954
➽ *Panulirus penicillatus* (Olivier, 1791)
➽ *Panulirus polyphagus* (Herbst, 1793)
➽ *Panulirus stimpsoni* Holthuis, 1963
➽ *Panulirus versicolor* (Latreille, 1804)

➽ *Puerulus angulatus* (Bate, 1888)
➽ *Puerulus velutinus* Holthuis, 1963

References

Chan, T.Y. and K.H. Chu. 1996. On the different forms of *Panulirus longipes femoristriga* (von Martens, 1872) (Crustacea: Decapoda: Palinuridae), with description of a new species. *J. Nat. Hist*., 30:367-387.

Chan, T.Y. and H.P. Yu. 1993. *The illustrated lobsters of Taiwan*. Taipei, SMC Publishing Inc., 248 p.

Chan, T.Y. and H.P. Yu. 1995. The rare lobster genus *Palinustus* A. Milne Edwards, 1880 (Decapoda: Palinuridae), with description of a new species. *J. Crust. Biol*., 15(2):376-394.

Holthuis, L.B. 1991. Marine lobsters of the world. FAO species catalogue. Vol. 13. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fish. Synop*., 125(13):1-292.

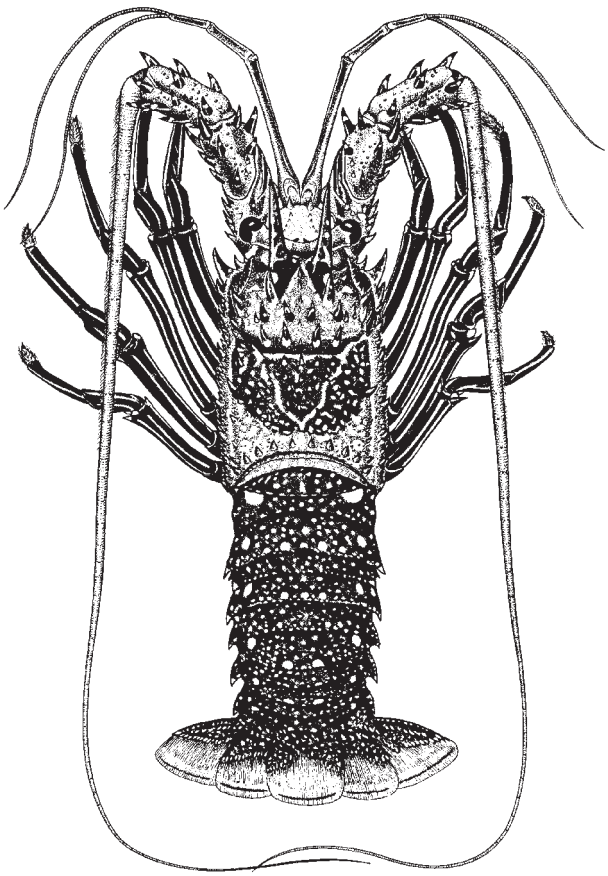
Poupin, J. 1994. The genus *Justitia* Holthuis, 1946, with the description of *J. chani* and *J. vericeli* spp. nov. (Crustacea, Decapoda, Palinuridae). *J. Taiwan Mus.*, 47(1):37-56.

Panulirus albiflagellum Chan and Chu, 1996

Frequent synonyms / misidentifications: None / *Panulirus longipes* (A. Milne Edwards, 1868); *P. longipes femoristriga* (Von Martens, 1872).

FAO names: En - White whisker spiny lobster.

Diagnostic characters: Carapace rounded and spiny; rostrum absent; anterior margin armed with irregular-sized spines; **height of frontal horn about 2.5 times the eye height; median area behind frontal horns generally with a longitudinal row of 3 spines only; cervical groove distinctly wider than posterior marginal groove**. Antennules with flagella longer than peduncle; **antennular plate at bases of antennae bearing 1 pair of well-separated principal spines and some scattered spinules; ventral surfaces of distal 2 antennal segments each with a row of 2 equal-sized large spines only**. First 4 pairs of legs without pincers. **Thoracic sternum with 2 strong submedian protrusions. Abdominal segments with a complete transverse groove joining the pleural groove; abdominal pleura only with that of second segment sometimes bearing spinules**. Posterior half of tail fan soft and flexible. **Colour:** body dark brown to indigo, covered with numerous white spots and markings. Eyes black-brown. **Lateral carapace with 2 longitudinal white stripes running along the entire carapace. Inner surface of antennal peduncle (including stridulating pad) and antennular plate pink**; antennal flagella dorsally brown, ventrally whitish to pink; antennules with peduncle dark brown but laterally white, **outer flagella dark brown and inner flagella entirely whitish. Legs striped with conspicuous white lines. Abdomen covered with numerous medium-sized white spots**. Soft part of tail fan orange-brown with distal margin whitish. Pleopods somewhat greenish with white margins. Eggs orange.

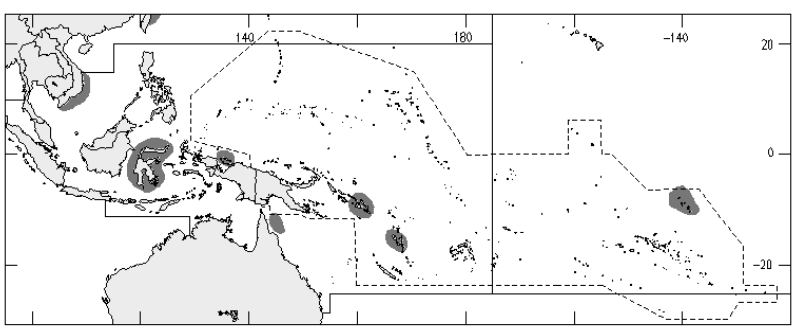


(after George and Holthuis, 1965)

Size: Maximum body length about 25 cm, commonly between 18 and 21 cm.

Habitat, biology, and fisheries: In shallow reef areas to a depth of about 20 m. Caught throughout its range, but apparently nowhere abundant. Nevertheless, in Indonesia this lobster can periodically be found in markets (live and fresh) and is sometimes even exported (live). No separate statistics are reported for this species because of former confusion with *Panulirus longipes*.

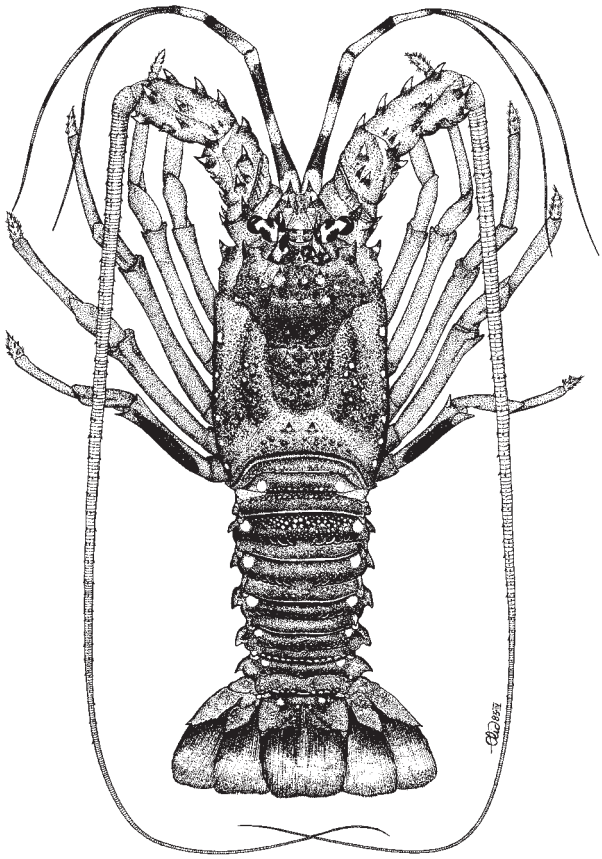
Distribution: Indo-West Pacific from the Maldive Islands, Viet Nam, Indonesia, Great Barrier Reef (Australia), Taiwan Province of China, and Japan; probably also occurs in the Solomon Islands, New Hebrides, and French Polynesia.



Panulirus homarus (Linnaeus, 1758)

Frequent synonyms / misidentifications: *Panulirus dasypus* (H. Milne Edwards, 1837); *P. burgeri* (De Haan, 1841) / None.

FAO names: En - Scalloped spiny lobster; **Fr** - Langouste festonée; **Sp** - Langosta festoneada.

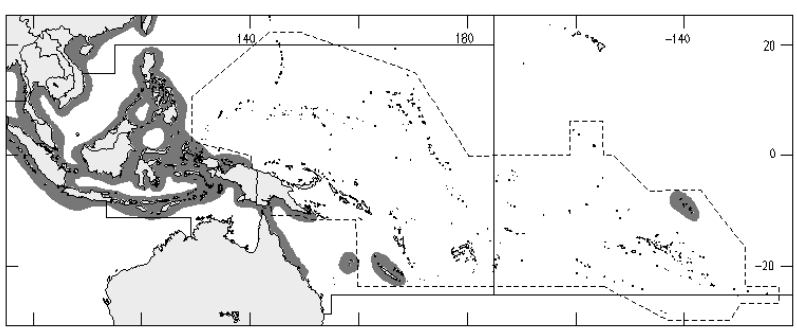


Diagnostic characters: Carapace rounded and spiny, sometimes with branchiostegal areas slightly inflated; rostrum absent; anterior margin armed with 4 regularly spaced large spines other than frontal horns; **height of frontal horns about 2 times the eye height**, **without spinules in between**. Antennules with flagella longer than peduncle, **antennular plate at bases of antennae bearing 2 pairs of well-separated principal spines (anterior pair slightly larger) and some spinules**. First 4 pairs of legs without pincers. **Abdominal segments with a slightly crenate transverse groove, sometimes interrupted at the middle**. Posterior half of tail fan soft and flexible. **Colour:** body greenish to brownish. Eyes dark brown. **Anterior carapace and region between eyestalks with bright orange and blue markings. Frontal horns banded with black and white. Antennular flagella alternated with brown and white bands. Legs blotched.** Abdomen covered with tiny white spots. Pleopods red-brown. Eggs orange.

Size: Maximum body length 31 cm, commonly between 16 and 25 cm.

Habitat, biology, and fisheries: In reef areas with sand in the surf zone and sometimes also in turbid waters at depths from 1 to 5 m, but can be found down to a depth of 90 m. Gregarious and nocturnal. The females produce 100 000 to 900 000 eggs per brood and hatching occurs after 25 to 59 days. The phyllosoma larvae last 4 to 7 months and have 9 stages. The juveniles molt every few weeks and become sexually mature after 2 to 3 years (carapace length 5 to 6 cm) after larval settlement. In the fourth year the reproductive potential is highest (carapace length 7 to 7.9 cm). The adults molt about 4 times a year and the life span of this lobster is estimated to be 8 to 10 years. Actively fished throughout its range by hand, with traps, gill nets, cast nets, and baited lines. Big catches are often possible after typhoons or heavy rains. The fishery of this lobster is mostly local though it is exported in some areas such as the Philippines and Indonesia (sometimes live) together with other species of the genus.

Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan, Australia, and the Marquesas Archipelago.

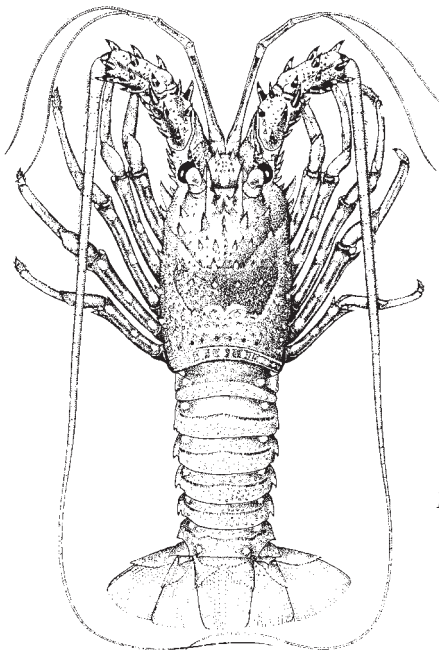


Panulirus longipes (A. Milne Edwards, 1868) LOJ

Frequent synonyms / misidentifications: *Panulirus longipes femoristriga* (Von Martens, 1872) / *Panulirus japonicus* (Von Siebold, 1824); *P. albiflagellum* Chan and Chu, 1996.

FAO names: En - Longlegged spiny lobster; **Fr** - Langouste diablotin; **Sp** - Langosta duende.

Diagnostic characters: Carapace rounded and spiny; rostrum absent; anterior margin armed with irregular-sized spines; **height of frontal horns about 2.5 times the eye height; median area behind frontal horns always bearing some additional spinules other than the regular longitudinal row of 3 spines; cervical groove about as wide as posterior marginal groove.** Antennules with flagella longer than peduncle; **antennular plate at bases of antennae bearing 1 pair of well-separated principal spines and some scattered spinules; ventral surfaces of distal 2 antennal segments each with 1 large spine, often flanked by some scattered spinules.** First 4 pairs of legs without pincers. **Thoracic sternum without strong sub-median protrusions. Abdominal segments with a complete transverse groove joining the pleural groove; abdominal pleura only with that of second segment sometimes** bearing spinules. Posterior half of tail fan soft and flexible. **Colour:** body dark brown to indigo and covered with numerous white spots and markings. Eyes black-brown. **Lateral carapace with 1 short (upper) and 1 long (lower) longitudinal white stripe. Inner surfaces of antennae and antennular plate brown to purple and with stridulating pad bright blue;** antennal flagella brownish with ventral surface lighter in colour; **antennules dark brown and alternated with conspicuous white bands.** Legs covered with prominent white spots connected by orange lines, or only striped with white or pale lines. **Abdomen covered with numerous small to medium-sized white spots.** Soft part of tail fan orange-brown with posterior margin whitish. Pleopods somewhat greenish with white margins. Eggs orange.



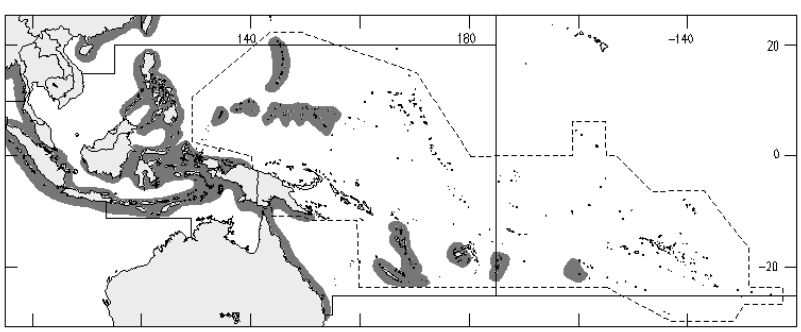
Panulirus longipes longipes

Panulirus longipes femoristriga

Size: Maximum body length 35 cm, commonly between 18 and 25 cm.

Habitat, biology, and fisheries: Found in shallow coral or rocky reefs (but can be found down to a depth of 130 m), usually in clear waters with moderate currents, sometimes in slightly turbid waters. Nocturnal and not gregarious; females produce an average of 132 000 eggs per brood. Actively fished throughout its range, but apparently nowhere very abundant. Taken by hand during night diving or with spears, also with traps, tangle nets and lobster pots. The fishery of this lobster is mostly of local interest. In some regions, such as the Philippines and Indonesia, occasionally exported live, together with other species of this genus.

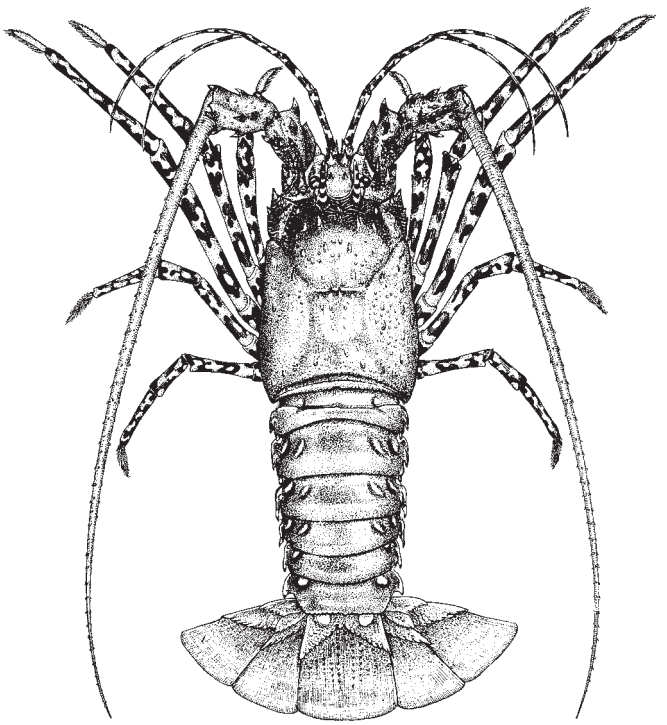
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan and Fiji. Two subspecies are recognized: the western or the spotted-legged form *Panulirus longipes longipes* occurring from eastern Africa to Thailand, Taiwan Province of China, the Philippines, and Indonesia; the eastern or the striped-legged form *P. longipes femoristriga* is known from Japan to the Bonin Islands, Taiwan Province of China, the Philippines, Indonesia, Australia, New Caledonia, the Loyalty Islands, New Hebrides, and Fiji; probably also in Micronesia, Papua New Guinea, Tonga, and the Cook Islands.



Panulirus ornatus (Fabricius, 1798)

Frequent synonyms / misidentifications: None / None.

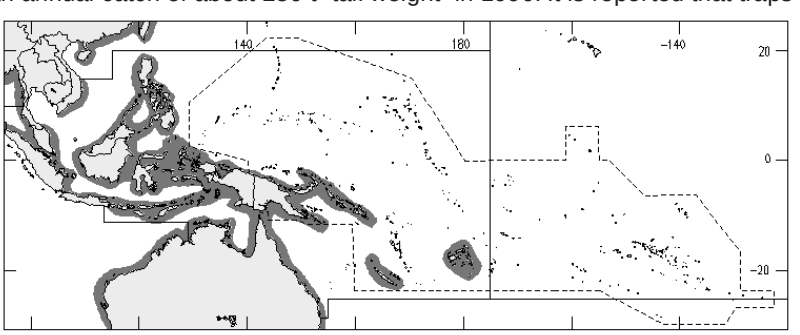
FAO names: En - Ornate spiny lobster; **Fr** - Langouste ornée; **Sp** - Langosta ornamentada.



Diagnostic characters: Carapace rounded and spiny; rostrum absent; anterior margin bearing irregular-sized spines other than frontal horns; **height of frontal horns about 2 times the eye height, without spinules in between**. Antennules with flagella longer than peduncle; **antennular plate at bases of antennae bearing 2 pairs of well-separated principal spines (anterior pair considerably larger), sometimes also with several spinules**. First 4 pairs of legs without pincers. **Abdomen naked and smooth, without transverse grooves or sunken pubescent areas.** Posterior half of tail fan soft and flexible. **Colour:** body greenish with carapace slightly bluish. Eyes black-brown. **Frontal horns intricately banded with yellowish white and brown markings.** Antennal peduncle bluish with stridulating pad somewhat pinkish. **Antennules and legs conspicuously ringed with pale yellow and black. Abdomen covered with broad transverse dark bands over middle of each segment and bearing large pale yellowish spots near hinges.** Pleopods yellowish. Eggs orange.

Size: Maximum body length about 60 cm, commonly between 20 and 35 cm. Maximum weight over 6 kg. Probably the largest species of the genus.

Habitat, biology, and fisheries: Usually occurs at depths from 1 to 10 m, but can be found to a depth of 200 m. In calm areas of coral and rocky reefs or reef slopes, sometimes also found on muddy substrate in river mouths with fairly turbid water. Lives solitary or in pairs; seasonal mass migrations have been observed in Torres Strait populations. Actively fished throughout its range, mostly by divers (using hand and spear), sometimes by hand nets and trawls (formerly a main fishing method in Torres Strait, but now banned). Sold mostly fresh or frozen in local markets, sometimes exported (as from the Philippines and Australia, live or tailed). In most parts of the area the catches are not very large but a commercial fishery for this species has been developed in Papua New Guinea (off the Gulf of Papua) and Australia (off Torres Strait and N.E. Queensland) since 1966, with an annual catch of about 250 t "tail weight" in 1990. It is reported that traps are not effective to catch this species and mass mortality may occur in breeding lobsters.



Distribution: Widely distributed in the Indo-West Pacific from East Africa to Japan, Australia, and Fiji. Recently also reported to enter the Mediterranean from the Red Sea.

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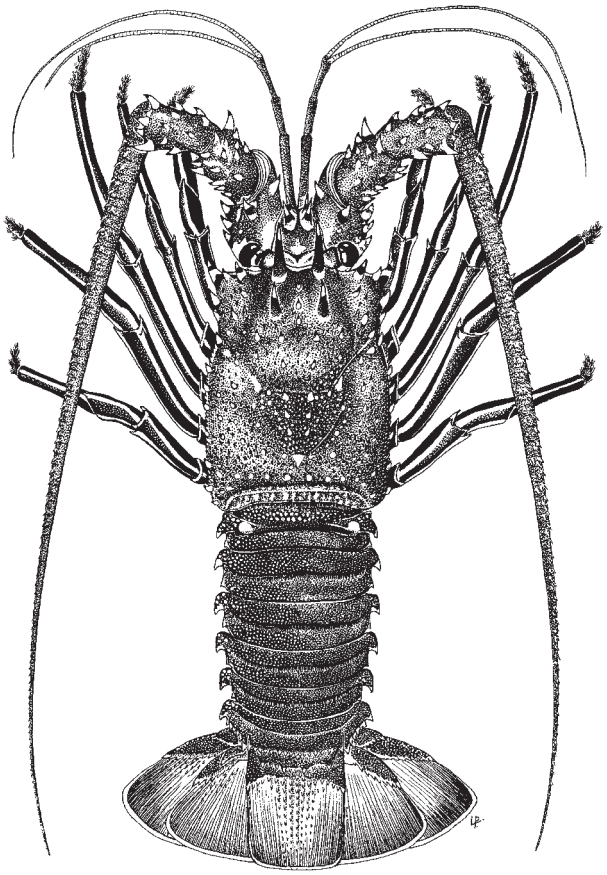
Panulirus penicillatus (Olivier, 1791)

Frequent synonyms / misidentifications: None / None.

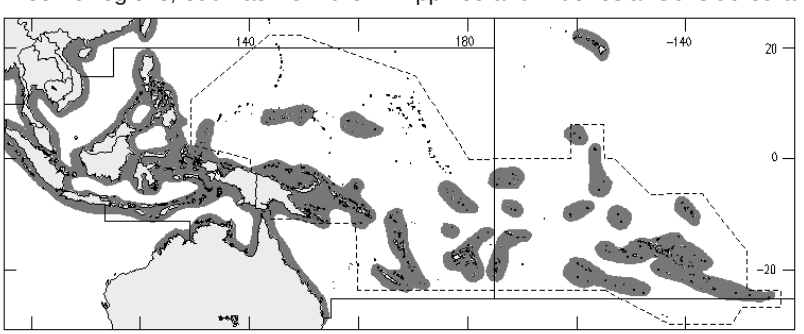
FAO names: En - Pronghorn spiny lobster; **Fr** - Langouste fourchette; **Sp** - Langosta horquilla.



Diagnostic characters: Carapace rounded and spiny, with branchiostegal areas slightly inflated; rostrum absent; anterior margin armed with 4 large and regularly spaced large spines other than frontal horns; **height of frontal horns about 2 times the eye height; median area behind frontal horns with a longitudinal row of spinules.** Antennules with flagella longer than peduncle; **antennular plate at bases of antennae armed with 4 close-set principal spines (posterior pair larger)**. First 4 pairs of legs without pincers. **Abdominal segments with a transverse groove, not continuous with pleural groove; anterior margins of pleura spinous.** Posterior half of tail fan soft and flexible. **Colour:** body dark blue and brown; males usually darker than females. Eyes black. Tips of large spines on carapace yellowish. Antennular peduncle striped with white lines, flagella uniformly brownish; **membranous areas at outer base of antenna light blue. Legs conspicuously striped with white lines.** Abdomen with tiny pale dots. Pleopods and soft part of tail fan black.

Size: Maximum body length 40 cm, commonly between 20 and 30 cm (males usually larger).

Habitat, biology, and fisheries: Found in shallow waters, usually at depths from 1 to 4 m (maximum depth 16 m) at seaward edges of reefs, in clear waters not influenced by rivers. Nocturnal and usually not gregarious, but sometimes occurs in a “harem” of mixed sexes; often found in deep caves during the daytime and strongly clinging to rocks at surf zones or areas with strong currents such as surge channels. Good catches are often possible during dark nights, particularly after the full moon. The phyllosoma larval stage of this species probably lasts 7 to 8 months and has 10 substages. The females seem to be reproductive all year around in the south western Pacific. Requires silt-free clear waters and is therefore found in optimal conditions around oceanic islands; it is the predominant spiny lobster in the South Pacific Islands. Fished throughout its range and mostly taken during day and night diving by hand and spear, sometimes also by trammel nets and traps, but less effectively so. However, the catches are generally not very abundant and it is mostly sold fresh, live, cooked whole or tailed for local consumption, but also exported in some regions, such as from the Philippines and Indonesia. Considered a commercially threatened species by the World Conservation Union (IUCN).

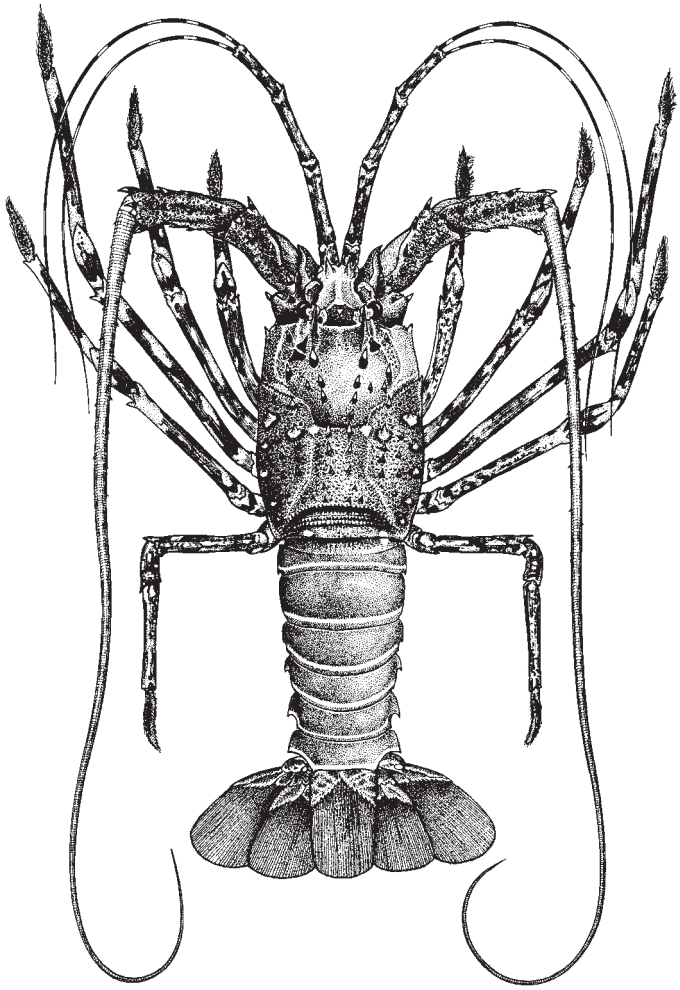


Distribution: Probably the most widely distributed species of the genus and can be found in the Indo-Pacific from the eastern coast of Africa to the Red Sea, Japan, Australia, French Polynesia, Hawaii, and the offshore islands near the western coasts of America (e.g. the Galapagos Archipelago).

Panulirus polyphagus (Herbst, 1793)

Frequent synonyms / misidentifications: *Panulirus fasciatus* (Fabricius, 1798) / None.

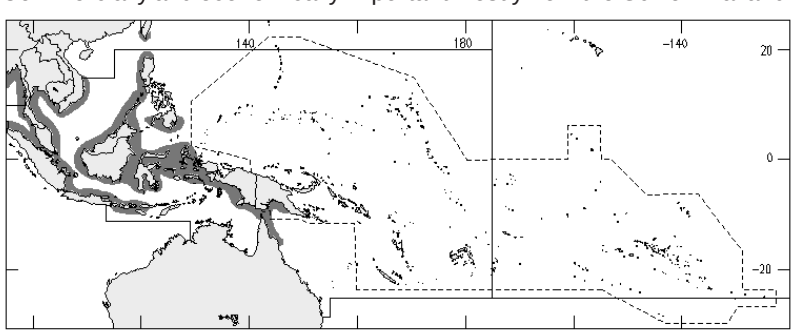
FAO names: En - Mud spiny lobster; **Fr** - Langouste de vase; **Sp** - Langosta fanguera.



Diagnostic characters: Carapace rounded and spiny; rostrum absent; anterior margin with irregular-sized spines other than frontal horns; **height of frontal horns less than 2 times the eye height, without spinules in between**. Antennules with flagella longer than peduncle; **antennular plate at bases of antennae armed with 1 pair of well-separated principal spines only.** First 4 pairs of legs without pincers. **Abdomen naked and smooth; without transverse grooves or sunken pubescent areas.** Posterior half of tail fan soft and flexible. **Colour:** body dull green. Eyes black-brown. Spines on carapace with yellowish brown tips, **orbital margin and posterior marginal groove yellowish white**. Antennular plate with a medial longitudinal yellowish white line; **antennular peduncle alternated with yellowish white and pale green bands, flagella banded with yellowish white and dark brown. Legs light brown with yellowish white blotches. Abdomen with tiny pale dots; a yellowish white band with brown margins near posterior border of each segment**. Pleopods and soft part of tail fan orange-brown with yellowish white margins.

Size: Maximum body length about 40 cm, commonly between 20 and 25 cm.

Habitat, biology, and fisheries: Mainly found on muddy bottoms (sometimes also on rocky bottoms) in turbid waters near river mouths at depths from 3 to 90 m, but usually less than 40 m deep. Unlike other spiny lobsters, this species is mainly taken by trawling, sometimes also by set nets, and seines, but rarely enters traps. Uncommon or absent in most parts of the area because of its preference for muddy substrate. Commercially and economically important mostly from the Gulf of Thailand. Sold fresh or frozen in local markets, and mounted dry specimens are sold as souvenirs to tourists.

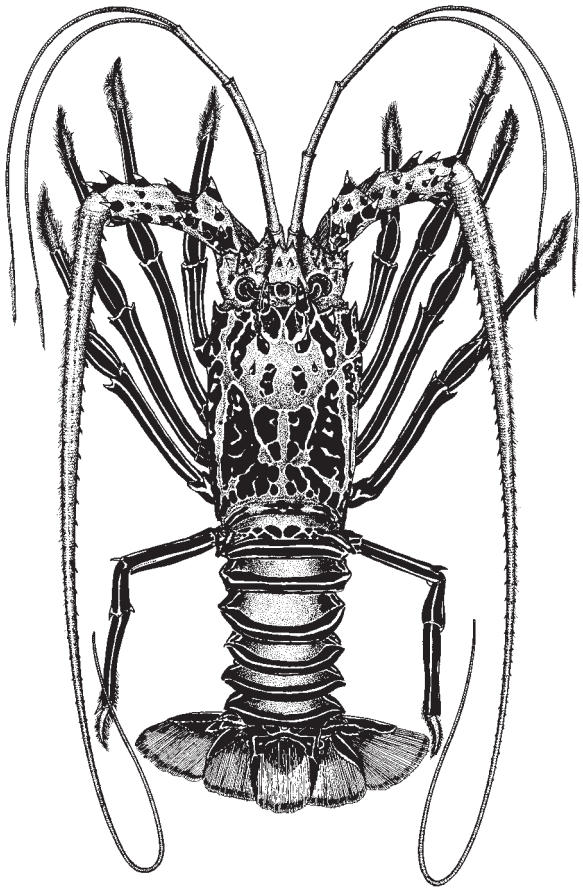


Distribution: Indo-West Pacific from Pakistan to India, Thailand, Viet Nam, Taiwan Province of China, the Philippines, Indonesia, Papua New Guinea, and northern Australia.

Panulirus versicolor (Latreille, 1804)

Frequent synonyms / misidentifications: None / *Panulirus fasciatus* (Fabricius, 1798) (= *P. polyphagus* (Herbst, 1793)).

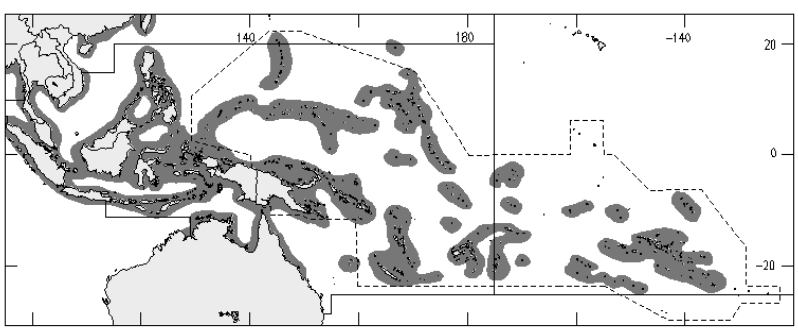
FAO names: En - Painted spiny lobster;
Fr - Langouste barriolée; **Sp** - Langosta colorete.



Diagnostic characters: Carapace rounded and spiny; rostrum absent; anterior margin bearing 4 regularly spaced large spines other than frontal horns; **height of frontal horns more than 3 times the eye height, without spinules in between.** Antennules with flagella longer than peduncle; **antennular plate at bases of antennae armed with 2 pairs of well-separated principal spines only (anterior pair larger)**. First 4 pairs of legs without pincers. **Abdomen more or less smooth, with broad but shallow sunken pubescent areas only present at each half of second and third segments.** Posterior half of tail fan soft and flexible. **Colour:** body of adults generally blue and green; more greenish in large individuals. Carapace, including frontal horns, with a mosaic pattern of green, white and blue. Eyes black-brown. **Antenna with inner surface pink and outer surface blue; inner surface of antennular peduncle white, outer surface blue; flagella whitish. Legs blue, distinctly striped with white lines. Abdomen greenish, having white lines with blue margins along posterior margin of each segment.** Soft part of tail fan green and blue or orange-brown (large individuals). Pleopods blue, with white margins and a conspicuous medial white line. **Coloration of juveniles somewhat different**: body bluish to dark blue with conspicuous longitudinal white lines on lateral carapace; antennae and antennular plate almost entirely whitish; antennules bluish and distally whitish; legs with dark blue stripes; pleopods without medial white line.

Size: Maximum body length about 40 cm, commonly between 20 to 30 cm.

Habitat, biology, and fisheries: Found in reef areas at depths of usually less than 16 m (mostly between 4 and 12 m) in clear or sometimes turbid water with strong currents, often on seaward edges of the reef plateau. Nocturnal and not gregarious; hides in crevices during the daytime with only the white antennae visible. Actively fished throughout its range by divers (using hand or spear), but apparently rarely enters traps or pots. The catches of this lobster are nowhere very large and it is mainly locally consumed live, fresh, cooked whole, or tailed, but in some regions, such as from the Philippines, exported live or tailed. The attractive coloration of the juveniles has caught the attention of the tropical marine aquarium trade and specimens presumably originating from the Philippines and Indonesia are sometimes sold in the aquarium shops of other Asian countries as well as in Europe and the USA (juveniles of other *Panulirus* species are occasionally also found in the aquarium trade, but usually sold at lower prices).

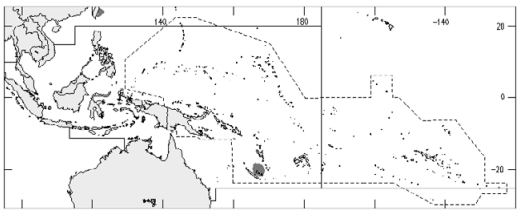


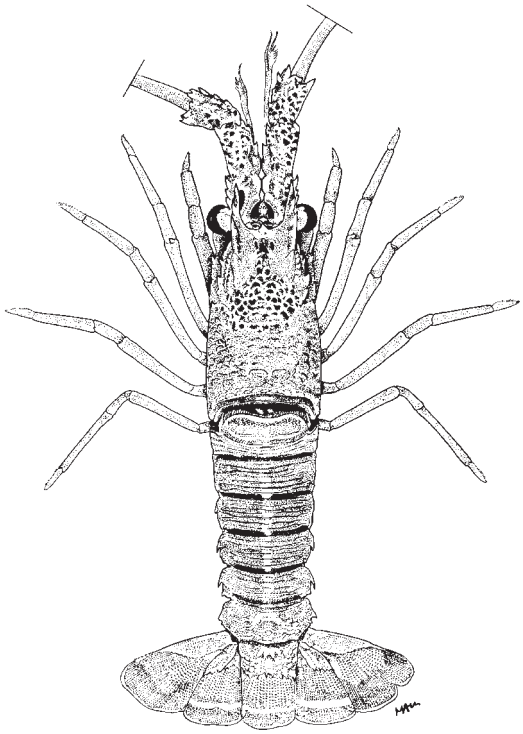
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Red Sea, Japan, Micronesia, Melanesia, northern Australia, and French Polynesia.

Justitia chani Poupin, 1994

En - Small furrow lobster.

Body length between 11 and 15.5 cm; probably the smallest species of the genus. On rocky substrate in depths from 150 to 340 m. Caught by tangle nets and dredges. Rare and of very limited interest to fisheries. Known from the western Pacific and so far only recorded from Japan, Taiwan Province of China, and New Caledonia.



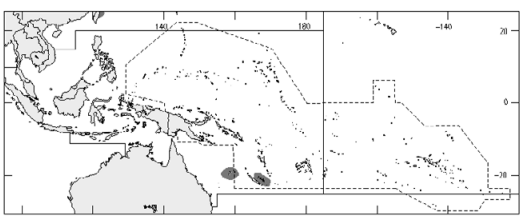


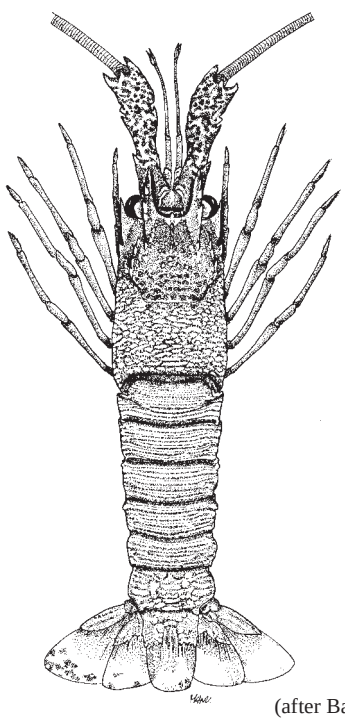
(after Poupin, 1994)

Justitia japonica (Kubo, 1955)

En - Japanese furrow lobster.

Maximum body length about 27 cm, commonly between 15 and 25 cm; probably the largest species of the genus. On rocky bottoms at depths from 90 to 340 m. A limited fishery potential because of its deep, untrawlable habitat; seldom caught by lobster pots and trap nets. Indo-West Pacific from Madagascar to Taiwan Province of China, Japan, New Caledonia, and the Chesterfields Islands.



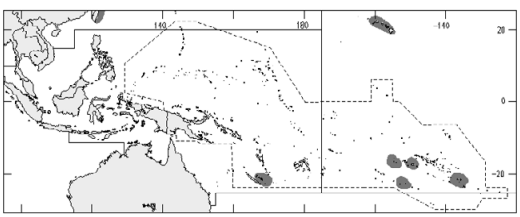


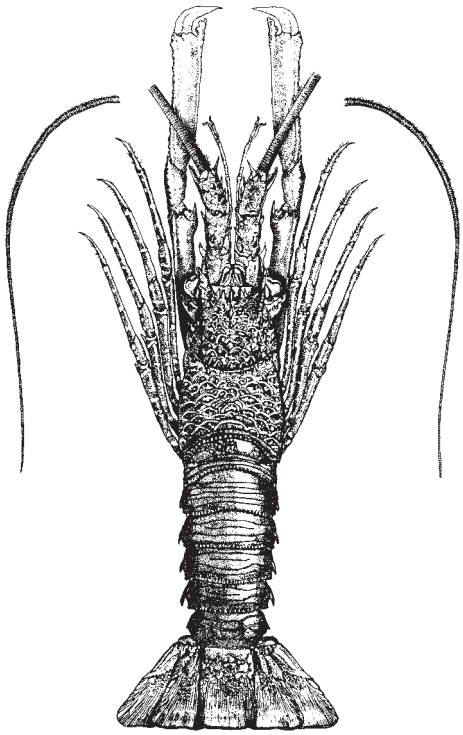
(after Baba et al., 1986)

Justitia longimanus (H. Milne Edwards, 1837)

En - Longarm furrow lobster; **Fr** - Langouste gibbon; **Sp** - Langosta de muelas. (The old FAO name of this species is re-used because recent research showed that *J. longimanus* and *J. mauritiana* represent the same species).

Maximum body length 18.5 cm, commonly between 11 and 16 cm. At depths from 23 to 454 m, usually between 50 and 150 m. Inhabits the outer parts of coral or rocky reef slopes. Although perhaps the most common species of the genus, it is only occasionally caught by traps, tangle nets, or divers. Of limited interest to fisheries because of its rocky habitat and usual occurrence in deeper waters. Worldwide distribution in tropical and subtropical seas; recorded in the western Atlantic from Bermuda to Brazil and in the Indo-Pacific from Madagascar to Taiwan Province of China, Japan, Hawaii, and French Polynesia.



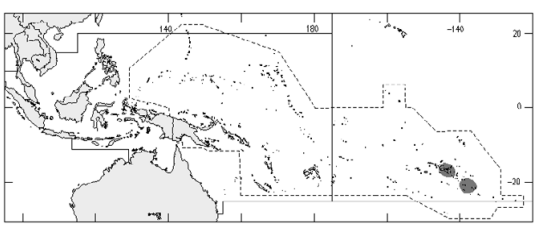


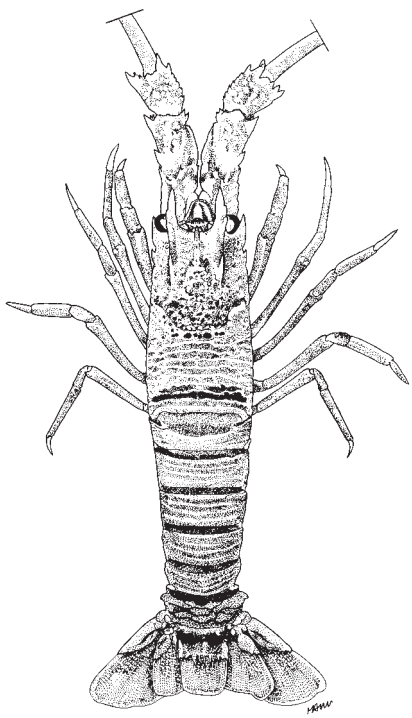
(after Miers, 1882)

Justitia vericeli Poupin, 1994

En - Polynesian furrow lobster.

Body length about 18 cm. On hard coral bottoms at depths from 160 to 320 m. Apparently very rare and only caught during experimental trapping operations. So far only known from the Tuamotu Archipelago (French Polynesia).



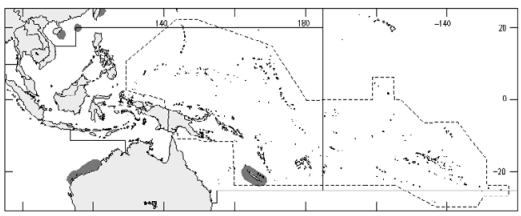


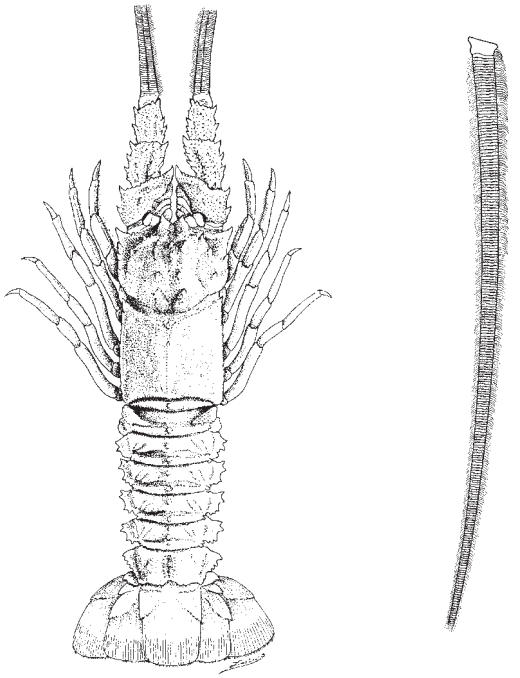
(after Poupin, 1994)

Linuparus sordidus Bruce, 1965

En - Oriental spear lobster.

Body length between 17 and 27 cm. On sandy mud and limestone rocks in depths from 200 to 500 m. A rare species, occasionally caught by trawls or traps. However, because of its large size and occurence in only moderately deep water, this lobster is potentially attractive for fisheries. Reported in the Indo-West Pacific from Taiwan Province of China, the South China Sea, northwestern Australia, and New Caledonia.



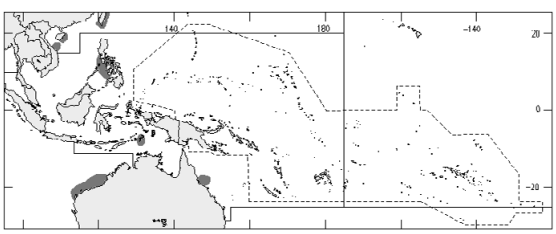


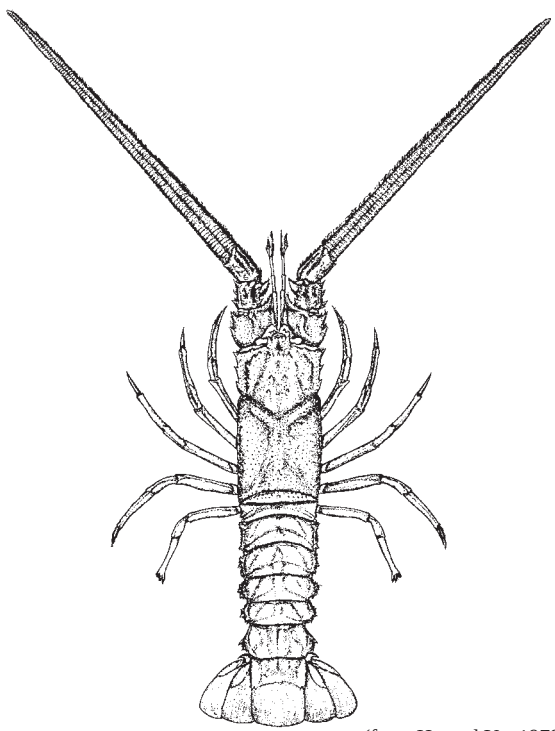
(after Bruce, 1965)

Linuparus trigonus (Von Siebold, 1824)

En - Japanese spear lobster.

Maximum body length 47 cm, commonly between 20 and 35 cm. On sand or mud bottoms in depths from 30 to 318 m. Occasionally taken by trawls, but apparently nowhere very abundant. Rarely sold in fish markets in the Philippines. Caught commercially on a small scale off northern Australia and Queensland during the northern prawn fishery closed seasons. The lobsters are tailed because their rigid antennae make them difficult to pack up. Indo-West Pacific from Japan to Taiwan Province of China, Viet Nam, the Philippines, Indonesia, and Australia.



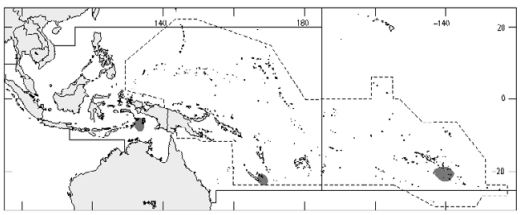


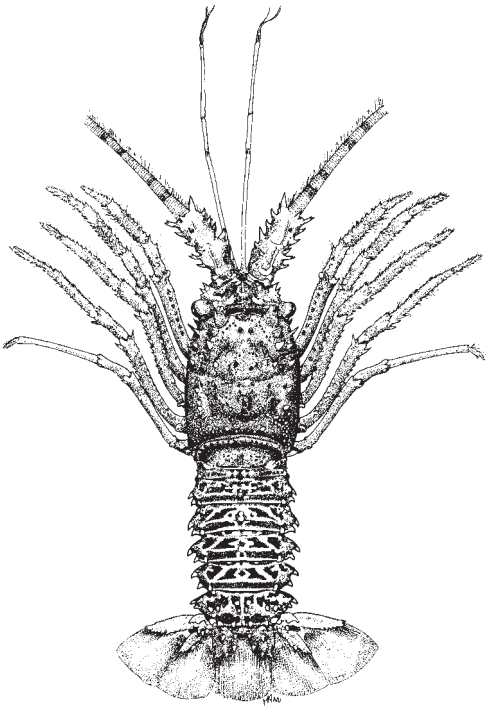
(from Ho and Yu, 1979)

Palinustus unicornutus Berry, 1979

En - Unicorn blunthorn lobster.

Maximum body length about 14 cm. On hard bottoms at depths from 205 to 670 m. Rare and mainly taken during experimental trawling and trapping operations. Indo-West Pacific from the eastern coast of South Africa to La Réuion, Comoro Islands, Japan, Indonesia, New Caledonia, and French Polynesia.



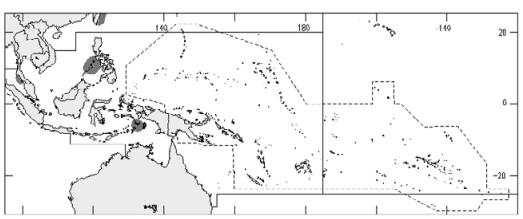


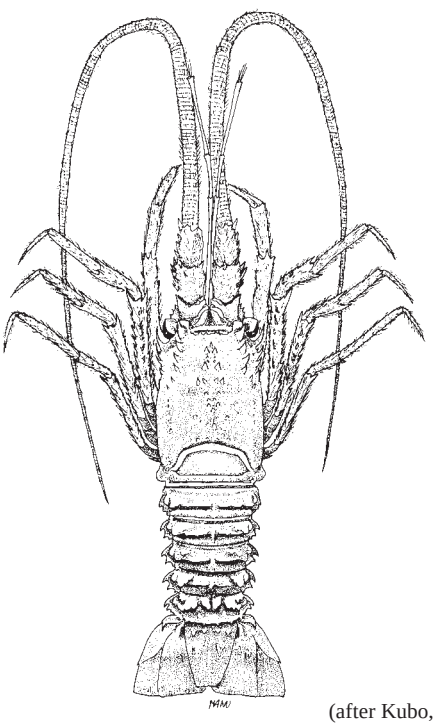
(after Berry, 1979)

Palinustus waguensis Kubo, 1963

En - Japanese blunthorn lobster.

Maximum body length about 14 cm, commonly to 10 cm. Inhabits the outer parts of coral and rocky reef slopes at depths from 72 to 180 m. The most common species of the genus although still moderately rare and only occasionally caught by tangle nets and trawls. A small species of very limited interest to fisheries. In Thailand, dried specimens are occasionally sold as souvenirs to tourists. Indo-West Pacific from Japan to Taiwan Province of China, the Philippines, Indonesia, Thailand, India, and Madagascar.



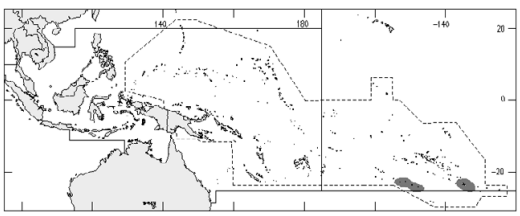


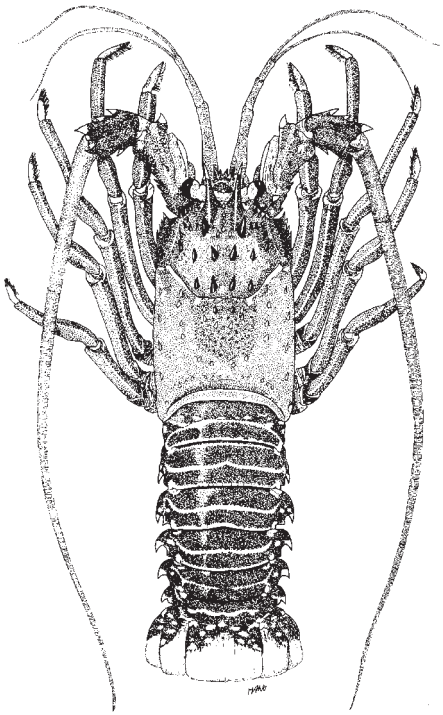
(after Kubo, 1963)

Panulirus pascuensis Reed, 1954

En - Easter Island spiny lobster.

Total body length of adults between 15 and 25 cm. Lives on rocky substrate in shallow waters to a depth of 50 m; breeding season around December. Caught by divers during both day and night by hand and spears, also by gill nets and lobster pots. Sold fresh and consumed locally. Only known from Easter Island, Pitcairn Islands and Austral Islands of French Polynesia.



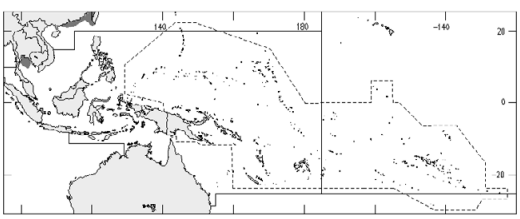


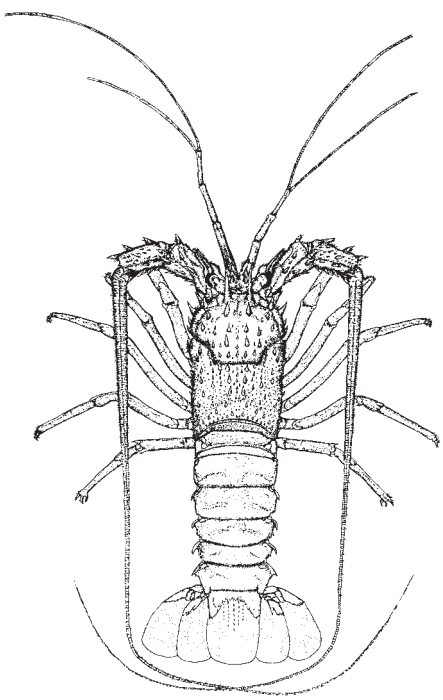
(after George and Holthuis, 1965)

Panulirus stimpsoni Holthuis, 1963

En - Chinese spiny lobster.

Maximum body length 35 cm, commonly between 16 and 23 cm; maximum weight about 3 kg. Found in reef areas at depths of less than 40 m. Mainly distributed along the southern coast of China, including Hong Kong, and the western coast of Taiwan Province of China. In the Western Central Pacific, only recently found in the Gulf of Thailand where it is apparently rare.



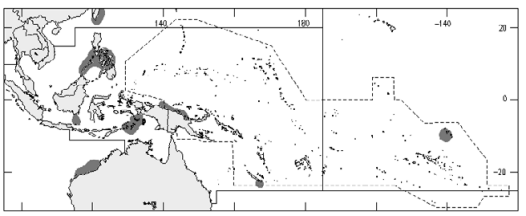


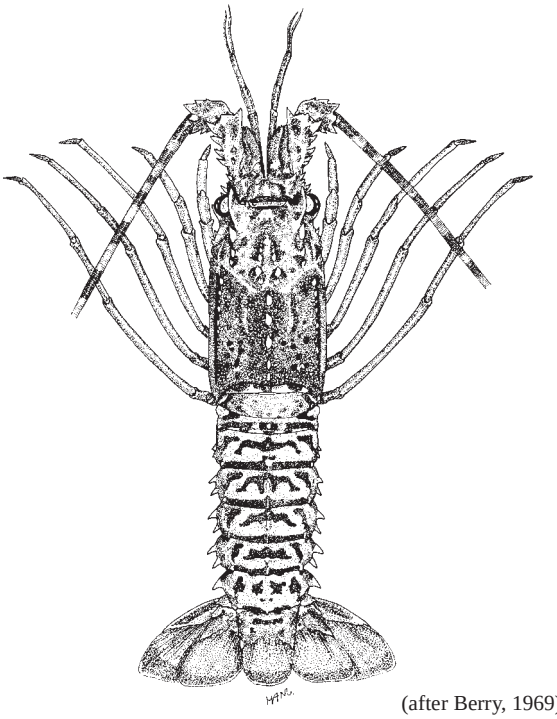
(from Ho and Yu, 1979)

Puerulus angulatus (Bate, 1888)

En - Banded whip lobster.

Maximum body length about 21 cm, commonly between 11 and 17 cm. On soft substrate at depths from 180 to 536 m. Often taken as bycatch during deep-sea trawling operations, but usually not in large numbers. Of potential interest to fisheries. Indo-West Pacific from the eastern coast of Africa to Japan, Taiwan Province of China, the Philippines, Indonesia, New Guinea, northwestern Australia, New Caledonia, and Marquesas Islands.



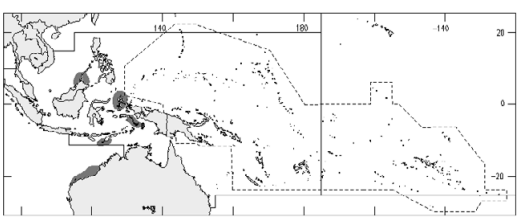


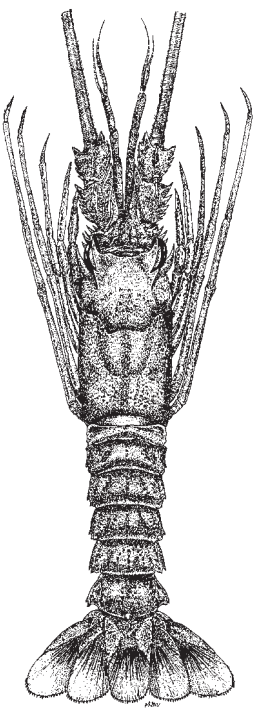
(after Berry, 1969)

Puerulus velutinus Holthuis, 1963

En - Velvet whip lobster.

Maximum body length about 19 cm. On sand or mud bottoms at depths from 485 to 683 m. So far only taken during experimental trawling operations, but sometimes collected in relatively great numbers and may therefore be of potential interest to fisheries. Only known from the Philippines, Indonesia, and northwestern Australia.





(after De Man, 1916)

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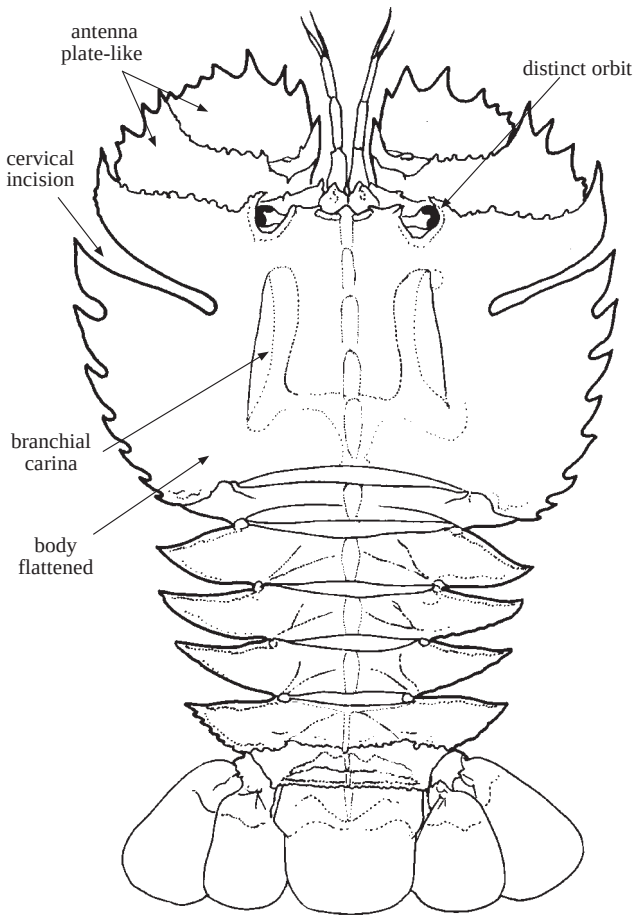
SCYLLARIDAE

Slipper lobsters

Diagnostic characters: Small to large crustaceans. **Body strongly depressed. Carapace laterally angular, rostrum absent or minute; eyes small but distinct and pigmented, enclosed within distinct orbits; no large frontal horns. Antennae short, broad, extremely flattened and plate- or scale-like**; antennules short and slender, with short flagella. **All legs similar in size and generally without pincers** (except in *Scyllarus cultrifer*, third and fourth legs ending in false pincers). Both abdomen and tail fan well developed and powerful, **posterior half of tail fan soft and flexible. Colour:** usually drab, somewhat brownish in various shadings; **dorsal surface of first abdominal segment often with a characteristic pattern of brightly coloured large spot(s).**



Habitat, biology, and fisheries: Six genera and about 30 species of slipper lobsters are currently known from the Western Central Pacific. Their adult sizes are ranging from 2 to 50.5 cm body length. All species are bottom dwelling and are found from very shallow water to a depth of more than 484 m. As in spiny lobsters, the sexes can easily be distinguished by the position of the gonopores at the bases of the third or fifth legs. Mature female slipper lobsters also have the tip of the fifth leg transformed into a small false or true pincer (except in *Thenus*). The eggs are generally very small and numerous and orange or yellowish in colour. Slipper lobsters have a long planktonic phyllosoma larval stage similar to that of spiny lobsters. Members of the genera *Arctides*, *Parribacus,* and *Scyllarides* live in shallow coral and rocky reefs. *Arctides* species are rare but species of the latter 2 genera often form the bycatches of fisheries for spiny lobsters and are of moderate commercial value. The genera *Ibacus* and *Thenus* mainly occur on soft bottoms (the former one in deeper waters) and can be taken by commercial trawlers. They reach a high production in some regions and may be used for export as well as for local consumption. Yearly production of all slipper lobsters in the Western Central Pacific from 1990 to 1995 ranged from 1641 to 3115 t (FAO Yearbook of Fishery Statistics). About 1/3 to 1/2 of this production originated in the Gulf of Thailand. The genus *Scyllarus* has the most numerous species in the family which occur in both soft and hard bottoms from shallow to deep waters. However, they are usually small in size and few in numbers and are therefore without economic value. Since the taxonomic status of many species of the genus *Scyllarus* is still unclear, a key to the species of this genus is not presented here, and only abbreviated species accounts are provided for 2 of the common species in the Western Central Pacific to give an idea of their general appearances.

Similar families occurring in the area

None. No other family of lobsters has such a strongly flattened body or plate-like antennae.

Key to the genera of Scyllaridae occurring in the area

1a. Carapace with deep cervical incisions and lateral margins cut into large teeth; abdominal pleura directed laterally (Figs 1, 2) . . . . . → ***2***

1b. Carapace with very shallow cervical incisions and lateral margins not cut into large teeth; abdominal pleura directed downwards (Figs 3 to 6) . . . . . → ***3***

2a. Dorsal surface of body rather smooth and provided with distinct branchial carinae; fifth abdominal segment bearing a posteromedian spine; body colour plain (Fig. 1) . . . . . ***Ibacus***

2b. Dorsal surface of body entirely covered with scale-like tubercles; branchial carina absent; fifth abdominal segment without posteromedian spine; body coloration mottled (Fig. 2) . . . . . ***Parribacus***

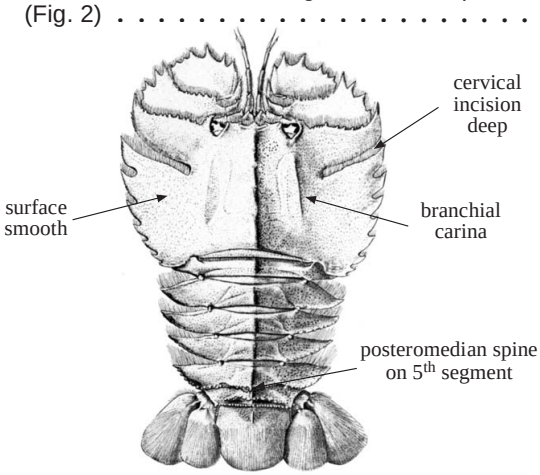


Fig. 1 ***Ibacus***

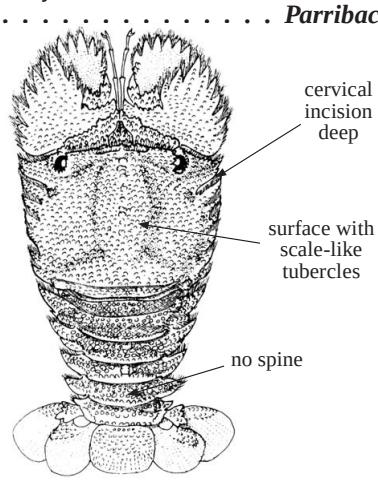


Fig. 2 ***Parribacus***

3a. Body strongly depressed; carapace trapezoid and narrowing posteriorly; orbits located at anterolateral angles of carapace (Fig. 3) . . . . . ***Thenus***
(a single species, *T. orientalis*, in this genus)

3b. Body not strongly depressed, sometimes slightly vaulted; carapace more or less rectangular; orbits situated on anterior margin . . . . . → ***4***

4a. Size large (up to 50.5 cm body length); distal margin of antenna finely crenate; abdomen uniformly granulate and not particularly sculptured (Fig. 4) . . . . . ***Scyllarides***

4b. Size medium or small (body length less than 17 cm); distal margin of antenna cut into distinct teeth; abdomen with transverse grooves or arborescent sculpture . . . . . → ***5***

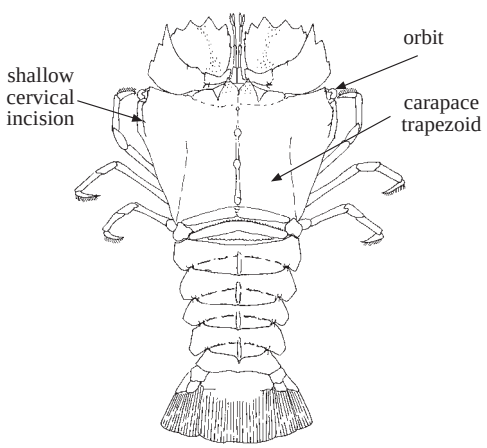


Fig. 3 ***Thenus orientalis***

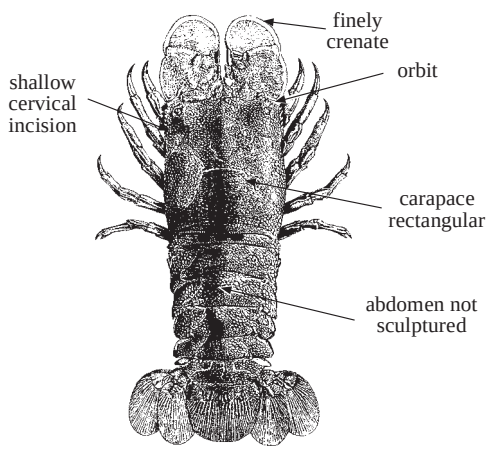


Fig. 4 ***Scyllarides***

5a. Medium size (adults more than 12 cm body length); distal margin of antenna with more than 20 small teeth; exopods of maxillipeds with multiarticulate flagella (Fig. 5) . . . . . ***Arctides***
(a single species, *Arctides regalis*, in the area)

5b. Small size (usually less than 10 cm body length); distal margin of antenna with less than 10 large teeth; exopods of maxillipeds without flagellum or with flagellum transformed to a single laminate segment (Fig. 6) . . . . . ***Scyllarus***
(generally, the species of *Scyllarus* can be separated into 2 groups: 1 has arborescent sculpture on the abdomen while the other group has broad transverse grooves on the abdomen and lacks an arborescent sculpture)

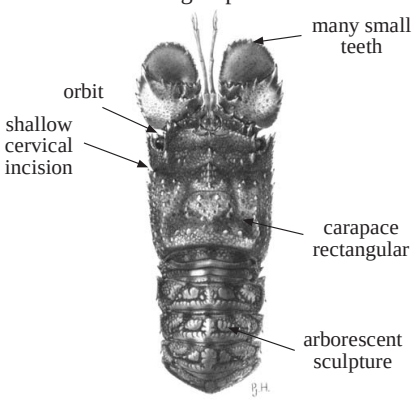


Fig. 5 ***Arctides regalis***

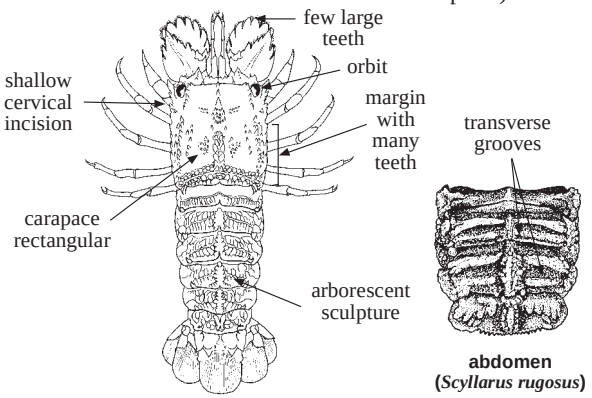


Fig. 6 ***Scyllarus***

Key to the species of *Ibacus* occurring in the area

1a. Carapace with 6 to 9 posterolateral teeth (Fig. 7a-c) . . . . . → ***2***

1b. Carapace with more than 9 posterolateral teeth (Fig. 7d-f) . . . . . → ***4***

2a. Merus of third maxilliped concave on ventral surface and without deep incisions on inner margin (Fig. 8a); cervical incision very wide (Fig. 7a) . . . . . ***Ibacus brucei***

2b. Merus of third maxilliped convex on ventral surface and provided with deep incisions on inner margin (Fig. 8b, c); cervical incision narrow (Fig. 7b, c) . . . . . → ***3***

3a. Branchial carina nearly straight (Fig. 7b); posterior incision of orbit without tubercle. . . . . ***Ibacus novemdentatus***

3b. Branchial carina strongly convex (Fig. 7c); posterior incision of orbit with a distinct tubercle . . . . . ***Ibacus peronii***

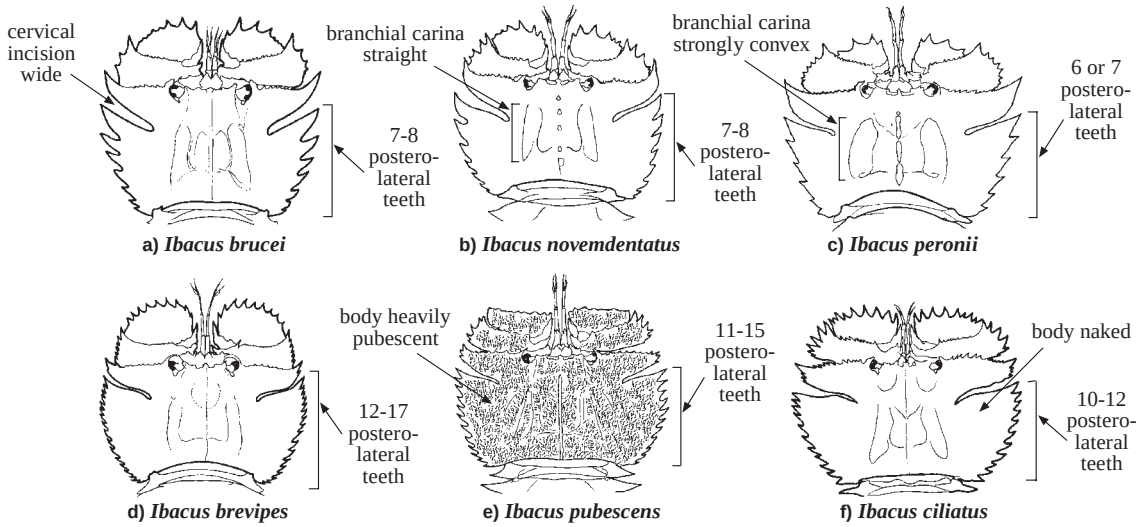


Fig. 7 carapace (dorsal view)

4a. Merus of third maxilliped convex on ventral surface and provided with deep incisions on inner margins (Fig. 8d) . . . . . ***Ibacus brevipes***

4b. Merus of third maxilliped concave on ventral surface and without deep incisions on inner margin (Fig. 8e) . . . . . → ***5***

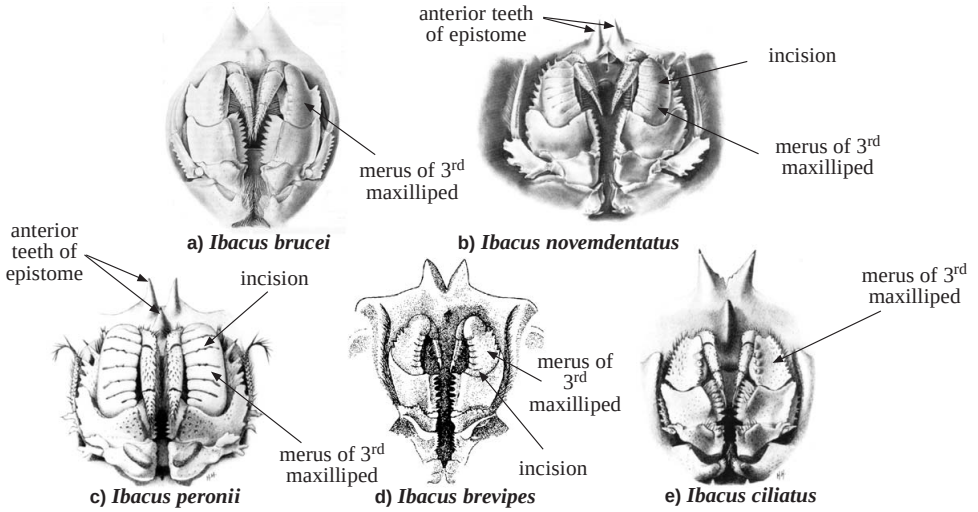


Fig. 8 mouth field (ventral view)

5a. Body heavily pubescent (Fig. 7e); posterior margin of fifth abdominal segment evenly serrated (Fig. 9a) . . . . . ***Ibacus pubescens***

5b. Body except distal segment of antenna naked (Fig. 7f); posterior margin of fifth abdominal segment only with a median spine and 3 to 4 lateral tubercles (Fig. 9b) . . . ***Ibacus ciliatus***

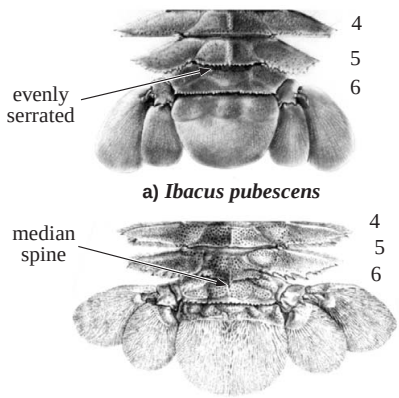


Fig. 9 posterior part of abdomen (dorsal view)

Key to the species of *Parribacus* occurring in the area

1a Median carina on second and third abdominal segments markedly elevated; transverse grooves separating articulated and non-articulated parts of abdominal segments wide and almost naked (Fig. 10a) . . . ***Parribacus antarcticus***

1b Median carina on second and third abdominal segments low; transverse grooves separating articulated and non-articulated parts of abdominal segments narrow and hairy (Fig. 10b) . . . . . → ***2***

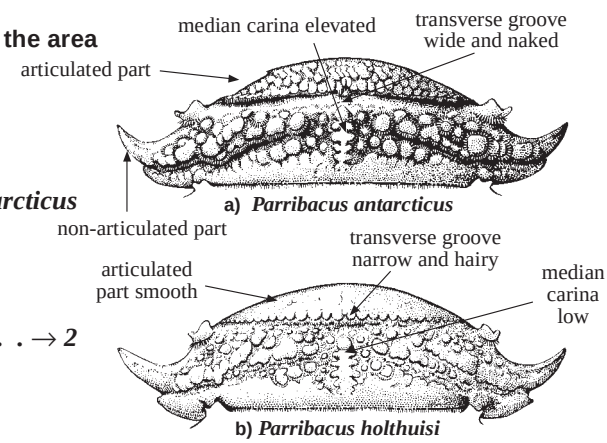


Fig. 10 third abdominal segment (dorsal view)

2a. Articulated parts of abdominal segments bearing distinct tubercles (Fig. 11a); fourth segment of antenna with 7 outer teeth (apical tooth not included) . . . . . ***Parribacus caledonicus***

2b. Articulated parts of abdominal segments more or less smooth (Fig. 10b); fourth segment of antenna with 5 to 6 outer teeth (apical tooth not included) . . . . . .→ ***3***

3a. Fourth segment of antenna bearing 5 outer teeth (apical tooth not included); the posterior of the 2 lateral teeth of carapace before cervical incision much smaller than the first (Fig. 11b) . . . . . ***Parribacus holthuisi***

3b. Fourth segment of antenna bearing 6 outer teeth (apical tooth not included); the 2 lateral teeth of the carapace before cervical incision only slightly unequal in size (Fig. 11c) . . . . . ***Parribacus scarlatinus***

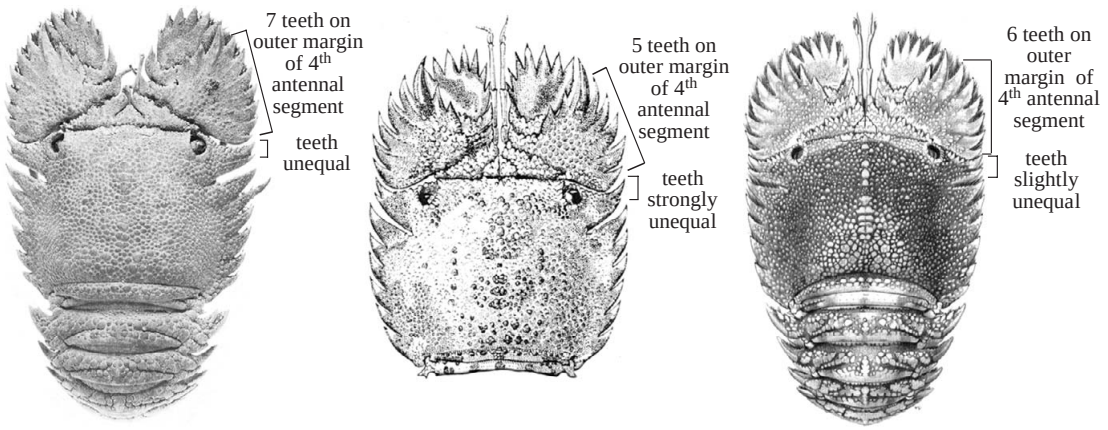


Fig. 11 carapace and anterior abdominal segments (dorsal view)

Key to the species of *Scyllarides* occurring in the area

1a. Carapace with a deep cervical groove and with posterior part distinctly wider than anterior half (Fig. 12a); fourth abdominal segment always produced into a remarkable hump medially; posterior margin of second abdominal pleuron somewhat concave (Fig. 13a); only diffuse spots present on first abdominal segment . . . . . ***Scyllarides haanii***

1b. Carapace with a shallow cervical groove and with anterior part more or less as wide as posterior half (Fig. 12b); middle of fourth abdominal segment never with a hump, only moderately ridged; posterior margin of second abdominal pleuron somewhat convex (Fig. 13b); first abdominal segment with large distinct spots . . . . . ***Scyllarides squammosus***

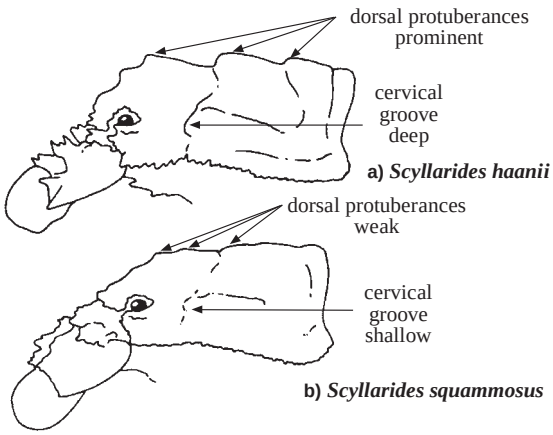


Fig. 12 carapax (lateral view)

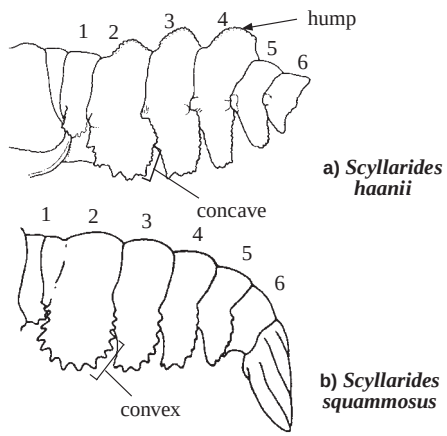


Fig. 13 abdomen (lateral view)

List of species occurring in the area

The symbol 🦐 is given when species accounts are included.

🦐 *Arctides regalis* Holthuis, 1963

Ibacus brevipes Bate, 1888
Ibacus brucei Holthuis, 1977
🦐 *Ibacus ciliatus* (Von Siebold, 1824)
🦐 *Ibacus novemdentatus* Gibbes, 1850
Ibacus peronii Leach, 1815
🦐 *Ibacus pubescens* Holthuis, 1960

🦐 *Parribacus antarcticus* (Lund, 1793)
🦐 *Parribacus caledonicus* Holthuis, 1960
🦐 *Parribacus holthuisi* Forest, 1954
🦐 *Parribacus scarlatinus* Holthuis, 1960

🦐 *Scyllarides haanii* (De Haan, 1841)
🦐 *Scyllarides squammosus* (H. Milne Edwards, 1837)

Scyllarus aesopius Holthuis, 1960
Scyllarus aureus Holthuis, 1963
Scyllarus aurora Holthuis, 1982
Scyllarus batei Holthuis, 1946
🦐 *Scyllarus bertholdii* Paulson, 1875
Scyllarus bicuspidatus (De Man, 1905)
Scyllarus cultrifer (Ortmann, 1897)
Scyllarus demani Holthuis, 1946
Scyllarus gibberosus (De Man, 1905)
Scyllarus martensii Pfeffer, 1881
Scyllarus rapanus Holthuis, 1993
🦐 *Scyllarus rugosus* H. Milne Edwards, 1837
Scyllarus sordidus (Stimpson, 1860)
Scyllarus timidus Holthuis, 1960
*Scyllarus umblica*tus Holthuis, 1963
Scyllarus vitiensis (Dana, 1852)

🦐 *Thenus orientalis* (Lund, 1793)

References

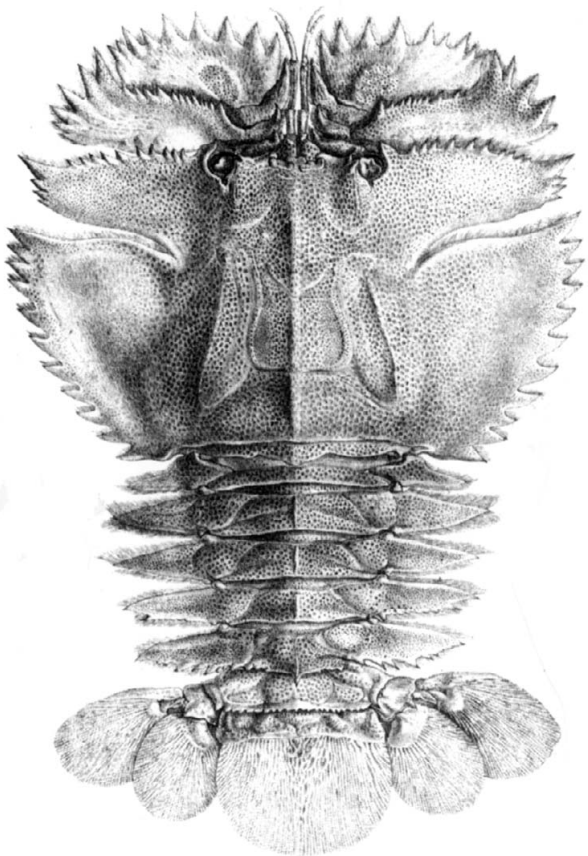
Chan, T.Y. and H.P. Yu. 1993. *The illustrated lobsters of Taiwan*. Taipei, SMC Publishing Inc., 248 p.

Holthuis, L.B. 1991. FAO species catalogue. Marine lobsters of the world. Vol. 13. An annotated and illustrated catalogue of species of interest to fisheries known to date. *FAO Fish. Synop.*, 125(13):1-292.

Ibacus ciliatus (Von Siebold, 1824)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Japanese fan lobster.



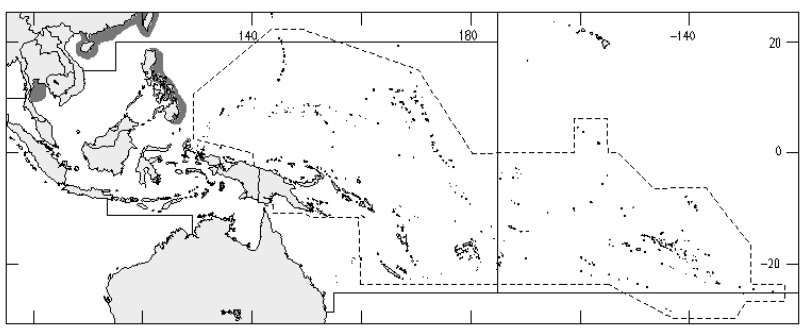
(from Holthuis, 1985)

Diagnostic characters: Body extremely flattened with **dorsal surface rather smooth or slightly pitted; only distal segment of antenna heavily pubescent, particularly in adult males**. Carapace with well-developed branchial carinae and deep cervical incisions, **posterolateral margin cut into 10 to 12 large teeth.** Eyes small and subspherical; orbits not closed and situated on anterior margin of carapace. Antennae broad, flattened and plate-like. **Merus of third maxilliped ventrally concave, with only shallow incisions on inner margin**. All legs without pincers and similar in size. **Posterior margin of fifth abdominal segment armed with a median spine and 3 or 4 lateral tubercles; abdominal pleura directed laterally**. Posterior half of tail fan soft and flexible. **Colour:** body purplish brown all over. Eyes dark brown. Legs orange-brown. Soft part of tail fan transparent and somewhat reddish brown. Setae light brown. Eggs orange.

Size: Maximum body length 23 cm, commonly to about 15 cm.

Habitat, biology, and fisheries: Found on soft substrate of sand, mud, or clay at depths from 48 to 314 m, mostly between 100 and 250 m. Taken by commercial trawlers and common in fish markets of the Philippines, but sold at lower prices than spiny lobsters. The females carry the eggs for about 30 days until the larvae hatch out; the phyllosoma larvae passes through 9 stages in 76 days and metamorphose to the benthic reptant larvae.

Distribution: Western Pacific from Japan, Korea, coast of China, Taiwan Province of China, the east coast of the Philippines, and Thailand.

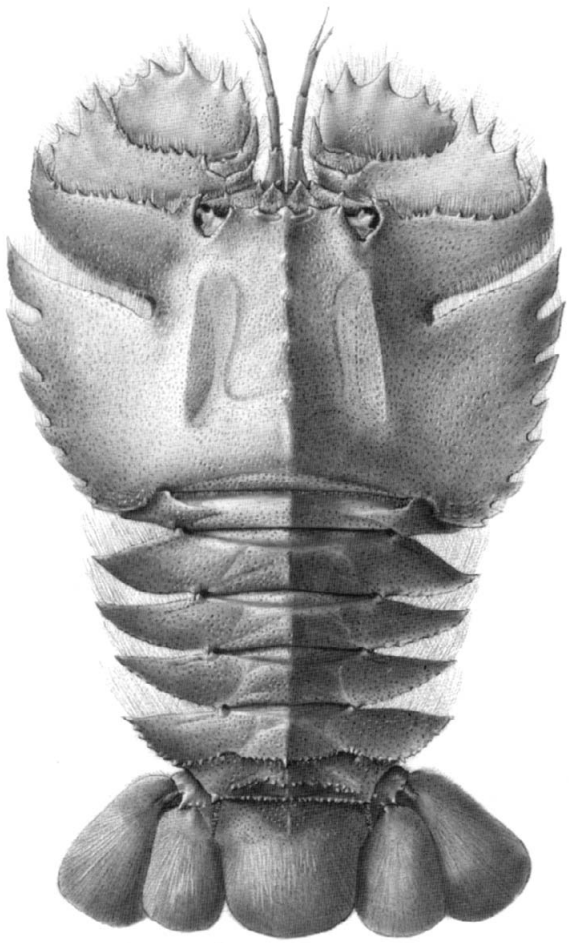


Ibacus novemdentatus Gibbes, 1850

Frequent synonyms / misidentifications: None / *Ibacus ciliatus* (Von Siebold, 1824); *I. pubescens* Holthuis, 1960; *I. peronii* Leach, 1815.

FAO names: En - Smooth fan lobster;
Fr - Cigale glabre; **Sp** - Cigarra liso.

Diagnostic characters: Body extremely flattened and with **dorsal surface rather smooth or slightly pitted. Carapace with nearly straight branchial carinae; cervical incisions deep but narrow; posterolateral margin cut into 7 or 8 large teeth.** Eyes small and subspherical; orbits not closed and **without tubercle at posterior incision,** situated on anterior margin of carapace. Antennae broad, flattened and plate-like. **Merus of third maxilliped ventrally convex, with deep incisions on inner margin.** All legs without pincers and similar in size. **Posterior margin of fifth abdominal segment evenly serrated, bearing a median spine; abdominal pleura directed laterally**. Posterior half of tail fan soft and flexible. **Colour:** body pale yellowish brown and marbled with reddish brown patches on dorsal surface. Ventral surfaces of carapace and legs brown and white. Eyes dark brown. Soft part of tail fan transparent and somewhat pale yellowish. Eggs orange.

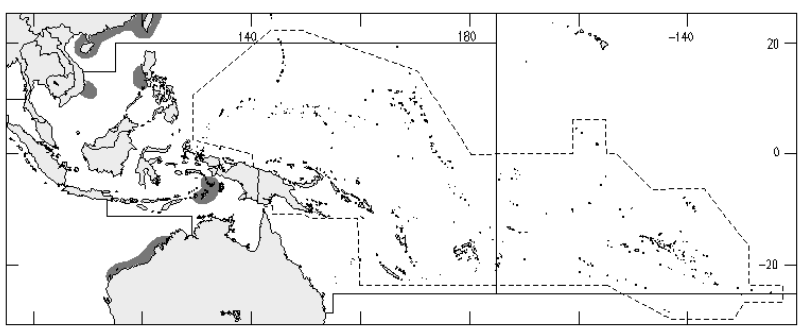


(from Holthuis, 1985)

Size: Maximum body length 19 cm, commonly between 14 and 17 cm.

Habitat, biology, and fisheries: Found at depths from 37 to 400 m on levelled bottom of sand and mud. The phyllosoma larva of this species has 7 stages and lasts for 65 days. Taken by commercial trawlers in the Philippines, but in smaller catches than *Ibacus ciliatus*. Also used as food and sold in local fish markets (with same local names as *I. ciliatus*).

Distribution: Indo-West Pacific from the east coast of Africa to Japan, the Philippines, Indonesia, and northwestern Australia.

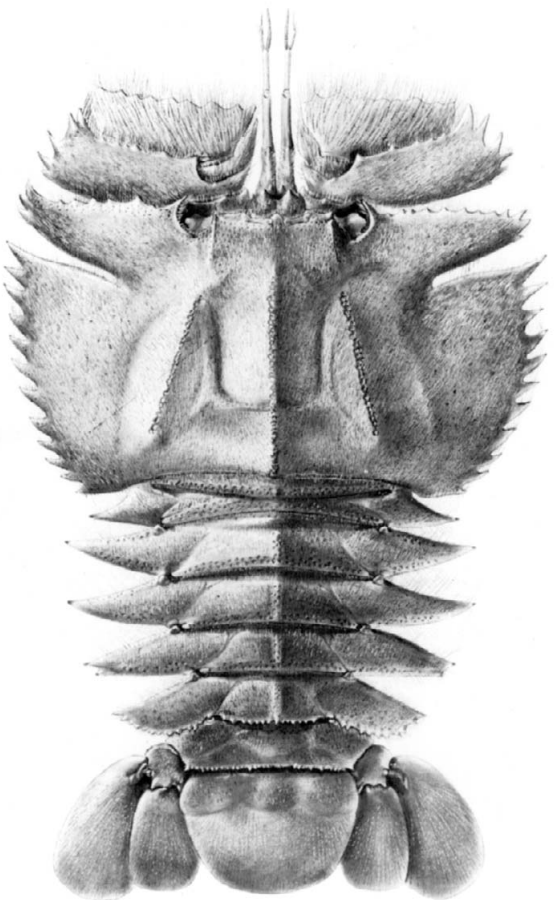


Ibacus pubescens Holthuis, 1960

Frequent synonyms / misidentifications: *Ibacus ciliatus pubescens* Holthuis, 1960 / *Ibacus ciliatus* (Von Siebold, 1824).

FAO names: En - Hairy fan lobster.

Diagnostic characters: Body extremely flattened and with **dorsal surface uniformly covered with dense short pubescence.** Carapace with well-developed branchial carinae and deep cervical incisions, **posterolateral margin cut into 11 to 15 distinct teeth**. Eyes small and subspherical; orbits not closed and situated on anterior margin of carapace. Antennae broad, flattened and plate-like. **Merus of third maxilliped ventrally concave, with only shallow incisions on inner margin.** All legs without pincers and similar in size. **Posterior margin of fifth abdominal segment evenly serrated, bearing a median spine; abdominal pleura directed laterally.** Posterior half of tail fan soft and flexible. **Colour:** body pale brown with lateral teeth on carapace somewhat whitish. Eyes dark brown. Soft part of tail fan transparent. Setae light brown.

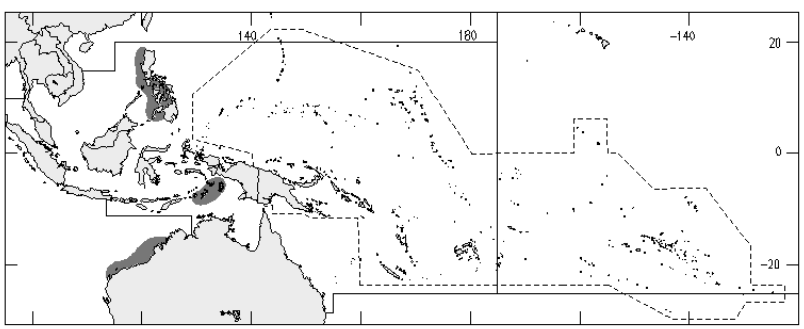


(from Holthuis, 1985)

Size: Maximum carapace length 7.8 cm, with a maximum body length of about 20 cm.

Habitat, biology, and fisheries: Over sand or mud bottoms at depths from 150 to 391 m. Taken by trawls. The hairy fan lobster was formerly often confused with *Ibacus ciliatus*, and it is still not known which of these 2 species is more common in the Western Central Pacific. Very likely mixed with *I. ciliatus* in the markets of the Philippines.

Distribution: So far only known amongst the islands and along the west coast of the Philippines, Indonesia, and northwestern Australia.



Parribacus antarcticus (Lund, 1793)

Frequent synonyms / misidentifications: *Parribacus ursus major* (Herbst, 1793) / None.

FAO names: En - Sculptured mitten lobster; **Fr** - Cigale savate; **Sp** - Cigarra chinesa.

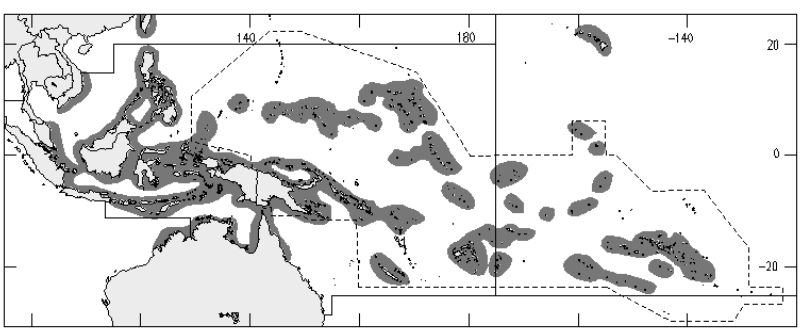
Diagnostic characters: Body extremely flattened, with **dorsal surface uniformly covered with scale-like tubercles and short hairs.** Carapace with distinct rostral tooth; without branchial ridge but with deep cervical incisions; lateral margin cut into large teeth. Eyes small and subspherical; orbits not closed and situated on anterior margin of carapace. Antennae broad, flattened and plate-like; **fourth segment armed with 6 large outer teeth** (sometimes bifurcated and excluding apical tooth). All legs without pincers and similar in size. **Abdomen with median carina on second and third segments markedly elevated; transverse grooves separating articulated and non-articulated parts of each segment are wide and almost naked; fifth segment without posteromedian spine; pleura directed laterally**. Posterior half of tail fan soft and flexible. **Colour:** body yellowish and mottled with brown and black patches. **Rostrum and orbital margin purplish.** Eyes black. **Large teeth on lateral carapace and antennae intricately banded with yellow, orange, light purple, deep brown and black distally.** Abdomen with 2 black lateral lines; **central region of first segment yellowish with some brown patches. Ventral surface of body greenish yellow, with pale green spots. Legs greenish yellow and covered with green bands, becoming rather inconspicuous on ventral surfaces. Tail fan light brown with deep blue dots.**

(from Holthuis, 1985)

Size: Maximum body length about 20 cm, commonly between 12 and 15 cm.

Habitat, biology, and fisheries: Lives in coral and stone reefs from shallow waters to a depth of 20 m. Nocturnal and sometimes found in small groups, hiding inside crevices and undercuts of reefs during daytime. Fished throughout its range but nowhere abundant. A common incidental catch for fisheries of spiny lobsters and caught by divers (using hand and spear), or by dipnets or tangle nets. Often considered as a delicacy, comparable to spiny lobsters, and mainly sold live or fresh in local markets.

Distribution: Worldwide in tropical seas and has been recorded in the Western Atlantic from the Caribbeans to Brazil, and in the Indo-West Pacific from the east coast of Africa to Taiwan Province of China, Hawaii, and French Polynesia.



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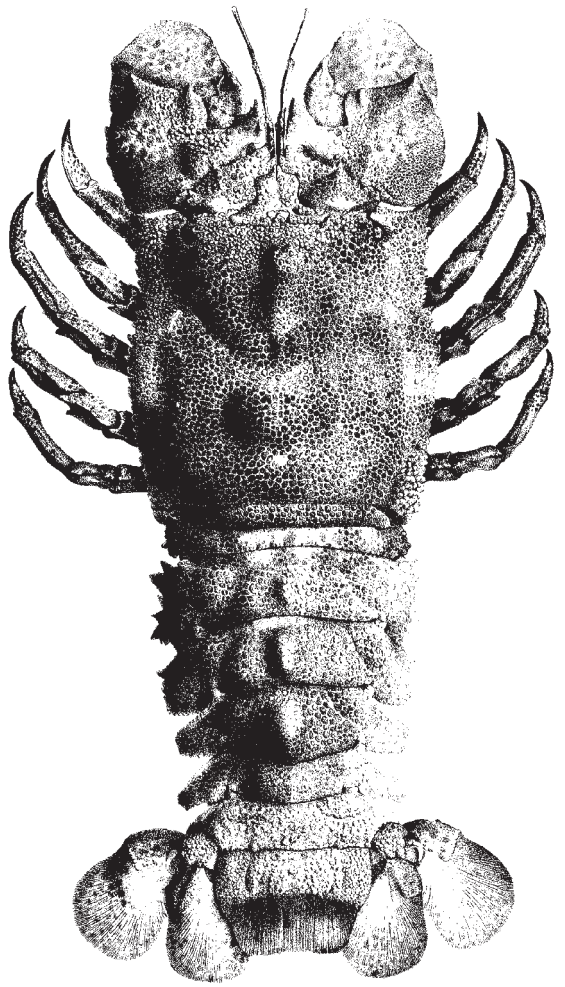
Scyllarides haanii (De Haan, 1841)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Aesop slipper lobster.

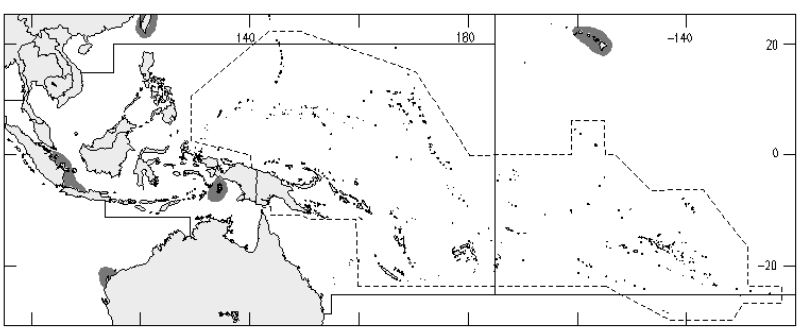


Diagnostic characters: Body vaulted, pubescent and covered with rounded tubercles. Eyes small and subspherical. **Carapace somewhat rectangular, but posterior half distinctly wider than anterior half; cervical groove strong; pregastric, gastric and cardiac teeth all strongly protruding.** Antennae broad, flattened and plate-like, with distal margin finely crenate. All legs without pincers and similar in size. Abdomen uniformly granulate and not particularly sculptured; **dorsal midline of second and third segments strongly ridged, and that of fourth segment produced into a remarkable hump; pleura directed downwards, with posterior margin of second pleuron somewhat concave.** Posterior half of tail fan soft and flexible. **Colour:** body and legs yellowish white and covered with purplish red patches; dorsal surfaces more purplish, ventral surfaces more yellowish. Eyes dark brown. **Antennae with purplish margins;** antennules somewhat orange except distal segment of peduncle and flagella purplish. **First abdominal segment yellowish with 3 diffused purplish red spots.** Soft part of tail fan light brown with numerous purple dots.

Size: Maximum body length 50.5 cm, commonly between 16 and 30 cm; probably the largest species of the genus.

Habitat, biology, and fisheries: Found in coral or rocky reefs at depths from 10 to 135 m, usually less than 50 m. Apparently nowhere abundant and in some places even uncommon. Despite of its large size therefore mostly incidentally taken during fishing activities for spiny lobsters (e.g. by hand or by lobster pots). When caught, this slipper lobster is highly esteemed as food and sold (usually live or fresh) in local markets at prices comparable to that of spiny lobsters.

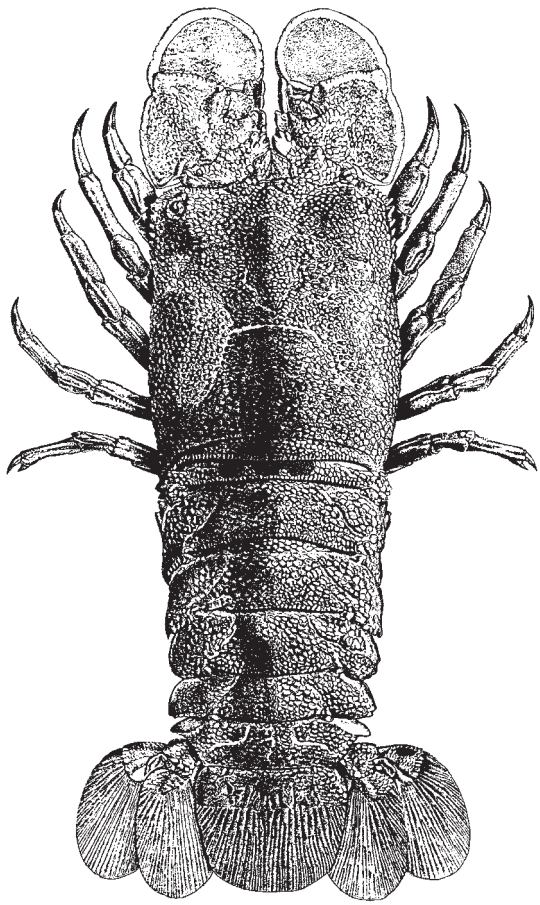
Distribution: Indo-West Pacific from Mauritius to the Red Sea, Japan, Hawaii, and Australia.



Scyllarides squammosus (H. Milne Edwards, 1837)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Blunt slipper lobster;
Fr - Cigale grenue; **Sp** - Cigarra ñato.

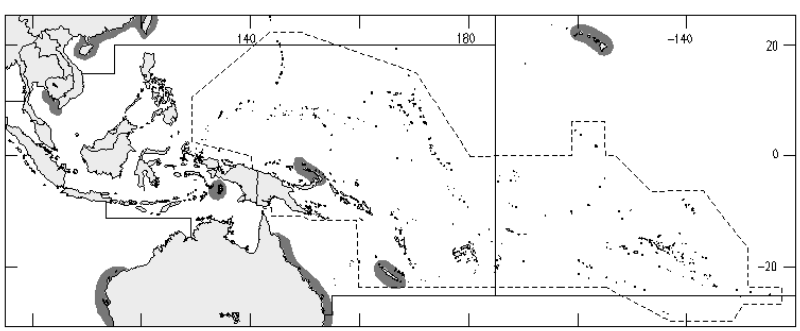


Diagnostic characters: Body vaulted, pubescent and densely covered with rounded tubercles. Eyes small and subspherical. **Carapace rectangular, with anterior half about as wide as posterior half; cervical groove shallow and constricted at middle; pregastric tooth slightly elevated, gastric tooth low and cardiac tooth almost levelled.** Antennae broad, flattened and plate-like, with distal margin finely crenate. All legs without pincers and similar in size. Abdomen uniformly granulate and not particularly sculptured; **dorsal midline of second to fourth segments weakly to moderately ridged and progressively higher posteriorly; pleura directed downwards, with posterior margin of second pleuron somewhat convex.** Posterior half of tail fan soft and flexible. **Colour:** body red-brown with depressed areas and ventral surfaces rather pale yellowish. Eyes black-brown. Margins of carapace orange-red; **antennae yellowish with orange-red margins;** antennules bright yellow with purplish flagella. Legs bright yellow with regions near joints distinctly purplish. **First abdominal segment with 3 distinct red spots, the central one much larger and anteriorly fused with lateral spots**. Soft part of tail fan light brown with red-brown dots.

Size: Maximum body length 40 cm, commonly to about 20 cm.

Habitat, biology, and fisheries: Nocturnal; inhabits coral and rocky reefs to a depth of about 80 m, mostly between 20 and 50 m. A common bycatch of fisheries for spiny lobsters and taken by hand during day and night diving, wire traps and tangle nets, but apparently nowhere abundant in the Western Central Pacific. Like other species of the genus, it is often considered as a delicacy and sold in local markets (fresh or live) at slightly lower prices than spiny lobsters.

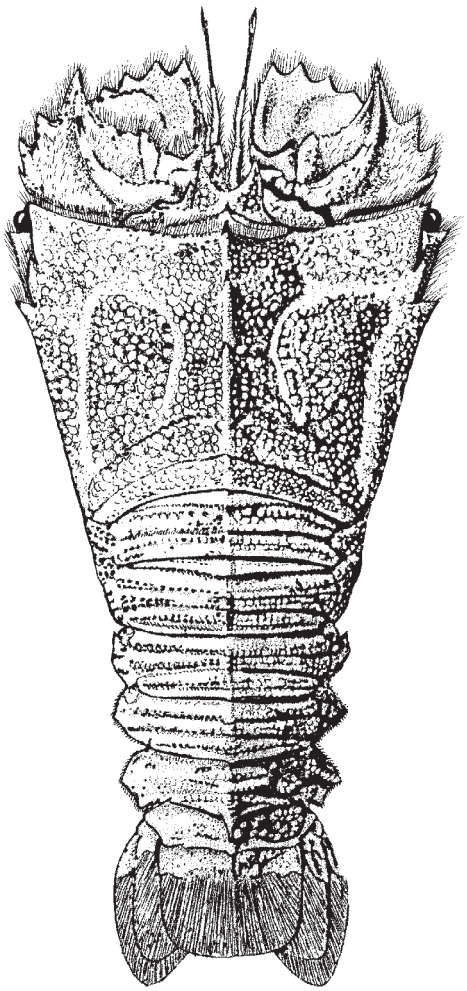
Distribution: Indo-West Pacific from the eastern coast of Africa to Japan, Australia, New Caledonia, and Hawaii.



Thenus orientalis (Lund, 1793)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Flathead lobster; **Fr** - Cigale raquette; **Sp** - Cigarra chata.

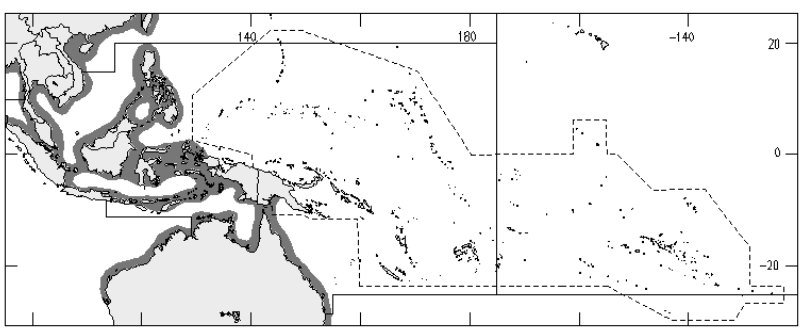


Diagnostic characters: Body markedly depressed, with surface pubescent and granulate. **Carapace trapezoid, narrowing posteriorly, with weak branchial carinae and shallow cervical incisions; anterior part of lateral margin with only 2 teeth, posterior 3/4 without teeth.** Eyes small and subspherical; **orbits situated at anterolateral angles of carapace**. Antennae broad, flattened and plate-like. All legs without pincers and similar in size. Abdomen with median carina and transverse grooves, **fifth segment armed with a strong posteromedian spine; pleura directed downwards.** Posterior half of tail fan soft and flexible. **Colour:** body brownish with reddish brown granules, ventral surface somewhat yellowish white. Eyes deep brown. Antennules yellowish white with red-brown bands. Legs yellowish white and distally brownish. Soft part of tail fan and pleopods somewhat orange-red. Setae light brown.

Size: Maximum body length 25 cm, commonly to about 16 cm; maximum weight over 0.5 kg.

Habitat, biology, and fisheries: Inhabits bottoms of soft substrate, sand and/or mud, sometimes with shells or gravel; at depths from 8 to more than 200 m, but usually between 10 and 60 m. It buries into the soft substrate with only the eyes and antennules visible during daytime; actively swims during nocturnal foraging, which covers long distances. The planktonic larval stage lasts for about 3 months. Common throughout its range but nowhere very abundant. Forms a bycatch of trawling operations and is sometimes also taken by diving (with a catch of over 500 t in Australia between 1989 and 1990). Marketed fresh or frozen in fish markets and used for food. Similar to the species of *Ibacus*, it is generally considered to have a good taste (in Queensland this species is even ranked above *Ibacus*) and sold at slightly lower prices than spiny lobsters.

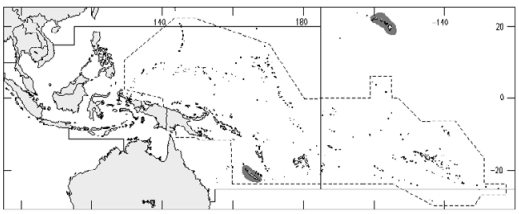
Distribution: Widely distributed in the Indo-West Pacific from the east coast of Africa to the Red Sea, Japan, and the northern coast of Australia.



Arctides regalis Holthuis, 1963

En - Royal Spanish lobster.

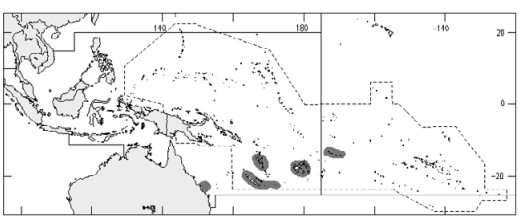
Maximum body length up to 17 cm. In shallow waters at depths from 5 to 50 m on the outer edges of coral reefs. Nocturnal and hides in cavities during daytime. Too rare to be of significant importance to fisheries, but highly valued in the aquarium trade for its bright coloration. Indo-West Pacific from Mauritius, La Réunion, New Caledonia, Hawaii, and Easter Islands.

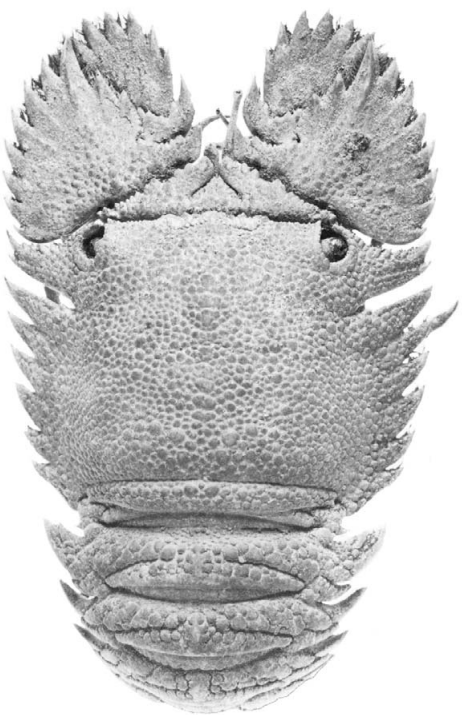


Parribacus caledonicus Holthuis, 1960

En - Caledonian mitten lobster.

Maximum body length about 18 cm. In shallow water to a depth of 6 m on reefs, usually on the exposed side and in surge channels. Hides in crevices during the daytime, often attached to the ceiling of caves. In Fiji, this species is often found in the same habitat with *Panulirus penicillatus*. Caught by divers with gloved hands and mainly for local consumption. Southern Pacific and known from Queensland (Australia), New Caledonia, Loyalty Islands, New Hebrides, Fiji, and Samoa.



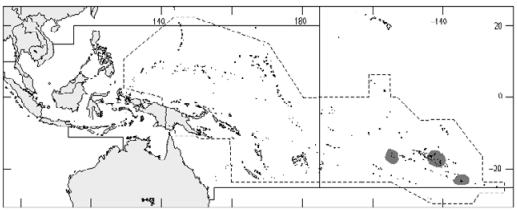


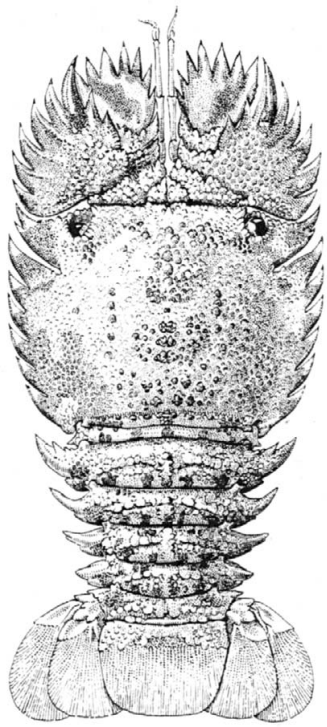
(from Holthuis, 1985)

Parribacus holthuisi Forest, 1954

En - Red-spotted mitten lobster.

Maximum body length about 14 cm. In shallow water at depths from 1 to 5 m on the sandy bottoms of coral reefs. Used as food locally and collected at night with torches. Only known from the Society, Tuamotu, and Gambier Islands (French Polynesia).



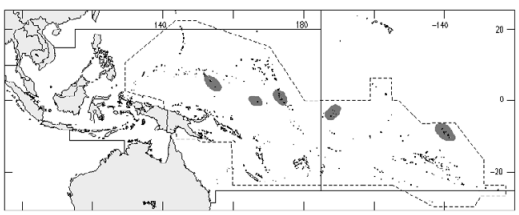


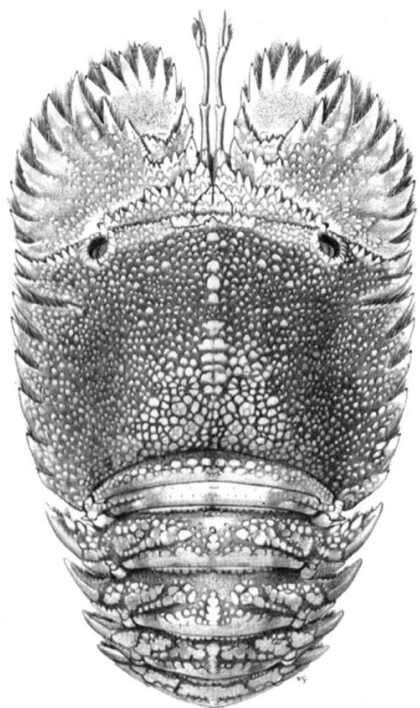
(from Forest, 1954)

Parribacus scarlatinus Holthuis, 1960

En - Marbled mitten lobster.

Maximum body length about 15 cm. In shallow reefs areas. Like other species of mitten lobsters, this species is used locally for human consumption. Central and South Pacific from Kapingamarangi through the Marshall, Gilbert, and Phoenix islands to the Marquesas.



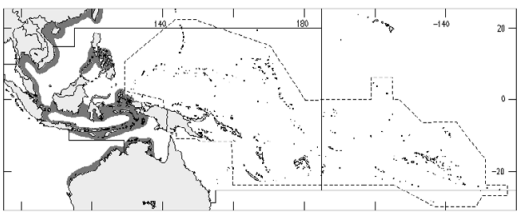


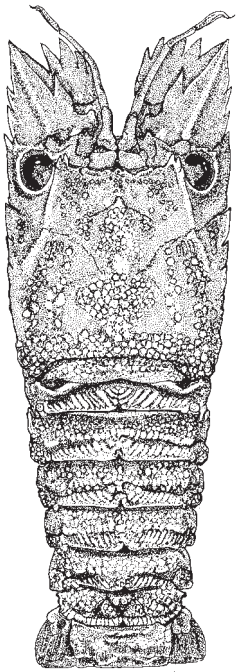
(from Holthuis, 1985)

Scyllarus bertholdii Paulson, 1875

En - Two-spot locust lobster.

Maximum body length 7 cm, commonly between 3 and 5 cm. On soft bottoms at depths from 15 to 150 m, commonly between 40 and 75 m. Caught incidentally during trawling operations. Like the other Indo-West Pacific species of the genus, it is generally considered to be of no economic importance due to its small size and limited abundance. Western Pacific and western Australia; from the East and South China Sea, Taiwan Province of China to Viet Nam, Thailand, the Philippines, Indonesia, northern and western Australia.

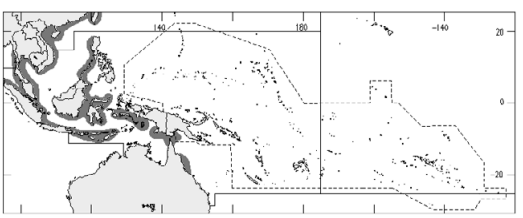


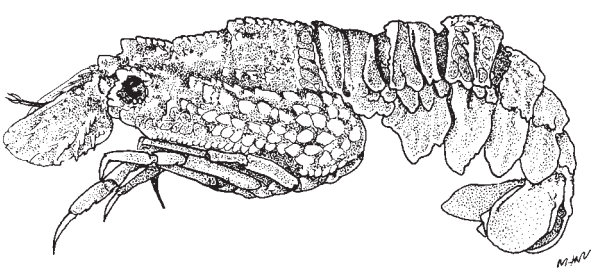


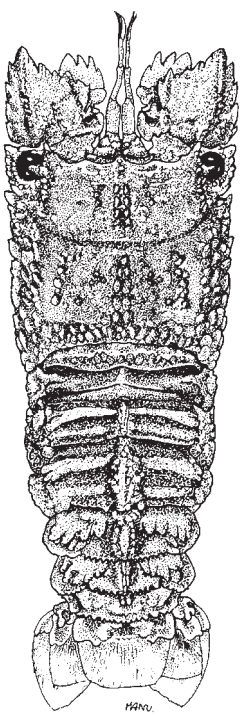
Scyllarus rugosus H. Milne Edwards, 1837

En - Hunchback locust lobster.

Maximum body length 6 cm, commonly between 4 and 5 cm. On soft bottoms at depths from 20 to 60 m, rarely to 200 m. Commonly and incidentally taken by trawlers fishing for other species. Nowhere abundant and of limited commercial importance due to its small size. Indo-West Pacific from East Africa to the Red Sea, Japan, and northeastern Australia.







(after Chan and Yu, 1986)

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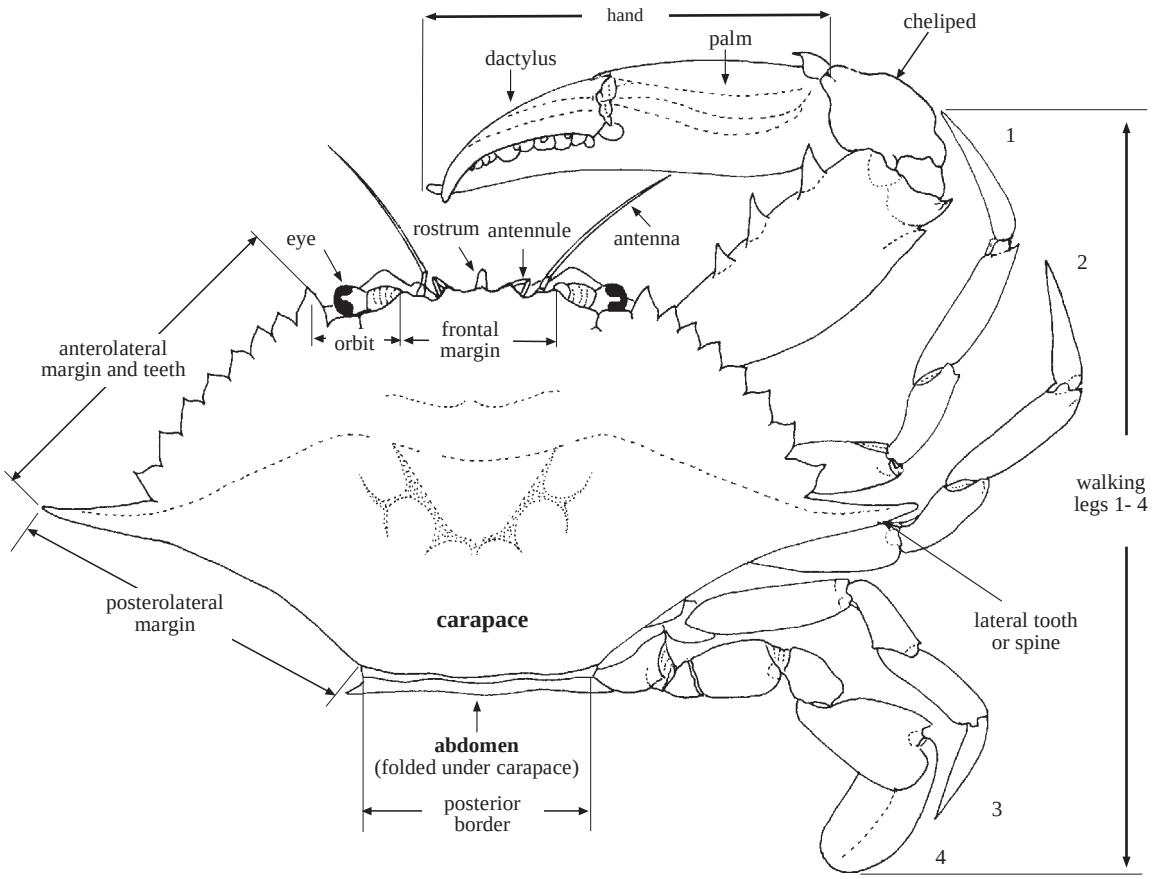
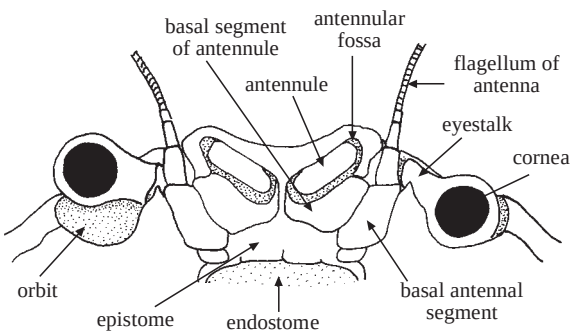
CRABS

by P.K.L. Ng

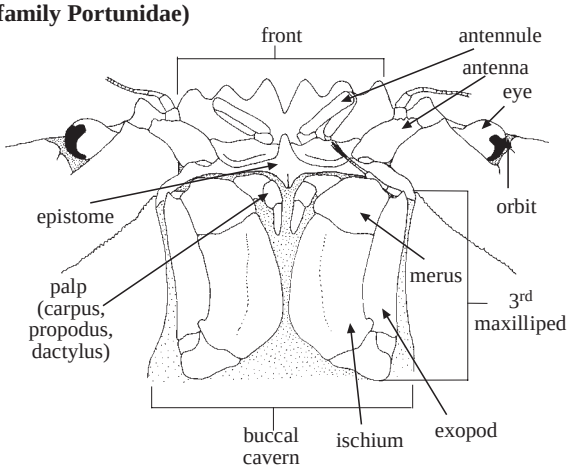
TECHNICAL TERMS AND MEASUREMENTS



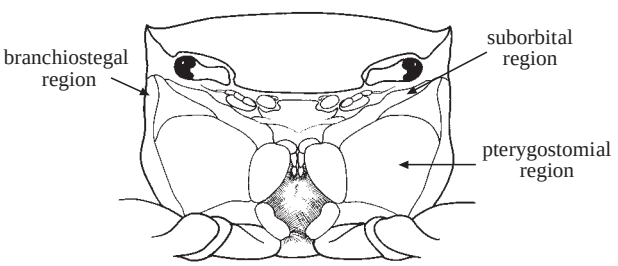
general shape (dorsal view) of a brachyuran crab (family Portunidae)



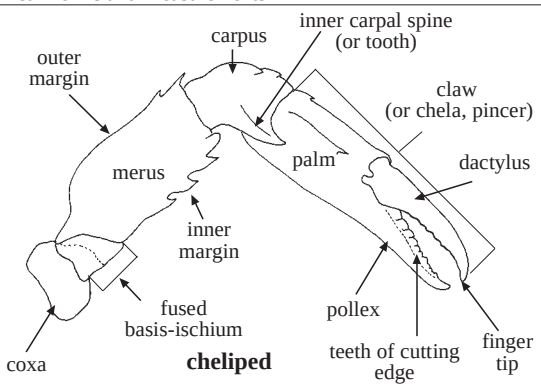
eyes, antennae, and antennules (ventral view)



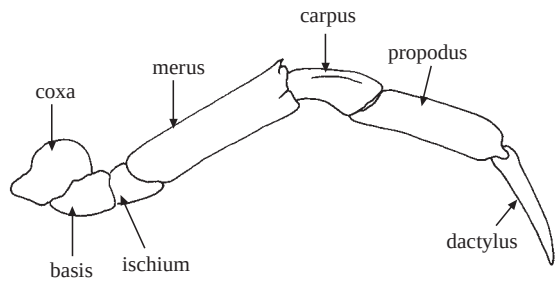
mouth field



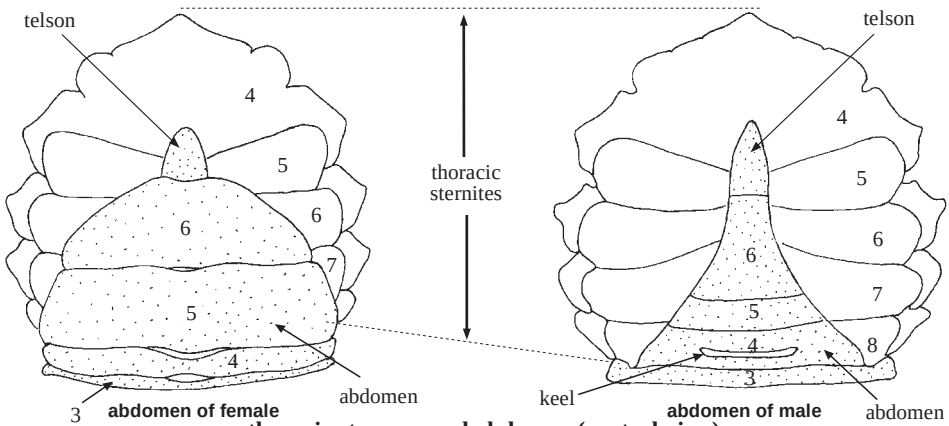
frontal view of body



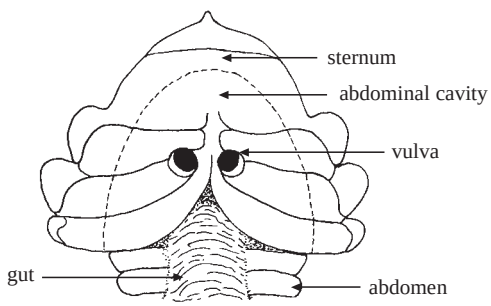
cheliped



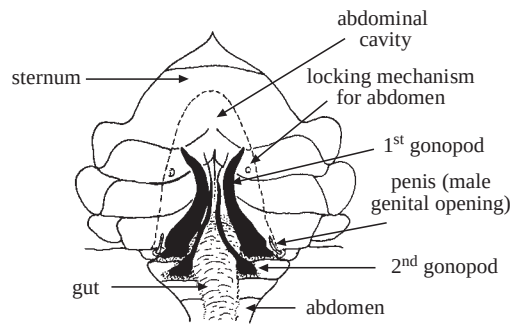
walking leg



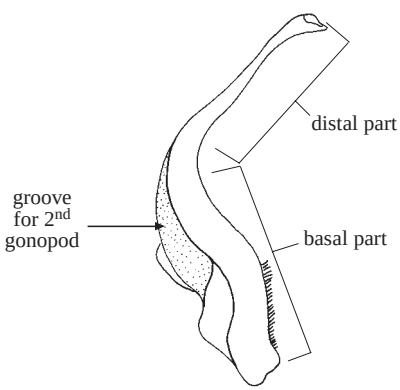
thoracic sternum and abdomen (ventral view)



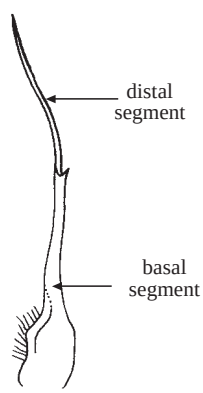
female abdominal cavity and vulvae



male abdominal cavity and gonopods



first gonopod



second gonopod

male gonopods

GENERAL REMARKS

Introduction

Like the shrimps and lobsters, crabs belong to the order Decapoda (= "ten-legged", referring to the 10 thoracic appendages normally present in these crustaceans). Crabs can be classified into 2 main groups, brachyuran crabs (infraorder Brachyura) and anomuran crabs (infraorder Anomura). Most species of Brachyura, or true crabs, can easily be separated from the so-called "false crabs" belonging to the infraorder Anomura by having 4 pairs of well-developed walking legs. Anomuran crabs always have only 3 pairs of walking legs clearly visible, while the fourth (last) pair is very small, normally tucked under the body and hardly noticeable. However, this is just a general rule rather than a distinct separating character as there are a number of true crabs which have their fourth pair of legs greatly reduced as well (e.g. Dynomenidae and Retroplumidae) or even completely reduced (Hexapodidae).

A more recent compilation of the actual number of all species of crabs known to date is pending. The last census was done by Fenner Chace Jr. (1951), who recorded worldwide 4 428 and 1 270 species of brachyuran and anomuran crabs, respectively. The late Raoul Serène (1968) estimated that perhaps some 1 000 species of brachyuran crabs occur in the Indo-Malayan area. However, these numbers have substantially increased over the last 40 years, due to the rapid pace of crab discoveries. It is not unreasonable to believe that the current number of brachyuran and anomuran crabs in the world ranges from 5 000 to 6 000 and 1 500 to 2 000 species, respectively. Of these, the largest proportion is found in the Western Central Pacific, where around 1 500 to 2 000 brachyuran crab species (marine and fresh-water taxa) are probably present.

The present contribution focuses on 15 families of brachyuran crabs and a single family of anomuran crabs which include commercially important species in the Western Central Pacific. The majority of edible crab species belong to the Brachyura, and accordingly, a large number of brachyuran crabs are caught for human consumption in the Western Central Pacific. It is important to note, however, that a much greater number of brachyuran crab species than listed here are collected for food by many poorer communities and indigenous people in the area. Any edible species which are common enough to be collected in great numbers can be eaten, even if they are small in size. To these belong many ocypodids such as soldier crabs (*Dotilla* spp.), fiddler crabs (*Uca* spp.), and periscope crabs (*Macrophtalmus* spp.), but also several medium-sized species of vinegar crabs (Sesarminae, Grapsidae). In addition, many medium-sized species of reef crabs of the families Xanthidae and Eriphiidae are locally consumed among natives of several Pacific islands. However, it is unrealistic to list and discuss every single species that is eaten once in a while or might be collected for food. Therefore, a selection has been made here of those species which at present have a distinct fishery value, are larger and more common, or have a good potential in the future as their fisheries develop. It is also worth noting that several species of fresh-water crabs of the families Potamidae and Parathelphusidae are consumed in many parts of Southeast Asia and Indo-China.

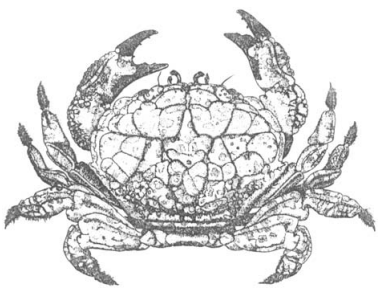
In contrast to the brachyurans, few anomuran crabs have a major fishery value in the Western Central Pacific, with a single species (the "coconut crab", *Birgus latro*) being of distinct commercial importance. The stone crabs (Lithodidae) are represented by several species within the area, but none of them are harvested so far, although some species are utilized for food in other regions of the world (the best known example is the large fishery for the "Alaskan king crab", *Paralithodes camtschaticus*, in the northern Pacific). The lithodid species occurring in the Western Central Pacific, however, are generally too rare to show any significant commercial importance, although it may be possible that a number of species can be utilized in the future. Reports that some large hermit crabs (Paguridae and Diogenidae) are sometimes caught for food are actually not very reliable, and almost certainly none of these show any commercial importance. Many species of land hermit crabs (genus *Coenobita*), however, are regularly collected for the pet trade. The so-called squat lobsters (Anomura: Galatheidae), which actually have a more crab-like than lobster-like appearance, are represented by a few edible species in the Atlantic, but none of the species in the Western Central Pacific are large or common enough to have any food value. The same is true for the deep-water chirostylids (deep-water squat lobsters). However, because of their crab-like shape, galatheids and chirostylids have been included in the present key to families of marine crab-like Anomurans. On the other hand, several anomurans of clearly lobster- or shrimp-like appearance, such as the mud lobsters (*Thalassina* spp., Thalassinidae, notably *T. anomala*) and mud shrimps (*Upogebia* spp., Upogebiidae), are occasionally caught for food in the Western Central Pacific.

Poisonous Crabs

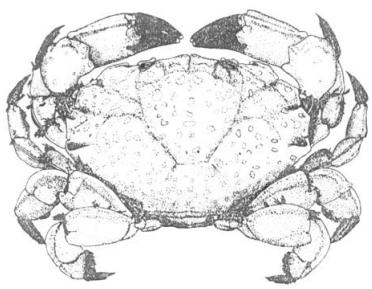
Although poisonous crabs have been known for a very long time, only in recent years have the necessary biochemical studies been done to quantify and qualify the toxins involved. Some people become violently sick after consumption of crabs because of allergic responses, a response not related to poison. In general, there are 2 categories of poisonous crabs:

The **first category** includes the permanent highly toxic species. These crabs are always poisonous, and include taxa such as the "mosaic crab" (*Lophozozymus pictor*), "demon crabs" (*Demania* spp.), "jewel crab" (*Zosimus aeneus*), "crested reef crab" (*Platypodia granulosa*), and "green egg crab" (*Atergatis floridus*). The consumption of any of these crabs, even if well cooked, is extremely dangerous and has proved fatal in several instances. It is important to note here that all these species belong to the family Xanthidae and they all have distinctive colour markings or striking colours, presumably to warn potential predators. All species are of moderately large size, reaching carapace widths from 7 to 10 cm, and as such, may be picked up by fishermen or collectors. The toxins that have been identified include palytoxins, saxitoxins, and tetrotoxins, and occur throughout the tissues and exoskeleton, being most concentrated in the liver and gonads. All these toxins act on the nervous system. As they loose their toxins when kept in captivity and fed on normal food, it is believed that the crabs obtain these toxins directly or indirectly from the food. The 2 most notorious genera are *Lophozozymus* and *Demania*, and a number of human deaths have been attributed to them. Tests on *Lophozozymus pictor* have shown that, although the degree of toxicity varies from individual to individual, they all contain enough toxins to kill an adult human. In a single analysis, 1 g of the crab's flesh contained enough toxins to kill 42 000 mice. A large specimen of *L. pictor*, however, can easily reach a weight of 100 g. This makes it one of the (if not THE) most poisonous crabs known. Not all species of *Lophozozymus* and *Demania* have been analyzed biochemically, but the general consensus is that most, if not all their members are highly toxic.

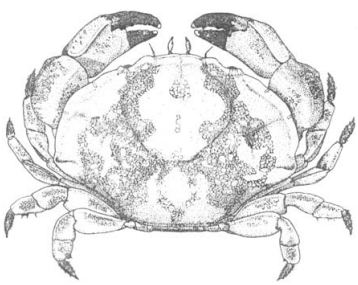
The **second category** of toxic crabs are those which are mildly poisonous and/or occasionally poisonous. The consumption of such crabs may cause illness but rarely death. The species involved here include "reef crabs" (*Carpilius* spp., Carpiliidae), "red-eyed crabs" (*Eriphia* spp., Eriphiidae), coral reef crabs like *Etisus* spp. and *Atergatis* spp. (Xanthidae) and "land crabs" (*Cardisoma* spp., Gecarcinidae). In most instances, these crabs are also not always poisonous, with their toxicity varying with place and time of year. This is very likely to be associated with the food habits of the crabs. In some cases, this is because the crabs have consumed poisonous fruits or leaves (e.g. for land crabs like *Cardisoma*). Poisonous crabs have also been associated with red-tide algal or dinoflagellate blooms. Species like the "red egg crab" (*Atergatis integerrimus*) are probably poisonous because they only occasionally feed on organisms which are toxic and only in small quantities. This second category of poisonous crabs poses problems for fishery officers as a species which is poisonous in one area may be totally harmless in another. Obviously, great care has to be taken in harvesting and consumption of those species.



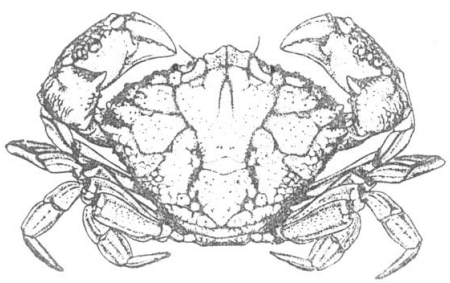
Zosimus aeneus



Lophozozymus pictor

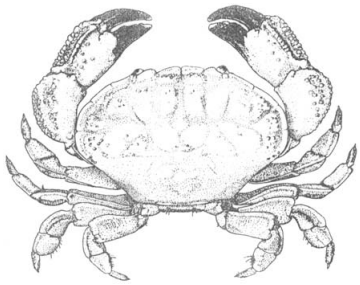


Atergatis floridus

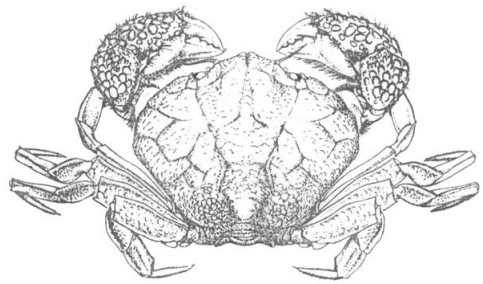


Demania cultripes

(after Garth and Alcala, 1977)



Platypodia granulosa



Demania toxica

(after Garth and Alcala, 1977)

Notes on the classification of brachyurans

The total number of families of Brachyura is still undetermined. Although many authors still follow the classification presented by Balss (1957), more recent studies by Guinot (1978, 1979) have shown that this system is artificial. Unfortunately, not all the brachyuran families currently recognized were dealt with by Guinot in detail and the status of a number of them remains unresolved. For the present report, the writer has essentially adopted Guinot's (1978) system of higher classification. Accordingly, 53 families are recognized, following mainly Guinot (1978) and Manning and Holthuis (1981). Out of these, 8 families are found in fresh water only and thus are outside the scope of the present contribution. Nevertheless, it is relevant to note that out of these 8 fresh-water families, 3 occur in the Western Central Pacific, namely the Potamidae (= Isolapotamidae), Gecarcinucidae, and Parathelphusidae (= Sundathelphusidae) (Ng, 1988). Of the 45 marine families, 40 have been recorded in the Western Central Pacific thus far, with only the Orithyiidae, Thiidae, Cheiragonidae, Pirimelidae, and Platyxanthidae apparently being absent from the area.

Some of the families recognized here have undergone nomenclatural changes. The Eriphiidae has previously been known as the Menippidae and Oziidae. However, Eriphiidae is the oldest name and thus has nomenclatural priority. The Mimilambridae Williams, 1979, is considered a junior synonym of Parthenopidae MacLeay, 1838 (see Ng and Rodriguez, 1986). The recognition of a separate family for the Eumedonidae, symbionts on echinoderms, follows Stevcic et al. (1988). Stevcic (1988) recognized a separate family, Cheiragonidae, for crabs previously classified in the Telmessinae (Atelecylidae). Finally, the Camptandriidae, previously considered to be a subfamily of the Ocypodidae, is regarded here as a separate family, following the suggestions of Harminto and Ng (1991).

Characters useful for identification

The teeth of the **anterolateral margins** of the **carapace** are also known as the epibranchial teeth. The **first anterolateral tooth** is often called the "external orbital" or "exo-orbital" angle (or tooth) and is counted separately from the following **anterolateral teeth** by many authors (but not here). The **frontal margin** (or **front)** becomes elongate and/or spiniform in many crabs such as the homolids (deep-water porter crabs) and majids (spider crabs), and is then frequently called a **rostrum**.

The maximum **carapace width** is used as principal measurement indicating the size of a crab, measured as the greatest distance between the lateral margins of the carapace.

The **buccal cavern** (location of the mouthparts), is bordered on both sides by the **pterygostomial regions**, and above by the **epistome**. The calcareous plate inside the buccal cavern is called the **endostome**. Usually, only the anterior part of the endostome is visible, even when the mouthparts are moved aside. The outer mouth parts or **third maxillipeds** are often just referred to as **"the mouthparts"**, even though there are actually 6 pairs of feeding appendages. Underneath the third maxillipeds, the **second maxillipeds** and **first maxillipeds** are located, normally covered by the third maxillipeds in life. Two smaller feeding appendages are situated below the 3 pairs of maxillipeds: the first maxilla (or maxilla) and second maxilla (or maxillules). Finally, the mouth is bordered by a pair of well-calcified, jaw-like, and highly modified appendages, the **mandibles**.

The 5 pairs of locomotory appendages of a crab (the pereiopods) are made up of a pair of usually powerful **chelipeds** (legs carrying a **chela** or **pincer**) and normally of 4 pairs of **walking** (or ambulatory) **legs**. For the present contribution, the first appendage is referred to as the **cheliped** and the last 4 appendages (walking legs) as **legs**. The claw (or chela) itself consists of a **palm** (or manus) and 2 **fingers**, one of which is movable (the **dactylus** or **movable finger**), whereas the other one (**pollex**) is fixed. The tips or edges of the fingers may be **pectinated**. In some families the last pair or all walking legs are modified for swimming or burrowing, as seen in the Portunidae and the Matutinae (the latter a subfamily of the Calappidae).

Adult male and female crabs are easily distinguished by the shape of their **abdomen**. In males, the abdomen is triangular to broadly T-shaped, whereas in females it is broad, usually semicircular, often covering most part of the ventral surface. Almost all crabs have 7 **abdominal segments** (although the seventh segment or **telson** is actually not a true segment), but in a number of families, several segments are partially or completely fused. This fusion may be complete (i.e. with the sutures between segments no longer visible) or incomplete (i.e. with parts of the sutures still present or obscure). In both cases, however, the segments are immovable.

Many crab species show a sexual dimorphism, with the males usually being larger or possessing special or excessively developed structures. In some species, however, it is the female which grows larger. Males possess **2 pairs** of **gonopods**, that is, modified pleopods specifically adapted for copulation (most crabs practice internal fertilization). The pleopods (abdominal appendages) of females are branched, setose and serve to carry the eggs: fertilized eggs are exuded, attached to the setose pleopods of females, and kept there for several weeks until the planktonic larvae (zoeae) hatch out. The larvae pass several stages before they finally metamorphose to a young crab.

Many species of crabs possess **pubescence** to varying degrees on their body and appendages. The hair (or more appropriately called **setae**) may be soft or stiff, simple or plumose (plume-like), or so short that it becomes pile-like, sometimes even short and dense, giving a velvet-like appearance. The setae may sometimes be hard and spine-like, especially on the propodus and dactylus of legs. Unlike real spines, however, those stiff setae are never calcareous. Majids often possess hook-like setae that attach to sponges, algae, and debris (similar in action to velcro), supporting the camouflage of the crab. In other species, the longer and/or plumose setae gather dirt and mud in order to obscure the animal's outline. Most of the softer setae on the legs and chelae have a sensory function.

Carapace types

The shape of the carapace is often used as a descriptive character in many guides and keys. Unfortunately, a large variety of terms have been introduced in the past, not always applied with exactly the same meaning. Therefore, an approximate categorization has been attempted here and those carapace types which belong to a respective category are illustrated below. It should be remembered, however, that there are sometimes no clear lines separating the different carapace types, and so the designation of a particular type may be somewhat subjective in certain cases. Nevertheless, the use of carapace shapes is still a useful character in many instances.

The carapace types utilized here are shown in Figures A to N.

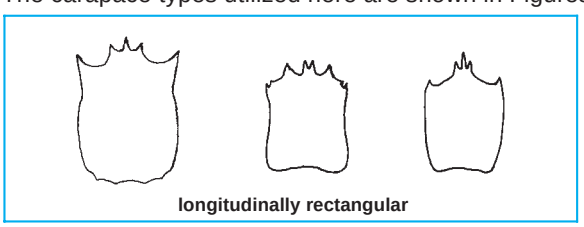


Figure A

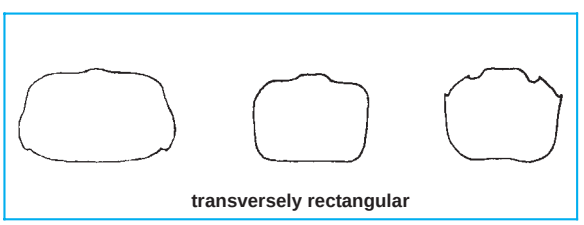


Figure B

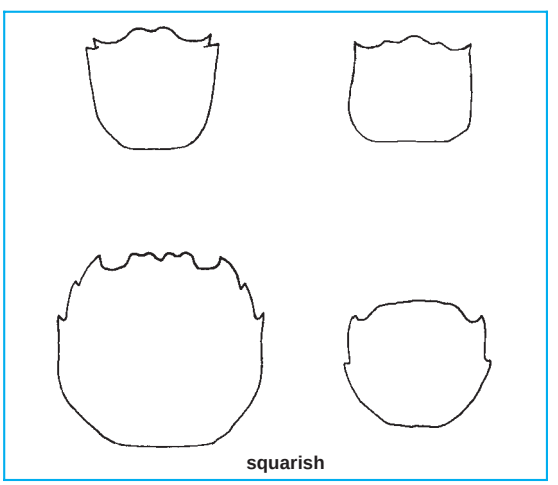


Figure C

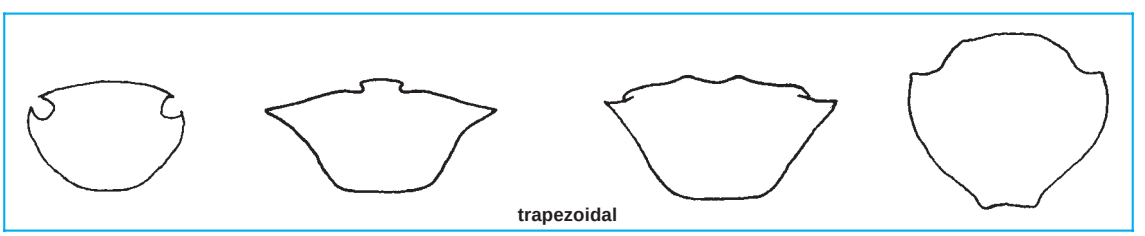
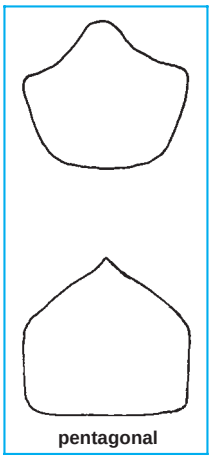


Figure D



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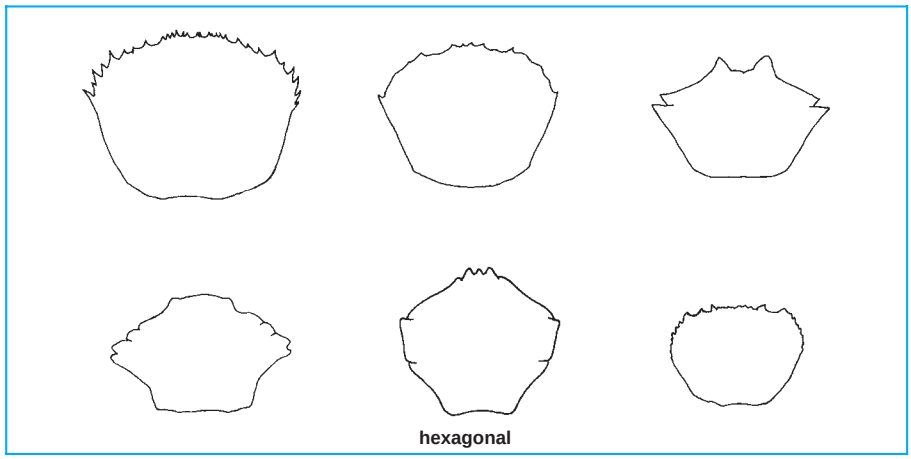

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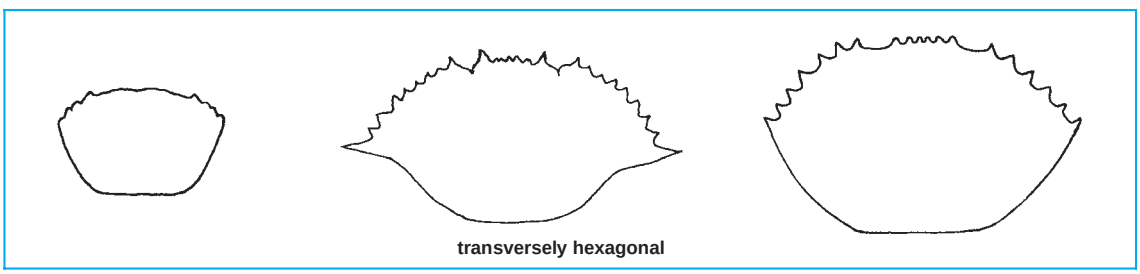

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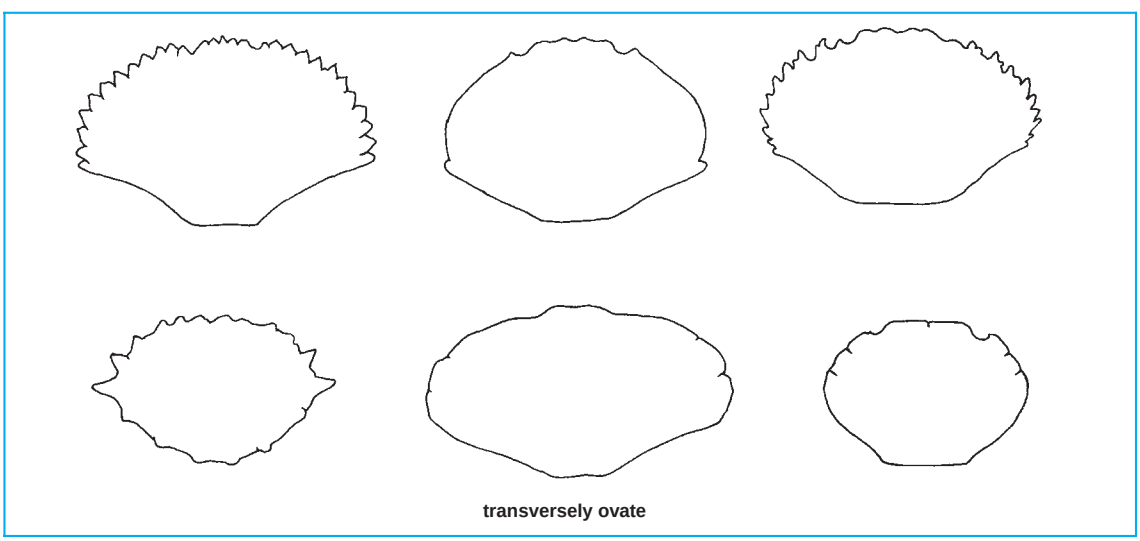


Figure H

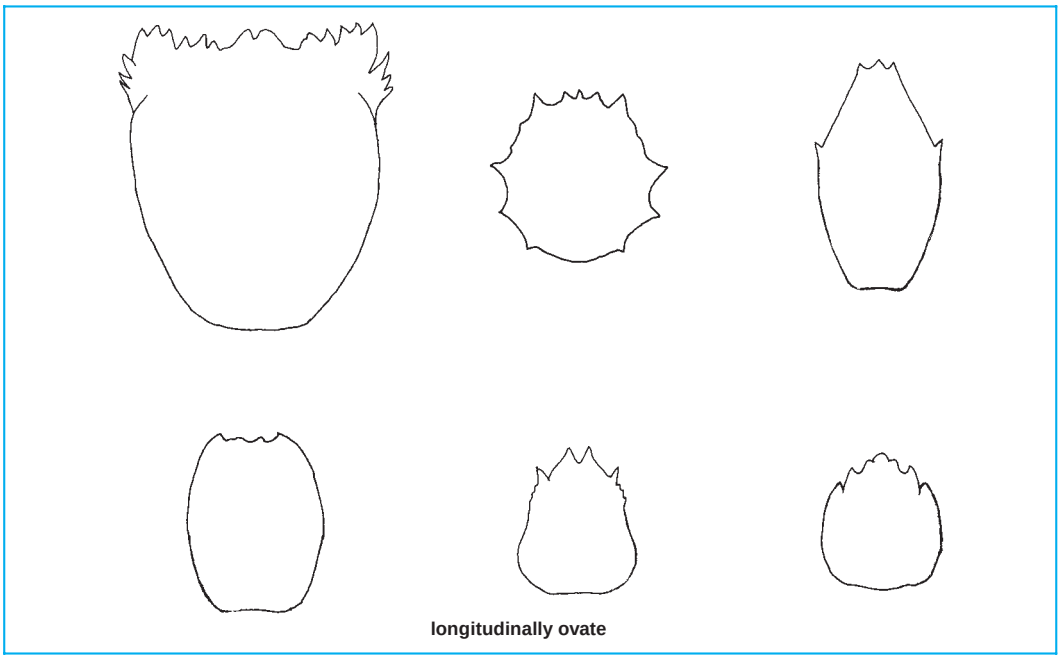


Figure I

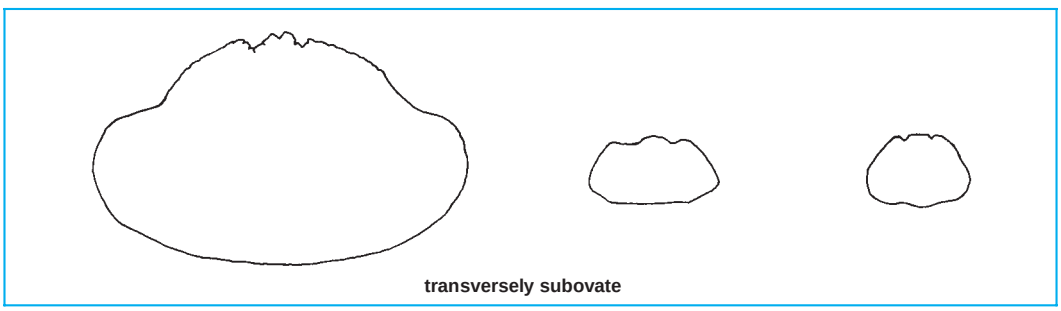


Figure J

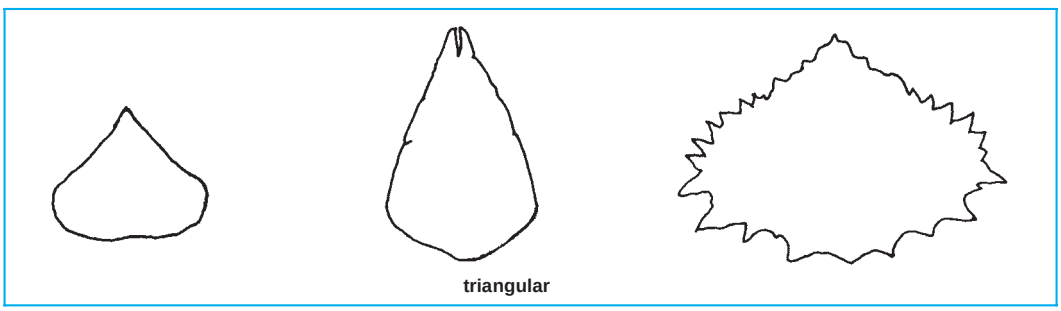


Figure K

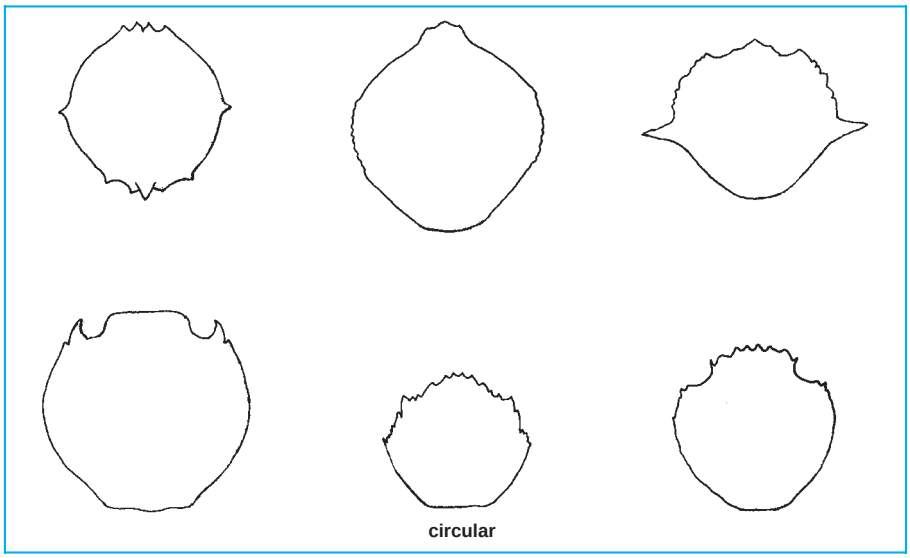


Figure L

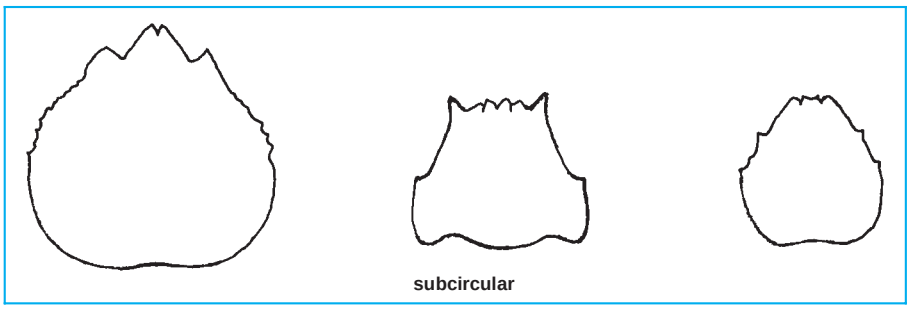


Figure M

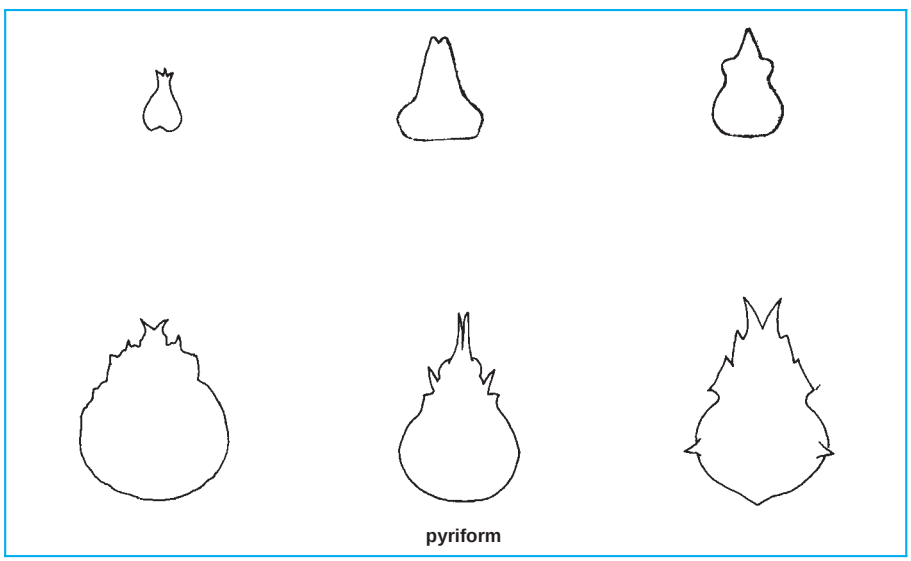
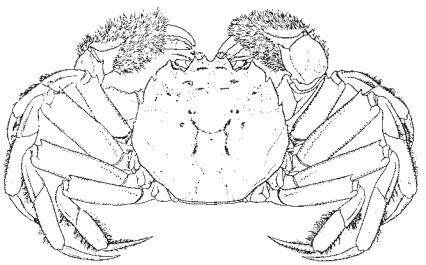


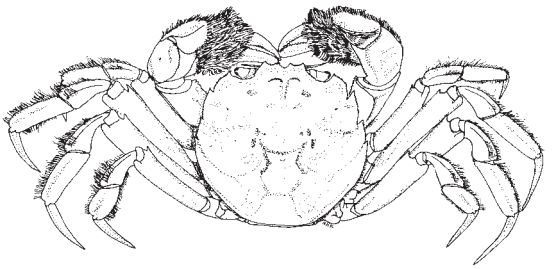
Figure N

IMPORTED CRABS OF COMMERCIAL IMPORTANCE

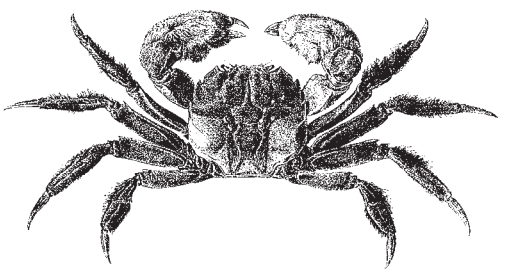
Several species of non-Western Central Pacific crabs are regularly imported into the area, notably to Singapore, Malaysia, and Thailand. They command very high market values and are popular not only among locals but also the relatively large expatriate community (especially Japanese) in these countries. In most cases, they are brought in alive for better value and for the live-seafood restaurant trade. Therefore, one would probably frequently encounter these species in markets or retailers. The main species imported are "Chinese mitten or hairy crabs" (*Eriocheir sinensis*, *E. hepuensis*), "Japanese mitten crab" (*E. japonicus*), "giant Tasmanian crab" (*Pseudocarcinus gigas*), "snow crab" (*Chionoecetes opilio* and *C. japonicus*), "queen crab" (*Erimacrus isenbeckii*), and "Alaskan king crab" (*Paralithodes camtschaticus*).



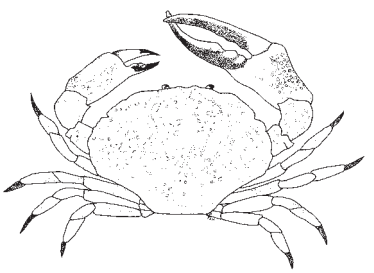
Eriocheir sinensis
(from Shen, 1932)



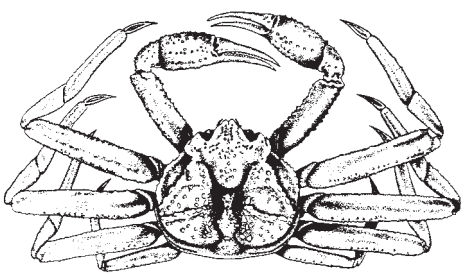
Eriocheir hepuensis



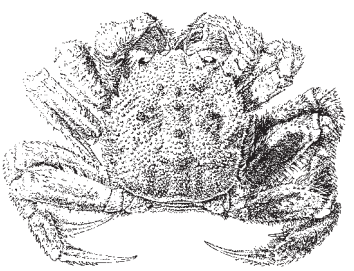
Eriocheir japonicus
(from De Haan, 1833)



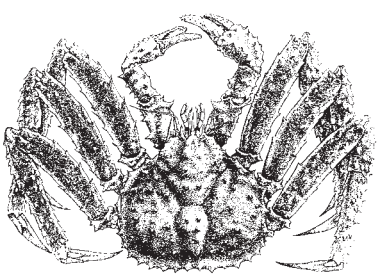
Pseudocarcinus gigas



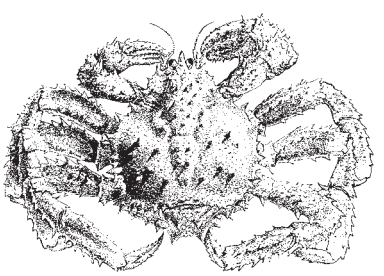
Chionoecetes opilio
(after Kobyakowa, 1955)



Erimacrus isenbeckii
(after Kobyakowa, 1955)



***Paralithodes camtschaticus* (male)**



***Paralithodes camtschaticus* (female)**

(after Kobyakowa, 1955)

click for next page

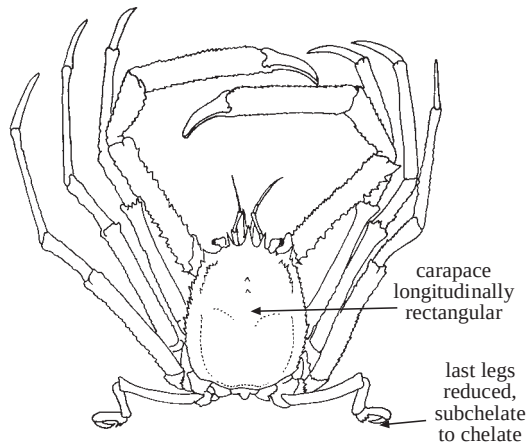
GUIDE TO FAMILIES OF INTEREST TO FISHERIES OCCURRING IN THE AREA

HOMOLIDAE

Page 1083

Deep-water carrier crabs

Carapace longitudinally rectangular; dorsal surface granulose to spinose; front narrow, usually with 3 long horn-like projections (rostra). Male chelipeds long. Last pair of legs inserted obliquely on carapace and directed upwards, reduced, subchelate to chelate, modified to carry sponges. All male abdominal segments distinct, movable.

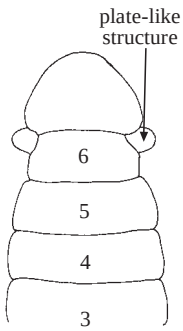


DROMIIDAE

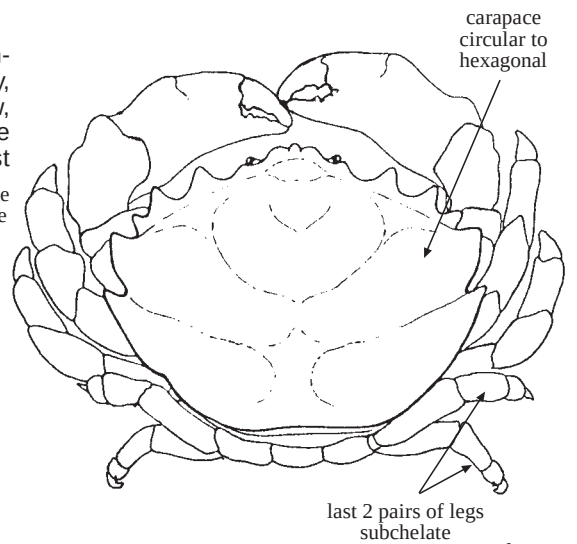
Page 1085

Sponge crabs

Carapace circular to hexagonal; dorsal surface gently to strongly convex longitudinally and transversely, smooth or granular, usually setose; front narrow, usually entire; anterolateral margins of carapace strongly convex, unarmed, or with small spines. Last 2 pairs of legs inserted obliquely on carapace and directed upwards, strongly reduced, subchelate, modified to carry sponges or tunicates on back of carapace. All male abdominal segments distinct, movable; a small platelet-like structure usually intercalated between edges of sixth abdominal segment and telson. Male first gonopod stout, simple; male second gonopod long, usually subequal or longer than length of male first gonopod. Male and female genital openings sternal.



male abdomen

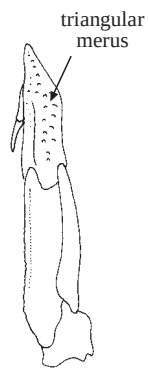


RANINIDAE

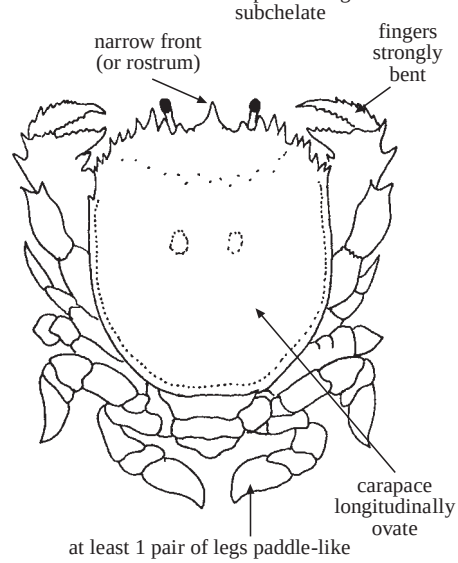
Page 1089

Spanner crabs

Carapace longitudinally ovate; dorsal surface strongly granulose or squamose to smooth; front triangular, narrow. Third maxillipeds very narrow, merus distinctly triangular. Eyestalks long, longer than front. Fingers of chela strongly bent; at least 1 pair of legs with last 2 or 3 segments paddle-like. Thoracic sternum very narrow, especially sternites 5 to 7. All male abdominal segments distinct, movable.



right 3rd maxilliped

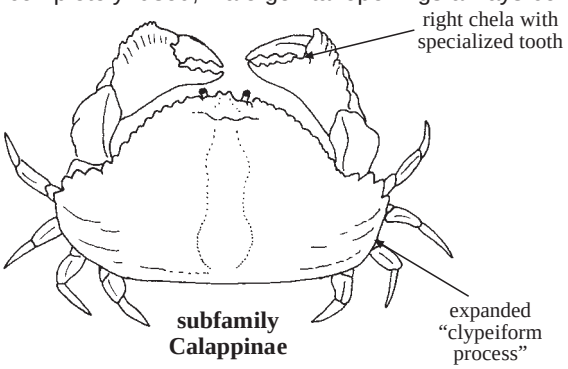


CALAPPIDAE

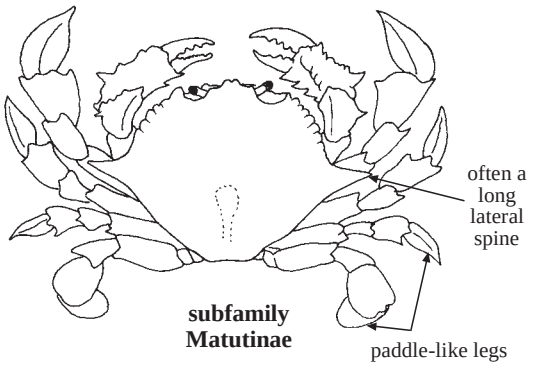
Page 1091

Box and moon crabs

Carapace circular, ovate to transversely ovate and subovate, sides of carapace may be expanded to form a clypeiform process (= expanded posterior edge). Merus of third maxillipeds distinctly triangular; opening for afferent respiratory current at base of chela, no canal present along sides of buccal cavern even when third maxillipeds pushed aside. Larger chela may have specialized cutting tooth for cutting gastropod shells. Propodus and dactylus of legs may be paddle-like. Male abdominal segments 3 to 5 completely fused; male genital openings always coxal.



subfamily Calappinae



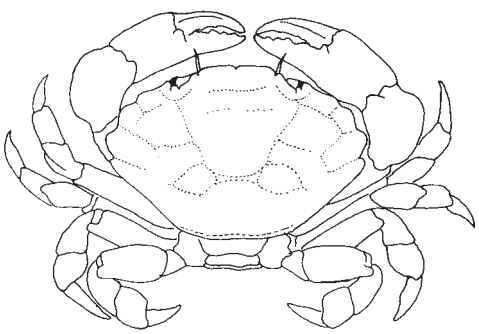
subfamily Matutinae

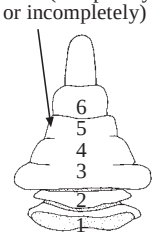
XANTHIDAE

Page 1098

Stone and mud crabs

Carapace hexagonal, transversely hexagonal to transversely ovate, sometimes circular; dorsal surface usually ridged or granulose; frontal margin usually notched medially; usually 2 to 6 spines, teeth and/or lobes on each anterolateral margin. Longitudinal ridges which define efferent respiratory current usually absent or strong only on posterior part of endostome, ridges not visible on anterior part of endostome when mouthparts pushed aside. Fingers of chela may be spoon-tipped. Legs varying in structure; propodus and dactylus may show a special dactylo-propodal articulation. Male abdominal segments 3 to 5 immovable, fused completely or incompletely. Male first gonopod slender, slightly sinuous; male second gonopod very short, less than 1/4 the length of male first gonopod.





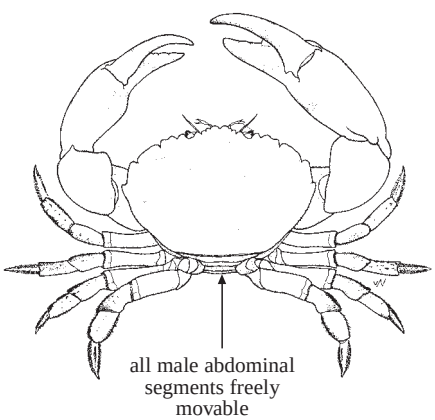
male abdomen

ERIPHIIDAE

Page 1103

Stone and mud crabs

Carapace hexagonal, transversely rectangular to transversely ovate; dorsal surface ridged or granulose; frontal margin notched medially; 4 teeth and/or lobes on each anterolateral margin. Legs normal. Longitudinal ridges which define efferent respiratory current well developed along entire endostome, ridges visible on anterior part of endostome when mouthparts pushed aside. All male abdominal segments distinct, movable. Male first gonopod stout, almost straight or gently curved; male second gonopod elongate, longer or subequal in length to male first gonopod.

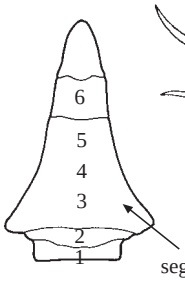


CARPILIIDAE

Page 1110

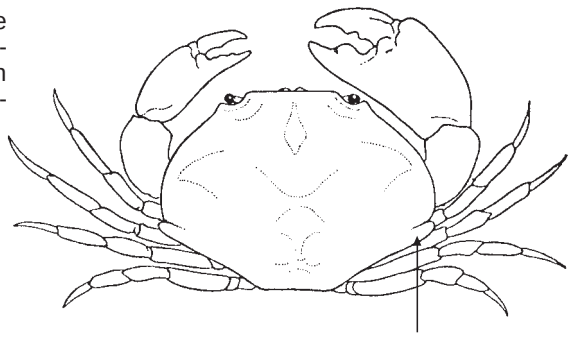
Reef crabs

Carapace transversely ovate; dorsal surface smooth, distinctly convex longitudinally and transversely; front entire; a single low, small tooth on each anterolateral margin. Legs simple. Longitudinal ridges which define efferent respiratory current usually absent or strongly developed on posterior part of endostome only; ridges not clearly visible on anterior part of endostome when mouthparts pushed aside. Male abdominal segments 3 to 5 immovable, completely fused. Male first gonopod stout, almost straight or gently curved; male second gonopod elongate, longer or subequal in length to male first gonopod.



segments 3-5 completely fused

male abdomen



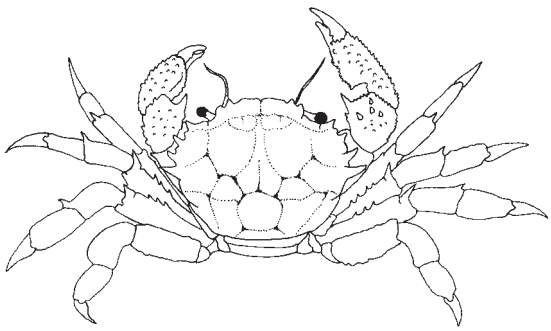
anterolateral margin with a single tooth

PILUMNIDAE

Page 1112

Hairy crabs

Carapace hexagonal, transversely rectangular or transversely ovate; dorsal surface convex, smooth to granulated; frontal margin entire to multilobate; usually 1 to 4 teeth or lobes on each anterolateral margin. Longitudinal ridges defining efferent respiratory current usually well developed along entire endostome, ridges visible on anterior part of endostome when mouthparts pushed aside. Legs normal. Male abdominal segments 3 to 5 freely movable. Male first gonopod slender, S-shaped, distal part simple; male second gonopod very short, sigmoid.



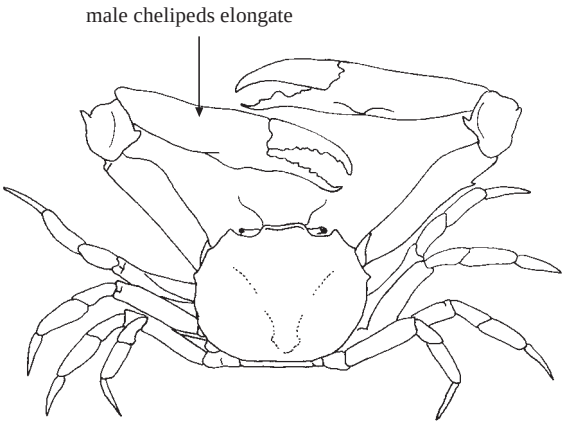
male chelipeds elongate

GONEPLACIDAE

Page 1114

Rhomboid crabs

Carapace hexagonal, transversely rectangular, trapezoidal, or transversely ovate; dorsal surface convex, usually smooth; frontal margin usually entire, sometimes multilobate; anterolateral margin usually armed with 1 to 4 teeth or lobes, or entire. Male abdominal segments 3 to 5 distinct, movable or fused and immovable. Male first gonopod moderately stout, gently curved or sinuous; male second gonopod relatively short to elongate, but usually shorter than male first gonopod.

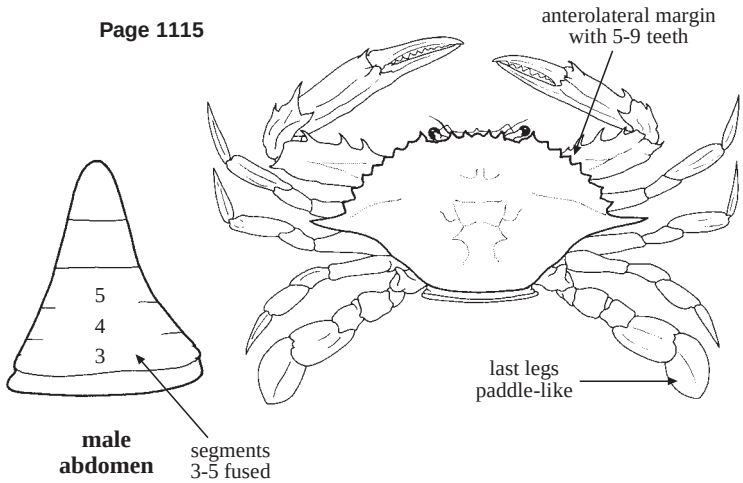


PORTUNIDAE

Page 1115

Swimming crabs

Carapace hexagonal, transversely ovate to transversely hexagonal, sometimes circular; dorsal surface relatively flat to gently convex, usually ridged or granulose; front broad, its margin usually multidentate; usually 5 to 9 teeth on each anterolateral margin of carapace; posterolateral margins usually distinctly converging. Legs laterally flattened to varying degrees, last 2 segments of last pair paddle-like. Male abdominal segments 3 to 5 completely fused, immovable.

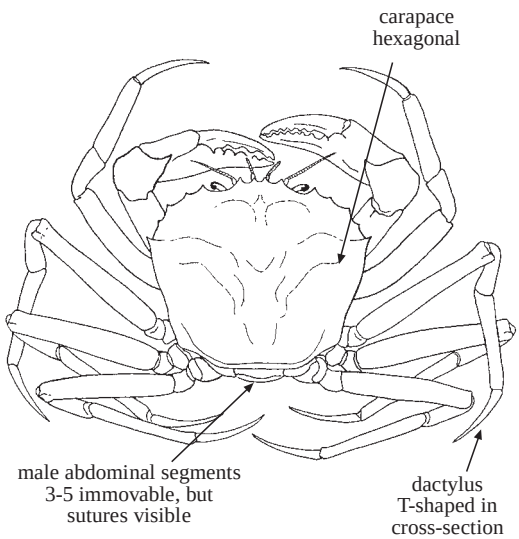


GERYONIDAE

Page 1132

Golden crabs

Carapace hexagonal; dorsal surface relatively smooth to granular; frontal margin with 4 teeth; anterolateral margins distinctly convex, each with 3 to 5 low, sometimes indistinct teeth. Dactylus of walking legs T-shaped in cross-section. Male abdominal segments 3 to 5 fused, functionally immovable, but sutures still visible.

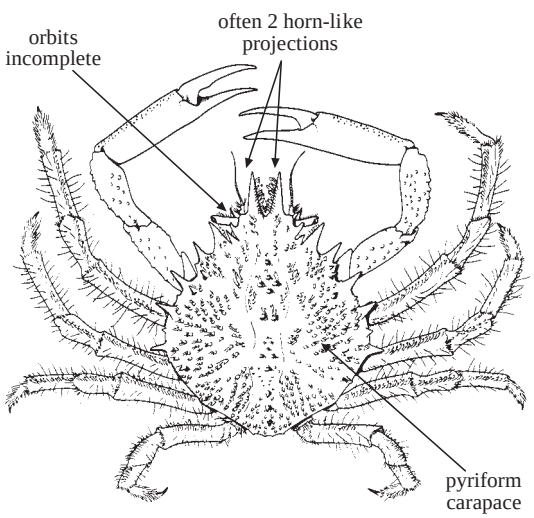


MAJIDAE

Page 1136

Spider crabs

Carapace pyriform, circular to subovate, anterior 1/2 to 1/3 usually distinctly narrower than posterior part; dorsal surface gently convex, spinulose, granulose and/or ridged; front narrow, often with 2 long horn-like projections (rostra); orbits poorly developed to absent; anterolateral margins of carapace often armed with well-developed spines. Legs spinulose and/or granulose, often with stiff setae. All male abdominal segments usually freely movable in most species.

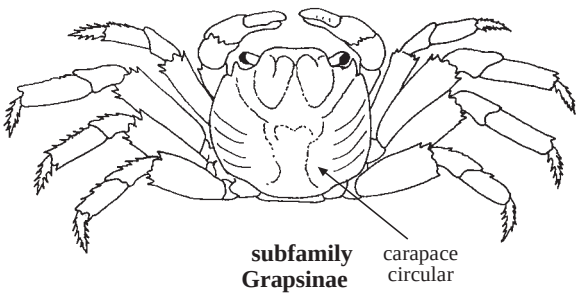


GRAPSIDAE

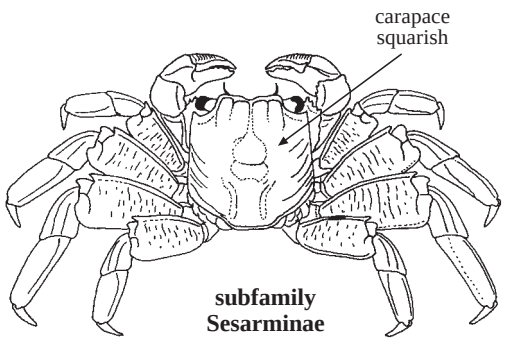
Page 1138

Sally-light-foots, vinegar crabs, and paddler crabs

Carapace squarish, transversely rectangular, trapezoidal or circular; dorsal surface flat to gently convex, with low oblique or transverse ridges; front much broader than orbits; orbits occupying almost entire anterior border (excluding front); antero- and posterolateral margins of carapace usually not clearly demarcated, lateral margins appearing almost straight or gently convex, usually armed with 1 or 2 teeth anteriorly. Rhomboidal gap usually present between third maxillipeds; mandibles often exposed. Dactylus of legs with distinct spines. Male abdominal segments 3 to 5 freely movable in most species.



subfamily Grapsinae



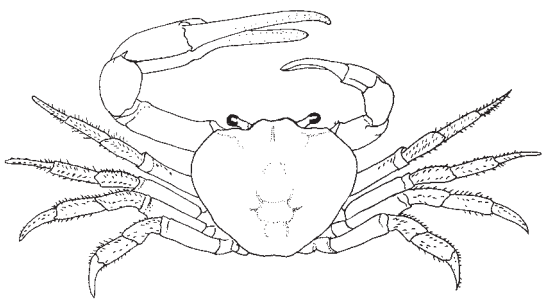
subfamily Sesarminae

GECARCINIDAE

Page 1147

Land crabs

Carapace circular to transversely ovate; dorsal surface smooth, strongly convex longitudinally and transversely; frontal margin entire; anterolateral margins unarmed or each with a single tooth; rhomboidal gap present between the third maxillipeds. Legs stout, dactylus longitudinally ridged, often with dense, stiff setae, margins with spines. All male abdominal segments distinct, movable.

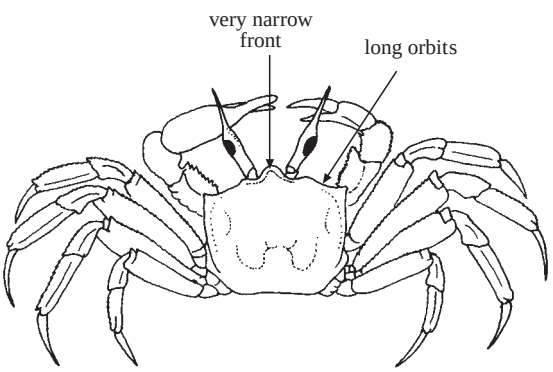


OCYPODIDAE

Page 1152

Ghost crabs

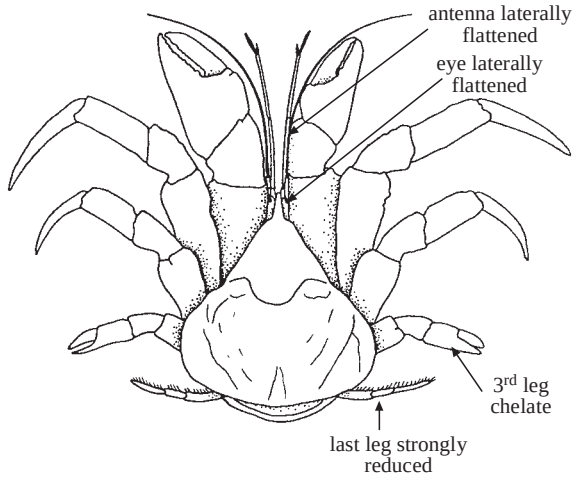
Carapace squarish, transversely rectangular, trapezoidal or transversely ovate; dorsal surface gently convex, usually smooth or with grooves; frontal margin entire, relatively narrow; orbits broad, occupying almost entire anterior border (excluding the front), antero- and posterolateral margins of carapace usually not clearly demarcated, lateral margins appearing almost straight or gently convex, lateral margins unarmed. Eyestalks long, longer than width of orbit. No rhomboidal gap between third maxillipeds. Dactylus of legs with numerous stiff setae. Ventral surface of abdomen or base of legs may have tufts of fine setae. All male abdominal segments distinct, movable.



COENOBITIDAE **Page 1154**

Land hermit crabs and coconut crabs

Carapace relatively well calcified; eyestalk laterally flattened; eyes usually held subparallel to each other. Antennae laterally flattened. Coxae of third maxillipeds close to each other, without distinct gap between them. Chelipeds short, stocky, equal or unequal; when unequal, left chela larger. First 2 pairs of walking legs well developed, last 2 pairs reduced, third legs chelate. Abdomen bilaterally asymmetrical, not clearly divided into segments. Either hermit crabs or distinctly crab-like animals with abdomen tucked under carapace; uropods modified into a "rasp" used for clinging interior of gastropod shells (except in *Birgus latro*).



KEY TO THE FAMILIES OF BRACHYURAN CRABS

Note: the following key covers all marine families of brachyuran crabs recognized in this work, most of which have been reported from the Western Central Pacific. The 5 families which so far are known only from other regions of the world have been included in the anticipation that some of them may be recorded in the future from the area. Wherever possible, external and easily viewed characters are utilized, and in most cases, no smaller structures have been chosen, such as male gonopods and structures of male and female genitalia (which are very important in crab classification). Due to the diversity in some families (e.g. Xanthidae and Goneplacidae), not all their members can be identified to the family level with this key, although it should work for the majority of species encountered. There are also a number of unusual species, the familial classification of which is still contentious. For a more comprehensive key, see Sakai (1976) and Dai and Yang (1991). For the identification of some more difficult species, the only safe way is to send the sample(s) to an expert of decapod taxonomy.

1a. Only 3 pairs of legs visible, fourth pair absent (Fig. 1) . . . . . **Hexapodidae**

1b. Four pairs of legs visible . . . . . → **2**

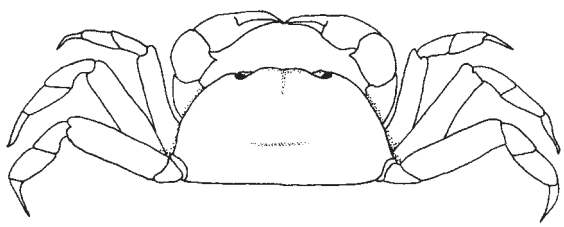


Fig. 1 Hexapodidae

2a. Basal segment of eyestalk much longer than terminal article, from dorsal view, eyestalk appears to be 2-segmented (Figs 2a and 3) . . . **Latreillidae**

2b. Basal segment of eyestalk much shorter than terminal article, from dorsal view, eyestalk appears to be unsegmented (Fig. 2b) . . . . . → **3**

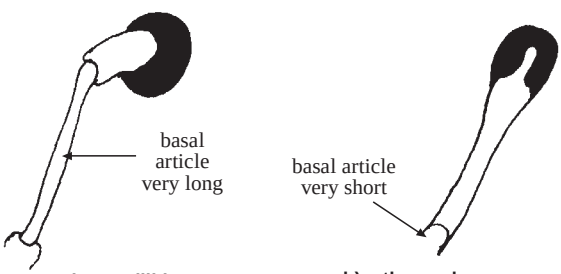


Fig. 2 eyestalk

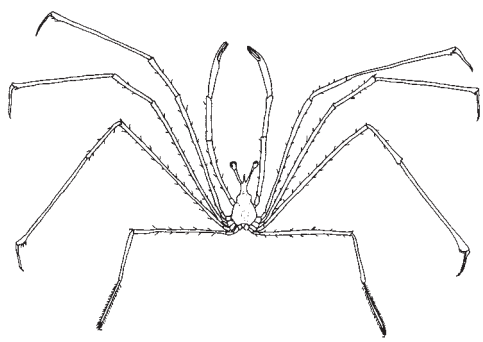


Fig. 3 Latreillidae

3a. Fourth (last) last pair of legs distinctly subchelate to chelate (Fig. 4a-f) or strongly reduced to just 3 articles, inserted obliquely on carapace and directed upwards . . . . . → **4**

3b. Fourth (last) last pair of legs normal in structure or reduced in size but not subchelate or chelate (Fig. 4g) and never reduced to just 3 articles, inserted laterally on carapace and directed laterally . . . . . → **10**

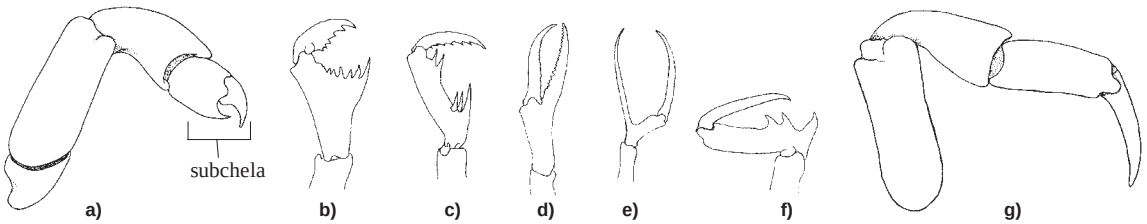


Fig. 4 last leg: (a-f) various types of subchelate to chelate conditions of propodus and dactylus; (g) normal leg

4a. Merus of third maxilliped distinctly triangular in shape (Fig. 5a) . . . . . → **5**

4b. Merus of third maxilliped quadrate to subquadrate, never clearly triangular in shape (Fig. 5b, c). . . . . → **7**

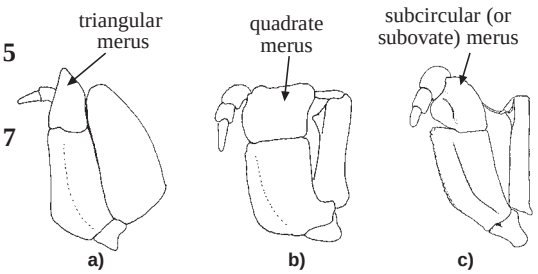


Fig. 5 third maxilliped

5a. Third maxillipeds not covering a large anterior part of buccal cavern which is normally filled by the exposed second maxillipeds (Fig. 6a); crab carries inanimate objects (e.g. shells and leaves) or sea anemones (Fig. 7) . . . **Dorippidae**

5b. Third maxillipeds covering or almost completely covering anterior part of buccal cavern, second maxillipeds always covered and not exposed (Fig. 6b); crab usually carries pieces of inanimate objects (e.g. dead shells and sticks) when alive . . . . . → **6**

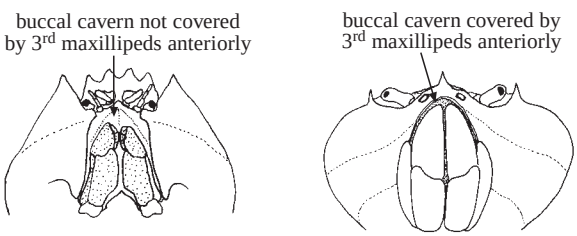


Fig. 6 mouth field

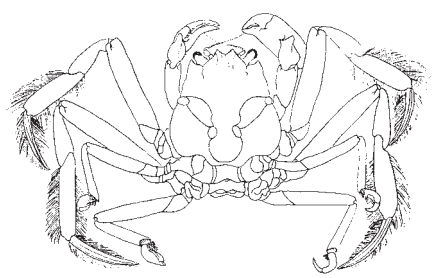


Fig. 7 Dorippidae (after Shen, 1932)

6a. Carapace hexagonal to subovate (Fig. 9); orbits distinct; exopod of third maxilliped usually without flagellum (Fig. 8a). . . . . **Cyclodorippidae**

6b. Carapace rectangular to squarish (Fig. 10); orbits absent; exopod of third maxilliped with distinct flagellum (Fig. 8b) . . . . . **Cymonomidae**

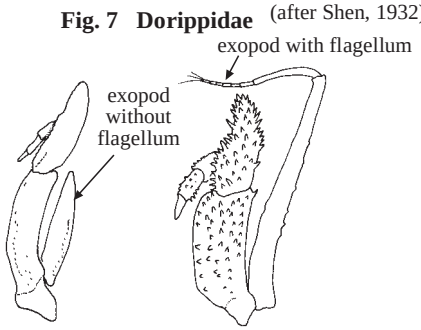


Fig. 8 third maxilliped

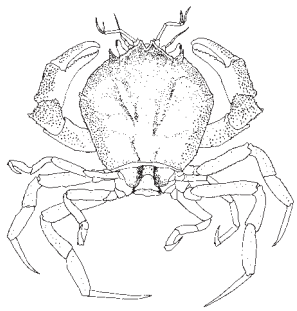


Fig. 9 Cyclodorippidae

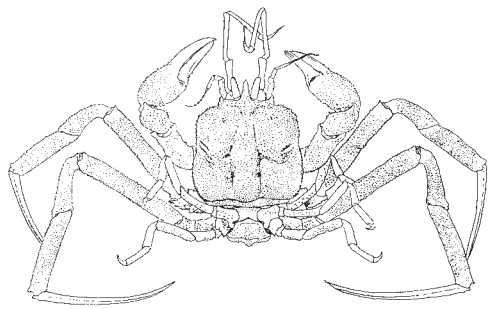


Fig. 10 Cymonomidae

7a. Carapace pyriform (pear-shaped) (Fig. 12); orbits incomplete; carapace, chelipeds, and legs often with hooked setae; vulvae of adult female on thoracic sternum (Fig. 11a) . . . . . **Majidae** (in part) (p. 1136)

7b. Carapace shape not as above; orbits usually complete; carapace, chelipeds, and legs without hooked setae; vulvae of adult female on coxae of third legs (Fig. 11b) . . . . . → **8**

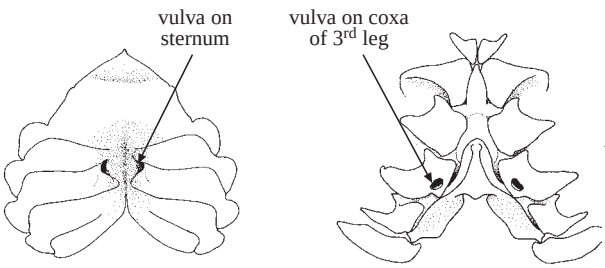


Fig. 11 position of female vulvae on ventral side of body (abdomen omitted)

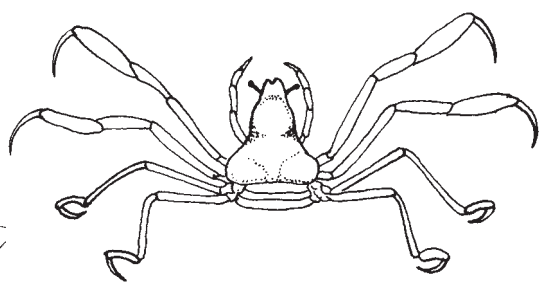


Fig. 12 Majidae

8a. Carapace longitudinally rectangular, dorsal surface glabrous or with scattered stiff setae; only fourth pair of legs with dactylus and propodus subchelate to chelate (Fig. 13) . . . . . **Homolidae** (p. 1083)

8b. Carapace longitudinally ovate, circular or hexagonal, dorsal surface usually with dense, soft setae; both third and fourth legs with dactylus and propodus subchelate to chelate; carries sponges and sea anemones when alive . . . . . → **9**

9a. Carapace circular to hexagonal; a small platelet-like structure usually intercalated between edges of sixth abdominal segment and telson (Fig. 14a); crab carries sponges, tunicates, and bivalve shells (Fig. 15) . . . . . **Dromiidae** (p. 1085)

9b. Carapace longitudinally ovate; no platelet-like structure intercalated between edges of sixth abdominal segment and telson (Fig. 14b); crab believed to carry sponges or related objects (Fig. 16) . . . . . **Homolodromiidae**

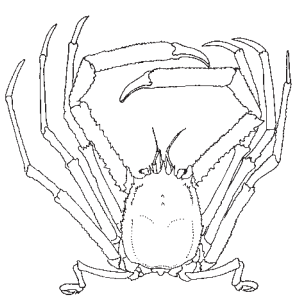


Fig. 13 Homolidae

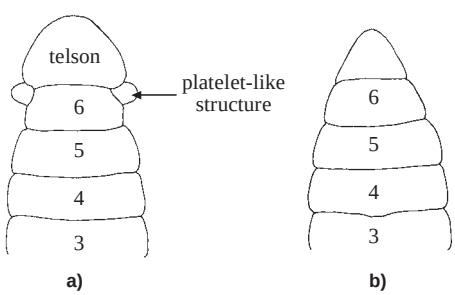


Fig. 14 male abdomen

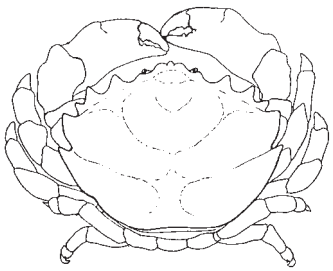


Fig. 15 Dromiidae

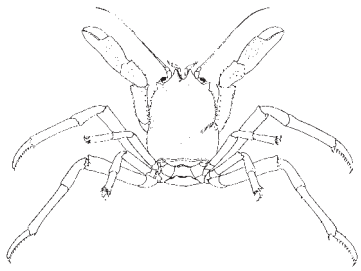


Fig. 16 Homolodromiidae
(after Alcock and Anderson, 1899)

10a. Merus of third maxilliped distinctly triangular in shape (Fig. 17a) . . . . . → **11**

10b. Merus of third maxilliped quadrate to ovoid, never distinctly triangular in shape (Fig. 17b) . . . . . → **14**

11a. Carapace longitudinally ovate; sternum very narrow, thoracic sternites 5 to 7 very narrow (Fig. 18a); fingers of chela strongly bent (Fig. 19) . . . . . **Raninidae** (p. 1089)

11b. Carapace shape not as above; sternum normal, thoracic sternites 5 to 7 not strongly narrowed (Fig. 18b); fingers of chela not strongly bent . . . . . → **12**

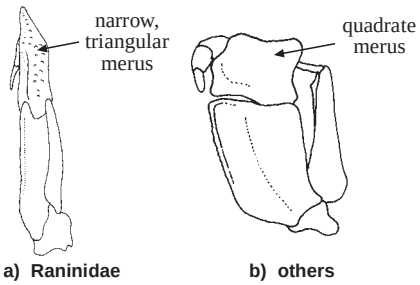


Fig. 17 third maxilliped

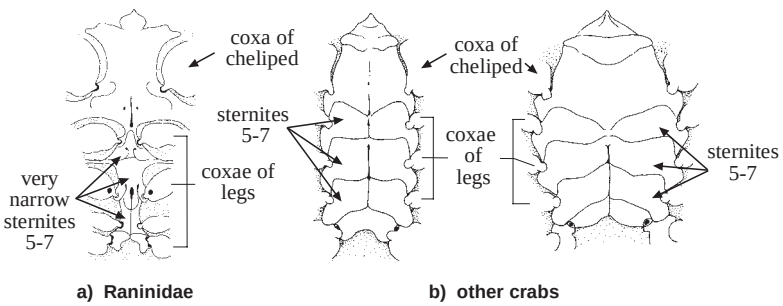


Fig. 18 thoracic sternum
(ventral side of body, between legs)

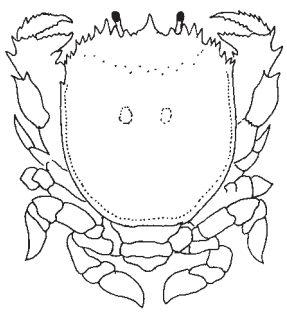


Fig. 19 Raninidae

12a. Carapace subcircular with strong teeth on lateral margins; only dactylus of fourth leg paddle-like (Fig. 21); vulvae of adult female exposed, not covered by abdomen (Fig. 20a) . . . . . **Orithyiidae**
(family not recorded from the area so far)

12b. Carapace either of differing shape, or, if subcircular, never with strong teeth on lateral margins; dactylus of fourth leg normal and styliform, or, if paddle-like, all other dactyli of legs are also similarly structured; vulvae of adult female always covered by abdomen (Fig. 20b) . . . . . → **13**

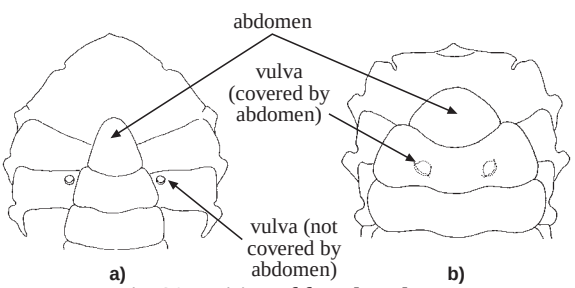


Fig. 20 position of female vulvae

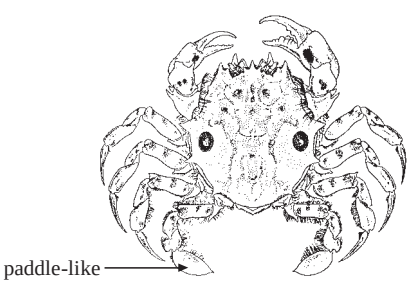


Fig. 21 Orithyiidae
(after Shen, 1932)

13a. Opening for afferent respiratory current below orbits, adjacent to endostome, with distinct canal present along sides of buccal cavern (Fig. 22a) when third maxillipeds pushed aside; sides of carapace never expanded to form a clypeiform process (= expanded posterior edge); larger chela never with specialized cutting tooth; legs never paddle-like (Fig. 23) . . . . . **Leucosiidae**

13b. Opening for afferent respiratory current at base of chela, no canal present along sides of buccal cavern even when third maxillipeds pushed aside (Fig. 22b); sides of carapace may be expanded to form a clypeiform process; larger chela may have a specialized cutting tooth (Fig. 24); propodus and dactylus of legs may be paddle-like (Fig. 25) . . . . . **Calappidae** (p. 1091)

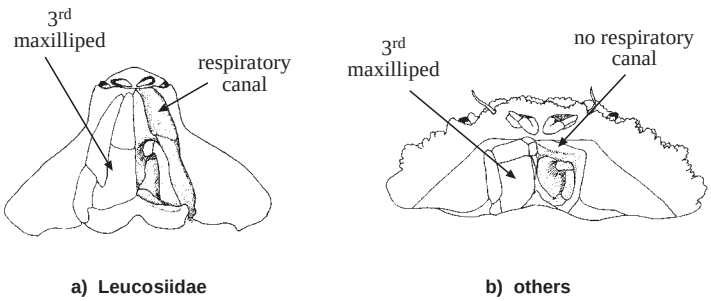


Fig. 22 presence or absence of respiratory canal

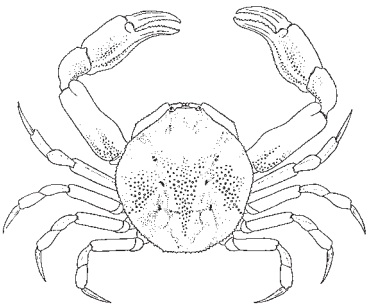


Fig. 23 Leucosiidae
(after Shen, 1932)

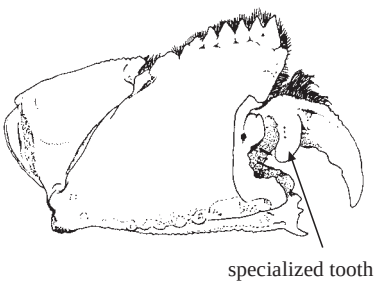
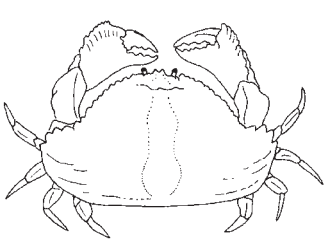


Fig. 24 right chela (Calappidae)



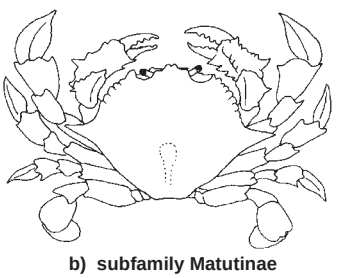


Fig. 25 Calappidae

14a. A small platelet-like structure always intercalated present between edges of sixth abdominal segment and telson (Fig. 26a); fourth leg strongly reduced, present only as a short appendage (only partially subchelate in 1 Atlantic species); no known carrying behaviour (Fig. 27) . . . . . **Dynomenidae**

14b. No platelet-like structure intercalated between edges of sixth abdominal segment and telson (Fig. 26b); fourth leg reduced but always distinct, with most segments slender, relatively long . . . . . → **15**

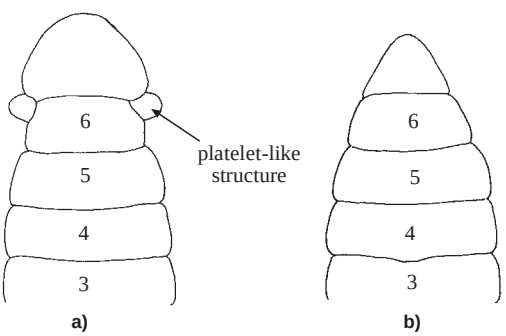


Fig. 26 male abdomen

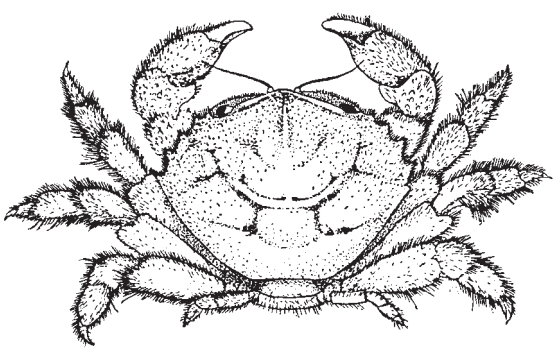


Fig. 27 Dynomenidae

15a. Fourth leg strongly reduced compared to other legs (Fig. 28a) . . . . . → **16**

15b. Fourth leg subequal to other legs, or if smaller, not greatly reduced in size compared to third leg (Fig. 28b) . . . . . → **17**

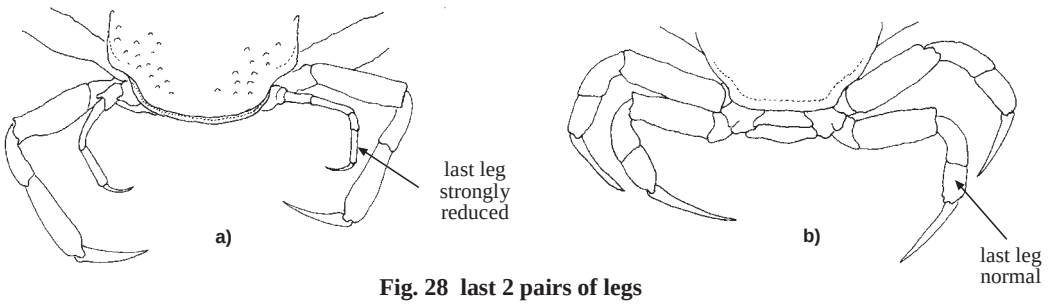


Fig. 28 last 2 pairs of legs

16a. Carapace circular; dorsal surface granulated; fourth leg reduced but normal in structure, dactylus curved, tapering to a sharp point (Fig. 29) . . . . . **Palicidae**

16b. Carapace hexagonal, dorsal surface usually with 1 or 2 distinct transverse ridges; fourth pair of legs very slender, almost filament-like, often appearing feather-like, dactylus straight, with rounded tip (Figs 30 and 31) . . . . . **Retroplumidae**

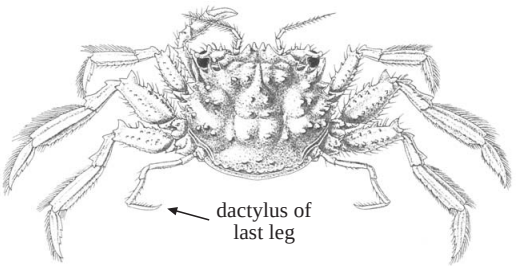


Fig. 29 Palicidae
(from Alcock and Anderson, 1899)

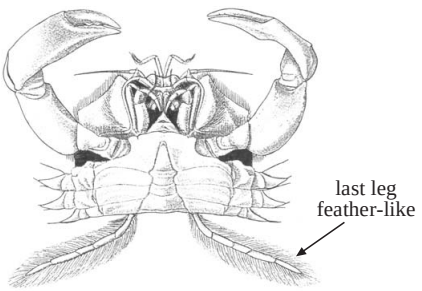


Fig. 30 Retroplumidae (ventral view)
(from Alcock and Anderson, 1899)

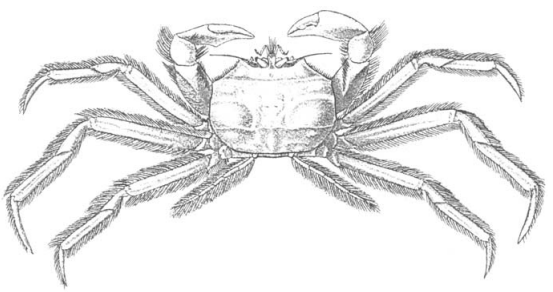


Fig. 31 Retroplumidae (dorsal view)
(from Alcock and Anderson, 1899)

17a. Carapace longitudinally rectangular (Fig. 33); female genital opening on coxa of third walking leg (Fig. 32a) . . . . . **Poupiniidae**

17b. Carapace not longitudinally rectangular; female genital opening on sternum (Fig. 32b) . . . . → **18**

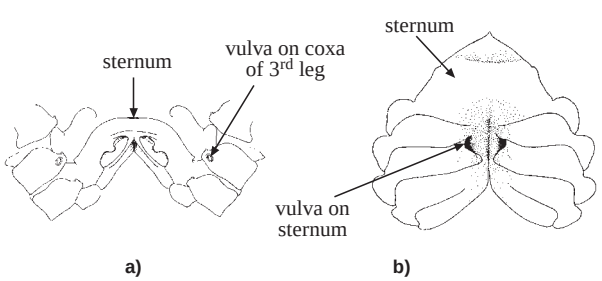


Fig. 32 position of female vulvae

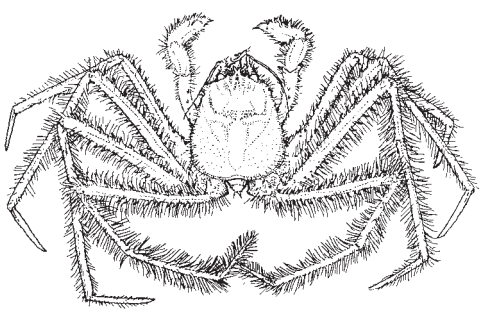


Fig. 33 Poupiniidae

18a. Antennae (excluding basal segment) strongly reduced (Figs 34a and 35) . . . . . **Belliidae**

18b. Antennae (excluding basal segment) normal, with distinct flagellum (Fig. 34b, c). . . . . → **19**

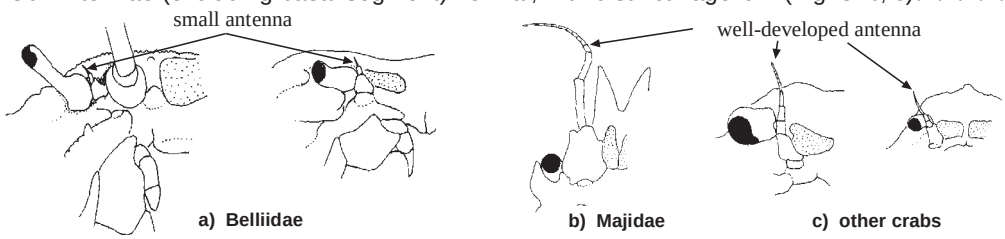


Fig. 34 front and antenna

19a. Fossae (sockets) for antennulae squarish to longer than broad, antennulae fold longitudinally or almost so (Fig. 36a, b) . . . . → **20**

19b. Fossae for antennulae broader than long, antennulae fold transversely or obliquely (Fig. 36c, d) . . . . . → **27**

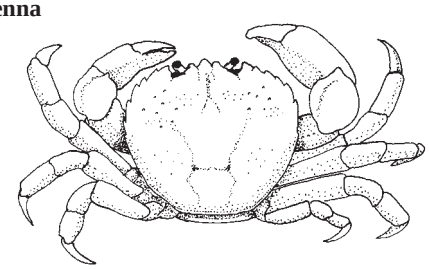


Fig. 35 Belliidae

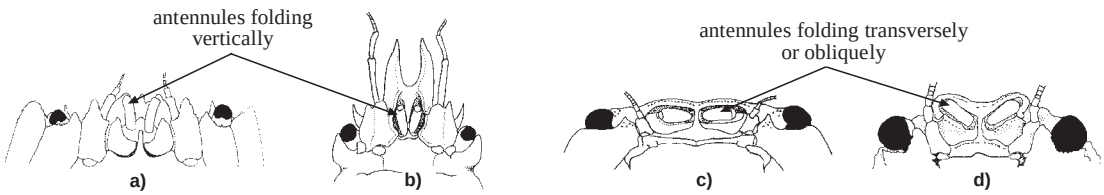


Fig. 36 anteriormost part of body (ventral view)

20a. Carapace pyriform, subpyriform, triangular, circular, or subcircular; orbits incomplete to absent (Fig. 37a) . . . . . → **21**

20b. Carapace longitudinally and transversely ovate, hexagonal, circular, or subcircular; orbits complete (Fig. 37b) . . . . → **22**

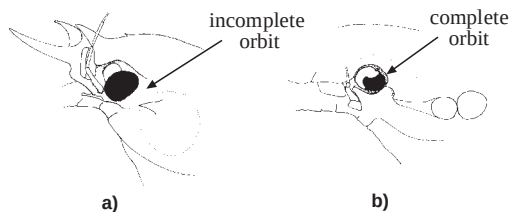


Fig. 37 orbits

21a. Carapace well calcified, dorsal surface gently to strongly convex, almost always covered with spines or granules (Fig. 40); hooked setae often present; abdomen usually with 6 segments and a telson (Fig. 38a) (rarely 5 segments and a telson); male genital openings coxal (i.e. situated at basis of coxae of fourth legs, Fig. 39a) . . . . . **Majidae** (in part) (p. 1136)

21b. Carapace poorly calcified, soft, dorsal surface flat to almost flat, never covered with spines or granules (Fig. 41); hooked setae absent; abdomen always with only 5 segments and a telson (Fig. 38b) (or fewer segments, some completely fused); male genital openings sternal (Fig. 39b) . . . . . **Hymenosomatidae**

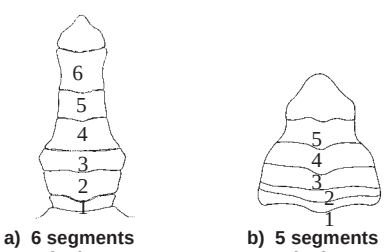


Fig. 38 abdomen

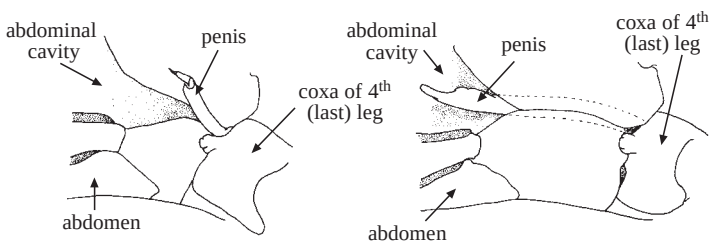


Fig. 39 position of male genital opening

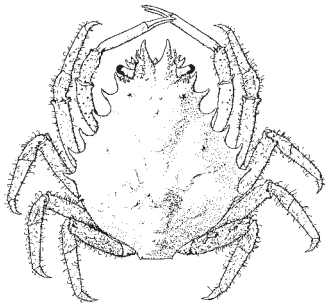


Fig. 40 Majidae

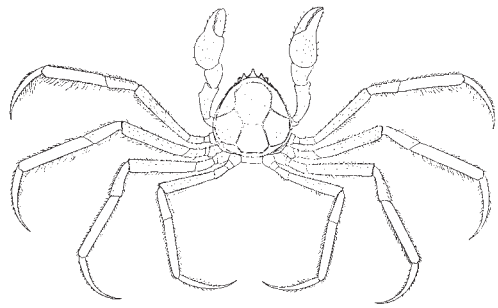


Fig. 41 Hymenosomatidae
(after Shen, 1932)

22a. Antennal flagellum distinctly setose (Fig. 42a) . . . . . → **23**

22b. Antennal flagellum slightly setose to glabrous (Fig. 42b) . . . . . → **26**

23a. Front entire, without teeth or lobes; anterolateral and posterolateral margins of carapace lined with dense, long setae forming distinct fringe (Fig. 43) . . . . . **Thiidae**
(family not recorded from the area so far)

23b. Front with teeth or lobes; anterolateral and posterolateral margins of carapace with relatively dense setae, but not forming distinct fringe . . . . . → **24**

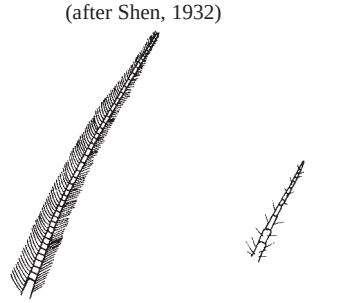


Fig. 42 antennal flagellum

24a. Antennae very long, longer than or as long as carapace length, strongly setose (Fig. 44). . **Corystidae**

24b. Antennae short, much shorter than carapace length, not strongly setose. . . . . → **25**

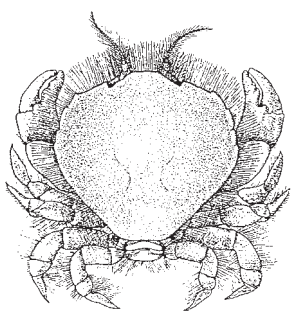


Fig. 43 Thiidae
(after Christiansen, 1969)

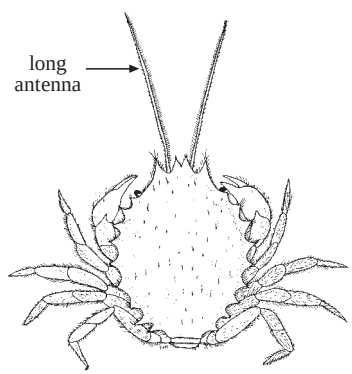


Fig. 44 Corystidae

25a. Carapace usually rounded to longitudinally ovate; vulvae of adult female completely covered by abdomen (Figs 45a and 46) . . . . **Atelecylidae**

25b. Carapace squarish to hexagonal; vulvae of adult female exposed, not covered by abdomen (Figs 45b and 47) . . . . . **Cheiragonidae**
(family not recorded from the area so far)

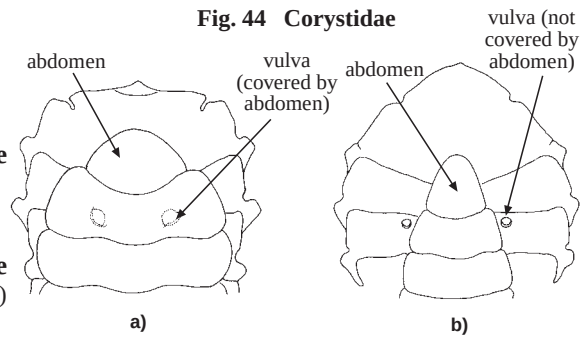


Fig. 45 position of female vulvae

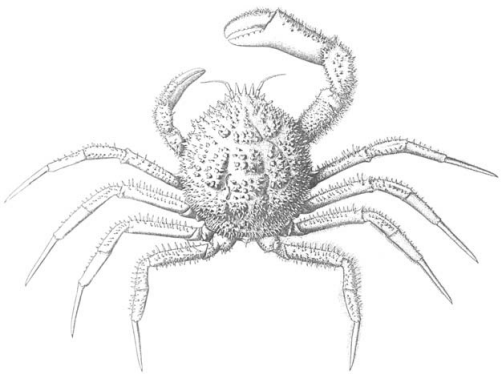


Fig. 46 Atelecylidae
(after Alcock and Anderson, 1899)

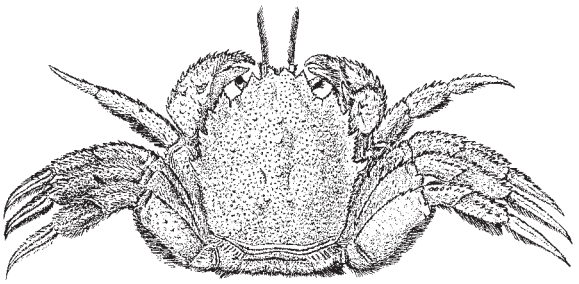


Fig. 47 Cheiragonidae
(after Sakai, 1976)

26a. Carapace hexagonal, its width and length subequal; front broad compared to maximum carapace width; anterolateral margins of carapace weakly convex, each with 4 or 5 well-developed teeth (Fig. 48) . . . . . **Pirimelidae**
(family not recorded from the area so far)

26b. Carapace transversely ovate; front narrow compared to maximum carapace width; anterolateral margins of carapace strongly convex, each usually with well-defined teeth or lobes (Fig. 49) . . . . . **Cancridae**

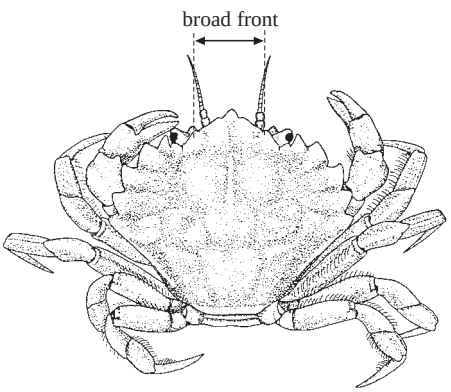


Fig. 48 Pirimelidae
(after Christiansen, 1969)

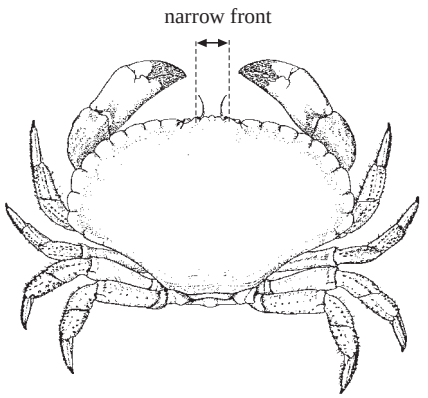
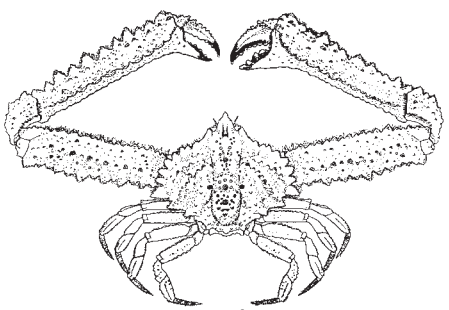


Fig. 49 Cancridae
(after Christiansen, 1969)

27a. Carapace triangular or hexagonal; front triangular, forked or spiniform; chelipeds usually stout, very elongate (Fig. 50) . . . . . **Parthenopidae**

27b. Carapace shape not as above; front usually truncate or multidentate; chelipeds usually stout to slender, relatively short; if chelipeds long, usually slender . . . . . → **28**



(after Shen, 1932)

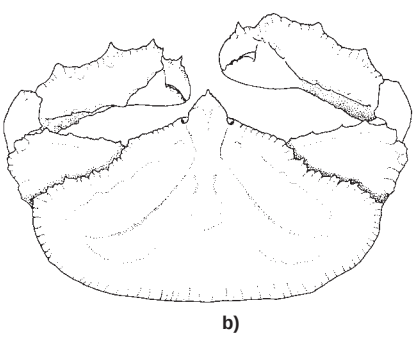


Fig. 50 Parthenopidae

28a. Merus of third maxilliped strongly reduced compared to ischium and other segments (Fig. 51a), sometimes completely fused with ischium (Fig. 51b); male genital openings always sternal (Fig. 52a); males always much smaller than females; parasites on hard corals, or symbionts on molluscs, echinoderms or worms . . . . . → **29**

28b. Merus of third maxilliped well developed, usually quadrate in shape (Fig. 51c); male genital openings usually coxal (i.e. situated at basis of coxae of fourth legs, Fig. 52b), occasionally sternal; males not much smaller, subequal or larger in size to females; free-living crabs, not parasites of hard corals, not symbionts on molluscs or worms . . . . . → **30**

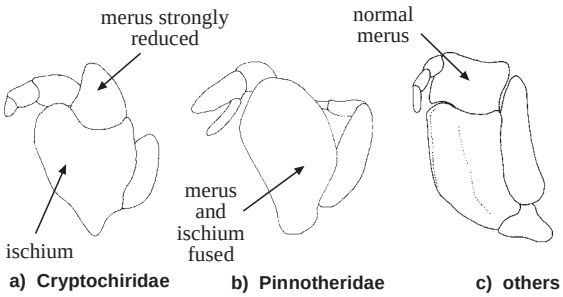


Fig. 51 third maxilliped

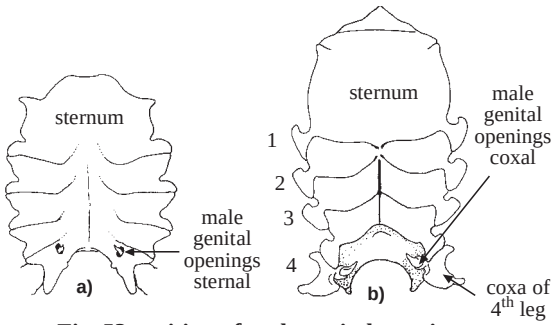


Fig. 52 position of male genital opening

29a. Carapace longitudinally ovate to longitudinally rectangular; dorsal surface of carapace usually with small spines or tubercles; merus of third maxilliped always separated from ischium, dactylus terminally attached to propodus; dactylus of legs strongly hooked; parasites on hard corals (Fig. 53) . . . . . **Cryptochiridae**

29b. Carapace circular to transversely ovate; dorsal surface of carapace smooth; merus of third maxilliped may be fused with ischium; dactylus usually subterminally to basally attached to propodus with palp often appearing bifurcated; dactylus of legs weak, not strongly hooked; parasitic or commensal on molluscs or worms (Fig. 54). . . **Pinnotheridae**

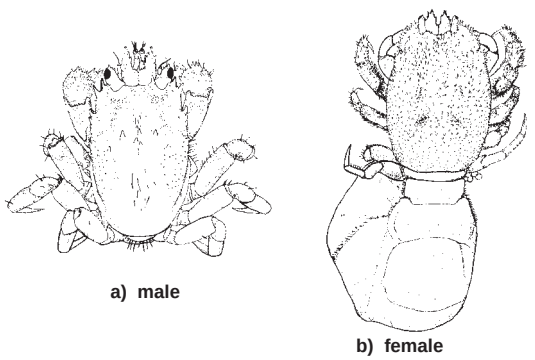


Fig. 53 Cryptochiridae

(after Takeda and Tamura, 1980)

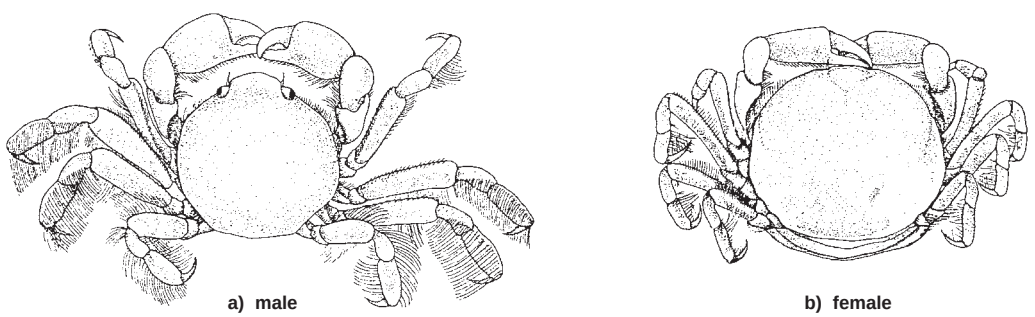


Fig. 54 Pinnotheridae

(after Christiansen, 1969)

30a. Last pair of legs with dactylus flattened, paddle-like (Fig. 55a) (with the exception of a few mud-dwelling and obligate coral-symbionts) (Fig. 56) . . . . . **Portunidae** (p. 1115)

30b. Last pair of legs with normal dactylus (Fig. 55b) . . . . . → **31**

31a. Distinct rhomboidal gap between third maxillipeds; mandibles usually visible when mouthparts closed (Fig. 57a) . . . . . → **32**

31b. No distinct rhomboidal gap between third maxillipeds (Fig. 57b); mandibles never visible when mouthparts closed. . . . . → **33**

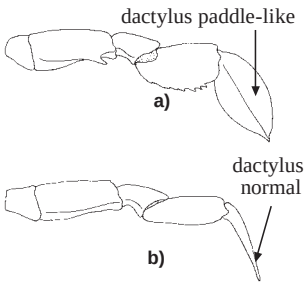


Fig. 55 fourth leg

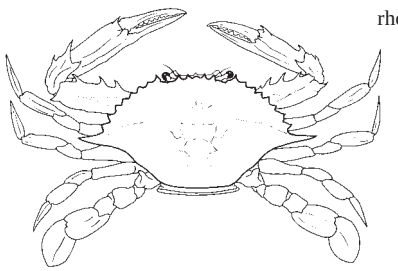


Fig. 56 Portunidae

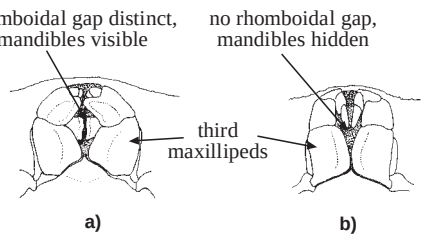


Fig. 57 third maxillipeds

32a. Carapace transversely ovate to circular, dorsal surface usually very smooth, rounded; land crabs (Fig. 58) . . . . . **Gecarcinidae** (p. 1147)

32b. Carapace squarish, transversely rectangular, trapezoidal or circular, dorsal surface rough, rugose or setose (Fig. 59) . . . . . **Grapsidae** (in part) (p. 1138)

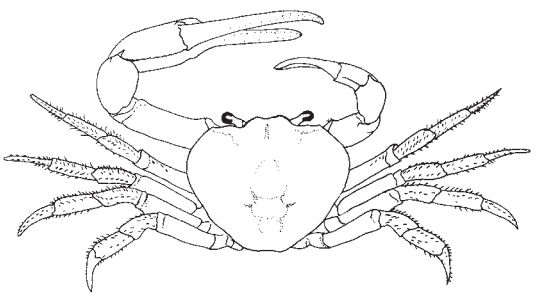
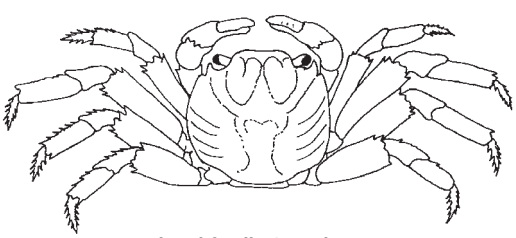


Fig. 58 Gecarcinidae



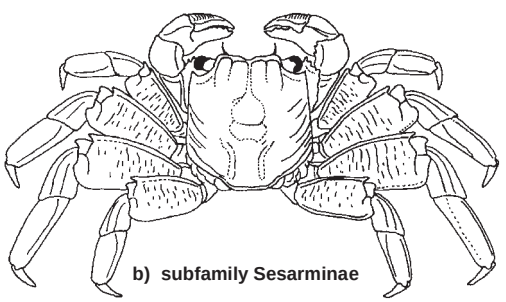
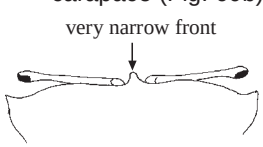


Fig. 59 Grapsidae

33a. Front simple, triangular, very narrow compared to broader carapace (Fig. 60a) . . . . . → **34**

33b. Front truncate, multilobate or multidentate, relatively broad compared to transverse carapace (Fig. 60b) . . . . . → **35**



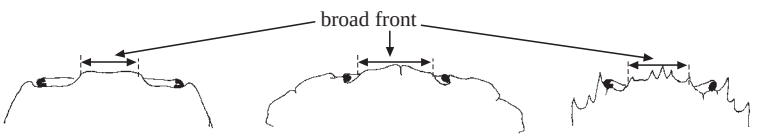


Fig. 60 anterior part of carapace (dorsal view)

34a. Orbits long, eyes elongate; terrestrial to semiterrestrial crabs (Fig. 61) . . . . **Ocypodidae** (p. 1152)
34b. Orbits absent, eyes relatively short; semiterrestrial crabs (Fig. 62) . . . . . **Mictyridae**

Fig. 61 Ocypodidae
(after Shen, 1932)

35a. Cross-section of dactylus of walking leg T-shaped (Figs 63 and 64). . . . . **Geryonidae** (p. 1132)
35b. Cross-section of dactylus of walking leg not T-shaped, usually quadrate to ovate (Fig. 63b) . . . . . → **36**

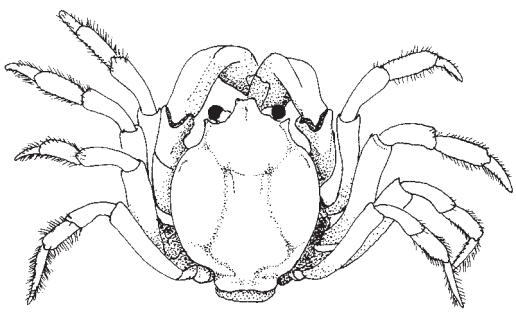


Fig. 62 Mictyridae

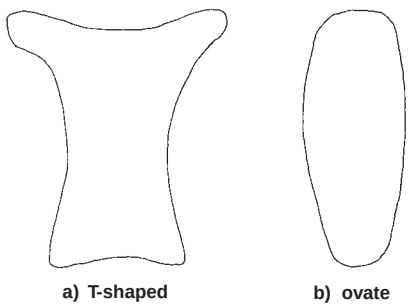


Fig. 63 cross-section of dactylus of walking leg

36a. Male abdominal segments 2 and 3 always immovable, completely to incompletely fused (Fig. 65a); male first gonopods strongly bent (Fig. 66a); small semiterrestrial crabs usually associated with estuarine habitats and mangroves (Fig. 67) . . . . . **Camptandriidae**
36b. Male abdominal segments 2 and 3 always movable, never fused (Fig. 65b); male first gonopods normal (Fig. 66b); aquatic to semiterrestrial crabs . . . . . → **37**

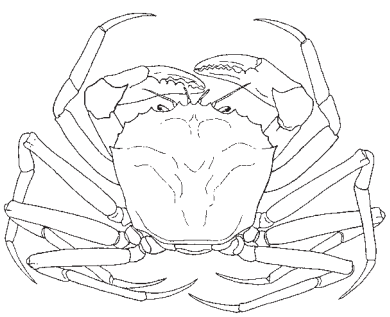


Fig. 64 Geryonidae

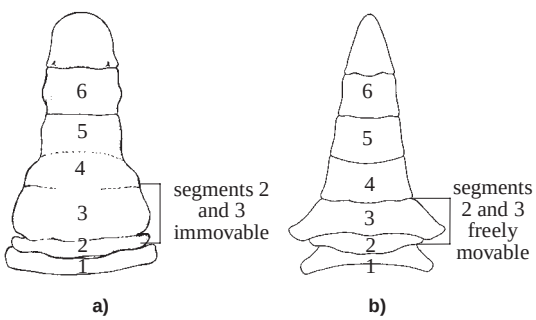


Fig. 65 abdomen

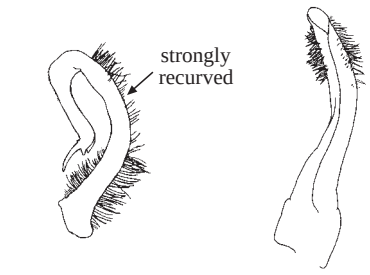


Fig. 66 male first gonopod

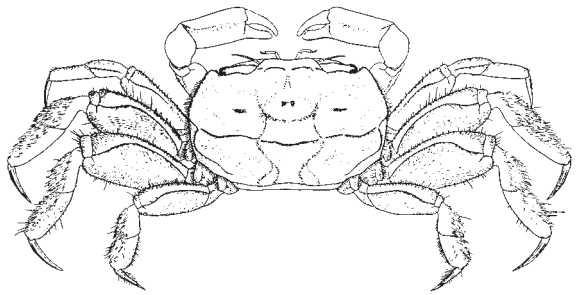


Fig. 67 Camptandriidae
(after Shen, 1932)

37a. Carapace squarish to longitudinally rectangular, posterolateral margins subparallel, dorsal surface flat or gently convex; free-living intertidal, estuarine, or fresh-water crabs (Fig. 68) . . . . . **Grapsidae** (in part) (p. 1138)

37b. Carapace shape not as above; dorsal surface usually convex; posterolateral margins gently to strongly converging; sublittoral to deep-water crabs . . . . . → **38**

38a. Legs with special dactylo-propodal articulation (formed by a rounded, submedian extension of the lateral margin of the propodus, sliding underneath a projecting button on the subproximal edge of the dactylus; Fig. 69a) . . . . . → **39**

38b. Legs without special articulation between propodus and dactylus (Fig. 69b) . . . . . → **41**

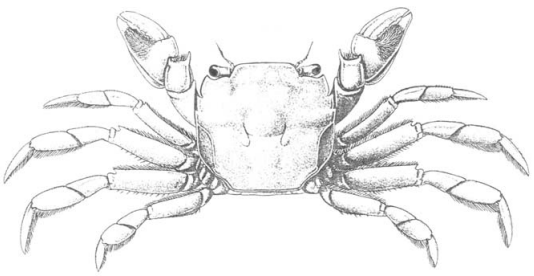


Fig. 68 Grapsidae (subfamily Varuninae)
(from Alcock and Anderson, 1899)

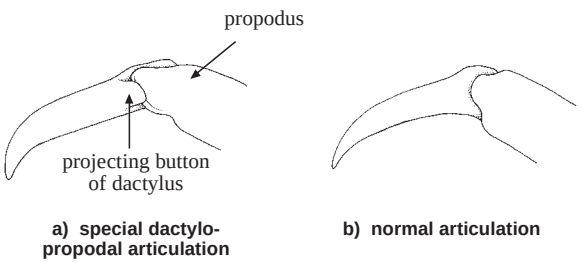


Fig. 69 distal end of walking leg

39a. Fingers of chelipeds distinctly spoon-tipped (Fig. 70a); male abdominal segments 3 to 5 always immovable, completely fused although sutures may be partially visible (Figs 71a and 72) . . . . . **Xanthidae** (in part) (p. 1098)

39b. Fingers of chelipeds with sharp tip, not distinctly spoon-tipped (Fig. 70b); male abdominal segments 3 to 5 freely movable (Fig. 71b) or fused . . . . . → **40**

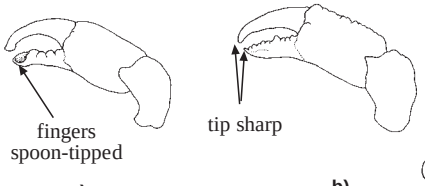


Fig. 70 pincer

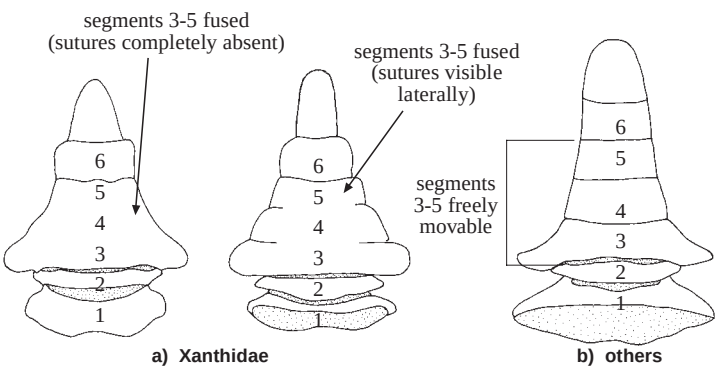


Fig. 71 abdomen

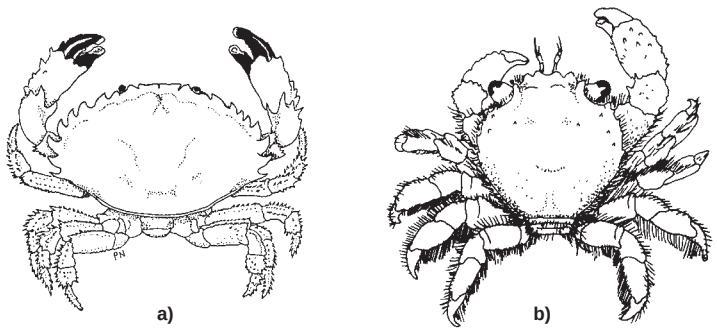


Fig. 72 Xanthidae

40a. Male first gonopod very slender, S-shaped (Fig. 73a); male second gonopod very short, sigmoid (very short, stout, comma-shaped) less than 1/4 the length of male first gonopod (Fig. 74b); internal and external commensals of echinoderms (Fig. 75) . . . **Eumedonidae**

40b. Male first gonopod moderately stout, slightly sinuous to almost straight (Fig. 73b); male second gonopod short but not sigmoid, always longer than 1/4 the length of male first gonopod (Fig. 74b); commensals on corals (Fig. 76) . . . . . **Trapeziidae**

Fig. 73 male first gonopod

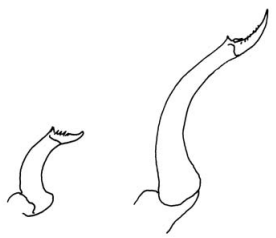


Fig. 74 male second gonopod

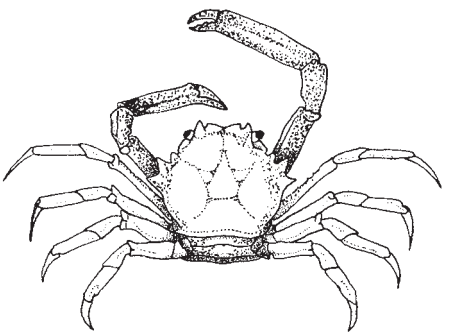


Fig. 75 Eumedonidae

41a. Male abdominal segments 3 to 5 distinct, movable (Fig. 77a); regions on carapace usually poorly defined . . . . → **42**

41b. Male abdominal segments 3 to 5 fused, immovable, although sutures may be partially visible (Fig. 77b, c); regions on carapace usually well defined . . . . . → **46**

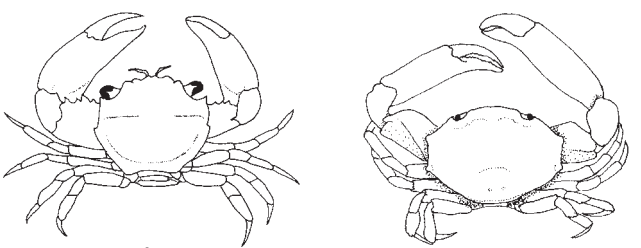


Fig. 76 Trapeziidae

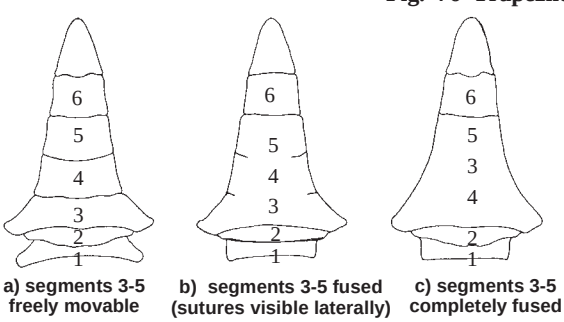


Fig. 77 male abdomen

42a. Longitudinal ridges which define efferent respiratory current absent, or strong only on posterior part of endostome, ridges not clearly visible on anterior part of endostome when mouthparts pushed aside (Fig. 78a, b); carapace and legs never spinose . . . . . → **43**

42b. Longitudinal ridges which define efferent respiratory current well developed along entire endostome, ridges visible on anterior part of endostome when mouthparts pushed aside (Fig. 78c); or carapace and legs strongly spinose . . . . . → **44**

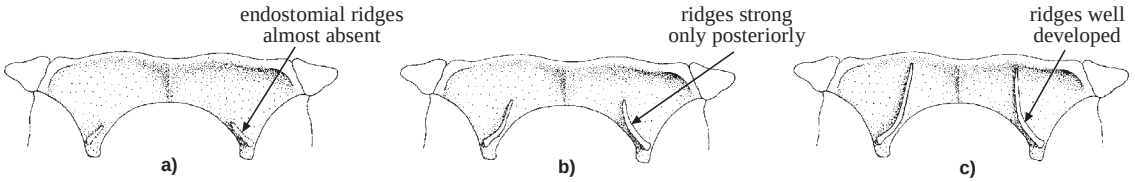


Fig. 78 endostome (= part of the "mouth field")

43a. Carapace transversely ovate; endopodite of first maxilliped usually with distinct lobe on inner angle (Fig. 79a); deep-water crabs, associated with hydrothermal vents (Fig. 80) . . . . . **Bythograeidae**

43b. Carapace hexagonal; endopodite of first maxilliped with small lobe or without small lobe on inner angle (Fig. 79b); mainly shallow-water crabs, if in deep waters, not known to be associated with hydrothermal vents (Fig. 81) . . . . . **Platyxanthidae**
(family not recorded from the area so far)

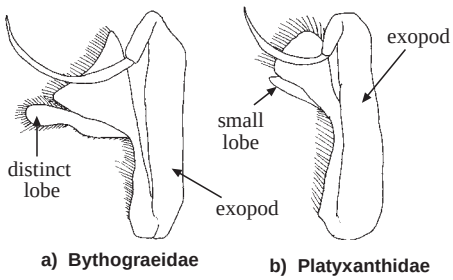


Fig. 79 first maxilliped

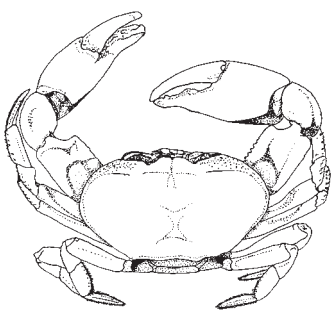


Fig. 80 Bythograeidae

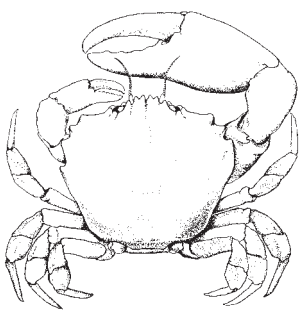


Fig. 81 Platyxanthidae

44a. Male first gonopod stout, straight (Fig. 82a); male second gonopod very elongate, subequal in length to, or longer than, male first gonopod (Figs 83a, b and 84) . . . . . **Eriphiidae** (p. 1103)

44b. Male first gonopod slender to stout, slightly sinuous to almost straight (Fig. 82b); male second gonopod distinctly shorter than length of male first gonopod (Fig. 83c). . . . . → **45**

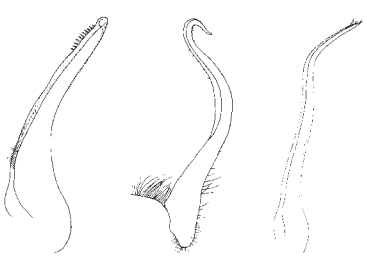


Fig. 82 male first gonopod

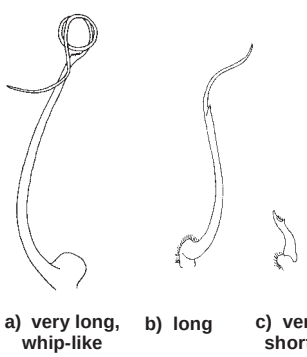


Fig. 83 male second gonopod

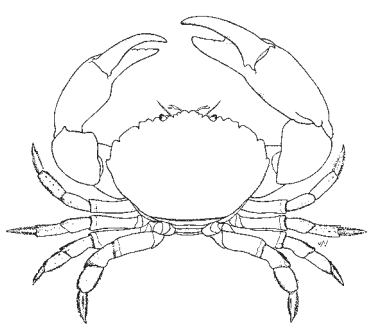


Fig. 84 Eriphiidae

45a. Male first gonopod slender, distinctly S-shaped to almost straight (Fig. 85a); male second gonopod sigmoid (very short, stout, comma-shaped) (Figs 86a and 87) . . . . . **Pilumnidae** (p. 1112)

45b. Male first gonopod moderately stout, slightly sinuous (Fig. 85b); male second gonopod about 1/3 to 1/2 the length of male first gonopod (Figs 86b and 88) . . **Goneplacidae** (in part) (p. 1114)

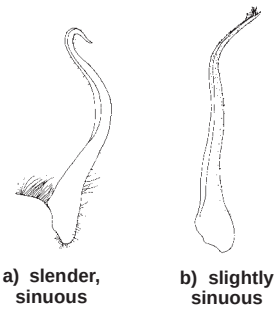


Fig. 85 male first gonopod

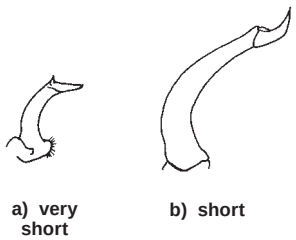


Fig. 86 male second gonopod

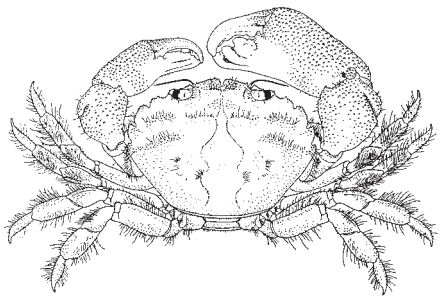


Fig. 87 Pilumnidae

(after Shen, 1932)

46a. Anterolateral margins entire, only 1 rounded lateral tooth present on each margin (Fig. 89) . . . . . **Carpiliidae** (p. 1110)

46b. Anterolateral margins multidentate or multilobate . . . . . → **47**

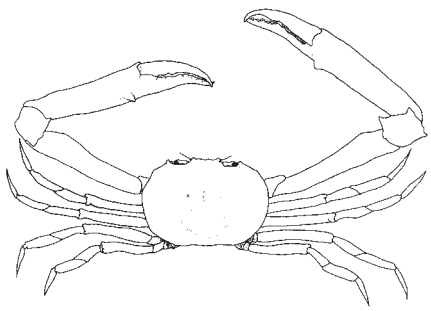


Fig. 88 Goneplacidae

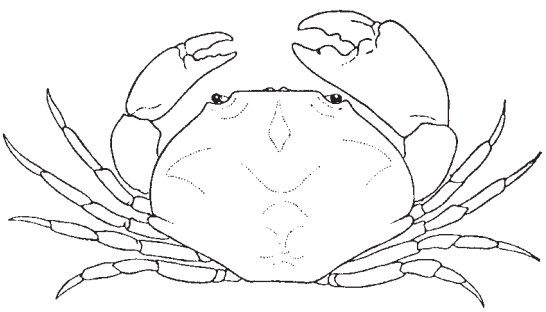


Fig. 89 Carpiliidae

47a. Carapace usually transversely rectangular, subcircular, sometimes transversely ovate; male second gonopod usually 0.3 times the length, to subequal length, of male first gonopod (Figs 90a and 91) . . . . . **Goneplacidae** (in part)

47b. Carapace usually hexagonal or transversely ovate; male second first gonopod short, subequal to, or less than, 0.3 times the length of male first gonopod but not distinctly sigmoid (stout, comma-shaped) (Fig. 90b) . . . . . → **48**

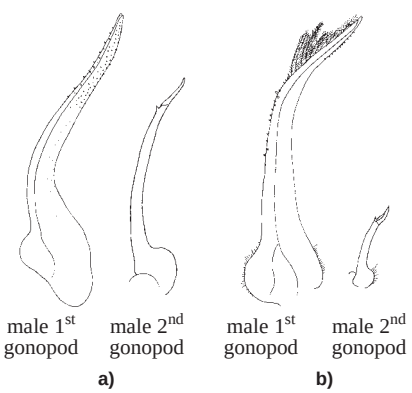


Fig. 90 relative length of male first and second gonopods

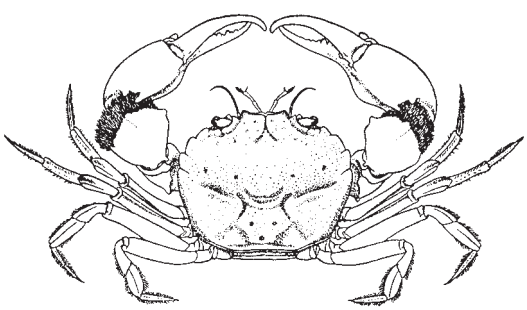


Fig. 91 Goneplacidae

(after Shen, 1932)

48a. Male first gonopods very slender, usually S-shaped, tip relatively simple, often with long setae subdistally and distally (Figs 92 and 93) . . . . **Xanthidae** (in part) (p. 1097)

48b. Male first gonopods moderately stout, sometimes slightly sinuous, tip usually with numerous complex folds (Figs 92b and 94) . . . . . **Panopeidae**

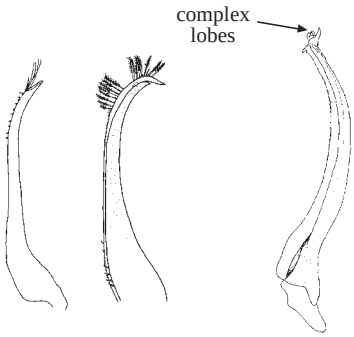


Fig. 92 male first gonopods

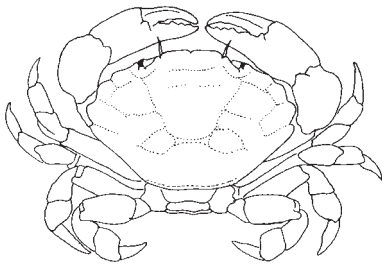


Fig. 93 Xanthidae

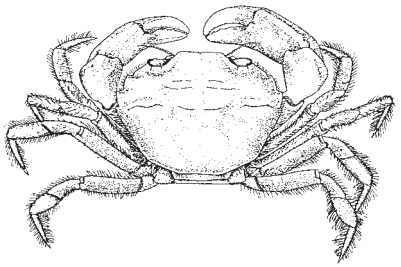


Fig. 94 Panopeidae
(after Christiansen, 1969)

KEY TO THE FAMILIES OF CRAB-LIKE ANOMURA

Notes: the following key covers all marine families of crab-like anomuran crabs recognized here, most of which (except the Lomidae) have been reported from the Western Central Pacific. The key uses, wherever possible, external and easily viewed characters. Due to the diversity in some families, however, not all their members can be identified to the family level with this key, although it should work for the majority of species encountered. A specialist should be consulted for the more difficult species. For further useful information on crab-like anomurans and allies see De Man (1928), Miyake (1982), Macpherson (1988), McLaughlin (1997), and Baba (1988).

1a. Carapace usually longitudinally ovate; dactyli of second to fourth legs curved, laterally flattened (Fig. 95a-c); burrowing crabs . . . . . → **2**

1b. Carapace usually not longitudinally ovate; dactyli of second to fourth legs normal, not laterally flattened, usually non-burrowing crabs . . . . . → **3**

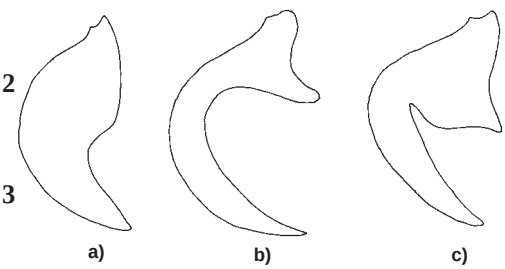


Fig. 95 dactylus of legs 2-4

2a. Carapace dorsoventrally flattened; first leg subchelate, with pincer-like structure (Fig. 96) . . . . . **Albuneidae**

2b. Carapace subcylindrical in cross-section; first leg simple, not subchelate (Fig. 97) . . . **Hippidae**

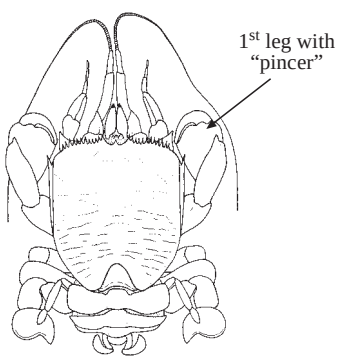


Fig. 96 Albuneidae

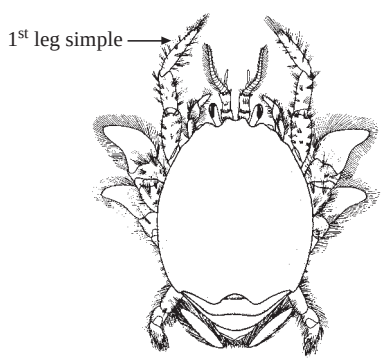


Fig. 97 Hippidae

3a. Uropods usually structurally modified into a "rasp" (Fig. 98a) and used for clinging onto interior of gastropod shells or hollow wood or underside of bivalve shells, at least in early crab stages . . . . . → **4**

3b. Uropods (may be absent) not modified for clinging purposes, no "rasp" present (Fig. 98b); crabs not associated with hollow or concave objects even in early crab stages . . . . . → **9**

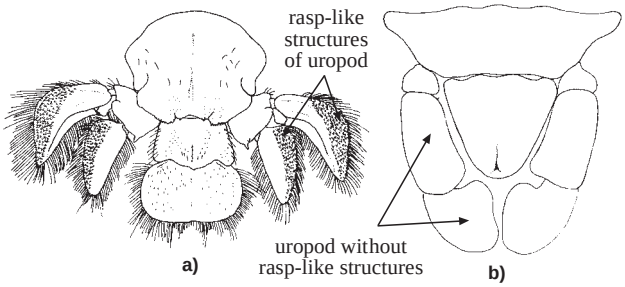


Fig. 98 posterior portion of body (dorsal view)

4a. Abdomen bilaterally symmetrical, clearly divided into segments, usually well calcified even at early crab stages, pleurites (side plates) distinct; shrimp- to lobster-like appearance, abdomen not tucked under carapace (Fig. 99) . . . . . **Pylochelidae**

4b. Abdomen usually bilaterally asymmetrical, not clearly divided into segments, usually weakly calcified or membranous, at least in early crab stages, pleurites (side plates) absent; typical hermit crabs or distinctly crab-like with abdomen tucked under the carapace . . . . . → **5**

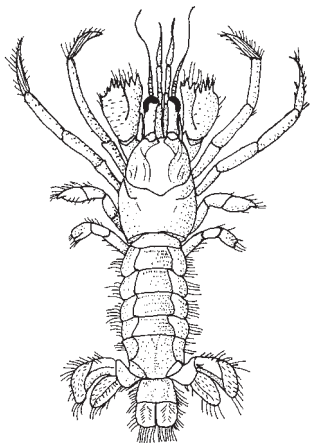


Fig. 99 Pylochelidae

5a. Coxae of third maxillipeds close to each other, no distinct gap between them (Fig. 100a); chelipeds equal or unequal, when unequal, left chela larger . . . . . → **6**

5b. Coxae of third maxillipeds distinctly separated from each other, wide gap between them (Fig. 100b); chelipeds unequal, with right chela larger . . . . . → **7**

6a. Eyestalk laterally flattened (Fig. 101a); eyes usually held subparallel to each other (Fig. 102a); antennae laterally flattened, short; completely terrestrial crabs (Fig. 103). . . . . **Coenobitidae** (p. 1154)

6b. Eyestalk circular to subcircular in cross-section, not laterally flattened (Fig. 101b); eyes held obliquely to each other (Fig. 102b); antennae long, subcylindrical in cross-section; completely aquatic crabs (Fig. 104). . . . . **Diogenidae**

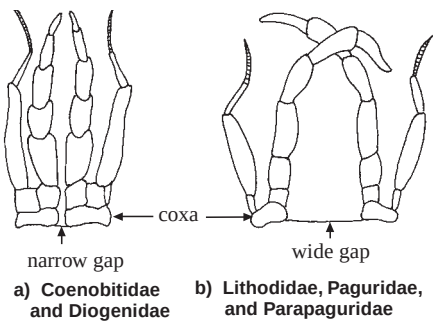


Fig. 100 third maxillipeds

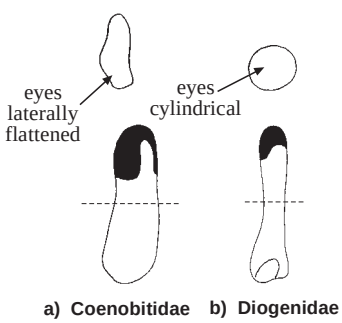


Fig. 101 eye in dorsal view

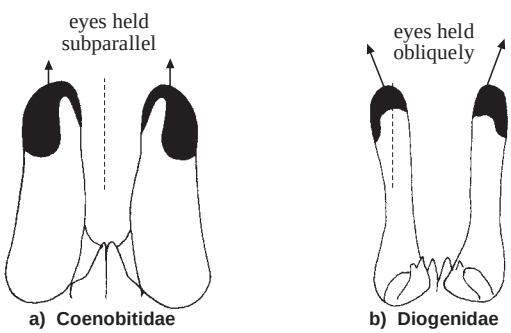


Fig. 102 relative position of eyes (dorsal view)

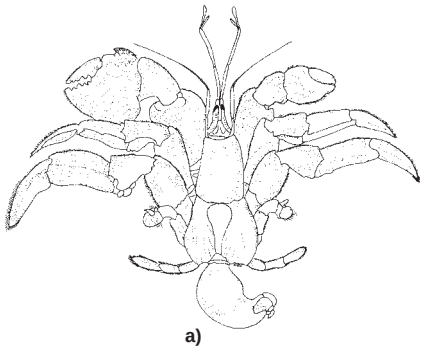


Fig. 103 Coenobitidae

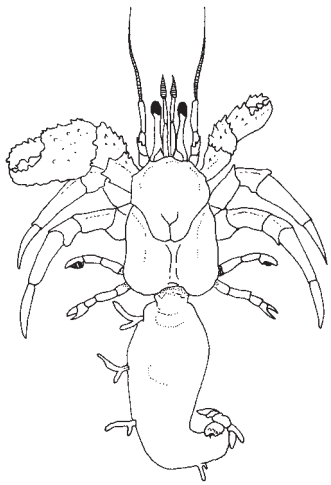


Fig. 104 Diogenidae

7a. Adults distinctly crab-like; carapace well calcified in adults, often with numerous strong granules or spines; rostrum spiniform, distinct; second to fourth legs distinct, fifth pair strongly reduced, inserted into branchial chamber (Fig. 105) . . . . . **Lithodidae**

7b. Adults typical hermit crabs; carapace weakly calcified in adults, rarely with granules or spines; rostrum weak to indiscernible; second to third legs distinct, fourth and fifth pair strongly reduced, but not inserted into branchial chamber . . . . . → **8**

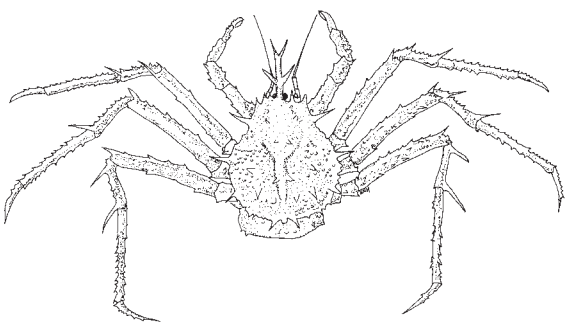


Fig. 105 Lithodidae

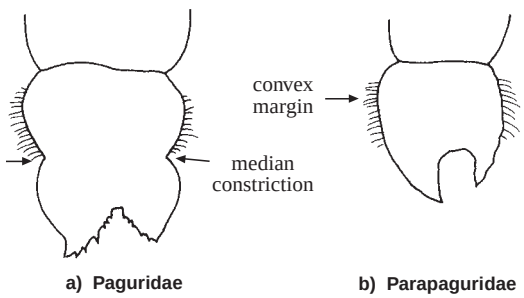


Fig. 106 sixth segment and telson (dorsal view)

8a. First maxilliped with distinct flagellum; telson usually with median constriction, lateral margins with median cleft (Fig. 106a); mostly shallow water with some deep-water species (Fig. 107) . . . . . **Paguridae**

8b. First maxilliped without flagellum; telson without median constriction, lateral margins entire (Fig. 106b); deep-water species (Fig. 108) . . . . . **Parapaguridae**

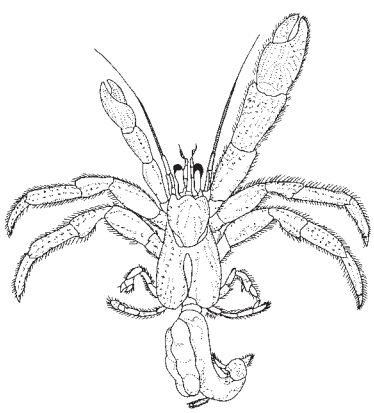


Fig. 107 Paguridae

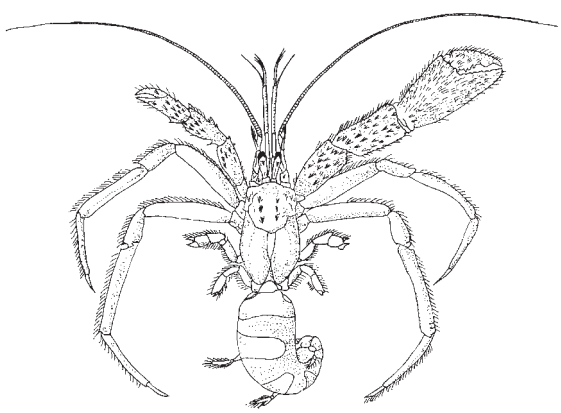


Fig. 108 Parapaguridae

9a. No tail fan (telson and uropods) present; eye peduncles broad and flat, cornea inserted laterally on peduncle (Fig. 109) . . . . . **Lomidae**
(family not recorded from the area so far)

9b. Distinct tail fan (telson and uropods) present; eye peduncles normal; cornea inserted terminally on peduncle . . . . . → **10**

10a. Carapace circular, subcircular to longitudinally ovate; rostrum short to absent; most of abdomen tucked underneath carapace (Fig. 110) . . . . . **Porcellanidae**

10b. Carapace longitudinally rectangular to longitudinally ovate, rarely circular; rostrum distinct; most of abdomen not tucked underneath carapace . . . . . → **11**

Fig. 109 Lomidae

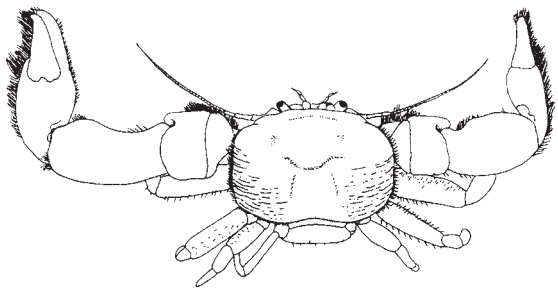


Fig. 110 Porcellanidae

11a. Antennular peduncle with 4 movable articles; telson divided into 2 or more smaller plates (Figs 111a and 112) . . . . . **Galatheidae**

11b. Antennular peduncle with 5 movable articles; telson entire, not divided into smaller plates (Figs 111b and 113) . . . . . **Chirostylidae**

a) divided into 2 or more small plates **b) not divided into small plates**

Fig. 111 telson (dorsal view)

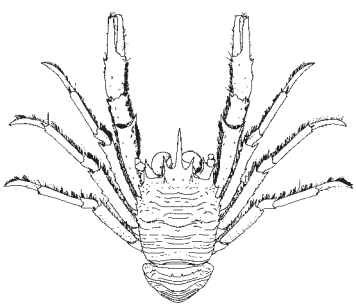


Fig. 112 Galatheidae

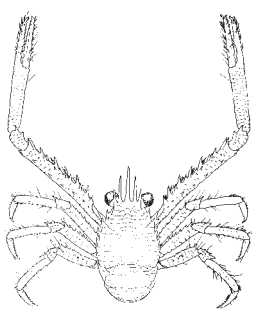


Fig. 113 Chirostylidae

LIST OF FAMILIES OF MARINE BRACHYURA AND CRAB-LIKE ANOMURA PRESENTLY RECOGNIZED

Note: the following list also includes 5 families of Brachyura and a single family of anomuran crab which have not been recorded yet from the Western Central Pacific. They are included in the list and above keys since it is likely that some of these families may be discovered in the future in the area. These families are marked in the list by an asterisk (*).

The symbol 🦀 is given for those families which are treated further in this contribution.

Infraorder BRACHYURA Latreille, 1803
ATELECYLIDAE Ortmann, 1893
BELLIIDAE Dana, 1852 (= Acanthocyclidae Dana, 1852)
BYTHOGRAEIDAE Williams, 1980
🦀CALAPPIDAE De Haan, 1833
CAMPTANDRIIDAE Stimpson, 1858
CANCRIDAE Latreille, 1803 (= Trichoceridae Dana, 1852)

* CHEIRAGONIDAE Ortmann, 1893 (= Telmessidae Guinot, 1977)
CARPILIIDAE Ortmann, 1893
CORYSTIDAE Samouelle, 1819 (= Nautilocorystidae Ortmann, 1893; Euryalidae Rathbun, 1930)
CRYPTOCHIRIDAE Paulson, 1875 (= Hapalocarcinidae Calman, 1900)
CYCLODORIPPIDAE Ortmann, 1892 (= Tymolidae Alcock, 1896)
CYMONOMIDAE Bouvier, 1898
DORIPPIDAE MacLeay, 1838
DROMIIDAE De Haan, 1833
DYNOMENIDAE Ortmann, 1892
ERIPHIIDAE MacLeay, 1838 (= Menippidae Ortmann, 1893; Oziidae Dana, 1851)
EUMEDONIDAE Dana, 1852
HEXAPODIDAE Miers, 1886
HOMOLIDAE De Haan, 1839 (= Thelxiopeidae Rathbun, 1937)
HOMOLODROMIIDAE Alcock, 1899
HYMENOSOMATIDAE MacLeay, 1838
GECARCINIDAE MacLeay, 1838
GERYONIDAE Colosi, 1923
GONEPLACIDAE MacLeay, 1838
GRAPSIDAE MacLeay, 1838
LATREILLIDAE Stimpson, 1858
LEUCOSIIDAE Samouelle, 1819
MAJIDAE Samouelle, 1819 (= Inachidae MacLeay, 1838; Epialtidae MacLeay, 1838; Blastidae Stebbing, 1902; Mamaiidae Stebbing, 1902)
MICTYRIDAE Dana, 1852
OCYPODIDAE Rafinesque, 1815
***** ORTHIYIIDAE Dana, 1852
PALICIDAE Bouvier, 1897 (= Cymopoliidae Faxon, 1895)
PANOPEIDAE Ortmann, 1893
PARTHENOPIDAE MacLeay, 1838 (= Mimilambridae Williams, 1979)
PILUMNIDAE Samouelle, 1819
PINNOTHERIDAE De Haan, 1833
***** PIRIMELIDAE Alcock, 1899
***** PLATYXANTHIDAE Guinot, 1977
PORTUNIDAE Rafinesque, 1815 (= Megalopidae Haworth, 1825; Carcinidae MacLeay, 1838; Xaividae Berg, 1900)
POUPINIIDAE Guinot, 1993
RANINIDAE De Haan, 1839
RETROPLUMIDAE Gill, 1894
***** THIIDAE Dana, 1852
TRAPEZIIDAE Miers, 1886
XANTHIDAE MacLeay, 1838

Infraorder ANOMURA H. Milne Edwards, 1832 (crab-like families listed only)
ALBUNEIDAE Stimpson, 1858
CHIROSTYLIDAE Ortmann, 1892
COENOBITIDAE Dana, 1851
DIOGENIDAE Ortmann, 1892
GALATHEIDAE Samouelle, 1819
HIPPIDAE Latreille, 1825
LITHODIDAE Samouelle, 1819
PAGURIDAE Latreille, 1803
PARAPAGURIDAE Smith, 1882
PORCELLANIDAE Haworth, 1825
PYLOCHELIDAE Bate, 1888 (= Pomatochelidae Stebbing, 1914)
* LOMIDAE Bouvier, 1895

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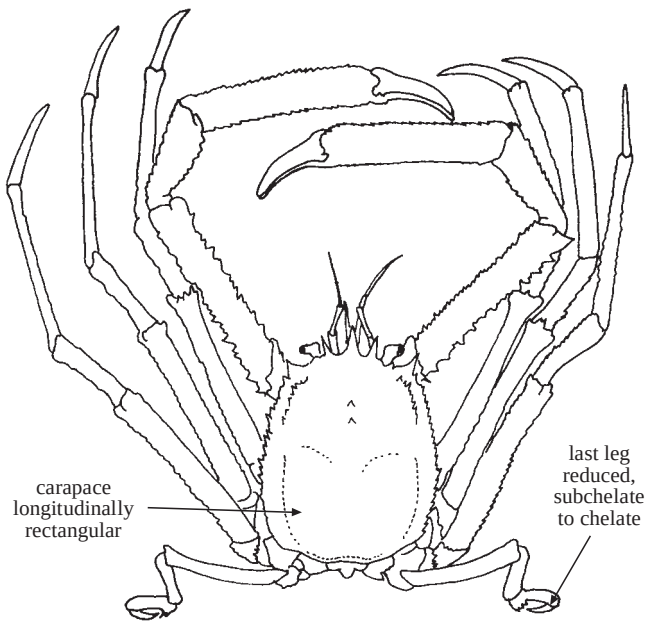
click for next page

Infraorder BRACHYURA

HOMOLIDAE

Deep-water carrier crabs

Diagnostic characters: Carapace longitudinally rectangular; dorsal surface granulose to spinose; **front narrow, usually with 3 long horn-like projections** (rostra). Male chelipeds long. **Last (fourth) pair of legs inserted obliquely on carapace and directed upwards, reduced, subchelate to chelate**, modified to carry sponges. All male abdominal segments distinct, movable.



Habitat, biology, and fisheries: Benthic deep-water crabs, usually occurring in depths below 200 m. Most species are of minor commercial value, being either too small or only occasionally caught. Only the large *Paromola japonica* and *P. macrochira* have some fishery value. *P. macrochira*, however, is known only from Japanese and Taiwanese waters, but not from the Western Central Pacific.

Similar families occurring in the area

The only other crab families which have the last (fourth) pair of legs modified to carry objects are the Dromiidae (sponge crabs), Homolodromiidae (deep-water sponge crabs), Latreillidae (spindle crabs), Cymonomidae and Cyclodorippidae (deep-water porter crabs) and Dorippidae (porter crabs); some Majidae (spider crabs) also have a similar structure. All these families, however, differ markedly in body shape (not longitudinally rectangular/subrectangular) from the Homolidae and none of them include species of commercial interest.

Poupiniidae (deep-water hedgehog crabs, non-commercial): in body shape, these recently discovered deep-water crabs are most similar to the Homolidae, but poupiniids have the fourth (last) walking leg unmodified (not subchelate or chelate).

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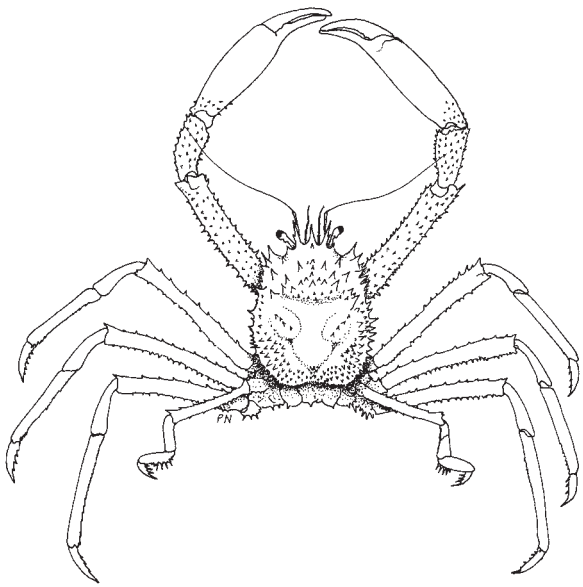
A single species of interest to fisheries occurring in the area.

Paromola japonica Parisi, 1915

Frequent synonyms / misidentifications: *Latreillopsis hawaiiensis* Edmondson, 1932 / *Paromola macrochira* Sakai, 1961.

FAO name: En - Japanese deepwater carrier crab.



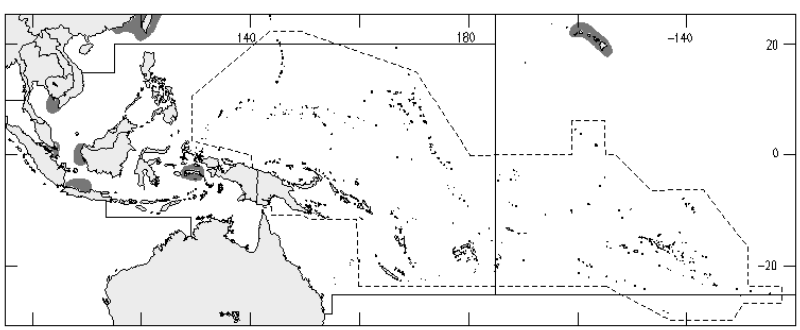
Diagnostic characters: Carapace rectangular, longer than broad, surface granular; lateral margins granular to spiniform; frontal margin (rostrum) with 3 spiniform projections. Last pair of legs short, with dactylus and propodus subchelate, modified for carrying objects. **Colour:** light to reddish brown overall.

Size: Maximum carapace length 18 cm (males).

Habitat, biology, and fisheries: A deep-water crab, found in depths from 150 to 250 m. No targeted fisheries are known for this species. Taken as incidental catch by benthic trawls and occasionally by traps. Commands low prices when sold in markets.

Distribution: West Pacific, including Southeast Asia and Hawaii.

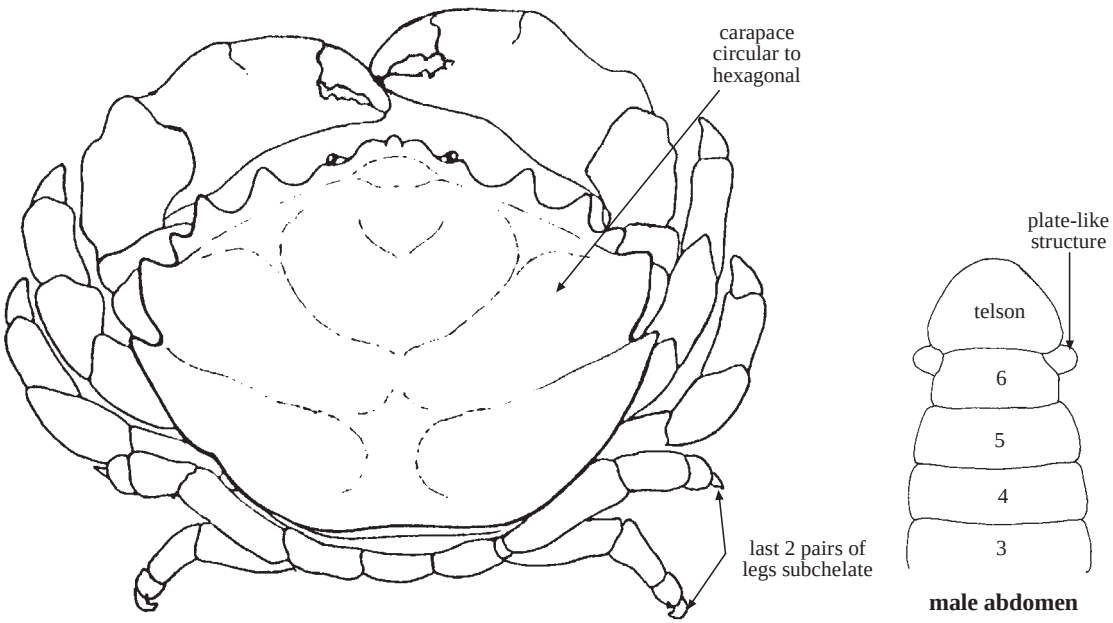
Remarks: The only other species that *Paromola japonica* might be confused with is *P. macrochira* which is also taken incidentally by trawls and traps, but so far known only from Japanese and Taiwanese waters. *P. japonica* is easily distinguished from *P. macrochira* by the more spiniform lateral margins of carapace and the basal antennal segment bearing several sharp tubercles (absent in *P. macrochira*).



DROMIIDAE

Sponge crabs

Diagnostic characters: Carapace circular to hexagonal; dorsal surface gently to strongly convex longitudinally and transversely, smooth or granular, usually setose; front narrow, usually entire; anterolateral margins of carapace strongly convex, unarmed, or with small spines. Anterior 2 pairs of legs normal; **last 2 pairs of legs inserted obliquely on carapace and directed upwards, strongly reduced, subchelate**, modified to carry sponges or tunicates on back of carapace. All male abdominal segments distinct, movable; **a small platelet-like structure usually intercalated between edges of sixth abdominal segment and telson**. Male first gonopod stout, simple; male second gonopod long, usually subequal or longer than length of male first gonopod. **Male and female genital openings sternal**.



Habitat, biology, and fisheries: Benthic crabs, with most species occurring in or near reefs or on soft-substrate bottoms. Omnivorous and known to feed on sea stars (Asteroidea). Best known for their habit of carrying sponges and colonial tunicates on their backs for camouflage. Only of minor commercial importance, as most species are too small to have any food value. Large members of the genera *Dromia* and *Lauridromia* are occasionally collected by trawls or traps and are sold in local markets.

Similar families occurring in the area

The only other crab families which have their last 2 pairs of legs turned upwards and adapted for carrying objects are the Homolodromiidae, Cymonomidae, Cyclodorippidae, and Dorippidae.

Homolodromiids (non-commercial): closest to the dromiids in general body shape, but dromiids are generally more rounded to quadrate in shape, and only dromiids possess a pair of intercalated platelet-like structures between the abdominal segments 6 and the telson.

Cymonomidae, Cyclodorippidae, and Dorippidae (all non-commercial): carapace much more rounded and flatter; legs proportionately much longer; merus of third maxillipeds triangular in shape (distinctly rectangular in dromiids).

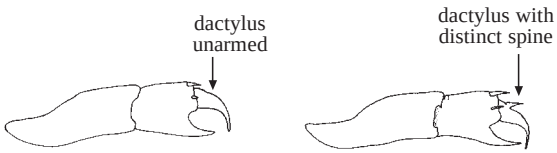
Key to species of interest to fisheries occurring in the area

1a. Dactylus of fourth leg without spine on outer margin (Fig. 1a) . . . . . ***Dromia dormia***

1b. Dactylus of fourth leg with distinct spine on outer margin (Fig. 1b) . . . . . → ***2***

2a. Carapace wider than long, surfaces with soft pubescence; 6 teeth on each anterolateral margin; 4 to 8 spines on inner margins of dactyli of first 2 pairs of legs (Fig. 2a) . . . . . ***Lauridromia indica***

2b. Carapace as wide as long, surfaces with coarse pubescence; 4 teeth on each anterolateral margin; 16 to 20 spines on inner margins of dactyli of first 2 pairs of legs (Fig. 2b) . . . . . ***Lauridromia dehaani***



a) ***Dromia dormia*** **b) genus** ***Lauridromia***

Fig. 1 fourth leg

a) ***Lauridromia indica*** **b)** ***Lauridromia dehaani***

Fig. 2 dactylus of first 2 legs

List of species of interest to fisheries occurring in the area

The symbol is given when species accounts are included.

Dromia dormia (Linnaeus, 1763)

Lauridromia dehaani (Rathbun, 1923)

Lauridromia indica (Gray, 1831)

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Dromia dormia (Linnaeus, 1763)

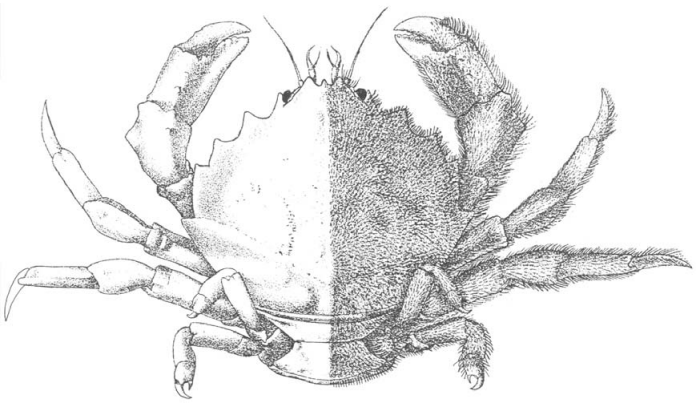
Frequent synonyms / misidentifications: *Cancer dormitator* Herbst, 1790; *Dromia rumphii* Weber, 1795; *D. hirsutissima* Dana, 1852 / None.

FAO name: En - Common sponge crab.

Diagnostic characters: Carapace rounded, as wide as or slightly wider than long; surfaces convex, with dense pubescence; 5 anterolateral teeth, median ones largest. No spine present on outer margin of dactylus of last walking leg. **Colour:** light brown overall with pink fingers.

Size: Maximum carapace width 20 cm (males) and 12 cm (females).

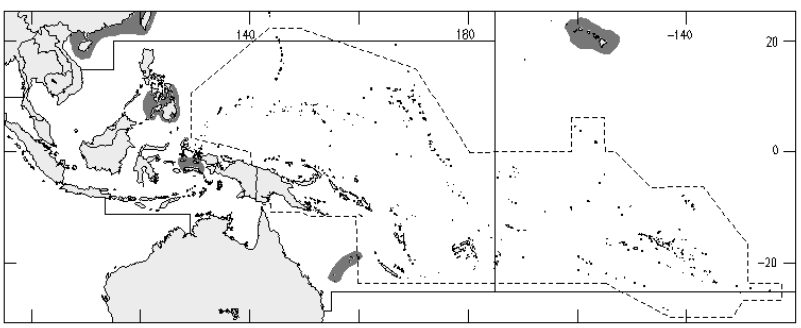
Habitat, biology, and fisheries: Prefers moderately shallow waters with rocky-muddy substrates, at depths from 5 to 50 m; sometimes found near reefs. Occasionally appears in markets in parts of eastern Indonesia and Philippines. Caught incidentally in nets, fish or crab traps, and sometimes by benthic trawls.



(from Alcock, 1901)

Distribution: Southern Philippines, Ambon, southern China, New Caledonia, and Hawaii.

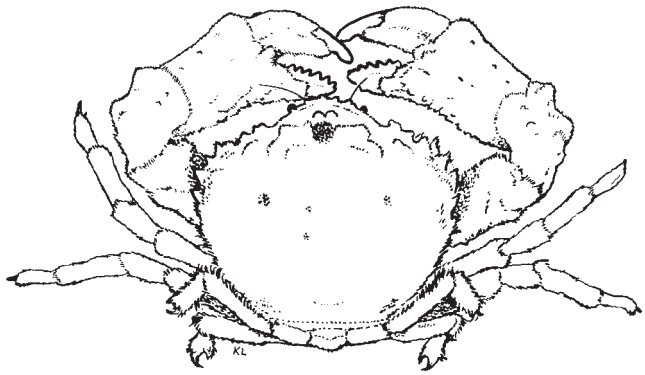
Remarks: Only 3 species of *Dromia* are known to occur in the Indo-West Pacific, and *D. dormia* is one of the largest representatives. It is the only Indo-West Pacific species of *Dromia* with all the 5 anterolateral teeth well developed and large.



Lauridromia indica (Gray, 1831)

Frequent synonyms / misidentifications: *Dromia orientalis* Miers, 1880; *Dromidiopsis cranioides* (De Man, 1888) / None.

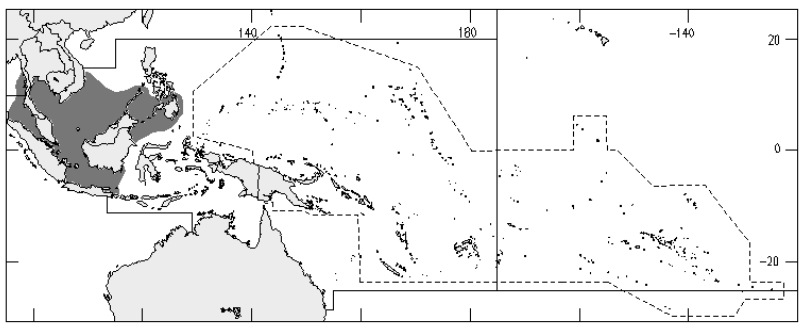
FAO name: En - Cannonball sponge crab.



Diagnostic characters: Carapace rounded, much wider than long; surfaces convex, with dense pubescence; 6 anterolateral teeth. Spine present on outer margin of dactylus of last walking leg. **Colour:** light brown with bright pink fingers.

Size: Maximum carapace width 8 cm (males) and 7 cm (females).

Habitat, biology, and fisheries: In muddy substrates from depths of 10 to 60 m. A relatively common species, caught incidentally by trawlers and benthic nets in various parts of Southeast Asia, sometimes in very large numbers. No targeted fisheries are known for this species, which has a minor commercial value due to the poor quality of its flesh.



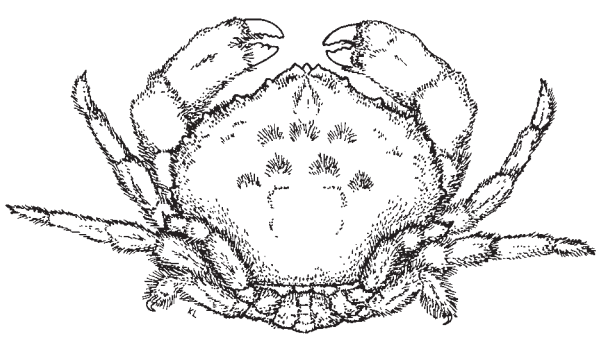
Distribution: Thailand, Malaysia, Singapore, northern Borneo, and southern Philippines.

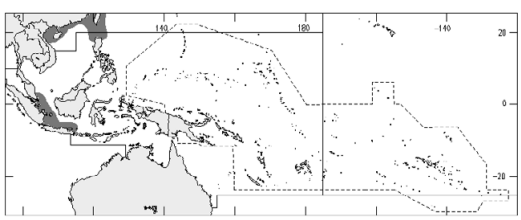
Remarks: Only 3 species of this Indo-West Pacific genus are known. *Lauridromia indica* can easily be distinguished from other species of the genus by its proportionately wider carapace with relatively soft pubescence and by having 6 teeth on each anterolateral margin.

Lauridromia dehaani (Rathbun, 1923)

En - Japanese sponge crab.

Maximum carapace width 10 cm (males) and 8 cm (females). On mud or sandy-muddy substrates from depths of 50 to 150 m. Locally consumed by some rural communities, rarely sold in markets. Japan, Taiwan Province of China, China, Hong Kong, Java, India, and Gulf of Aden.



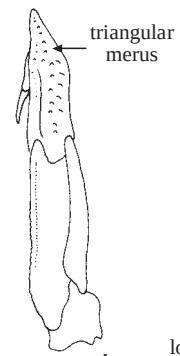


RANINIDAE

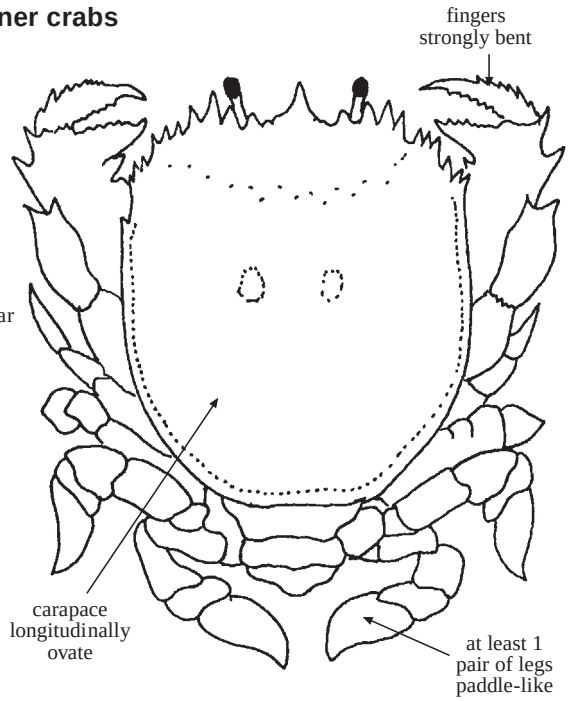
Spanner crabs

Diagnostic characters: Carapace longitudinally ovate; dorsal surface strongly granulose or squamose to smooth; front triangular, narrow. **Third maxillipeds very narrow, merus distinctly triangular**. Eyestalks long, longer than front. At least one pair of legs with last 2 or 3 segments paddle-like. **Thoracic sternum very narrow, especially sternites 5 to 7**. All male abdominal segments distinct, movable.

Habitat, biology, and fisheries: Spanner crabs burrow in soft substrates and tend to occur in moderately shallower waters. They are absent or rare in continental shelf waters and prefer more saline waters. They feed on a variety of worms and soft-shelled molluscs. Most species are moderately small and are not often encountered. A single species, *Ranina ranina*, is large and abundant enough to be fished commercially.



right 3rd maxilliped

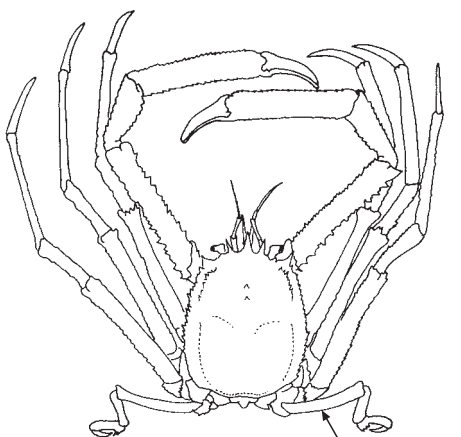


Similar families occurring in the area

The combination of a longitudinally ovate, elongate carapace with its very narrow thoracic sternum, and the narrow third maxillipeds with a triangular merus easily distinguish raninids from other crab families. The following 2 families look superficially similar to the Raninidae:

Homolidae: carapace similarly longitudinally elongate, but subcylindrical in shape; last pair of legs reduced, subchelate, turned upwards and adapted for carrying objects.

Corystidae (non-commercial): many species similar in body shape, but have broader and more rectangular mouthparts, a broader thoracic sternum, and never have any of their legs paddle-like and possess a pair of very long and highly setose antennae.



Homolidae

References

Brown, I. W. 1986. South Queensland's spanner crabs - a growing fishery. *Australian Fisheries*, 45(10):3-7.

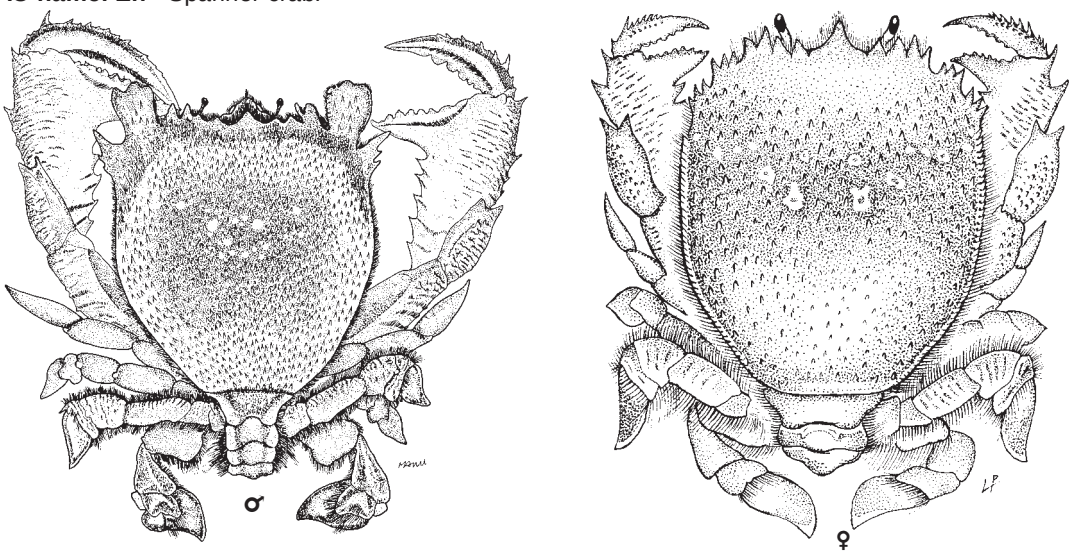
Ihle, J.E.W. 1918. Die Decapoda Brachyura der Siboga-Expedition. III. Oxystomata: Calappidae, Leucosiidae, Raninidae. *Siboga Exped. Monogr.*, 39b(2):159-322.

A single species of interest to fisheries occurring in the area.

Ranina ranina (Linnaeus, 1758)

Frequent synonyms / misidentifications: *Ranina dentata* H. Milne Edwards, 1837 / None.

FAO name: En - Spanner crab.

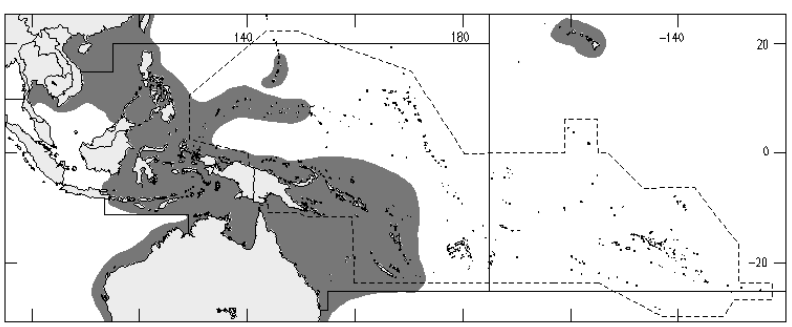


Diagnostic characters: Carapace very elongate, much longer than broad; anterior part much broader than narrow, posterior part waist-like. Abdomen clearly visible from dorsal view. Chelae greatly outsized in males; chelae and legs laterally flattened, spade-like. **Colour:** orange to red overall.

Size: Maximum carapace length 15 cm (males) and 12 cm (females); weight up to 900 g (males) and 400 g (females).

Habitat, biology, and fisheries: Mainly in more oceanic waters, but also in intertidal waters, to depths of more than 100 m, with preference for open sandy areas. Harvested throughout its range, taken by trawls, dredges, baited tangle nets, and bottom nets. A widely exploited species in the Philippines, eastern Indonesia, East Asia, and eastern and northern Australia. The fishery for *Ranina ranina* in Australia has grown substantially in the 1980s and is probably one of the largest for this species, with almost 700 t landed in Queensland and New South Wales from 1989 to 1990. Large specimens command very high prices, especially in live-seafood markets. Prices in Australia amount to about US$2 to US$3 per kg, while live specimens in Hong Kong (China) and Taiwan Province of China are sold for US$5 to US$10 per kg. The fishery for this species is managed in Australia but not elsewhere.

Distribution: Indo-West Pacific, including Australia, Guam, New Caledonia, and Hawaii.



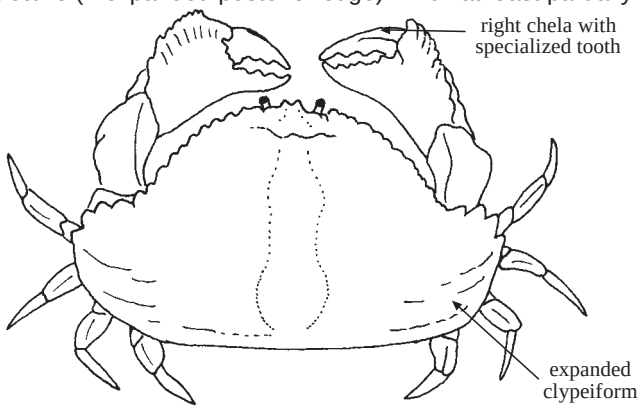
CALAPPIDAE

Box and moon crabs

Diagnostic characters (principal family characters): Carapace circular or ovate to transversely ovate or subovate; frontal margin triangular, narrow. **Merus of third maxillipeds distinctly triangular. Opening for afferent respiratory current at base of chela, no canal present along sides of buccal cavern** (even when third maxillipeds pushed aside). **Male abdominal segments 3 to 5 completely fused; male genital openings always coxal**.

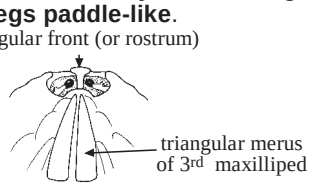
Subfamily Calappinae (box crabs): **carapace circular or subcircular to transversely ovate or subovate**; dorsal surface strongly convex longitudinally and transversely, smooth to granular, and ridged; anterolateral margins armed with numerous small teeth and lobes, **posterolateral parts of carapace sometimes strongly expanded to form a clypeiform structure** (= expanded posterior edge) which at least partially conceals the legs. Chelae laterally flattened, dorsal margin with high, multidentate crest, **right (larger) chela with special tooth on base of pollex** for peeling gastropods, left chela with forceps-like fingers. Legs smooth, laterally flattened to varying degrees but never paddle-like.

right chela

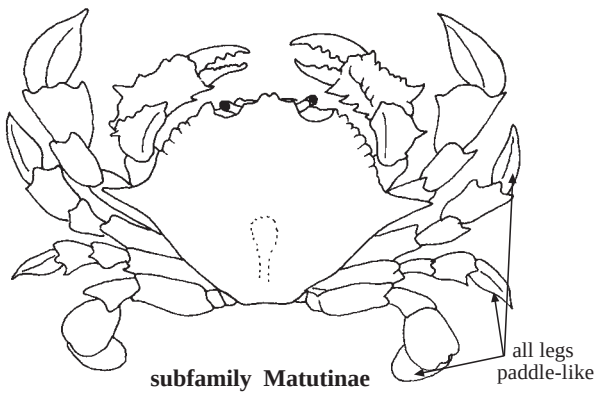


subfamily Calappinae

Subfamily Matutinae (moon crabs): **carapace circular to ovate**; dorsal surface usually almost smooth to granulose; junction of antero- and posterolateral margins well developed, often with long spine. **Legs distinctly flattened laterally, last 2 segments of all legs paddle-like**.



anterior part of body



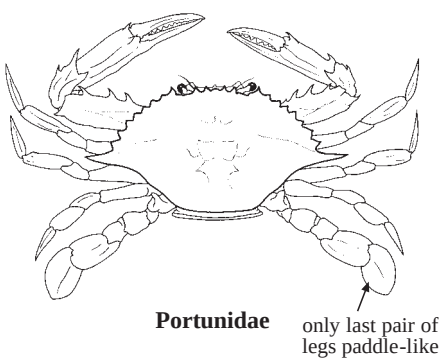
subfamily Matutinae

Habitat, biology, and fisheries: Burrowing crabs on soft and mud substrates. Most species of minor commercial importance, with only *Calappa lophos*, *C. philargius*, and *Ashtoret lunaris* being more commonly seen in markets.

Similar families occurring in the area

Portunidae: may be confused with members of the Matutinae (also with paddle-like legs and often long lateral spines), but can be readily distinguished by the following combination of characters: carapace hexagonal, transversely ovate to transversely hexagonal; only the last pair of legs paddle-like; meri of third maxillipeds quadrate.

Dorippidae (non-commercial): also with triangular meri of the third maxillipeds, but differ by having the last 2 pairs of legs small, inserted obliquely on carapace and directed upwards for carrying objects; sides of the carapace never expanded into a clypeiform process; chelae relatively delicate, never with specialized teeth for opening mollusc shells.



Portunidae

Leucosiidae (non-commercial): small, pea-like crabs, also possess triangular meri of the third maxillipeds, but differ by having the opening for afferent respiratory current located below the orbits, adjacent to the endostome; a distinct canal present along sides of buccal cavern when third maxillipeds are pushed aside; sides of carapace never expanded into a clypeiform process; chelae usually delicate, never with specialized teeth for opening mollusc shells; legs never paddle-like.

Key to the subfamilies of Calappidae

1a. Dactylus of legs normal, not paddle-like; right (larger) chela with specialized cutting tooth (Fig. 1a); posterolateral part of carapace often strongly expanded to form a clypeiform structure (= expanded posterior edge) which covers legs (Fig. 2) . . . . . **Calappinae**

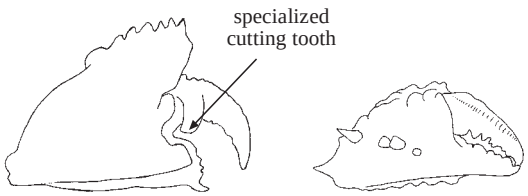


Fig. 1 right chela

1b. Dactylus of legs paddle-like; larger chela normal, without specialized cutting tooth (Fig. 1b); carapace round, lateral spine very strong; posterorlateral part of carapace never expanded; propodus and dactylus of all legs paddle-like (Fig. 3) . . . . . **Matutinae**

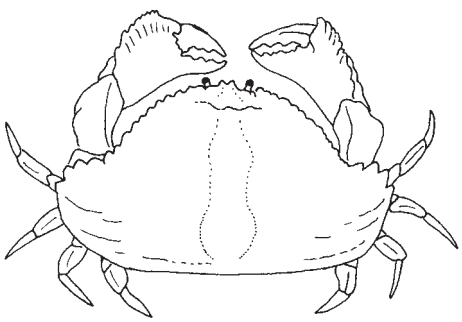


Fig. 2 Calappinae

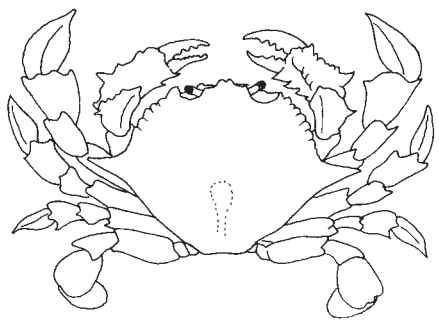


Fig. 3 Matutinae

Key to food species of Calappinae occurring in the area

1a. Clypeiform part (= expanded posterior edge) of carapace with margin smooth, entire, not armed with spines or teeth (Fig. 4) . . . . . ***Calappa calappa***

1b. Clypeiform part of carapace with margin armed with spines or teeth . . . . . → ***2***

2a. Lateral part of clypeiform part (= expanded posterior edge) of carapace with strong, transverse, outwardly pointing projections; carapace with purple lines on lateral regions, purple spots on median and posterior regions in life (Fig. 5) . . . . . ***Calappa lophos***

2b. Lateral part of clypeiform part of carapace with dentate margin, colour pattern of life specimens not as above . . . . . → ***3***

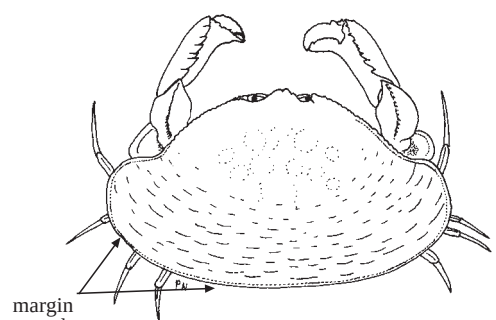


Fig. 4 ***Calappa calappa***

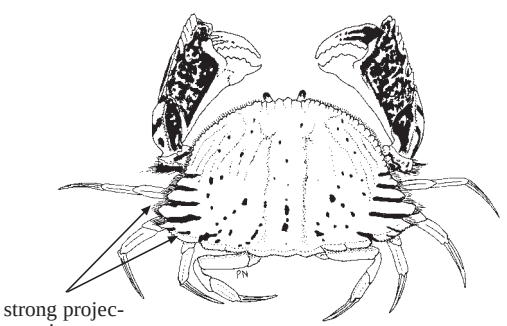


Fig. 5 ***Calappa lophos***

3a. Entire posterior margin of carapace and clypeiform part (= expanded posterior edge) armed with strong teeth; large purple spot on palm and carpus of cheliped, and around each orbit in life (Fig. 6) . . . . . ***Calappa philargius***

3b. Only anterior edge of clypeiform part of carapace gently denticulate; life colour a uniform yellowish grey to grey (Fig. 7) . . . . . ***Calappa hepatica***

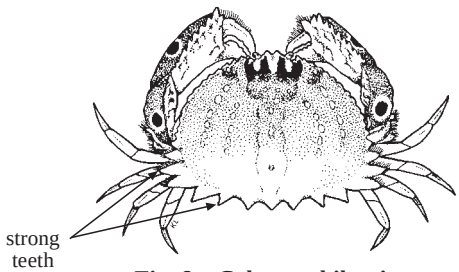


Fig. 6 ***Calappa philargius***

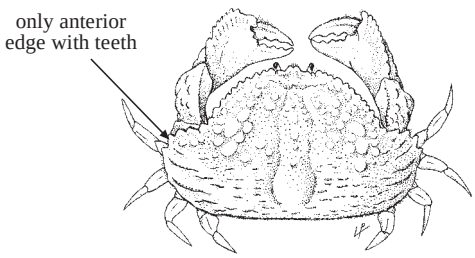


Fig. 7 ***Calappa hepatica***

Key to food species of Matutinae occurring in the area

1a. Outer surface of palm with ridge subparallel to ventral margin (Fig. 8a) . . . . . ***Ashtoret lunaris***

1b. Outer surface of palm with oblique ridge (Fig. 8b) . . . . . → ***2***

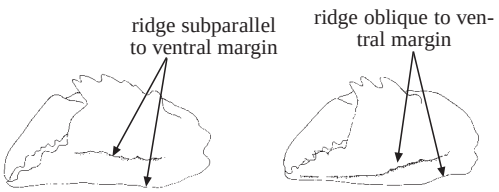


Fig. 8 chela

2a. Carapace surface with pattern of fine red lines forming mesh-like pattern; ventral margin of palm entire (Fig. 9) . . . . . ***Matuta planipes***

2b. Carapace surface with numerous small spots; ventral margin of palm serrated (Fig. 10) . . ***Matuta victor***

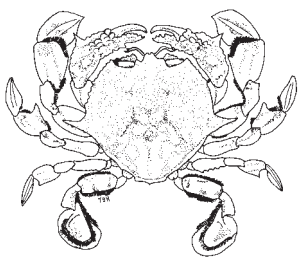


Fig. 9 ***Matuta planipes***

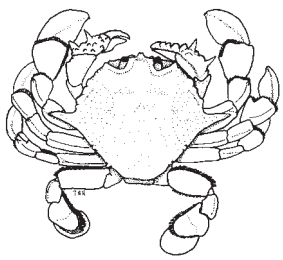


Fig. 10 ***Matuta victor***

List of species of interest to fisheries occurring in the area

The symbol is given when species accounts are included.

Subfamily CALLAPINAE

- *Calappa calappa* (Linnaeus, 1758)
- *Calappa hepatica* (Linnaeus, 1758)
- *Calappa lophos* (Herbst, 1785)
- *Calappa philargius* (Linnaeus, 1758)

Subfamily MATUTINAE

- *Ashtoret lunaris* (Forsskål, 1775)
- *Matuta planipes* Fabricius, 1798
- *Matuta victor* (Fabricius, 1781)

References

Chen, H.L. 1993. The Calappidae (Crustacea: Brachyura) of Chinese waters. In *The marine biology of the South China Sea*, by E.B. Morton, pp. 675-704.

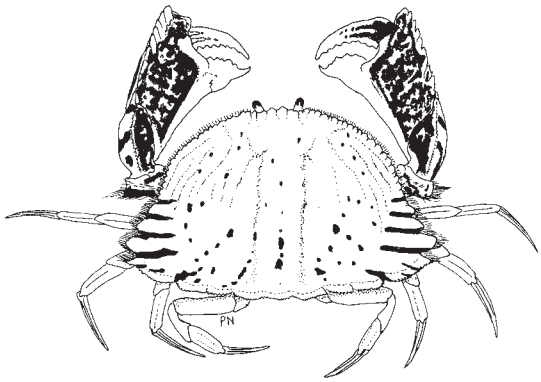
Galil, B.S. 1997. Crustacea Decapoda: A revision of the Indo-Pacific species of the genus *Calappa* Weber, 1795 (Calappidae). In Résultats des Campagnes MUSORSTOM, Vol. 18, edited by A. Crosnier. *Mém. Mus. natn. Hist. nat.*, 176:271-335.

Ihle, J.E.W. 1918. Die Decapoda Brachyura der Siboga-Expedition. III. Oxystomata: Calappidae, Leucosiidae, Raninidae. *Siboga Exped. Monogr.*, 39b(2):159-322.

Calappa lophos (Herbst, 1785)

Frequent synonyms / misidentifications: *Calappa guerini* Brito Capello, 1871 / None.

FAO name: En - Common box crab.

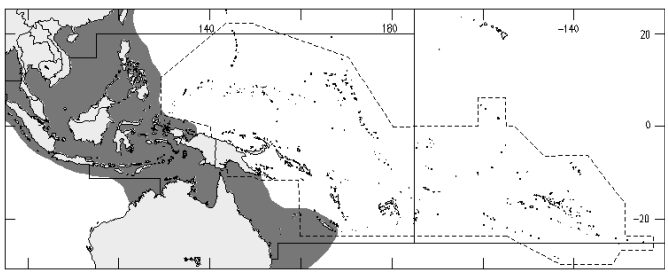


Diagnostic characters: Clypeiform posterolateral part of carapace with strong lateral projections. **Colour:** ground colour yellowish beige to yellow; posterior 1/3 of carapace with distinct red spots, posterolateral part with transverse red stripes; outer surface of cheliped with red streaks and spots.

Size: Maximum carapace width 10 cm.

Habitat, biology, and fisheries: In sandy-muddy areas from depths of 10 to 100 m. Irregularly sold in markets, like most of the larger species of *Calappa*. They are more frequently marketed in the Philippines and East Asia, but do not command high prices. The crabs are caught mainly by trawlers, benthic nets, and sometimes in traps.

Distribution: Japan, China, Southeast Asia, and Australia; westwards to Sri Lanka.

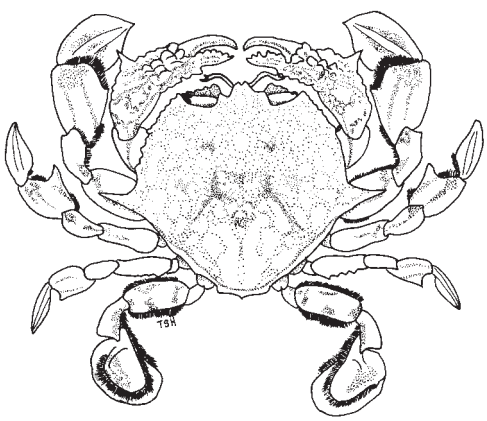


Remarks: Aside from *Calappa lophos*, several larger species of *Calappa* are found in the area, of which only *C. philargius*, *C. hepatica*, and *C. calappa* are large and/or common enough to be sold in markets.

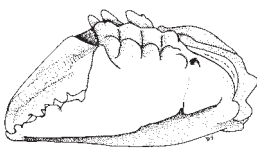
Matuta planipes Fabricius, 1798

Frequent synonyms / misidentifications: None / None.

FAO name: En - Flower moon crab.



Diagnostic characters: Carapace rounded, with 2 long, well-developed lateral spines; anterolateral margins unevenly serrated. Outer surface of palm with strong oblique ridge. **Colour:** mosaic to reticulate network of maroon lines on a white background.

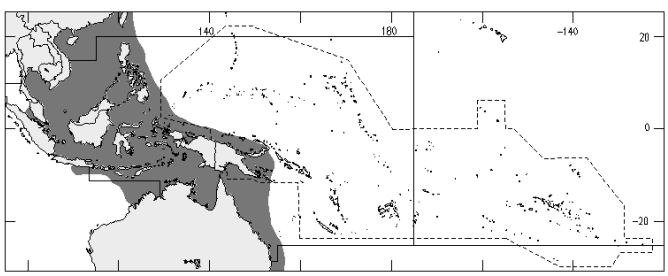


chela (outer surface)

Size: Maximum carapace width (excluding lateral spines).

Habitat, biology, and fisheries: Mainly in soft substrates from depths of 10 to 40 m. Taken mainly as a bycatch of trawlers, but rarely caught in sufficient numbers to have significant market value. Sometimes caught in nets and consumed locally.

Distribution: China, Japan, Southeast Asia, and Australia; westwards to India.

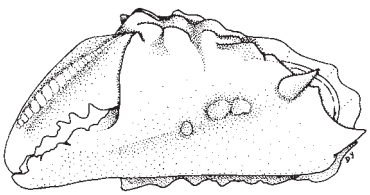


Remarks: The coloration of this species is very distinctive and it cannot be confused with any other species in the area.

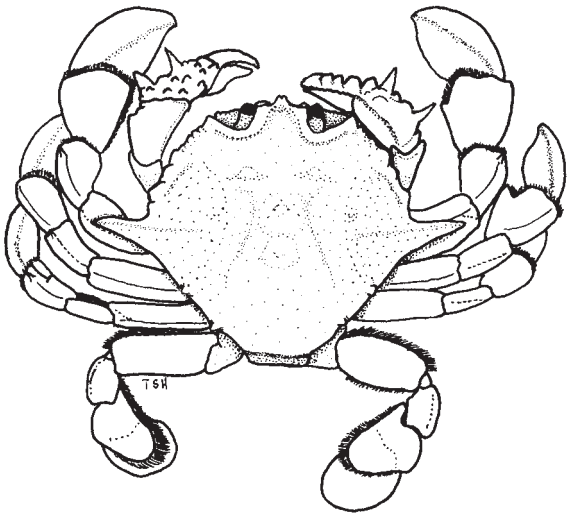
Matuta victor (Fabricius, 1781)

Frequent synonyms / misidentifications: *Matuta lunaris* Forsskål, 1775 (in part); *M. peronii* Leach, 1817; *M. lesuerii* Leach, 1817; *M. crebripunctata* Miers, 1877 / None.

FAO name: En - Common moon crab.



chela (outer surface)



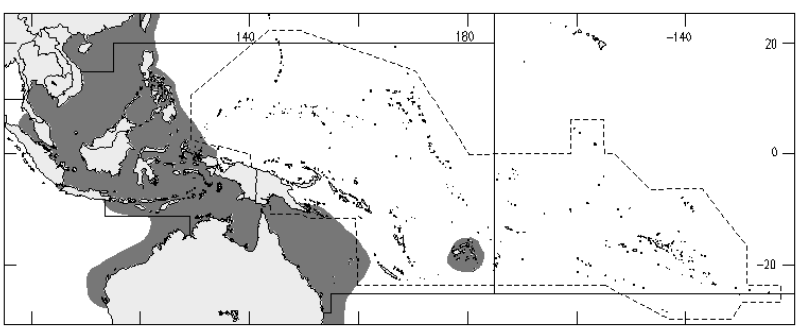
Diagnostic characters: Carapace rounded, with 2 long, well-developed lateral spines; anterolateral margins gently serrated. Outer surface of palm with low but distinct oblique ridge. **Colour:** yellowish ground colour with numerous fine black spots and several larger ones on carapace; legs and chelae bright yellow.

Size: Maximum carapace width 5 cm (excluding lateral spines).

Habitat, biology, and fisheries: Prefers sandy areas, from the intertidal zone to depths of about 20 m. Often caught by local communities in nets, by hand, or beach seines.

Distribution: Southeast Asia to the Philippines, New Caledonia, Fiji, and New Hebrides.

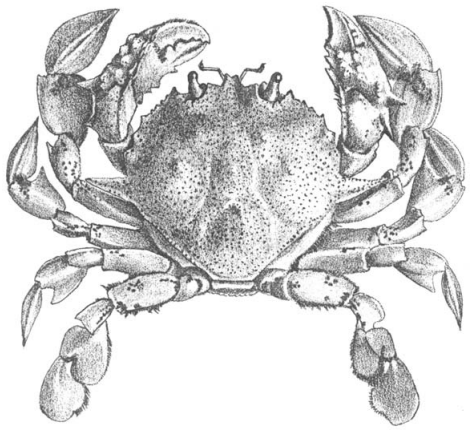
Remarks: The identity of *Matuta victor* has been badly confused with *Ashtoret lunaris* (Forsskål, 1775) and *Matuta banksii* Leach, 1817. The recent revision by Galil and Clark (1994) has shown that the type material of *Cancer lunaris* Forsskål, 1775, is mixed and *Matuta banksii* is in fact a junior synonym of *Ashtoret lunaris*. The common Indo-West Pacific species with the carapace pattern of fine black spots which has been identified at one time or another as *Matuta lunaris*, *M. victor,* or *M. banksii*, is actually either *Matuta victor* or *Ashtoret lunaris*.



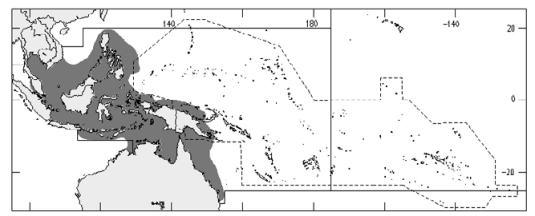
Ashtoret lunaris (Forsskål, 1775)

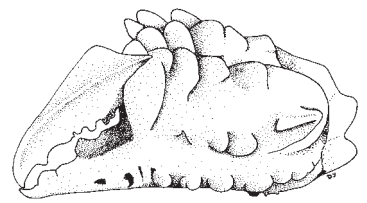
En - Yellow moon crab.

Maximum carapace width 5 cm. Found in sandy substrates, often near reefs or seagrass beds, from the intertidal zone to a depth of 50 m. Caught in nets for food in some parts of its range, often in good numbers. Indo-West Pacific, eastwards to Papua New Guinea and Australia.



(from Rüppell, 1830)



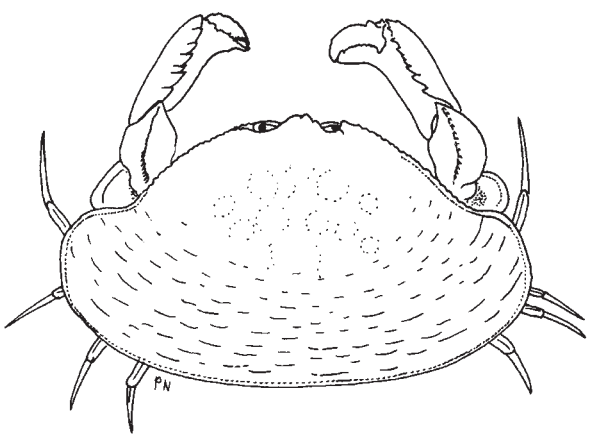


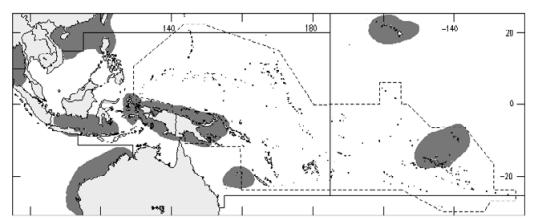
chela (outer surface)

Calappa calappa (Linnaeus, 1758)

En - Giant box crab.

Maximum carapace width 13 cm. Two colour morphs are known: one uniform tan and the other speckled with numerous red to maroon spots. Found in rocky to shelly substrates, from depths of 10 to 50 m. Usually caught in traps or nets. Of interest to fisheries due to its large size, but nowhere common enough to have major commercial importance. Also popular as a curiosity (e.g. in Hawaii). Indo-West Pacific, including Japan, Australia, Papua New Guinea, New Caledonia, and Hawaii.

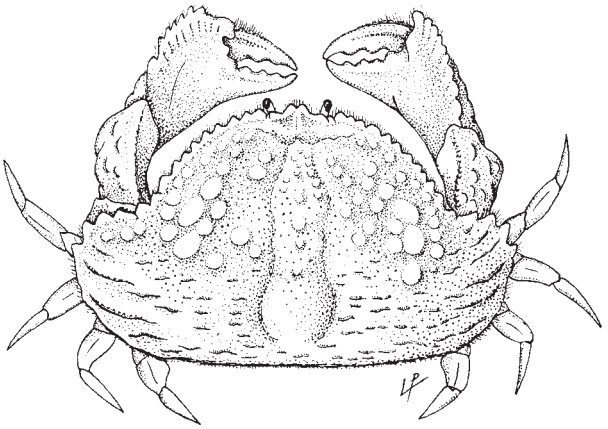


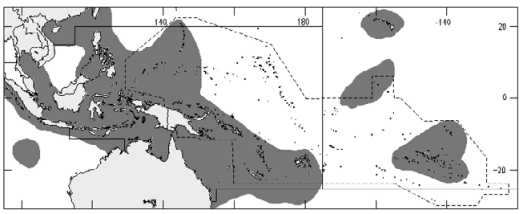


Calappa hepatica (Linnaeus, 1758)

En - Reef box crab.

Maximum carapace width 8 cm. In sandy and shelly substrates, often in reefs and among seagrass beds, from the intertidal zone to a depth of about 100 m. Collected for food, occasionally by hand or in traps. Indo-West Pacific, reaching Australia, Hawaii, and French Polynesia.

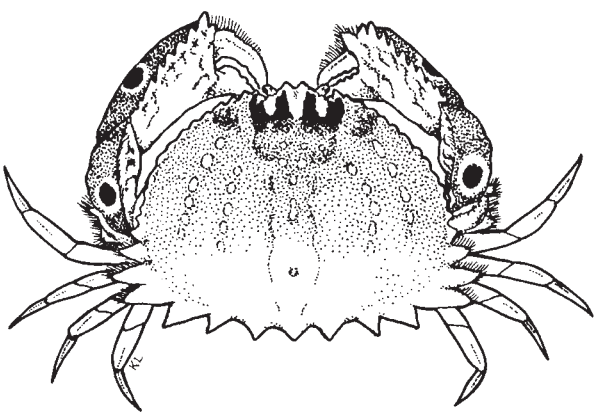


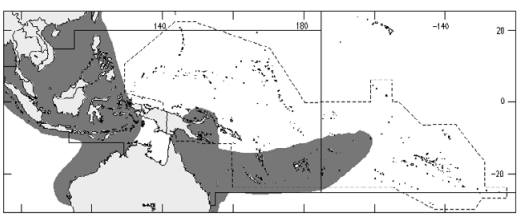


Calappa philargius (Linnaeus, 1758)

En - Spectacled box crab.

Maximum carapace width 12 cm. Prefers sandy to slightly muddy substrates at depths from 10 to 100 m. Usually collected in nets or trawls. Caught for food in many parts of its range but nowhere very important and rarely sold in markets. Indo-West Pacific, including Korea and Japan.

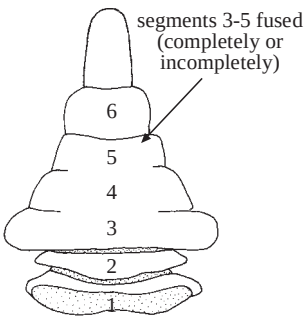




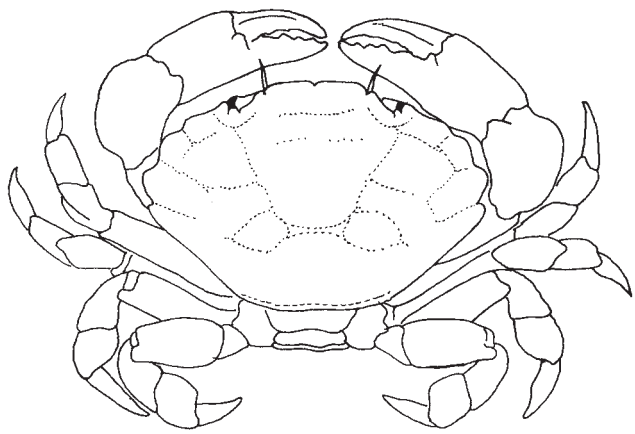
XANTHIDAE

Xanthid stone and mud crabs

Diagnostic characters: Carapace hexagonal, transversely hexagonal to transversely ovate, sometimes circular; dorsal surface usually ridged or granulose; frontal margin usually notched medially; usually 2 to 6 spines, teeth and/or lobes on each anterolateral margin. Longitudinal ridges which define the efferent respiratory current usually absent or strong only on posterior part of endostome; ridges not visible on anterior part of endostome when mouthparts pushed aside. Fingers of chela may be spoon-tipped. Legs varying in structure; propodus and dactylus with or without a special dactylo-propodal articulation, which is formed by a rounded submedian extension of the lateral margin, shaped to slide underneath a projecting button on the subproximal edge of the dactylus. **Male abdominal segments 3 to 5 immovable**, fused completely or incompletely. **Male first gonopod slender, slightly sinuous**; distal part relatively simple, without complex folds, long setae usually present distally or subdistally; **male second gonopod very short**, less than 1/4 the length of male first gonopod.



male abdomen

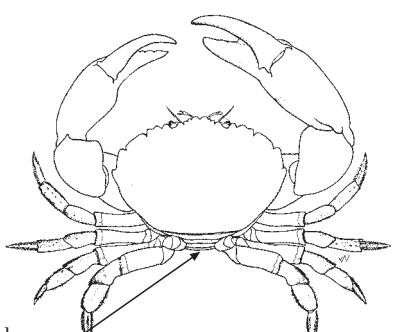


Habitat, biology, and fisheries: Benthic crabs with diverse habits. Most species of minor or no commercial importance. A single species of *Atergatopsis* ("egg crabs") and 4 of the reef species of *Etisus* ("spooner crabs") are of interest to fisheries in the area. **It is important to note here that several species of xanthids are highly poisonous,** particularly *Zosimus aeneus*, *Lophozozymus pictor*, and *Atergatis floridus*, and their consumption has caused a number of human deaths (see General Remarks).

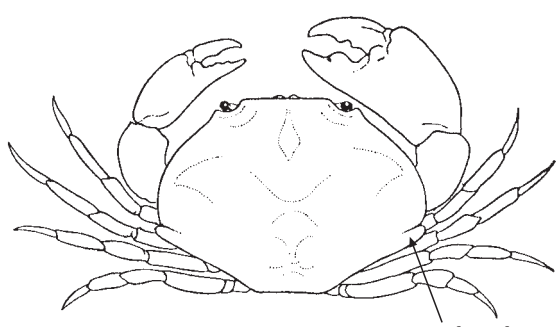
Similar families occurring in the area

The Xanthidae is a very diverse group and can easily be confused with a number of families. Particularly difficult to distinguish are the Eriphiidae (likewise called "stone and mud crabs") and Carpiliidae (reef crabs), both of which were previously included in the Xanthidae.

Carpiliidae, Eriphiidae: adult males can be distinguished from xanthids by having the male first gonopods stout and cylindrical (rather than slender and sinuous), and the male second gonopods very slender, longer than the male first gonopod (rather than very short). Male eriphiids can also be distinguished from xanthids by having all the male abdominal segments freely movable, with the sutures clearly visible (versus male abdominal segments 3 to 5 completely fused, with sutures not dicernible).



Eriphiidae



Carpilidae

Key to species of interest to fisheries occurring in the area

1a. Anterolateral margins almost entire except for a weak lateral tooth (Fig. 1) . . . . . ***Atergatopsis signatus***

1b. Anterolateral margins multidentate to multispinate . . . . . → ***2***

2a. Anterolateral margins each with first 2 teeth lobiform, not spine-tipped; adult chelipeds elongate; margins of legs unarmed (Fig. 2) . . . . . ***Etisus laevimanus***

2b. Anterolateral margins with teeth distinct, sharp; adult chelipeds normal; margins of legs armed with sharp granules or spines . . . . . → ***3***

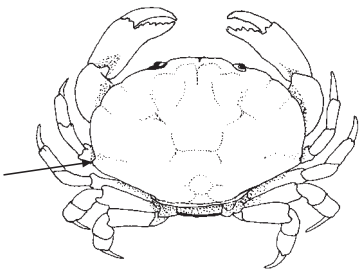


Fig. 1 ***Atergatopsis signatus***

3a. Anterolateral margins each with 8 strong, equal-sized teeth which curve distinctly forward (Fig. 3) . . . . . ***Etisus utilis***

3b. Anterolateral margins each with 6 strong, equal-sized triangular teeth which do not curve distinctly forward, often with 4 to 5 smaller teeth between them (Figs 4 and 5) . . . . . → ***4***

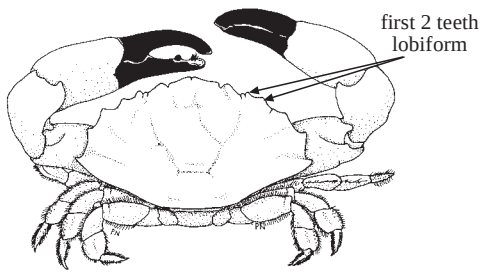


Fig. 2 ***Etisus laevimanus***

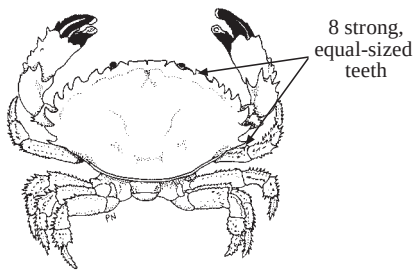


Fig. 3 ***Etisus utilis***

4a. Frontal lobes separated by narrow groove; carpus of cheliped with 1 spine on inner margin (Fig. 4) . . . . . ***Etisus dentatus***

4b. Frontal lobes separated by shallow, broad, V-shaped sulcus (cleft); carpus of cheliped with 2 spines on inner margin (Fig. 5) . . . . . ***Etisus splendidus***

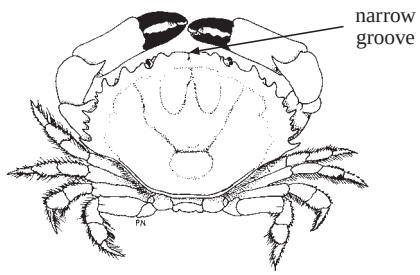


Fig. 4 ***Etisus dentatus***

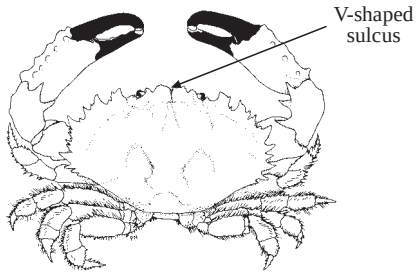


Fig. 5 ***Etisus splendidus***

List of species of interest to fisheries occurring in the area

The symbol is given when species accounts are included.

Atergatopsis signatus (Adams and White, 1848)

Etisus dentatus (Herbst, 1785)
Etisus laevimanus Randall, 1840
Etisus splendidus Rathbun, 1906
Etisus utilis Jacquinot, 1852

References

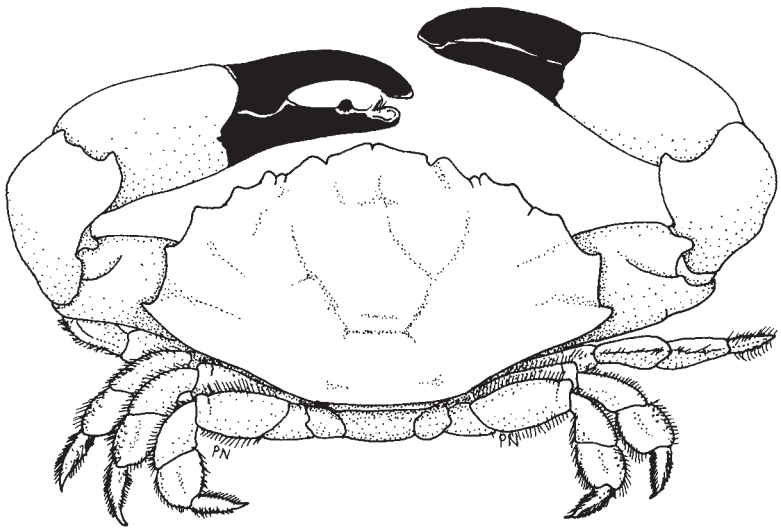
Alcock, A., 1898. Materials for a carcinological fauna of India. No. 3. The Brachyura Cyclometopa. Part I. The family Xanthidae. *J. Asiat. Soc. Bengal*, 67(2), No. 1:67-233.

Serène, R. 1984. Crustacés Décapodes Brachyoures de l'Ocean Indien occidental et de la Mer Rouge. Xanthoidea: Xanthidae et Trapeziidae. Addendeum Carpiliidae et Menippidae - A. Crosnier. *Faune Tropicale (ORSTOM)*, 24:1-400.

Etisus laevimanus Randall, 1840

Frequent synonyms / misidentifications: *Etisus macrodactylus* Bianconi, 1851; *E. convexus* Stimpson, 1858; *E. maculatus* Heller, 1861 / None.

FAO name: En - Smooth spooner.



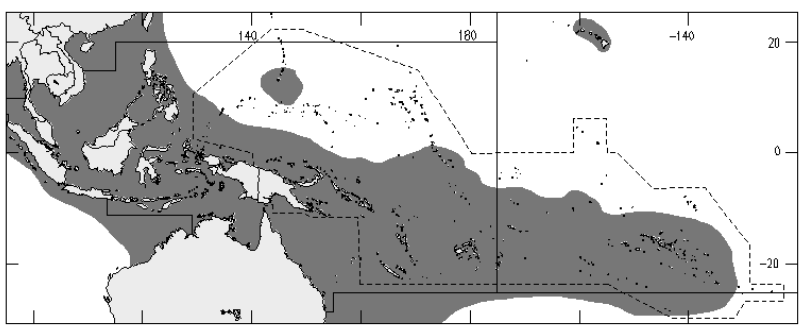
Diagnostic characters: Carapace distinctly broader than long, surfaces very smooth; anterolateral margin with 5 lobiform teeth (first 2 teeth never spine-tipped). Chelae very long in adults, reaching or almost reaching maximum width of carapace. **Colour:** quite variable, from dark grey to reddish brown, often with a patchwork of grey and dark brown.

Size: Maximum carapace width 8 cm.

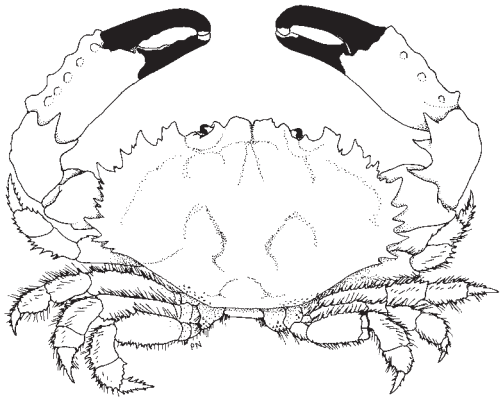
Habitat, biology, and fisheries: Inhabits reefs from the intertidal zone to a depth of about 20 m. Caught incidentally on reefs, using nets and fish traps; also collected by hand in some parts of its range. Of low market value, although it may be very common in certain regions, especially on disturbed reef flats.

Distribution: Indo-West Pacific, reaching eastwards to Guam, Hawaii, and French Polynesia.

Remarks: One of the most distinctive members of the genus because of its very broad and smooth carapace with lobiform anterolateral margins, and the elongate chelipeds.



Etisus splendidus Rathbun, 1906



Frequent synonyms / misidentifications: None / *Etisus utilis* Jacquinot, 1852; *E. dentatus* (Herbst, 1785).

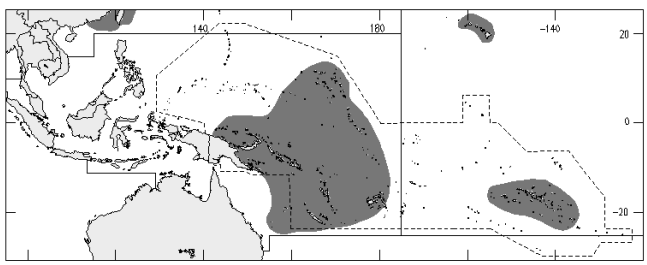
FAO name: En - Splendid spooner.

Diagnostic characters: Carapace ovate, surfaces smooth; 8 large teeth on each anterolateral margin (often with smaller denticles between them); front divided into 2 distinct lobes, separated by distinct V-shaped cleft. Carpus of cheliped with 2 spines on inner margin. **Colour:** red to reddish brown overall.

Size: Maximum carapace width 15 cm.

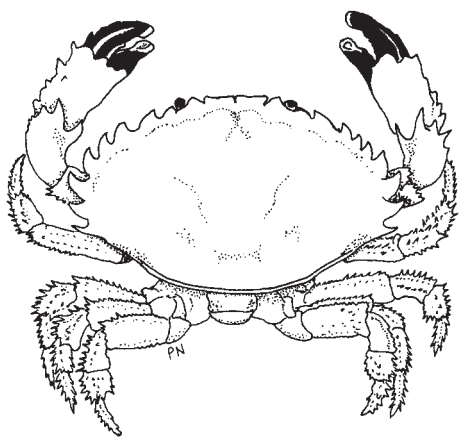
Habitat, biology, and fisheries: A coral reef crab. Never collected in large numbers, but prized when caught, because of its large size. Often caught in benthic nets and fish traps, or by hand in intertidal reef areas.

Distribution: Indo-West Pacific, eastwards to Hawaii and French Polynesia, but not yet known from Southeast Asia.



Remarks: There are 2 species in the area similar to *Etisus splendidus* in size and general morphology, namely *E. utilis* and *E. dentatus* (see species accounts below). *E. utilis* is easily recognized by its 8 anterolateral teeth which are curved forwards and dorsoventrally flattened, whereas *E. dentatus* can be distinguished by the distinct sinus between the 2 frontal lobes being very narrow and the carpus of the cheliped possessing only 1 spine on the inner margin.

Etisus utilis Jacquinot, 1852



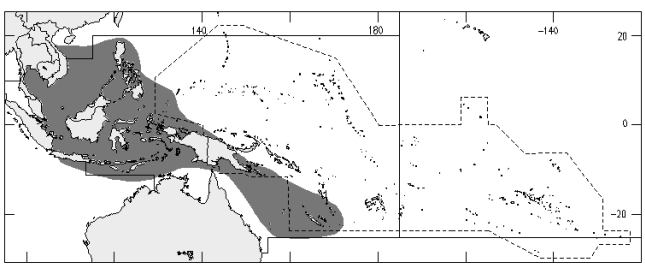
Frequent synonyms / misidentifications: None / *Etisus splendidus* Rathbun, 1906; *E. dentatus* (Herbst, 1785).

FAO name: En - Sawedged spooner.

Diagnostic characters: Carapace ovate, surfaces smooth; 8 large teeth on each anterolateral margin (often with smaller denticles between them); front divided into 2 distinctly truncate lobes, separated by narrow fissure. Carpus of cheliped with 2 large spines on inner margin. **Colour:** reddish brown overall; tips of dactylus of legs red.

Size: Maximum carapace width 15 cm.

Habitat, biology, and fisheries: A coral reef crab. Caught by hand, in benthic nets, and fish traps. Often collected for food, although rarely in large numbers. There is some evidence that this species may be temporarily mildly poisonous in some parts of its range.



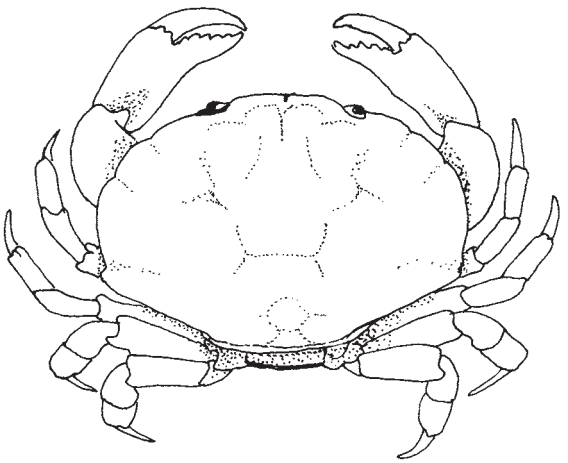
Distribution: Indo-West Pacific, reaching eastwards to New Caledonia.

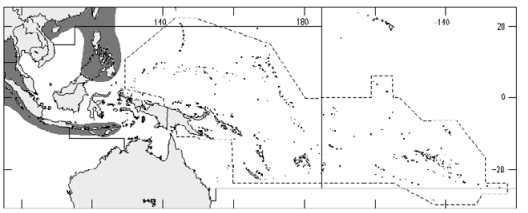
Remarks: See *Etisus splendidus*.

Atergatopsis signatus (Adams and White, 1848)

En - Giant egg crab.

Maximum carapace width 12 cm. Inhabits reefs from the intertidal zone to a depth of 25 m. Occasionally collected by hand or in traps because of its large size, but not a common species and therefore only locally of importance. Indo-West Pacific to Japan.

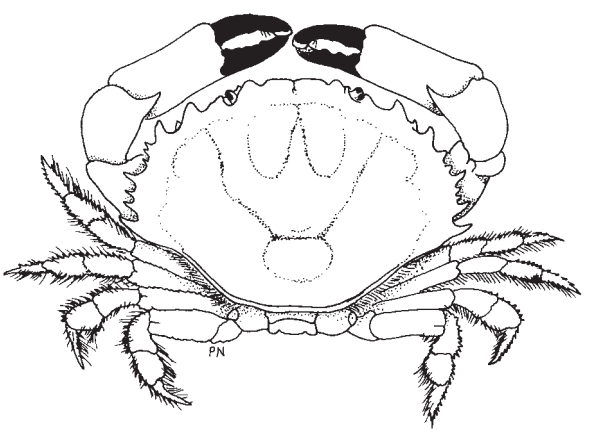


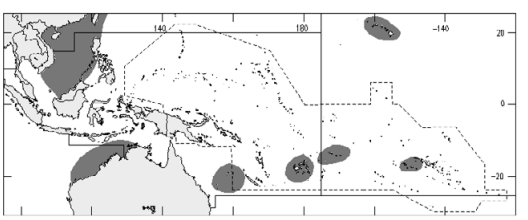


Etisus dentatus (Herbst, 1785)

En - Spiny spooner.

Maximum carapace width 12 cm. In reefs or among rocky substrates, from the intertidal zone to a depth of 20 m. Occasionally collected by hand or in traps, but nowhere of significant importance. Indo-West Pacific, eastwards to Tahiti and Hawaii, but not recorded from most of Southeast Asia.





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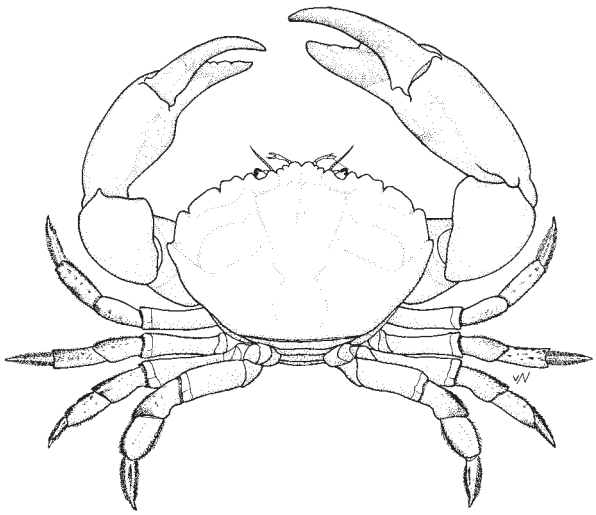
ERIPHIIDAE

(= Menippidae, Oziidae)

Eriphiid stone and mud crabs

Diagnostic characters: Carapace hexagonal, transversely rectangular to transversely ovate; dorsal surfaces ridged or granulose; frontal margin notched medially; 4 teeth and/or lobes on each anterolateral margin. Legs normal. Longitudinal ridges which define efferent respiratory current well developed along entire endostome, ridges visible on anterior part of endostome when mouthparts pushed aside. **All male abdominal segments distinct, movable. Male first gonopod stout, almost straight or gently curved; male second gonopod elongate**, longer or subequal in length to male first gonopod.



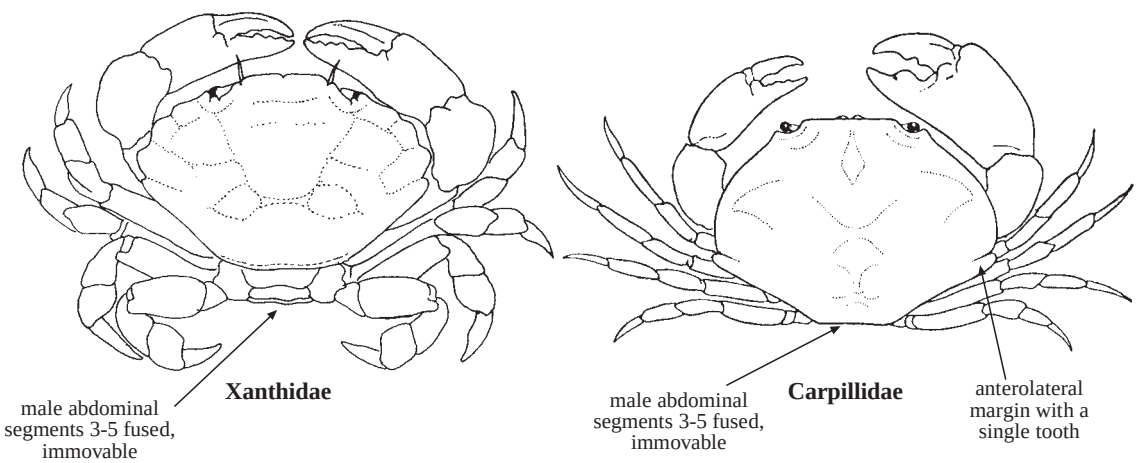
Habitat, biology, and fisheries:[1/] Benthic crabs. Most eriphiids are only of minor importance to fisheries. The more commonly collected species in the area are *Myomenippe hardwickii*, *Menippe rumphii*, and *Hypothalassia armata*.

Similar families occurring in the area

The Eriphiidae can easily be confused with the Xanthidae (likewise called “stone and mud crabs”) and Carpiliidae. These 3 groups were previously classified together in the Xanthidae.

Xanthidae: adult males can be distinguished from eriphiids by having abdominal segments 3 to 5 fused and immovable (versus all segments freely movable), the male first gonopods slender and sinuous (rather than stout, cylindrical), and the male second gonopods very short (rather than very elongate, longer than first gonopod).

Carpiliidae: can only be effectively distinguished from eriphiids by having male abdominal segments 3 to 5 immovable, completely fused, and the sutures not discernible (versus all male abdominal segments freely movable, sutures clearly visible).



1/ The most important commercial species of this family is probably the Australian “Tasmanian giant crab”, also known as the “queen crab”, *Pseudocarcinus gigas* (Lamarck, 1818), which occurs just outside the boundaries of the Western Central Pacific. It grows up to 40 cm in carapace width, at a maximum weight in excess of 12 kg. Over 50 t of these giant crabs are caught annually in Australia, where it commands prices of US$6 per kg, but it is even more expensive when exported.

Key to species of interest to fisheries occurring in the area

1a. Surfaces of carapace, chelipeds and legs with numerous sharp, long, slender spines (Fig. 1) . . . . . ***Hypothalassia armata***

1b. Surfaces of carapace, chelipeds and legs smooth or armed at most with low granules or tubercles . . . . . → ***2***

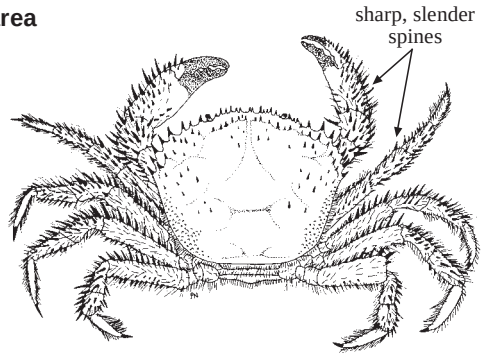


Fig. 1 ***Hypothalassia armata***

2a. Front finely granulate; anterolateral margins with clearly defined lobes or teeth . . . . . → ***3***

2b. Front multilobed or multidentate; anterolateral margins denticulate but without distinct lobes or teeth . . . . . → ***4***

3a. Outer surface of palm smooth (Fig. 2) . . . . . ***Eriphia sebana***

3b. Outer surface of palm granulose (Fig. 3) . . . . . ***Eriphia smithii***

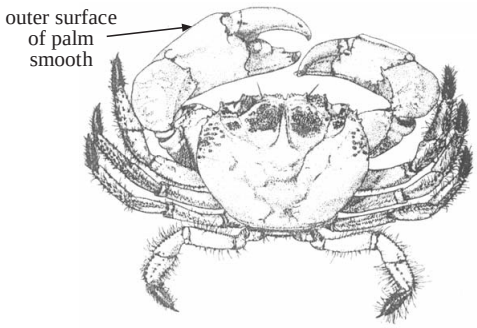


Fig. 2 ***Eriphia sebana***
(after Garth and Alcala, 1977)

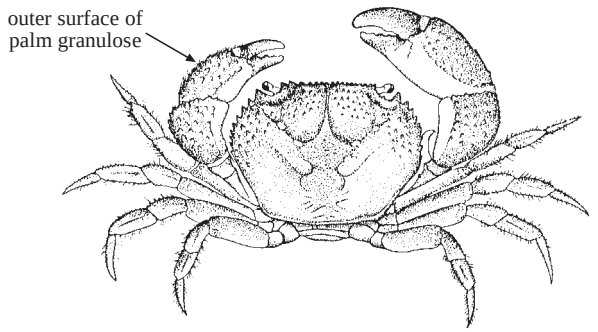


Fig. 3 ***Eriphia smithii***

4a. Anterolateral teeth not crested (Fig. 4a); base of movable finger of larger chela with large, gently curved tooth (Fig. 5a) . . . . . → ***5***

4b. Anterolateral teeth crested (Fig. 4b); base of movable finger of larger chela with large molariform tooth (Fig. 5b) . . . . . → ***7***

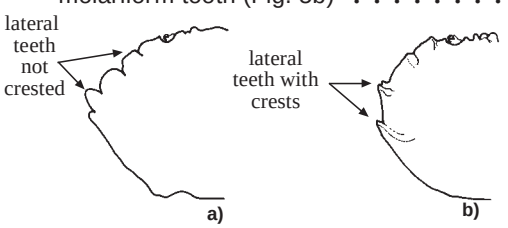


Fig. 4 anterolateral margin of carapace

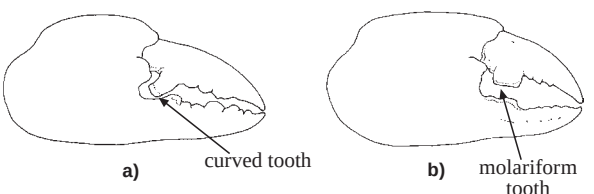


Fig. 5 outer surface of large chela

5a. Palm of smaller chela slender; fingers slender, forceps-like; palm and fingers either subequal in length, or fingers longer (Fig. 6a) . . . . . ***Epixanthus dentatus***

5b. Palm of smaller chela moderately stout; fingers not forceps-like; palm and fingers either subequal in length, or (usually) fingers shorter (Fig. 6b) . . . . . → ***6***

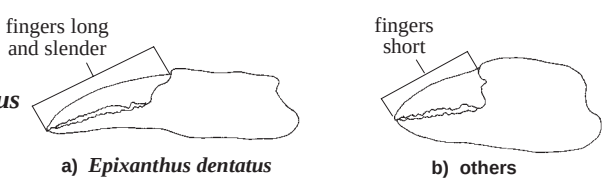


Fig. 6 outer surface of small chela

6a. Dorsal surface of carapace smooth or with numerous small, shallow pits (Fig. 7) . . . ***Ozius guttatus***

6b. Dorsal surface of carapace with numerous small but distinct rounded granules (Fig. 8) . . . . . ***Ozius tuberculosus***

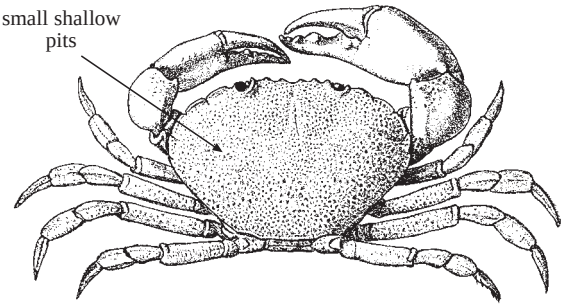


Fig. 7 ***Ozius guttatus***
(from A. Milne Edwards, 1873)

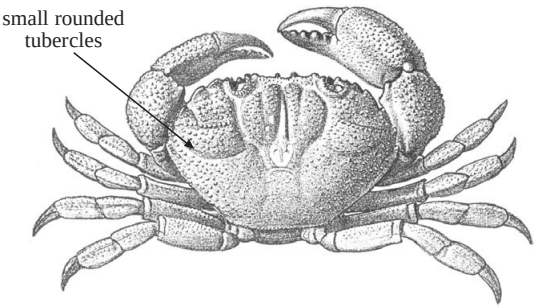


Fig. 8 ***Ozius tuberculosus***
(from A. Milne Edwards, 1873)

7a. Dorsal surface of carapace and chelipeds granulose (Fig. 9) . . . . . ***Myomenippe hardwickii***

7b. Dorsal surface of carapace and chelipeds smooth . . . . . → ***8***

8a. Basis-ischium and merus of cheliped movable, with suture demarcating them still distinct (Fig. 10a); reddish brown in life; non-mangrove species . . . . . ***Menippe rumphii***

8b. Basis-ischium and merus of cheliped fused, immovable, with suture demarcating them partially to almost completely reduced (Fig. 10b); dirty-brown in life; usually mangrove species . . . . . ***Myomenippe fornasinii***

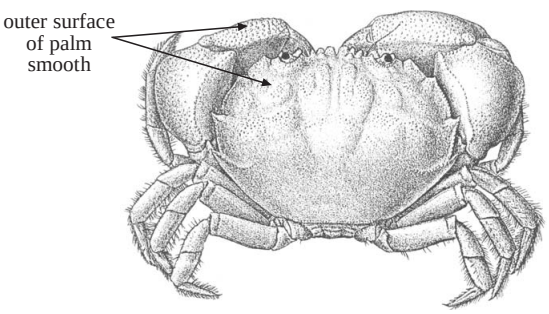
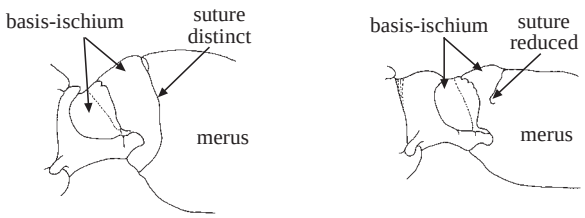


Fig. 9 ***Myomenippe hardwickii***
(from De Man, 1887)



a) ***Menippe rumphii*** **b)** ***Myomenippe fornasinii***

Fig. 10 basis-ischium and merus of cheliped

List of species of interest to fisheries occurring in the area

The symbol is given when species accounts are included.

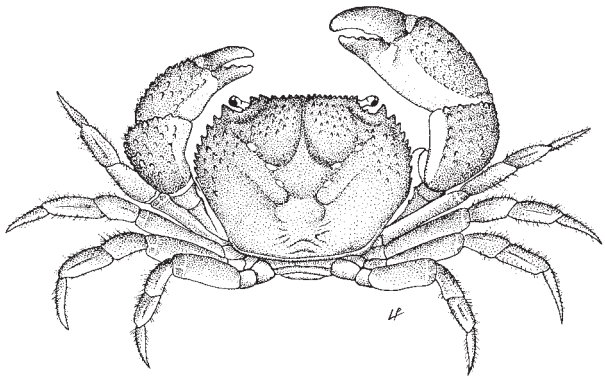
- *Epixanthus dentatus* (White, 1847)
- *Eriphia sebana* (Shaw and Nodder, 1803)
- *Eriphia smithii* (MacLeay, 1838)
- *Hypothalassia armata* (De Haan, 1835)
- *Menippe rumphii* (Fabricius, 1798)
- *Myomenippe hardwickii* (Gray, 1831)
- *Myomenippe fornasinii* (Bianconi, 1851)
- *Ozius guttatus* H. Milne Edwards, 1834
- *Ozius tuberculosus* H. Milne Edwards, 1834

References

Alcock, A. 1898. Materials for a carcinological fauna of India. No. 3. The Brachyura Cyclometopa. Part I. The family Xanthidae. *J. Asiat. Soc. Bengal*, 67(2), No. 1:67-233.

Serène, R. 1984. Crustacés Décapodes Brachyoures de l'Ocean Indien occidental et de la Mer Rouge. Xanthoidea: Xanthidae et Trapeziidae. Addendeum Carpiliidae et Menippidae - A. Crosnier. *Faune Tropicale (ORSTOM)*, 24:1-400.

Eriphia smithii MacLeay, 1838



Frequent synonyms / misidentifications: None / *Eriphia sebana* (Shaw and Nodder, 1803).

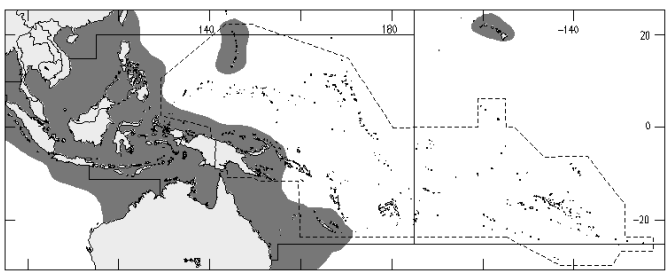
FAO name: En - Rough redeyed crab.

Diagnostic characters: Carapace rectangular, anterior surface granulated; anterolateral margins with numerous spines, but without distinct teeth or lobes. Base of movable finger of larger claw with large molariform tooth. **Colour:** dark reddish brown overall, with bright red eyes.

Size: Maximum carapace width 6 cm.

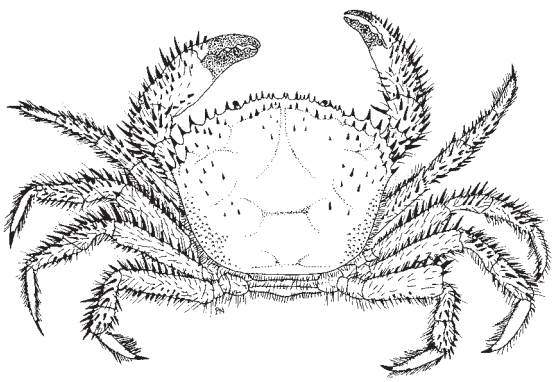
Habitat, biology, and fisheries: A reef species, preferring intertidal areas. Both species of *Eriphia* included here have a low fishery value and are only collected locally, although frequently, by hand during low tide periods. *Eriphia* species are said to be poisonous in some areas, but those reports could not been confirmed biochemically. It may be possible that upon feeding on poisonous molluscs or material, the crabs become toxic for a short period as well.

Distribution: Indo-West Pacific, reaching to Hawaii.



Remarks: Can only be confused with *Eriphia sebana*, which is easily distinguished by the smooth outer surface of the palm (palm covered with numerous granules in *E. smithii*). *E. sebana* also has a lighter coloured, beige-brown carapace (dark-reddish brown in *E. smithii*).

Hypothalassia armata (De Haan, 1835)



Frequent synonyms / misidentifications: *Acanthodes armatus* De Haan, 1835 / None.

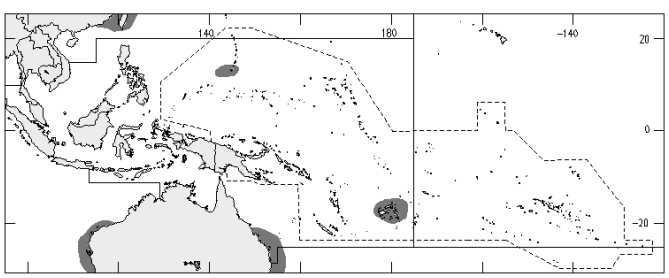
FAO name: En - Champagne crab.

Diagnostic characters: Carapace smooth; anterolateral margins with numerous very sharp spines of differing sizes. Surfaces of legs and chelae with numerous sharp, brown-black spines of differing sizes. **Colour:** carapace reddish brown to brown, especially on anterior part; spines black to brown; fingers black.

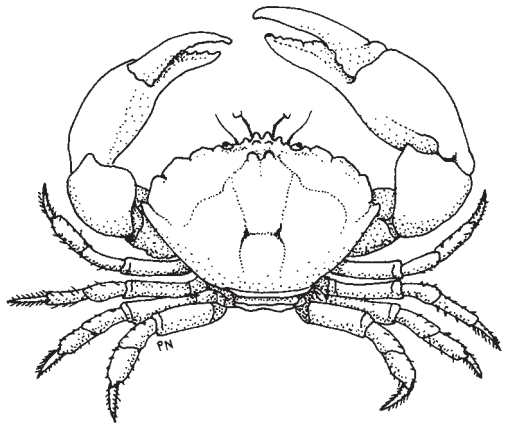
Size: Maximum carapace width 15 cm for males, females generally smaller.

Habitat, biology, and fisheries: The monotypic *Hypothalassia armata* prefers rocky and muddy substrates, at depths from 30 to 540 m. It is caught in deep-water lobster pots and sometimes in bottom trawls. Highly valuable for human consumption because of its large size and the enlarged chelae. The common name, “champagne crab”, refers to its flesh, which is considered to be of a very fine quality. Occasionally marketed in Australia. Larger markets are being sought for this crab which is exported to Taiwan Province of China and Singapore, where live specimens command premium prices of up to US$40 per kg. Outside the area, it is occasionally caught off Western Australia; sometimes also collected for food in southern Japan and Taiwan Province of China, but more frequently cleaned, dried, and mounted for the souvenir trade.

Distribution: Australia, Guam, Fiji, Taiwan Province of China, and Japan.



Menippe rumphii (Fabricius, 1798)



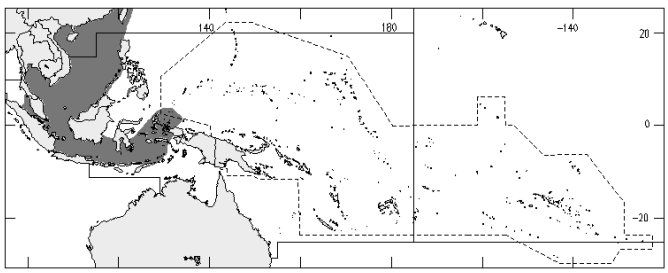
Frequent synonyms / misidentifications: None / *Myomenippe hardwickii* (Gray, 1831).

FAO name: En - Maroon stone crab.

Diagnostic characters: Carapace ovate, smooth, regions well defined; 4 broad lobiform teeth on each anterolateral margin. Eyes red in life. A large molariform tooth at base of movable finger of larger chela. **Colour:** carapace and appendages reddish brown to pinkish brown and maroon in adults; young crabs maroon to reddish brown, longitudinally striped with white.

Size: Maximum carapace width 9 cm.

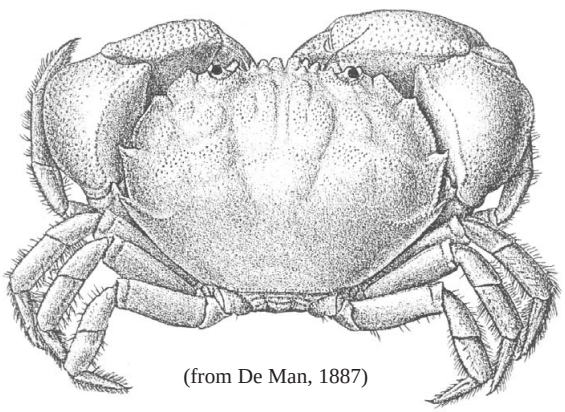
Habitat, biology, and fisheries: Prefers shallow to intertidal waters, on sandy-muddy substrates, usually under rocks. *Menippe rumphii* is occasonally fished for food, collected by hand or with nets and fish traps. There are no targeted fisheries for this species, although it can be quite common in parts of the Sunda Shelf. Like *Myomenippe hardwickii*, usually only the chelae are retained for sale.



Distribution: Malaysia, Singapore, Indonesia Thailand, southern China and Taiwan Province of China.

Remarks: Can only be confused with *Myomenippe hardwickii*, which is easily distinguished by the dull brown coloration, green eyes, and rougher carapace surface.

Myomenippe hardwickii (Gray, 1831)



(from De Man, 1887)

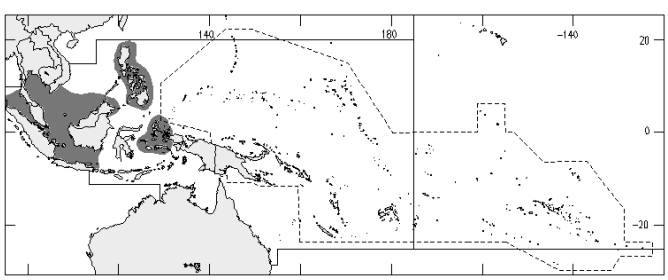
Frequent synonyms / misidentifications: *Menippe granulosa* De Man, 1888; *Myomenippe granulosa* (Gray, 1831) / *Menippe rumphii* (Fabricius, 1798); *Myomenippe fornasinii* (Bianconi, 1851).

FAO name: En - Mangrove stone crab.

Diagnostic characters: Carapace ovate, covered with numerous very small granules; regions well defined; 4 broad lobiform teeth on each anterolateral margin. Eyes green in life. A large molariform tooth at base of movable finger of larger chela. **Colour:** carapace dirty-brown overall; eyes green, fingers black.

Size: Maximum carapace width 10 cm.

Habitat, biology, and fisheries: Essentially a shallow-water to intertidal mangrove species, preferring rocky areas, or areas densely covered by bivalves, such as *Perna* spp. Caught using fish traps, drift nets, and also taken by hand. An abundant species, caught in large quantities for its massive chelae, but no targeted fisheries are known. Similar to practice in the Americas with certain crab species, the chelae are frequently broken off and the animal is thrown back into the water.



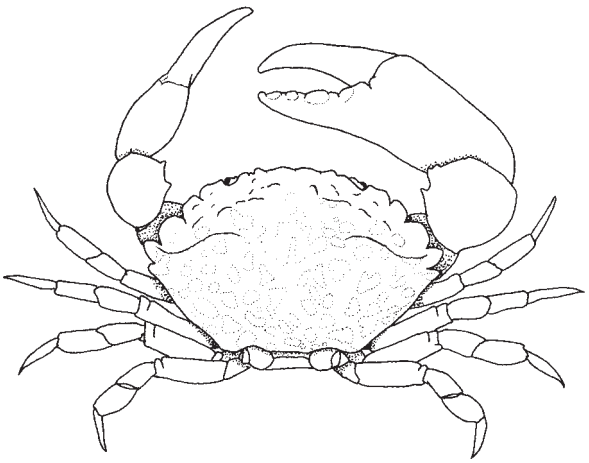
Distribution: Throughout Southeast Asia, reaching the Philippines.

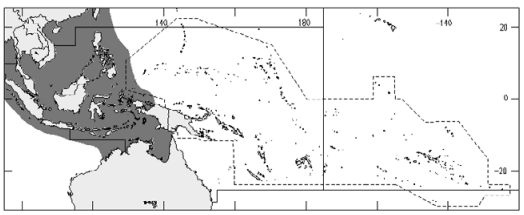
Remarks: Can be confused with *Myomenippe fornasinii* and *Menippe rumphii*, but these 2 species have much smoother carapace and cheliped surfaces (not granulose as seen in *Myomenippe hardwickii*). *Menippe rumphii* additionally differs by its reddish brown coloration and its red eyes.

Epixanthus dentatus (White, 1847)

En - Longfingered peeler crab.

Maximum carapace width 7 cm. Mainly along mangroves, usually under rocks or timber. A moderately large species, quite common in many areas and therefore very likely collected for food by local populations. Indo-West Pacific in distribution, southwards reaching northern Australia.

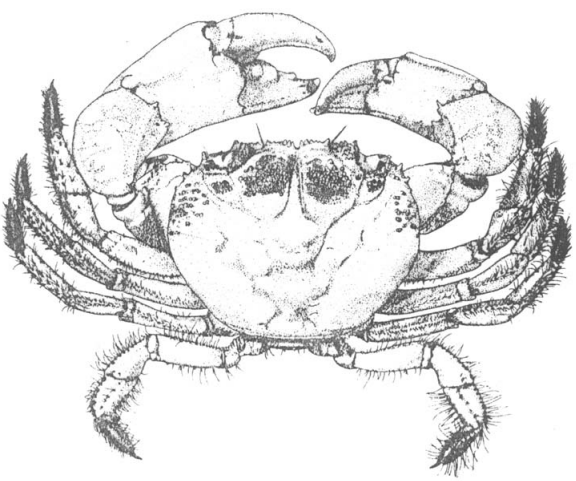




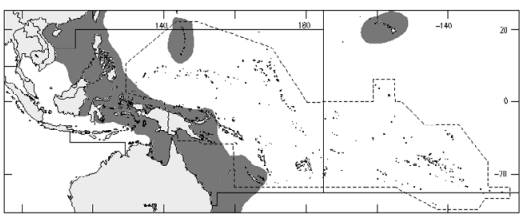
Eriphia sebana (Shaw and Nodder, 1803)

En - Smooth redeyed crab.

Maximum carapace width 8 cm. A rocky-shore or reef-dwelling species. Occasionally collected for food, but never in large numbers. There have been reports that this species is occasionally mildly poisonous in some parts of its range (see also *E. smithii*). Throughout Indo-West Pacific, including Hawaii and various parts of Southeast Asia.



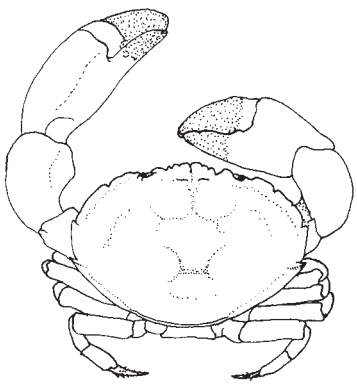
(from Garth and Alcala, 1977)

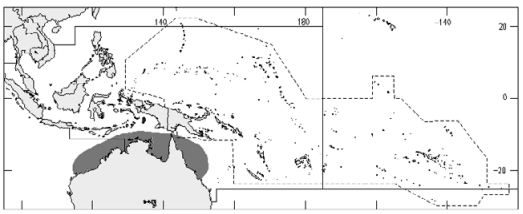


Myomenippe fornasinii (Bianconi, 1851)

En - Smooth stone crab.

Maximum carapace width 9 cm. A littoral species, with preference for rocky shores with muddy-sand bottoms, commonly found under rocks and timber, and in crevices in mangroves. Probably occasionally collected for food by local populations for its large size. Occurs in parts of the Indian Ocean and northern Australia.

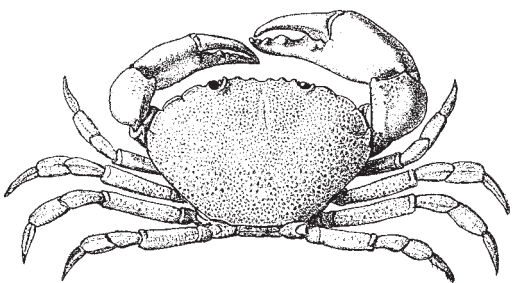




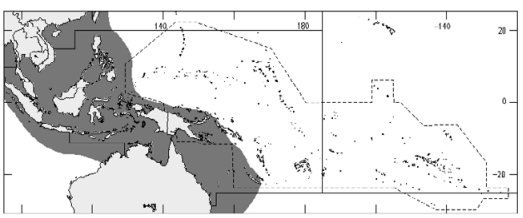
Ozius guttatus H. Milne Edwards, 1834

En - Spottedbelly rock crab.

Maximum carapace width 9 cm. Along rocky shores in intertidal to shallow subtidal waters, sometimes in estuaries, usually hiding in crevices. Occasionally collected by hand for human consumption. Indo-West Pacific, from the Indian Ocean to Southeast Asia, Japan, and New Caledonia.



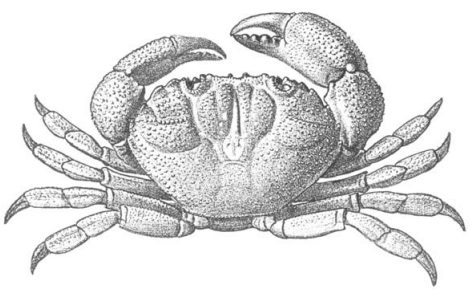
(from A. Milne Edwards, 1873)



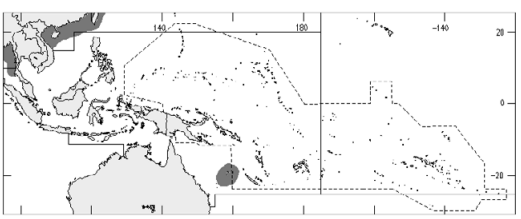
Ozius tuberculosus H. Milne Edwards, 1834

En - Beaded rock crab.

Maximum carapace width 9 cm. Usually along rocky shores in intertidal to shallow subtidal waters. Occasionally collected by hand or traps for human consumption. Indo-West Pacific, known from Mauritius and southern India to Southeast Asia, China, Japan, and New Caledonia.



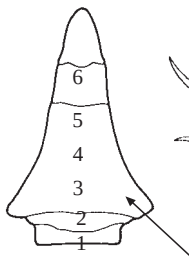
(from A. Milne Edwards, 1873)



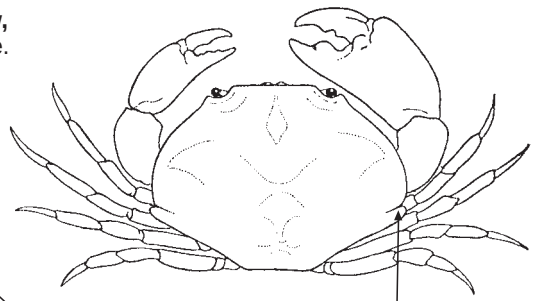
CARPILIIDAE

Reef crabs

Diagnostic characters: Carapace transversely ovate; dorsal surface smooth, distinctly convex longitudinally and transversely; front entire; **a single low, small tooth on each anterolateral margin of carapace**. Legs simple. Longitudinal ridges which define efferent respiratory current usually absent or strongly developed on posterior part of endostome only; ridges not clearly visible on anterior part of endostome when mouthparts pushed aside. **Male abdominal segments 3 to 5 immovable, completely fused. Male first gonopod stout, almost straight or gently curved; male second gonopod elongate**, longer or subequal in length to male first gonopod.



male abdomen



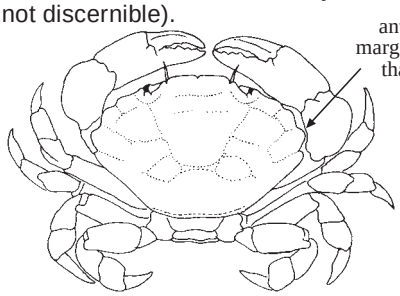
Habitat, biology, and fisheries: Benthic reef crabs. A single genus of Carpiliidae, *Carpilius* (with only 2 species in the Pacific), has fishery value. Both Pacific species of *Carpilius*, *C. maculatus* and *C. convexus*, are occasionally collected for food.

Similar families occurring in the area

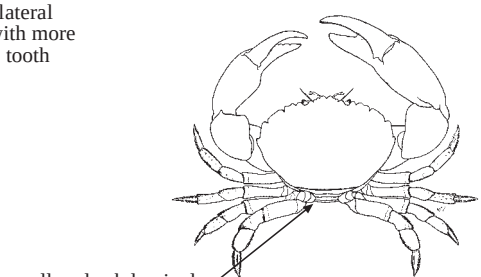
Only the Xanthidae and Eriphiidae (both families known as "stone and mud crabs") can easily be confused with carpiliids. These 3 taxa were all previously classified in a single family (Xanthidae).

Xanthidae: can be distinguished from carpiliids by the shape of the male first gonopods, which are slender and sinuous (rather than stout, cylindrical), and the male second gonopods, which are very short (rather than very elongate, longer than first gonopod).

Eriphiidae: can only be effectively distinguished from carpiliids by having all the male abdominal segments freely movable, with the sutures clearly visible (versus male abdominal segments 3 to 5 completely fused, sutures not discernible).



Xanthidae



Eriphiidae

Key to species of interest to fisheries occurring in the area

1a. Cream to pink ground colour in life, carapace with 9 large violet to maroon spots . . . . . ***Carpilius maculatus***

1b. Uniform red to reddish brown colour in life . . . . . ***Carpilius convexus***

List of species of interest to fisheries occurring in the area

The symbol 🦀 is given when species accounts are included.

🦀 *Carpilius convexus* (Forsskål, 1775)
🦀 *Carpilius maculatus* (Linnaeus, 1758)

References

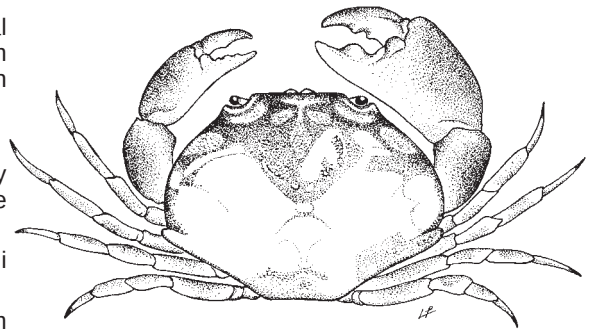
Alcock, A. 1898. Materials for a carcinological fauna of India. No. 3. The Brachyura Cyclometopa. Part I. The family Xanthidae. *J. Asiat. Soc. Bengal*, 67(2), No. 1:67-233.

Serène, R. 1984. Crustacés Décapodes Brachyoures de l'Ocean Indien occidental et de la Mer Rouge. Xanthoidea: Xanthidae et Trapeziidae. Addendeum Carpiliidae et Menippidae - A. Crosnier. *Faune Tropicale (ORSTOM)*, 24:1-400.

Carpilius convexus (Forsskål, 1775)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Red reef crab.



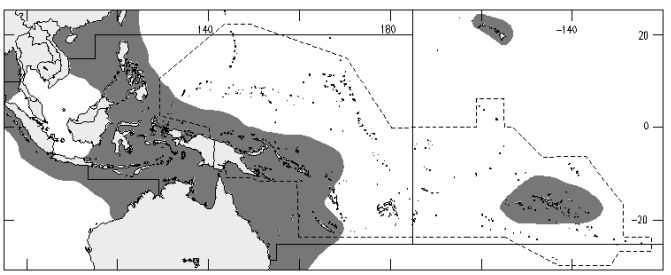
Diagnostic characters: Carapace ovate; dorsal surface very smooth and convex. **Colour:** uniform red to reddish brown, with irregular dark brown patches on the dorsal surface of carapace.

Size: Maximum carapace width 15 cm.

Habitat, biology, and fisheries: A reef crab. Biology and fisheries similar to *Carpilius maculatus* (see below).

Distribution: Indo-West Pacific, reaching Hawaii and French Polynesia.

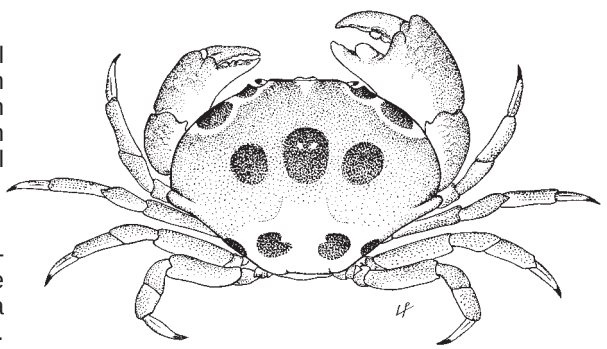
Remarks: *C. convexus* is easily distinguished from *C. maculatus* by its distinct coloration which remains even after preservation.



Carpilius maculatus (Linnaeus, 1758)

Frequent synonyms / misidentifications: None / None.

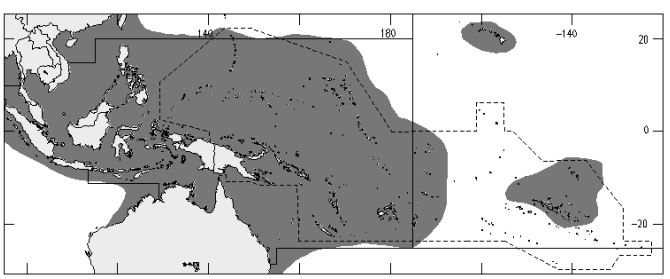
FAO name: En - Spotted reef crab.



Diagnostic characters: Carapace ovate; dorsal surface very smooth and convex. **Colour:** cream to pink ground colour, with 9 large violet to maroon spots on dorsal surface of carapace: 3 on median region, 2 on posterior region, 2 on anterolateral region, and 2 around the orbits.

Size: Maximum carapace width 18 cm.

Habitat, biology, and fisheries: A reef crab. Collected extensively for food, although never in large quantities. Frequently seen in markets of East Asia and parts of Indonesia, but only in small numbers. Usually collected by hand or with baited traps. There have been reports that this species is poisonous, but this could not been confirmed by biochemical tests. It is possible that after feeding on poisonous molluscs, the crabs become toxic for a short period as well.



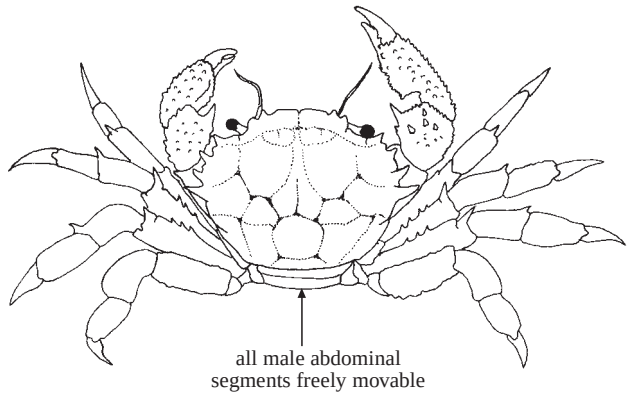
Distribution: Indo-West Pacific, reaching Hawaii and French Polynesia.

Remarks: The only other species of *Carpilius* in the area is *C. convexus*, which can easily be distinguished by its very different coloration.

PILUMNIDAE

Hairy crabs

Diagnostic characters: Carapace hexagonal, transversely rectangular or transversely ovate; dorsal surface convex, smooth to granulated; frontal margin entire to multilobate; usually 1 to 4 teeth or lobes on each anterolateral margin. **Longitudinal ridges defining efferent respiratory current usually well developed along entire endostome**, ridges visible on anterior part of endostome when mouthparts pushed aside. Legs normal. **Male abdominal segments 3 to 5 freely movable. Male first gonopod slender, usually S-shaped**, distal part simple; **male second gonopod very short**, sigmoid.



Habitat, biology, and fisheries: Benthic crabs with diverse habits. Most species in this family are of no commercial value. The moderately large-sized *Galene bispinosa* has minor economic importance.

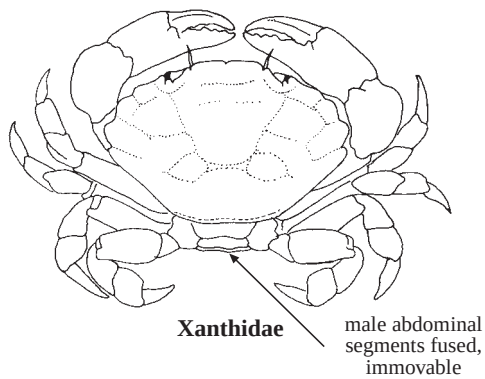
Remarks: Despite their common name, "hairy crabs", many pilumnids (including *Galene bispinosa*) are actually not very setose (or "hairy").

Similar families occurring in the area

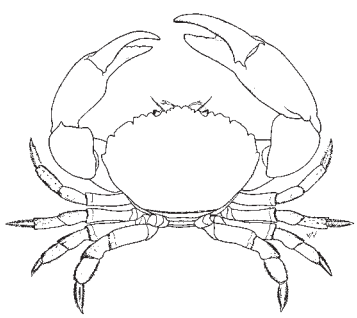
The Pilumnidae is a very diverse group and its taxonomy remains unsettled. As their general (usually hexagonal) carapace shape is similar to those of xanthids, eriphiids, and goneplacids, the safest way to identify a pilumnid species is to examine the male abdomen and gonopods. All pilumnids share very similar male abdominal, male pleopodal, and larval characters.

Xanthidae: male abdominal segments 3 to 5 fused (instead of freely movable).

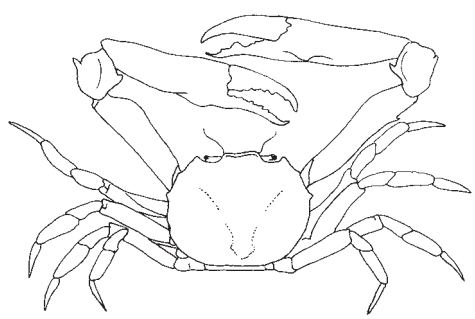
Eriphiidae: male first gonopods stout (rather than slender and sinuous); male second gonopods long (rather than very short).



Goneplacidae: generally have stouter male first gonopods and/or proportionately longer male second gonopods; some species with male abdominal segments 3 to 5 fused.



Eriphiidae



Goneplacidae

References

Balss, H. 1933. Beitrage zur Kenntnis der Gattungen *Pilumnus* (Crustacea Dekapoda) und verwandter Gattungen. *Capita Zoologica*, 4(3):1-47.

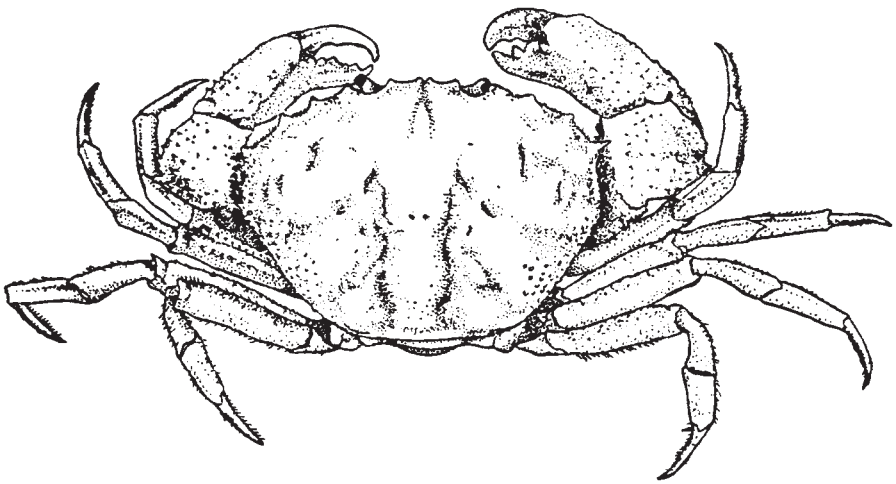
Ng, P.K.L. 1987. The Indo-Pacific Pilumnidae II. A revision of the genus *Rhizopa* Stimpson, 1858 and the status of the Rhizopinae Stimpson, 1858 (Crustacea: Decapoda: Brachyura). *Indo-Malayan Zoology*, 4(1):69-111.

A single species of interest to fisheries occurring in the area.

Galene bispinosa (Herbst, 1783)

Frequent synonyms / misidentifications: *Podopilumnus fittoni* M'Coy, 1849; *Gecarcinus trispinosus* Desmarest, 1822; *Galene granulosa* Miers, 1884 / None.

FAO name: En - Square-shelled crab.

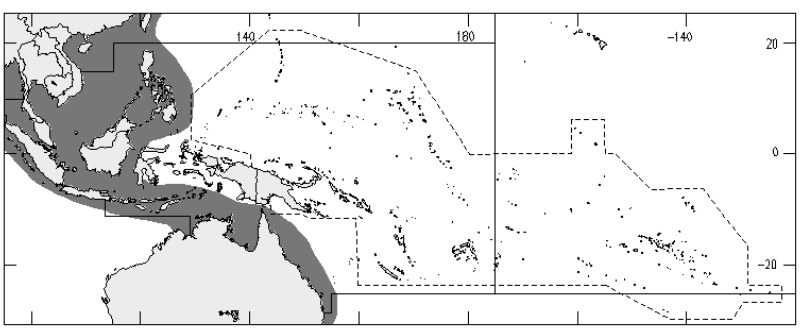


Diagnostic characters: Carapace subpentagonal, dorsal surface gently convex, lateral regions with numerous small, rounded granules; 2 or 3 distinct conical teeth on each lateral margin (2 teeth always distinct). Chelipeds stout, surfaces finely granulated. **Colour:** tan to purplish tan.

Size: Maximum carapace width 8 cm.

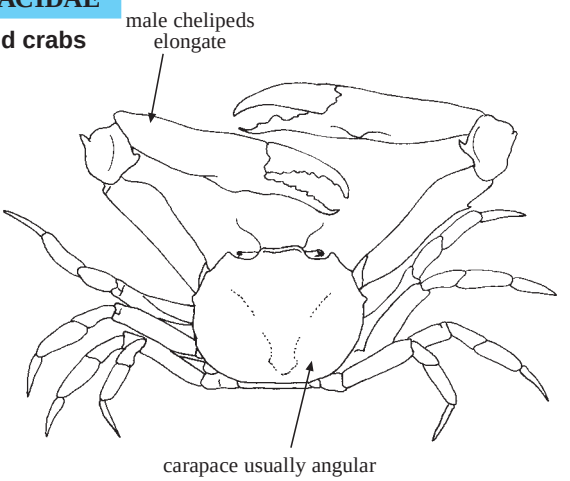
Habitat, biology, and fisheries: In shallower waters, down to depths of about 100 m, living on muddy substrates. Caught mainly by bottom trawls, often in large quantities. Of low fishery value, although very abundant in some areas. Only occasionally seen in markets and sold for low prices. Fished mainly in Thailand and various parts of Indonesia.

Distribution: India and Southeast Asia to Australia and Japan.



GONEPLACIDAE

Rhomboid crabs



Diagnostic characters: Carapace hexagonal, transversely rectangular, trapezoidal, or transversely ovate; dorsal surface convex, usually smooth; frontal margin usually entire, sometimes multilobate; anterolateral margin usually armed with 1 to 4 teeth or lobes, or entire. **Male abdominal segments 3 to 5 distinct, movable or fused and immovable. Male first gonopod moderately stout, gently curved or sinuous; male second gonopod relatively short to elongate**, but usually shorter than male first gonopod.

Habitat, biology, and fisheries: Benthic crabs with diverse habits. Most species in this family are of little or no commercial value. The relatively common and large *Carcinoplax longimanus* has a minor importance to fisheries in the Western Central Pacific.

Similar families occurring in the area

The Goneplacidae is doubtless a very heterogeneous group. Obviously, the genera included here were assigned to this family due to lacking evidence to place them into any others of the known families. Although the angular carapace of most goneplacids readily separates them from species of other families, a clear definition of the Goneplacidae is not known. Accordingly, any comparisons with outside taxa are very difficult and must be done on a genus by genus basis. *Carcinoplax*, the only genus in the area that includes an edible species, resembles in general body shape some species of Xanthidae, Eriphiidae, and Carpiliidae.

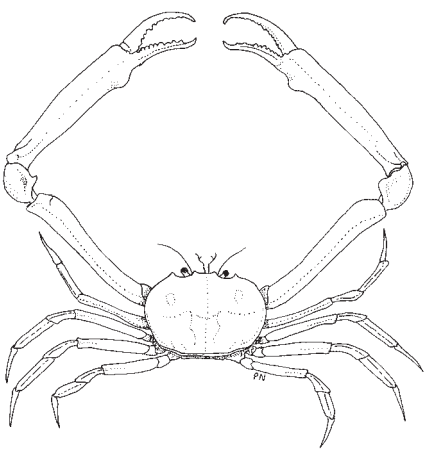
Xanthidae, Eriphiidae, and Carpiliidae: compared to species of these families, in *Carcinoplax*, the carapace is clearly more ovate in shape and the adult male chelipeds are extremely elongated. In addition, the male second gonopods of *Carcinoplax* are intermediate in relative length between xanthids (very short, as in pilumnids) and eriphiids (very long).

References

Guinot, D. 1989. Le genre *Carcinoplax* H. Milne Edwards, 1852 (Crustacea: Decapoda: Goneplacidae). In *Résultats des Campagnes MUSORSTOM*, 4, edited by J. Forest. *Mém. Mus. natn. Hist. nat.*, 144:265-345.

Tesch, J.J. 1918. The Decapoda Brachyura of the Siboga Expedition. II. Goneplacidae and Pinnotheridae. *Siboga Exped. Monogr.*, 39c(1):149-295.

A single species of interest to fisheries occurring in the area.



Carcinoplax longimanus (De Haan, 1833)

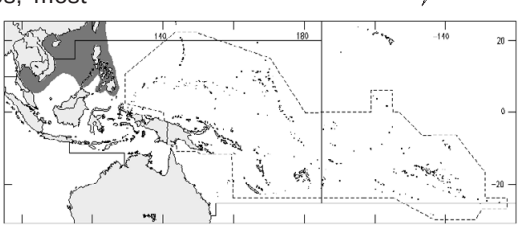
Frequent synonyms / misidentifications: *Carcinoplax longimanus japonicus* Doflein, 1904; *Carcinoplax longimanus typicus* Doflein, 1904 / None.

FAO name: En - Long-armed crab.

Diagnostic characters: Carapace ovoid; dorsal surface convex and smooth; lateral margin with 3 strong teeth in juveniles, becoming small to almost indiscernible in adults. Male chelipeds very elongate. **Colour:** red to pink overall.

Size: Maximum carapace width 8 cm.

Habitat, biology, and fisheries: On muddy substrates, most commonly found in deeper waters from depths of 100 to 800 m. Fished mainly in southern Japan and southern China. Taken incidentally in major fishery operations, mainly by bottom trawls and often in large numbers. Only larger specimens are sold, but have a low value in most markets.



Distribution: Japan, Taiwan Province of China, China, Philippines, and Thailand.

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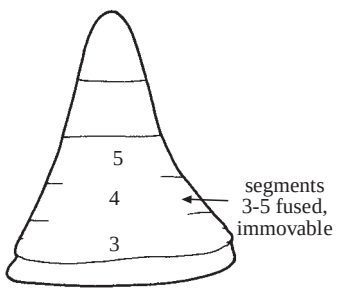
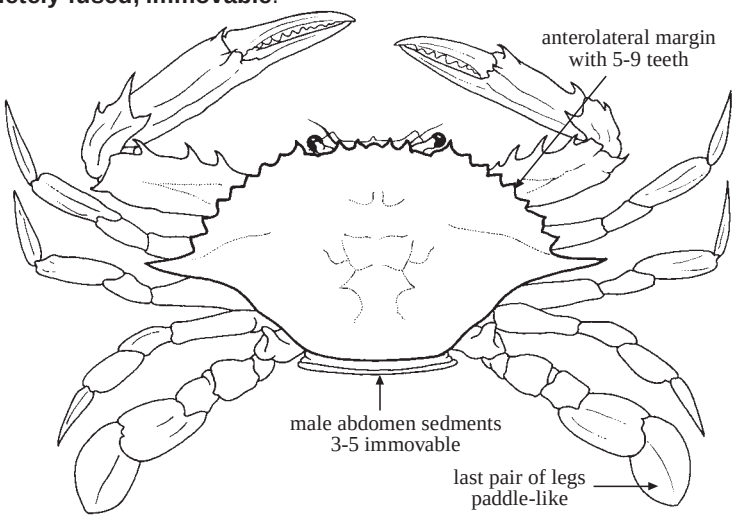
PORTUNIDAE

Swimming crabs

Diagnostic characters: Carapace hexagonal, transversely ovate to transversely hexagonal, sometimes circular; dorsal surface relatively flat to gently convex, usually ridged or granulose; front broad, margin usually multidentate; usually 5 to 9 teeth on each anterolateral margin, posterolateral margins usually distinctly converging. **Endopodite of second maxillipeds with strongly developed lobe on inner margin**. Legs laterally flattened to varying degrees, **last 2 segments of last pair paddle-like. Male abdominal segments 3 to 5 completely fused, immovable**.



male abdomen



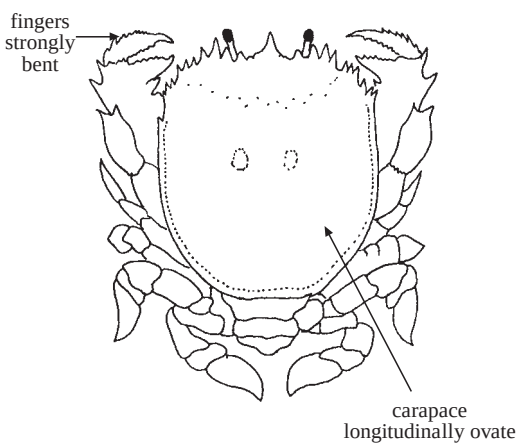
Habitat, biology, and fisheries: Benthic to semipelagic crabs with diverse habits. Many species of great fishery value, notably *Scylla serrata*, *Portunus pelagicus, P. sanguinolentus, P. trituberculatus,* and *Charybdis feriatus*.

Similar families occurring in the area

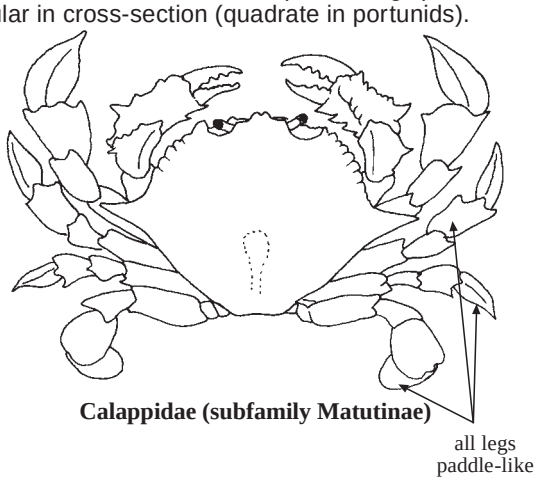
Portunids may be confused with spanner crabs (Raninidae) and moon crabs (Calappidae: Matutinae), which also possess paddle-like legs. They can be separated from portunids as follows:

Raninidae: carapace usually longitudinally ovate; sternum very narrow; fingers of chela strongly bent; meri of third maxillipeds triangular (quadrate in portunids).

Calappidae (subfamily Matutinae): carapace circular to subcircular; at least last 3 pairs of legs paddle-like, (not only the last pair); meri of third maxillipeds triangular in cross-section (quadrate in portunids).



Raninidae



Calappidae (subfamily Matutinae)

Key to species of interest to fisheries occurring in the area

1a. Carapace with 2 anterolateral teeth; eyes very long, reaching lateral edge of carapace (Fig. 1) . . . . . ***Podophthalmus vigil***

1b. Carapace with more than 2 anterolateral teeth; eyes normal in size . . . . . → ***2***

2a. Carapace rounded; ventral surface of palm with stridulatory (sound-producing) ridges (Fig. 2a) . . . . . ***Ovalipes punctatus***

2b. Carapace transversely ovate; palm without any stridulatory (sound-producing) ridges (Fig. 2b) . . . . . → ***3***

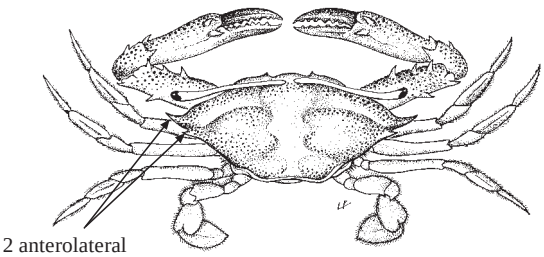


Fig. 1 ***Podophthalmus vigil***

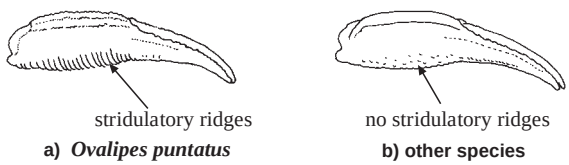


Fig. 2 chela in ventral view

3a. Five to 7 teeth on each anterolateral margin (Fig. 3a-c) . . . . . → ***4***

3b. Nine teeth on each anterolateral margin (Fig. 3d) . . . . . → ***12***

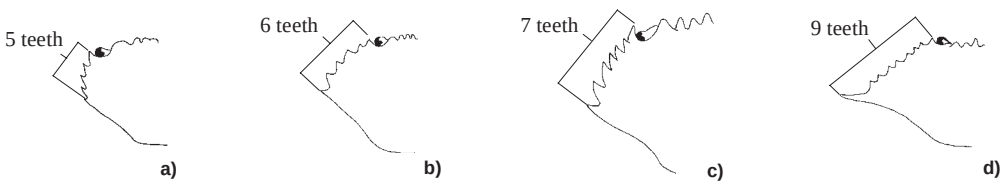


Fig. 3 lateral margin of carapace (dorsal view)

4a. Width of frontal-orbital border not much less than greatest width of carapace; 5 teeth on each anterolateral margin (first tooth sometimes with accessory denticle) (Fig. 4a) . . . . . → ***5***

4b. Width of frontal-orbital border distinctly less than greatest width of carapace; 6 or 7 teeth on each anterolateral margin (Fig. 4b) . . . . . → ***6***

5a. Basal antennal segment with a smooth or granulated ridge (Fig. 5a) . . . . . ***Thalamita crenata***

5b. Basal antennal segment with several sharp spines (Fig. 5b) . . . . . ***Thalamita spinimana***

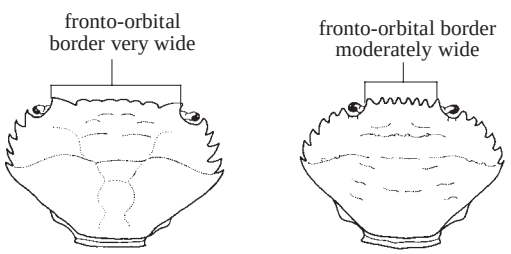


Fig. 4 carapace (dorsal view)

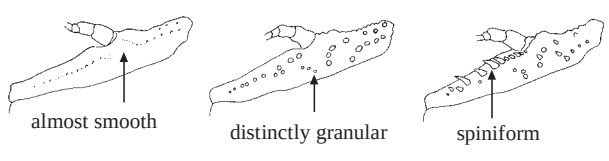


Fig. 5 basal antennal segment

6a. Posterior border of carapace forming an angular junction with posterolateral border (Fig. 6a); merus of cheliped without distal spine on posterior border . . . . . ***Charybdis truncata***

6b. Posterior border of carapace forming a curve with posterolateral border (Fig. 6b); merus of cheliped with distal spine on posterior border . . . . . → ***7***

7a. Carapace with distinct ridges or granular patches behind level of last pair of anterolateral teeth (Fig. 7a) . . . . . ***Charybdis natator***

7b. Carapace without distinct ridges or granular patches behind level of last pair of anterolateral teeth (Fig. 7b) . . . . . → ***8***

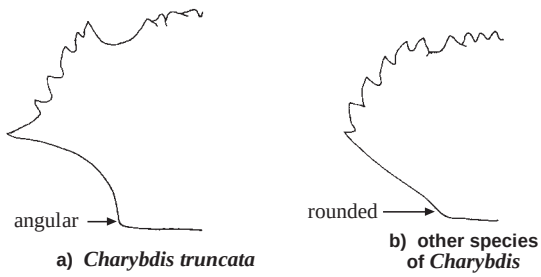


Fig. 6 left side of carapace (dorsal view)

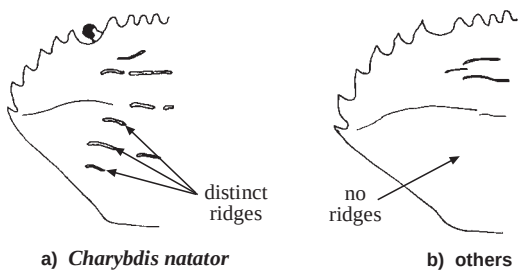


Fig. 7 left side of carapace (dorsal view)

8a. Merus of cheliped with 2 spines on anterior border; palm with 2 spines on upper surface (Fig. 8a) . . . . . ***Charybdis anisodon***

8b. Merus of cheliped with 3 or 4 spines on anterior border; palm with more than 2 spines on upper surface (Fig. 8b) . . . . . → ***9***

9a. First anterolateral tooth not truncate or notched (Fig. 9a) . . . . . ***Charybdis annulata***

9b. First anterolateral tooth truncate or notched (Fig. 9b) . . . . . → ***10***

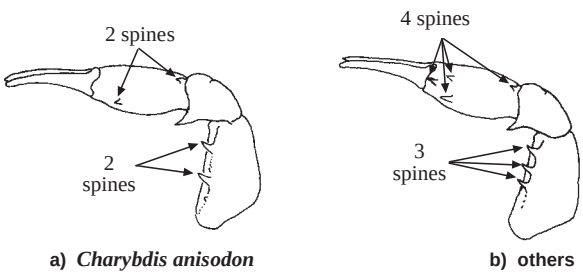


Fig. 8 right cheliped (dorsal view)

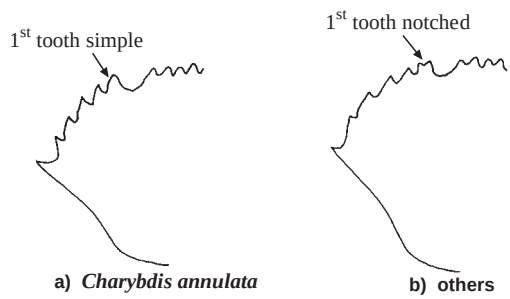


Fig. 9 lateral margin of carapace (dorsal view)

10a. Palm of cheliped with 4 spines on upper surface (Fig. 10a); male abdominal segment 4 keeled (Fig. 11a) . . . . . ***Charybdis feriatus***

10b. Palm of cheliped with 5 spines on upper surface (Fig. 10b); male abdominal segment 4 not keeled (Fig. 11b) . . . . . → ***11***

Fig. 10 right cheliped (dorsal view)

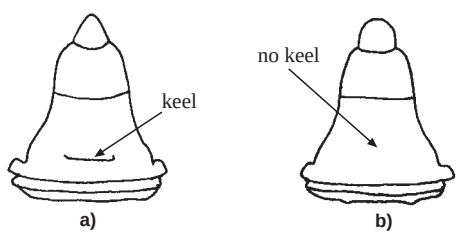


Fig. 11 male abdomen

11a. Palm with well-developed spines (Fig. 12a); male abdominal segment 6 with convex lateral borders (Fig. 13a); last anterolateral tooth smallest and spiniform, not projecting beyond preceding tooth (Fig. 14a) . . . . . ***Charybdis japonica***

11b. Palm with poorly developed spines (Fig. 12b); male abdominal segment 6 with lateral borders parallel in proximal half (Fig. 13b); last anterolateral tooth elongate, projecting laterally beyond preceding tooth (Fig. 14b) . . . . . ***Charybdis affinis***

12a. Last anterolateral tooth subequal in size to others (Fig. 15a) . . . . . → ***13***

12b. Last anterolateral tooth at least 2 times larger than others (Fig. 15b) . . . . . → ***16***

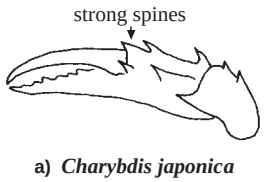


Fig. 12 right cheliped

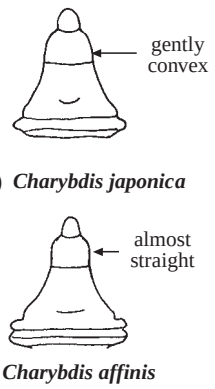


Fig. 13 male abdomen

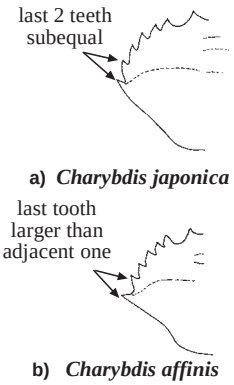


Fig. 14 anterolateral teeth

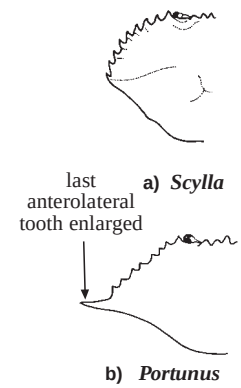


Fig. 15 anterolateral teeth

13a. Carpus of cheliped with only 1 low to very low granule on outer surface, never spiniform (Fig. 16a); colour of palm usually with at least some patches of orange or yellow in life . . . . → ***14***

13b. Carpus of cheliped with 2 distinct spiniform or sharp granules or spines on outer surface (Fig. 16b); colour of palm in life green to purple . . . . . → ***15***

14a. Frontal margin usually with sharp teeth (Fig. 17a); palm usually with distinct, sharp spines (Fig. 18a) . . . . . ***Scylla paramamosain***

14b. Frontal margin usually with rounded teeth (Fig. 17b); palm usually with reduced, blunt spines (Fig. 18b) . . . . . ***Scylla olivacea***

15a. Frontal margin usually with rounded teeth (Fig. 19a); sharp granules on palm and carpus never spiniform; colour in life: carapace usually very dark green to black, outer surface of palm purple and never with marbled pattern, last legs marbled only in males . . . . . ***Scylla tranquebarica***

15b. Frontal margin usually with sharp teeth (Fig. 19b); sharp granules on palm and carpus often spiniform; colour in life: carapace usually green to olive-green, outer surface of palm green and often with marbled pattern, last legs marbled both in males and females . . . . . ***Scylla serrata***

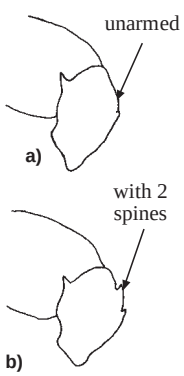


Fig. 16 carpus of cheliped

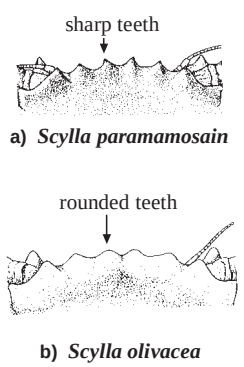


Fig. 17 frontal margin of carapace (dorsal view)

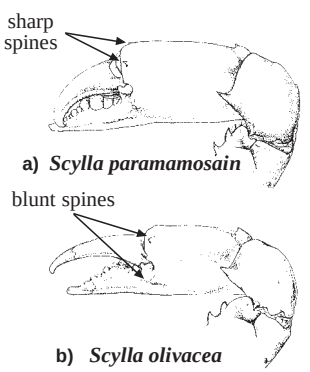


Fig. 18 right cheliped

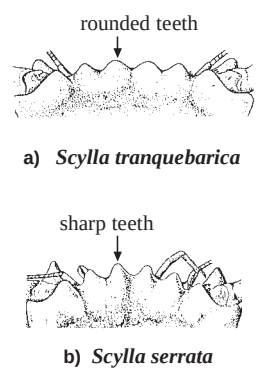


Fig. 19 frontal margin of carapace (dorsal view)

16a. Carapace with 3 purple to red spots on posterior half (Fig. 20) . . . ***Portunus sanguinolentus***

16b. Carapace marbled or with uniform coloration . . . . . → ***17***

17a. Front with 4 teeth (Fig. 21a); inner margin of merus of cheliped with 3 spines (Fig. 22a) . . . . . ***Portunus pelagicus***

17b. Front with 3 teeth (Fig. 21b); inner margin of merus of cheliped with 4 spines (Fig. 22b) . . . . . ***Portunus trituberculatus***

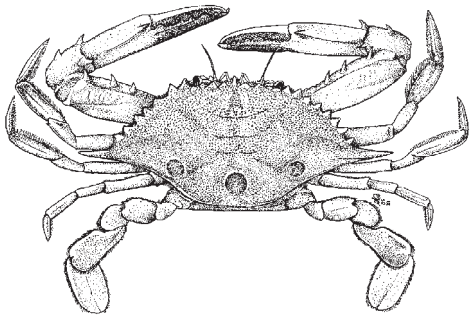


Fig. 20 ***Portunus sanguinolentus***

Fig. 21 frontal margin of carapace (dorsal view)

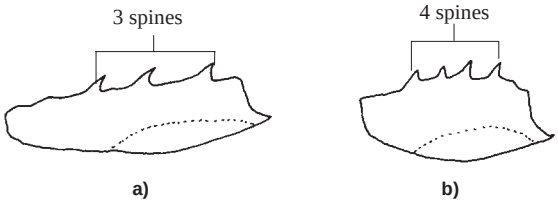


Fig. 22 merus of cheliped (inner margin)

List of species of interest to fisheries occurring in the area

The symbol 🕷 is given when species accounts are included.

🕷 *Charybdis affinis* Dana, 1852
🕷 *Charybdis anisodon* (De Haan, 1850)
🕷 *Charybdis annulata* (Fabricius, 1798)
🕷 *Charybdis feriatus* (Linnaeus, 1758)
🕷 *Charybdis japonica* (A. Milne Edwards, 1861)
🕷 *Charybdis natator* (Herbst, 1794)
🕷 *Charybdis truncata* (Fabricius, 1798)

🕷 *Ovalipes punctatus* (De Haan, 1833)

🕷 *Podophthalmus vigil* (Fabricius, 1798)

🕷 *Portunus pelagicus* (Linnaeus, 1758)
🕷 *Portunus sanguinolentus* (Herbst, 1783)
🕷 *Portunus trituberculatus* (Miers, 1876)

🕷 *Scylla olivacea* (Herbst, 1796)
🕷 *Scylla serrata* (Forsskål, 1775)
🕷 *Scylla paramamosain* Estampodor, 1949
🕷 *Scylla tranquebarica* (Fabricius, 1798)

🕷 *Thalamita crenata* (Latreille, 1829)
🕷 *Thalamita spinimana* (Dana, 1852)

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Leene, J.E. 1938. The Decapoda Brachyura of the Siboga Expedition. VII. Brachygnatha: Portunidae. *Siboga Exped. Monogr.*, 39c(131):1-156.

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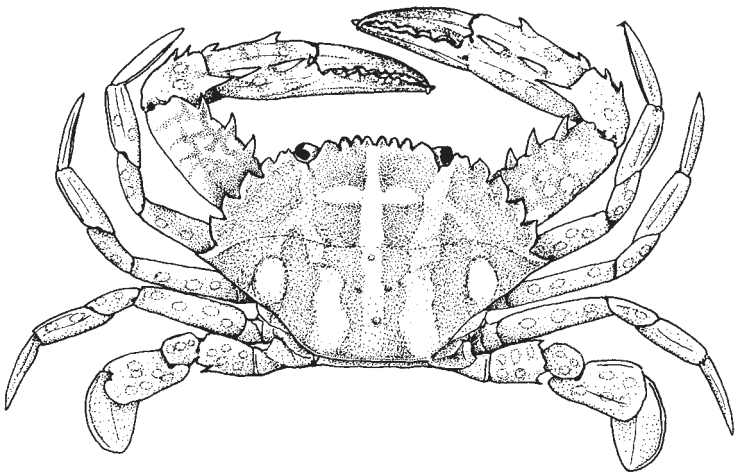
Charybdis feriatus (Linnaeus, 1758)

Frequent synonyms / misidentifications: *Charybdis crucifer* (Fabricius, 1792); *C. cruciata* (Herbst, 1794) / None.

FAO name: En - Crucifix crab.



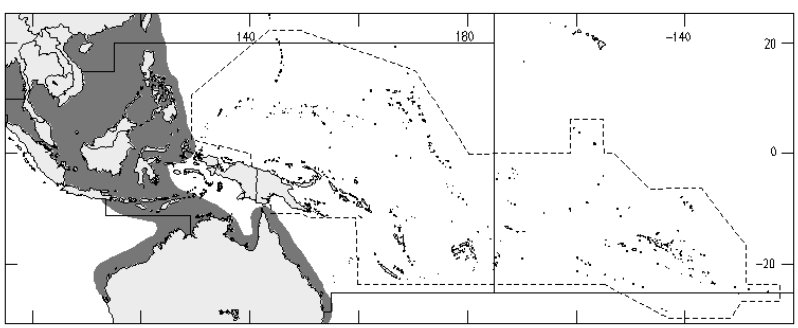
Diagnostic characters: Carapace ovate; 5 distinct teeth on each anterolateral margin. **Colour:** distinctive pattern of longitudinal stripes of maroon and white, usually with distinct white cross on median part of gastric region; legs and pincers with numerous scattered white spots.

Size: Maximum carapace width 20 cm.

Habitat, biology, and fisheries: Prefers sandy to sandy-muddy substrates, at depths from 30 to 60 m. Collected mainly by bottom trawls, sometimes by traps and nets. The commercially most important species of *Charybdis*. Like *Portunus* spp., *Charybdis feriatus* is more delicate than *Scylla*, and is frequently sold frozen. The lucrative and booming live-seafood market, however, is seeing the increased use of aquaria to keep these species alive. The crucifix crab is especially important in markets in East Asia where it commands substantially higher premium prices than *Portunus* spp., being sold for US$8 to US$15 per kg.

Distribution: Widely distributed in the Indo-West Pacific, reaching Japan and Australia.

Remarks: There are several species of *Charybdis* in the area which are also occasionally fished and infrequently appear in markets. These include *C. affinis* Dana, 1852, *C. acuta* (A. Milne Edwards, 1869), *C. anisodon* (De Haan, 1850), *C. annulata* (Fabricius, 1798), *C. natator* (Herbst, 1789) and *C. truncata* (Fabricius, 1798). They are all easily distinguished by carapace and cheliped armature features.

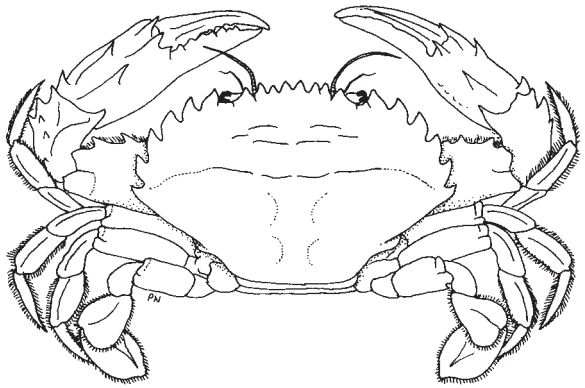


Charybdis japonica (A. Milne Edwards, 1861)

Frequent synonyms / misidentifications: None / None.

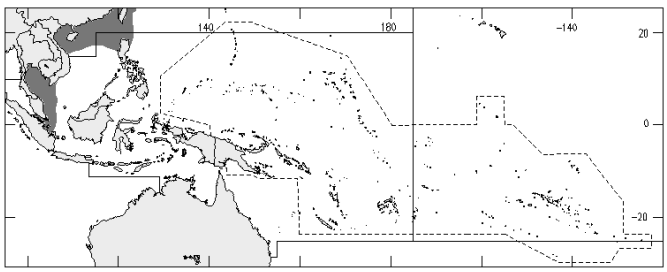
FAO name: En - Japanese swimming crab.

Diagnostic characters: Carapace without transverse ridges behind last anterolateral tooth; frontal teeth acutely triangular; anterolateral teeth all acutely triangular. Posterior border of propodus of legs serrated. Palm with 5 sharp spines, longitudinal ridges on palm granulated. **Colour:** carapace white with large greyish patches, tips of anterolateral teeth reddish brown; fingers red and white.



Size: Maximum carapace width 7 cm.

Habitat, biology, and fisheries: Occurs just offshore on muddy, sandy, or stony substrates. Taken mainly by trawlers or in nets as incidental catch. Although locally common, there is no sustained fishery for this species. Fished mainly in Japanese and Chinese waters.



Distribution: Japan, China, Taiwan Province of China, Thailand, and Malaysia.

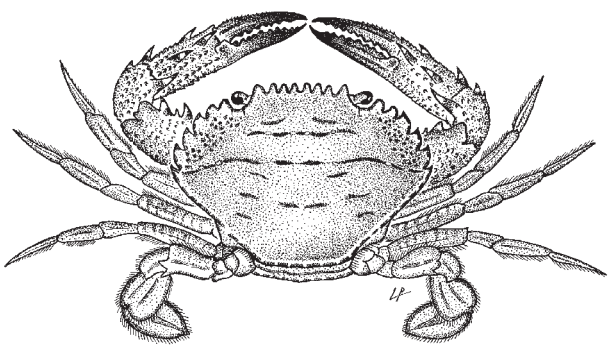
Remarks: See *Charybdis feriatus*. The above characters and coloration of *C. japonica* readily distinguish it from all other species of *Charybdis*.

Charybdis natator (Herbst, 1789)

Frequent synonyms / misidentifications: None / None.

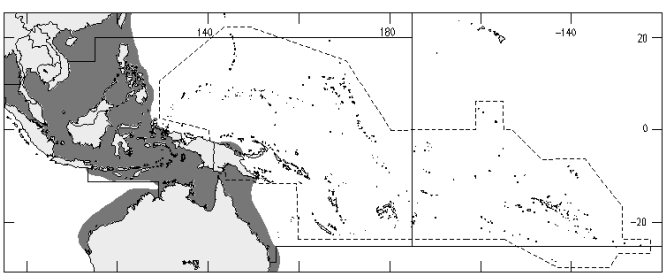
FAO name: En - Ridged swimming crab.

Diagnostic characters: Carapace with densely covered with very short pubescence which is absent on several distinct transverse granulated ridges in anterior half. **Colour:** orangish red overall, with ridges on carapace and legs dark reddish brown.



Size: Maximum carapace width 17 cm.

Habitat, biology, and fisheries: Near or in rocky-sandy substrates, sometimes near reefs, from depths of 5 to 40 m. *Charybdis natator* is caught incidentally by trawlers, and has some commercial value because of its large size.



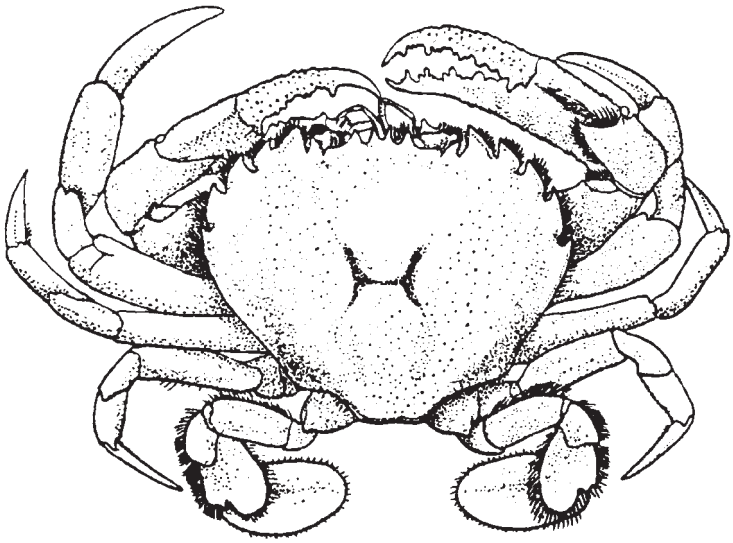
Distribution: China, Taiwan Province of China, Philippines, Thailand, Indonesia, Malaysia, Singapore, and Australia.

Remarks: See *Charybdis feriatus*.

Ovalipes punctatus (De Haan, 1833)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Sand crab.



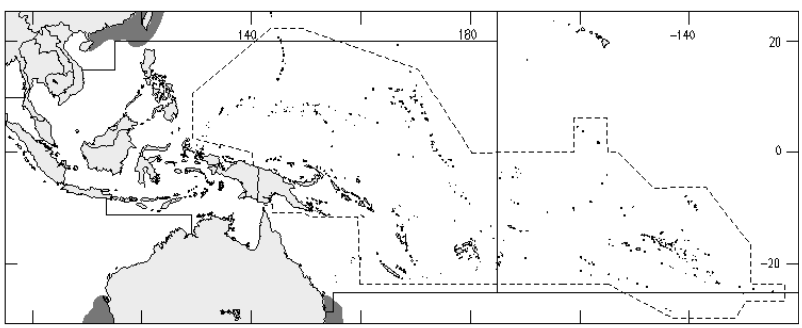
(after Shen and Dai, 1964)

Diagnostic characters: Carapace rounded, surfaces finely granular, appearing almost smooth; 4 well-developed teeth on each anterolateral margin; stridulatory ridges present on ventral surface of palm. **Colour:** carapace reddish brown to maroon, margins lighter coloured, with scattered dirty-white and darker spots, white gastric depression, margins lighter coloured; dactylus of fourth walking leg bluish purple.

Size: Maximum carapace width 9.5 cm.

Habitat, biology, and fisheries: Found from depths of 30 to 50 m. Caught mainly by trawls or dredges, and fished intensively in southern Japan, Taiwan Province of China, and China (mainly off southern China and Japan). Usually, only the chelae are sold in markets, where they command premium prices.

Distribution: Throughout the northern and southern hemispheres in the Pacific. In the area, it occurs in the northern part of the South China Sea and in Queensland (Australia).

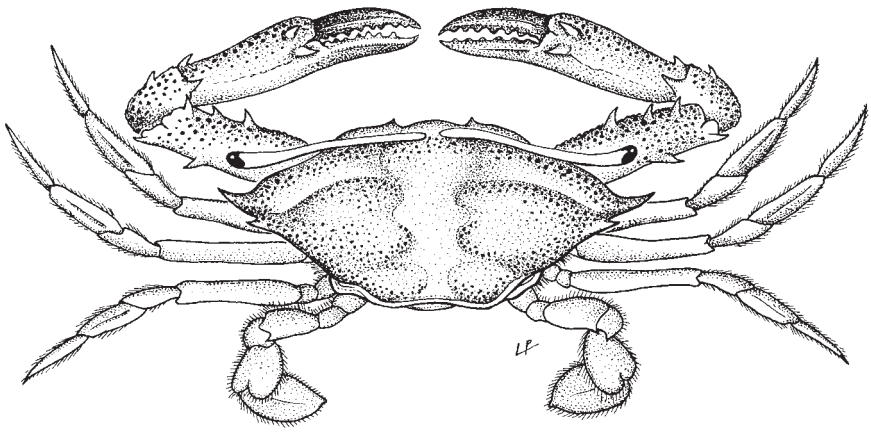


Remarks: Several species of *Ovalipes* of minor commercial importance are known, notably *O. australiensis* Stephenson and Mees, 1968, from Australia, which, however, does not occur in the Western Central Pacific. It can easily be separated from *O. punctatus* by the condition of the carapace surface (finely granular in *O. punctatus*, but coarsely granular in *O. australiensis*). In addition, *O. australiensis* has 2 large, clear pigmented ovate spots on the posterolateral region (absent in *O. punctatus*).

Podophthalmus vigil (Fabricius, 1798)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Sentinel crab.



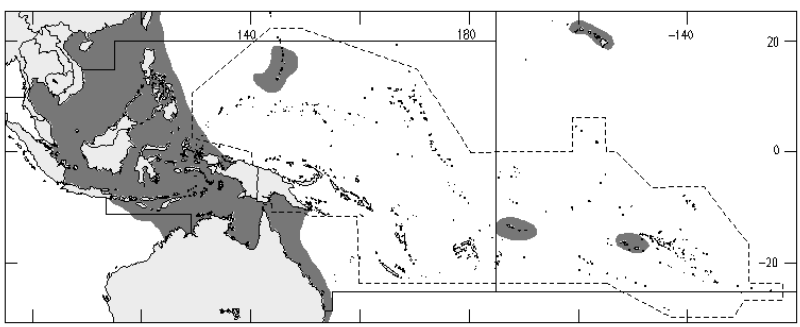
Diagnostic characters: Carapace distinctly broader than long; anterior margin much broader than posterior margin, with posterolateral margins converging strongly towards narrow posterior carapace margin; orbits very broad. Eyes very long, reaching to or extending beyond edge of carapace. **Colour:** carapace green; chelipeds and parts of legs violet to maroon in adults.

Size: Maximum carapace width 15 cm.

Habitat, biology, and fisheries: On sandy to muddy substrates in offshore waters. Occasionally caught by offshore trawlers, although rarely in large numbers. When marketed, it commands prices similar to those for *Portunus pelagicus*.

Distribution: Indo-West Pacific.

Remarks: Three species of *Podophthalmus* are known. *P. vigil* is the only large species that shows the colour pattern described above, and the only species of the genus with commercial value.



Portunus pelagicus (Linnaeus, 1758) SCD

Frequent synonyms / misidentifications: *Portunus mauritianus* Ward, 1942 / *Portunus trituberculatus* (Miers, 1876).

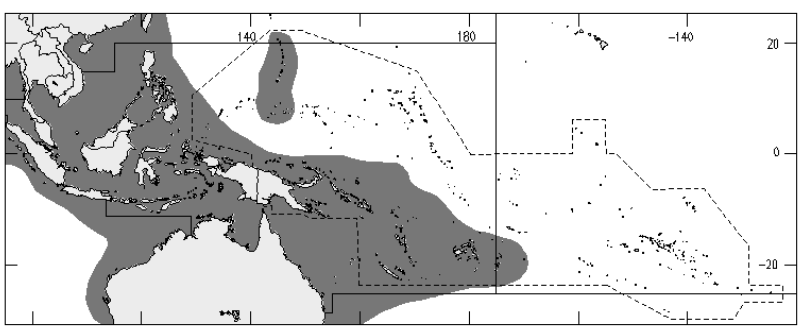
FAO name: En - Flower crab.

Diagnostic characters: Carapace rough to granulose, regions discernible; front with 4 acutely triangular teeth; 9 teeth on each anterolateral margin, the last tooth 2 to 4 times larger than preceding teeth. Chelae elongate in males; larger chela with conical tooth at base of fingers; pollex ridged. **Colour:** males with blue markings, females dull green.

Size: Maximum carapace width 20 cm for males (including lateral teeth).

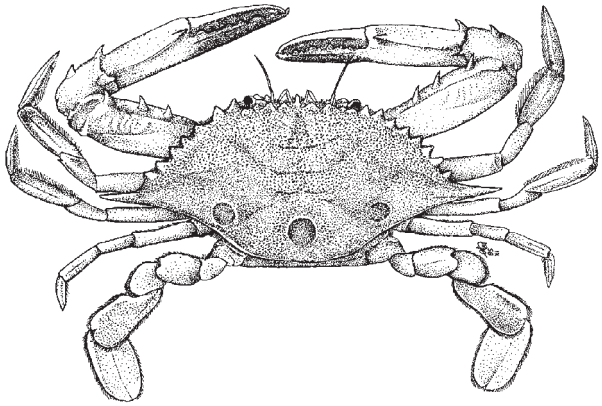
Habitat, biology, and fisheries: Prefers sandy to sandy-muddy substrates in shallow waters down to a depth of 50 m, including areas near reefs, mangroves, and in seagrass and algal beds. Juveniles tend to occur in shallow intertidal areas. The crabs mature at about 1 year. Collected mainly by artisanal traps, trawls, beach seines, cylindrical wire traps, folding traps, pots, hop nets, drop nets, and sunken crab gill nets. In shallow waters, beach seines, rakes, and dab nets are used. Although sold for lower prices than *Scylla*, crabs of *Portunus* are taken in much larger quantities. They are caught in enormous numbers for sale in local markets (frozen or fresh) and for the crab-flesh canning industry. Many species of *Portunus* are commercially collected in the area. Among the 3 more frequently collected species included here, *P. pelagicus* is most widely sold in markets in Southeast Asia, including the Philippines. The market price varies from US$3 to US$5 per kg for fresh crabs, and from about US$5 to US$8 for live crabs. The fisheries for this species is well managed in Australia. From 1990 to 1995, the reported yearly catch of *P. pelagicus* from the Western Central Pacific (Australia, Indonesia, and Thailand) ranged from around 36 700 to 48 000 t (FAO Yearbook of Fishery Statistics).

Distribution: Throughout Indo-West Pacific.



Remarks: May be confused with *P. trituberculatus*, which resembles a large stocky female of *P. pelagicus*. *P. trituberculatus*, however, can easily be distinguished by having only 3 frontal teeth (4 teeth in *P. pelagicus*), and by the presence of 4 spines on the inner margin of the chelipedal merus (only 3 spines in *P. pelagicus*).

Portunus sanguinolentus (Herbst, 1783)



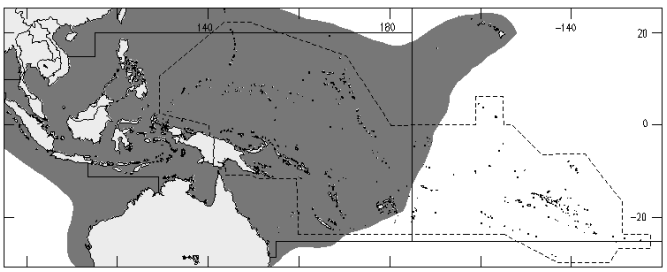
Frequent synonyms / misidentifications: None / None.

FAO name: En - Three-spot swimming crab.

Diagnostic characters: Carapace finely granulose, regions just discernible; 9 teeth on each anterolateral margin, the last tooth 2 to 3 times larger than preceding teeth. Chelae elongated in males; larger chela with conical tooth at base of fingers; pollex ridged. **Colour:** olive to dark green, with 3 prominent maroon to red spots on posterior 1/3 of carapace.

Size: Maximum carapace width 20 cm.

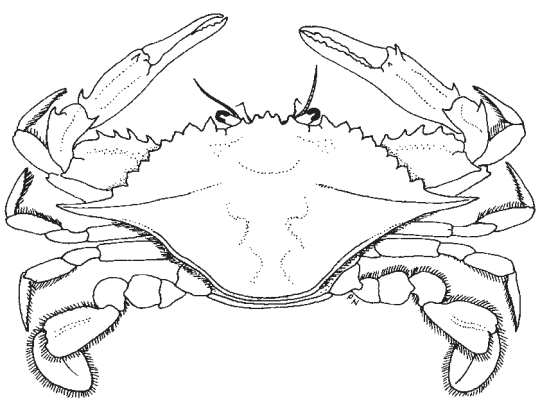
Habitat, biology, and fisheries: Occurs on sandy to sandy-muddy substrates, from the intertidal zone (especially juveniles) to depths of 30 m. Collected mainly by nets or seines. This species is less common than *Portunus pelagicus*, and appears only occasionally in markets. It is priced similarly to, or for slightly lower prices as, *P. pelagicus*.



Distribution: Indo-West Pacific.

Remarks: This species can be easily separated from all other *Portunus* species by its very distinctive colour markings.

Portunus trituberculatus (Miers, 1876)



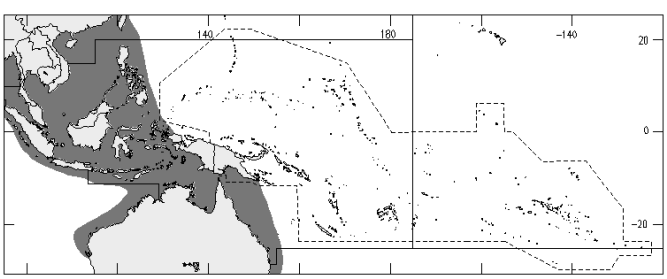
Frequent synonyms / misidentifications: None / *Portunus pelagicus* (Linnaeus, 1758).

FAO name: En - Horse crab.

Diagnostic characters: Carapace rough to granulose, regions discernible; front with 3 acutely triangular teeth; 9 teeth on each anterolateral margin, the last tooth much larger than preceding teeth. Larger chela with conical tooth at base of fingers; pollex ridged. **Colour:** carapace dull green to brown.

Size: Maximum carapace width 15 cm (males).

Habitat, biology, and fisheries: Prefers sandy to sandy-muddy substrates in shallow waters, up to depths of 50 m. Caught mainly by trawls. A commercially very important species in Japan and collected in large numbers in some areas.



Distribution: Indo-West Pacific.

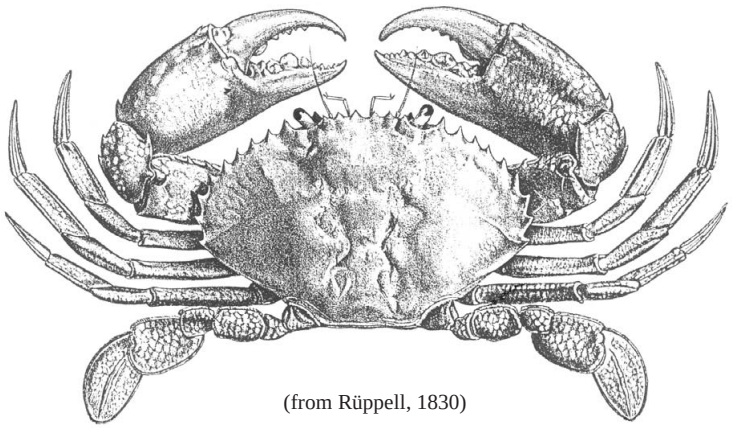
Remarks: This species is perhaps closest to *Portunus pelagicus* in its general appearance, resembling a large stocky female of that species. *P. pelagicus*, however, is easily distinguished by having 4 frontal teeth (only 3 teeth in *P. trituberculatus*) and by the presence of 3 spines on the inner margin of the chelipedal merus (4 spines in *P. trituberculatus*).

Scylla serrata (Forsskål, 1775) MUD

Frequent synonyms / misidentifications: *Acheolus crassimanus* MacLeay, 1838; *Scylla serrata* var. *oceanica* Dana, 1852 / see **Remarks**.

FAO name: En - Giant mud crab.

Diagnostic characters: Carapace smooth, with strong transverse ridges; H-shaped gastric groove deep; relatively broad frontal lobes, all more or less in line with each other; broad anterolateral teeth, projecting obliquely outwards. Well-developed spines present on outer surface of chelipedal carpus and anterior and posterior dorsal parts of palm. **Colour:** carapace green to almost black; legs may be marbled.

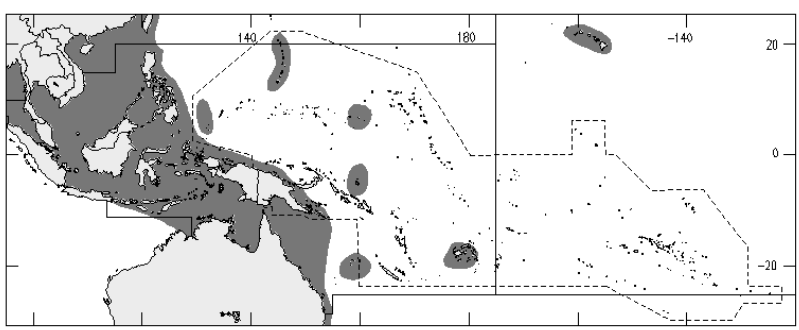


(from Rüppell, 1830)

Size: Maximum carapace width between 25 and 28 cm (males); maximum weight between 2 and 3 kg.

Habitat, biology, and fisheries: *Scylla serrata* prefers more oceanic waters, usually found just offshore on soft muddy bottoms. Crabs can be caught up to 50 km offshore as they migrate there to spawn. The other 3 species of *Scylla* included here prefer mangroves in continental shelves with less saline waters. All species of *Scylla* dig deep burrows in mangroves and soft substrates in shallow or intertidal waters. Species of *Scylla* are collected mainly using trawls, traps, baited wire mesh pots, hooking, and by hand throughout their ranges. From 1990 to 1995, the reported yearly catch of *Scylla serrata* from the Western Central Pacific ranged from around 6 150 to 18 600 t (FAO Yearbook of Fishery Statistics). It must be pointed out, however, that these figures cover all 4 species of *Scylla* recognized here (see remarks on that problem below). Species of *Scylla* are almost always marketed alive. At present, the main markets are Taiwan Province of China, Hong Kong (China), and Singapore, where large crabs (so-called “meat crabs”) and females with ripe ovaries (“roe crabs”) command premium prices. For both kinds of crabs, current demand still far exceeds the supply. They are always sold for high prices, ranging from US$5 to US$10 per kg. “Roe crabs” can even cost 25 to 50% more. In Australia, they are sold for an average price of US$6 per kg. Currently, the largest exporters of mud crabs in Asia are Indonesia, Sri Lanka, India, and Bangladesh, with the markets in Myanmar, Viet Nam, and Pakistan picking up rapidly. *S. serrata* and *S. olivacea* are also the main food species in Australia. There is no clear management for the 4 species of *Scylla* in Southeast and East Asia. In Australia, the fishery for *S. serrata* and *S. olivacea* is quite intense (700 t collected between 1989 to 1990, mainly from Queensland with over 400 t) but is reasonably well managed. There have been attempts to culture the crabs in captivity, but none of the closed-cycle enterprises have gone commercial. Many *Scylla* crab farms rely on the tide to bring megalopae or late zoeae into ponds, where the crabs grow out. Alternatively, many farms in Southeast Asia keep smaller or freshly moulted crabs (so-called “water crabs” because of the consistency of their flesh) caught from natural stocks to grow them out or add on more flesh. Similarly, female crabs of all 4 species are kept until their ovaries are full to improve their market prices.

Distribution: All 4 species of *Scylla* apparently have a wide Indo-West Pacific distribution. *Scylla serrata*, has been introduced to Hawaii from Samoa 55 years ago, and has become established there.



Remarks: The taxonomy of the genus *Scylla* has been terribly confused and is still difficult. While generally a single, supposedly widely distributed species is recognized, namely *S. serrata*, it is now known that the genus includes 4 species. Recent research in Australia (Keenan et al., 1998) has clearly shown, using morphological, DNA, and allozyme data, that there are 4 species of *Scylla*.

The differences in allozyme and mtDNA are substantial, but the morphological features which separate the 4 species are rather subtle and sometimes difficult to recognize in smaller specimens. The distal parts of the male gonopods are also slightly but distinctly different (unpublished data). Given that all 4 species of *Scylla* are marketed throughout their range by the extensive export market, the existing catch figures and fishery management practices currently applied to a single species (*S. serrata*) obviously have to be revised.

The very large species depicted above (often called the "Sri Lanka crab" in South, Southeast and East Asia) is the "real" *Scylla serrata* and has a wide distribution, with preference for more saline waters. It varies from green to almost black, has a smooth carapace with distinct transverse ridges, deep H-shaped gastric groove, relatively broad frontal lobes, all of which are more or less in line with each other, broad anterolateral teeth which project obliquely outwards, and has very well-developed spines on the outer surface of the chelipedal carpus and palm.

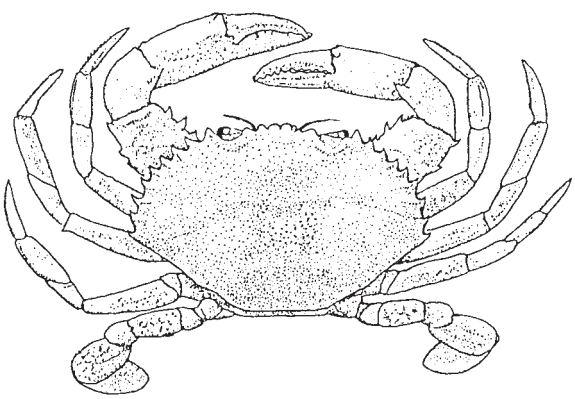
Two of the species are smaller and more closely associated with mangroves than the real *S. serrata*, and occur more or less in the same region, but generally prefer less saline conditions and are more common in continental shelf waters. *S. serrata* is not known to occur inside the Sunda Shelf, but it is the only species of *Scylla* known from the Red Sea. *Scylla olivacea* (Herbst, 1796) is usually brownish to brownish green in colour (sometimes orangish). It has a smoother, more evenly convex carapace with very low transverse ridges, a shallow H-shaped gastric groove, the median pair of the frontal lobes more rounded and projecting slightly forwards of the lateral ones, the anterolateral teeth gently curving anteriorly, giving the carapace a less transverse appearance. It also has very low spines on both the outer surface of the chelipedal carpus and the dorsal surface of palm. (See abbreviated species account below). The second mangrove species, *Scylla tranquebarica* (Fabricius, 1798) (= *Lupa lobifrons* H. Milne Edwards, 1834) varies from brown to almost black in coloration, and has very well-developed spines on the outer surfaces of the chelipedal carpus and the palm (as seen in *S. serrata*). It differs from *S. serrata*, however, by having the frontal teeth more acutely triangular, the median pair projecting slightly forwards of the lateral pair, and the anterolateral teeth gently curving anteriorly, giving the carapace a less transverse appearance. (See abbreviated species account below).

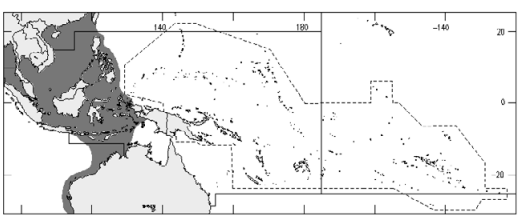
The fourth *Scylla* species, *Scylla paramamosain* Estampador, 1949, seems to prefer areas which are more rocky or near reefs, although it is also known from estuarine ponds and mangrove forests. It seems to be intermediate between *S. serrata* and *S. olivacea* both in morphology and coloration but can usually be distinguished by the form of its frontal margin and cheliped armature (see key). (See abbreviated species account below).

Scylla olivacea (Herbst, 1796)

En - Orange mud crab.

Maximum carapace width 18 cm (males). Carapace brownish to brownish green in colour (sometimes orangish), palm orange to yellow. Inhabits mangroves. Collected in large numbers and probably the most common species of *Scylla* to be found in many markets in Sundaic Southeast Asia and Thailand. Known so far from the continental waters of the Sunda Shelf and various parts of the East Pacific. (See species account of *S. serrata* for further information).

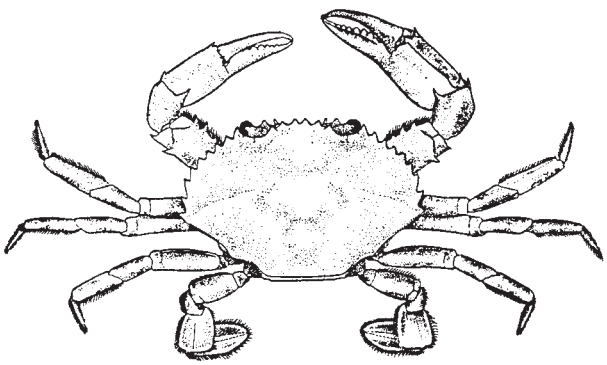


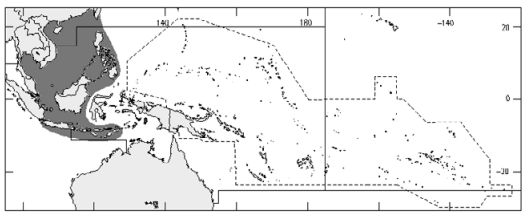


Scylla paramamosain Estampador, 1949

En - Green mud crab.

Maximum carapace width 20 cm (males), commonly between 15 and 18 cm; weight up to 2 kg. Carapace usually green to light green, palm green to greenish blue with lower surface and base of fingers usually pale yellow to yellowish orange. Rock areas, near reef, and mangroves. Common in northern parts of South China Sea and parts of Java, but less so elsewhere. Shelf species. (See species account of *S. serrata* for further information).

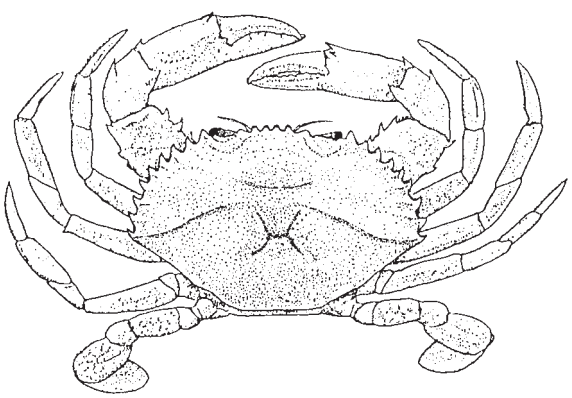


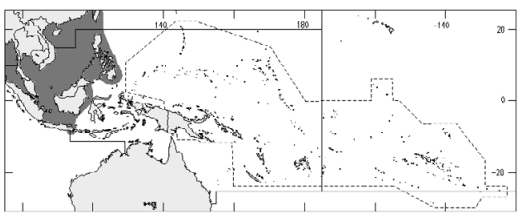


Scylla tranquebarica (Fabricius, 1798)

En - Purple mud crab.

Maximum carapace width 20 cm (males); weight up to 2 kg. Carapace green to almost black, palm purple. Mainly in mangroves (down to sublittoral parts) and collected in large numbers. This is probably the second most common species seen in Sundaic Southeast Asian markets, but less common in Thailand and the Philippines. Known from various parts of the Indo-West Pacific, including shelf waters. (See species account of *S. serrata* for further information).



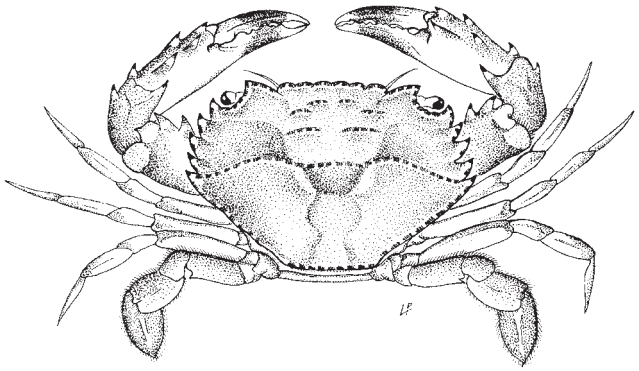


Thalamita crenata (Latreille, 1829)

Frequent synonyms / misidentifications: None / None.

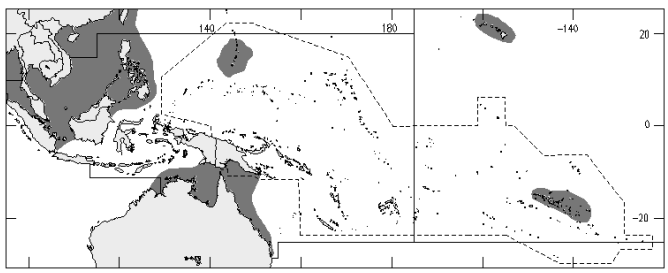
FAO name: En - Crenate swimming crab.

Diagnostic characters: Surface of carapace smooth, ridges low but distinct; front with 6 equal-sized, rounded lobes. **Colour:** dark to olive green overall.



Size: Maximum carapace width 8 cm.

Habitat, biology, and fisheries: One of the most distinctive species of the genus, and one of the few found in shallow non-reef habitats with soft substrates. Prefers areas near mangroves or with muddy-rocky substrates. Frequently collected by traps, trawlers, seines, and nets. Fished mainly in Southeast and East Asian countries. Although it can be very common in some areas, *T. crenata* has a low value in markets as it grows smaller than other, more commercial portunids found in the area.



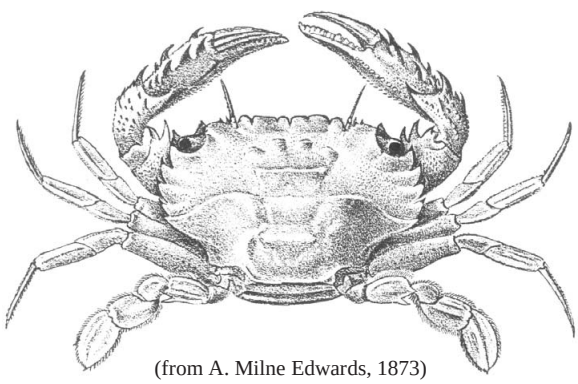
Distribution: China, Indonesia, Malaysia, Singapore, Australia, Tuamotu, Tonga, French Polynesia, and Hawaii.

Thalamita spinimana (Dana, 1852)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Spiny claw swimming crab.

Diagnostic characters: Surface of carapace smooth, sometimes with low pubescence; ridges distinct; front with 6 lobes, median 4 lobes truncate, lateral 2 lobes rounded. **Colour:** usually bright red overall, but sometimes green, or with a mixture of red and green.



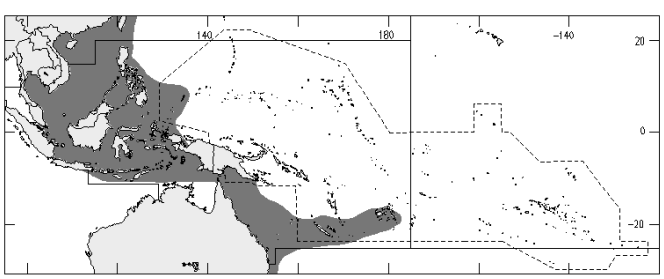
(from A. Milne Edwards, 1873)

Size: Maximum carapace width 12 cm.

Habitat, biology, and fisheries: Occasionally collected for food throughout its range, caught by traps and nets. It is sold for comparatively low prices in markets.

Distribution: West Pacific.

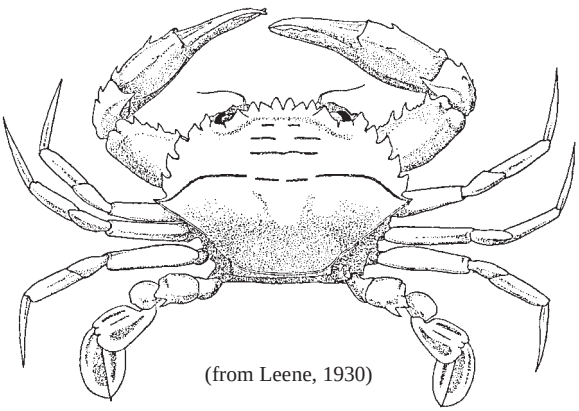
Remarks: A large number of coral reef species of *Thalamita* are found in the area. Most of these, however, are of small size and have no economic value. *T. spinimana* is one of the more common larger species in the genus, easily distinguished by its spinose palm and the bright red coloration.



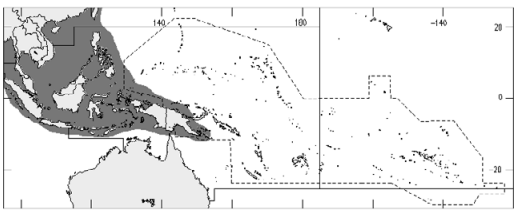
Charybdis affinis Dana, 1852

En - Smoothshelled swimming crab.

Maximum carapace width 6 cm. Prefers sandy to muddy substrates in subtidal waters. Fished sporadically and occasionally seen in local markets where it is sold for low prices, due to its small size. China and Japan to various parts of India and Southeast Asia.



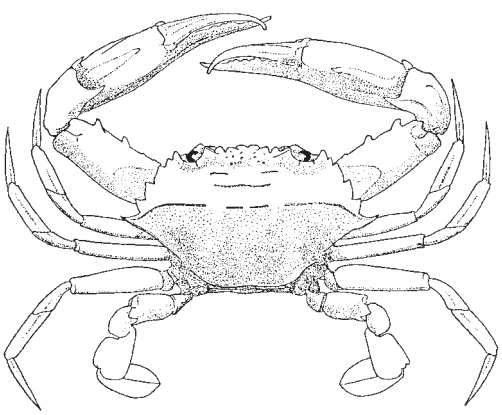
(from Leene, 1930)



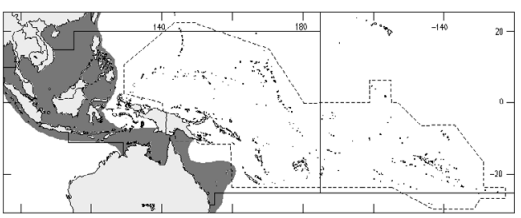
Charybdis anisodon (De Haan, 1850)

En - Twospined arm swimming crab.

Maximum carapace width 8 cm. Prefers muddy substrates at depths to 15 m. Occasionally collected by trawls and sold in local markets for its moderately large size. Indo-West Pacific in distribution, reaching Hawaii.



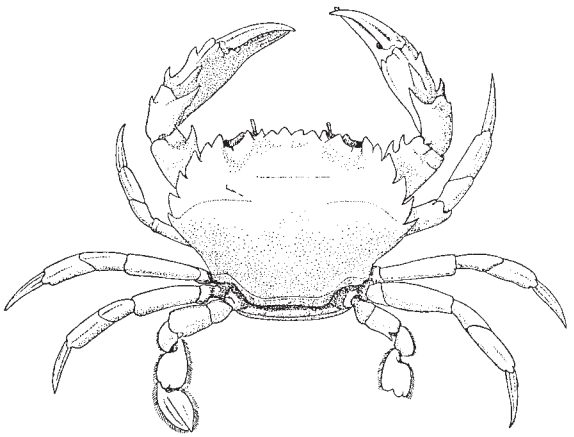
(from Leene, 1930)



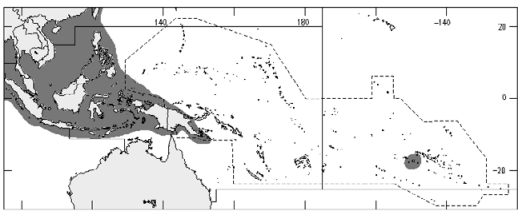
Charybdis annulata (Fabricius, 1798)

En - Banded-legged swimming crab.

Maximum carapace width 7 cm. Shows distinctive broad blue and white bands on the legs when alive. Prefers rocky areas and reefs, from the intertidal zone to a depth of about 20 m. Occasionally collected for food, but never abundant enough to be commercially important. Indo-West Pacific, from South Africa to Southeast Asia, Japan, and Tahiti.



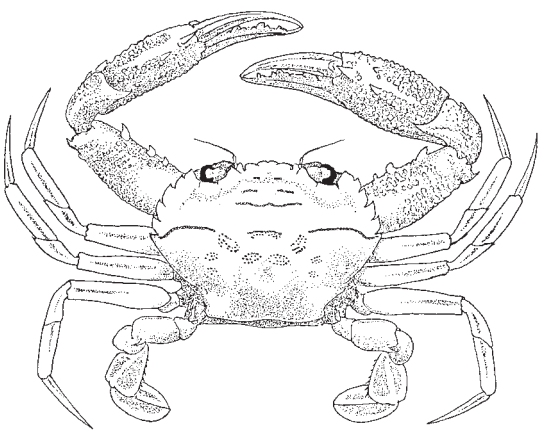
(from Leene, 1930)



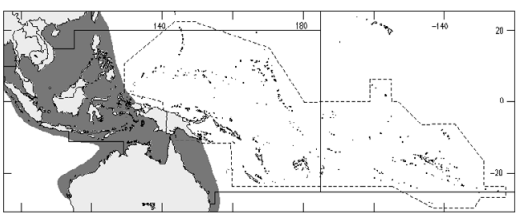
Charybdis truncata (Fabricius, 1798)

En - Blunt-toothed crab.

Maximum carapace width 5 cm. Prefers muddy bottoms at depths from 10 to 100 m. Locally abundant in some areas and obtained by trawls. Not commonly sold in markets. Indo-West Pacific, reaching Japan and Australia.



(from Leene, 1930)



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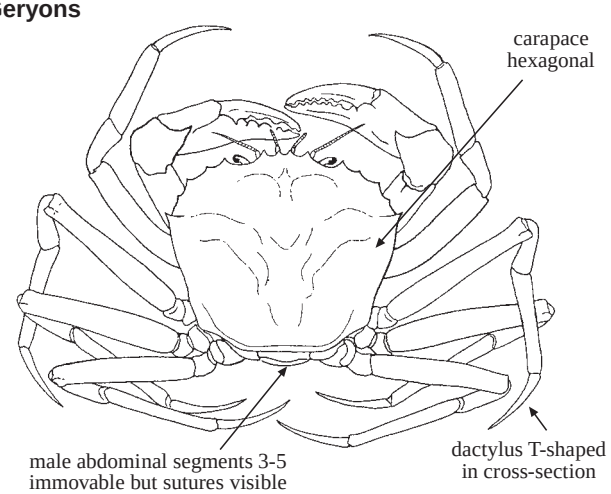
GERYONIDAE

Geryons



Diagnostic characters: Carapace hexagonal; dorsal surface relatively smooth to granular; frontal margin with 4 teeth; anterolateral margins distinctly convex, each with 3 to 5 low, sometimes indistinct teeth. **Dactylus of walking legs T-shaped in cross-section. Male abdominal segments 3 to 5 fused**, functionally immovable, but sutures still visible.

Habitat, biology, and fisheries: These are deep-sea crabs, normally occurring in depths below 100 m. Taken incidentally by trawls and traps. Crabs of the genus *Chaceon* are represented by numerous species of interest to fisheries. Although not all these species are harvested in large numbers, the fishery potential of geryons is quite great. The most widely exploited species is the Atlantic *C. maritae*. Five species of *Chaceon* are known from the Western Central Pacific so far. The more important species in the area are *C. granulatus* and *C. bicolor*. Further new species can be expected when more deep-water areas are sampled.

Remarks: The golden crabs or geryons (genus *Chaceon*) are a very distinctive taxonomic group. However, the composition of the family is still not settled and some genera which have been assigned to the Geryonidae should probably be transferred to the Goneplacidae instead. The known species of *Chaceon* can easily be separated into 2 groups: among the species occurring in the area, *C. bicolor*, *C. australis*, and *C. poupini* belong to the group in which the dactylus of walking legs is not laterally flattened, and the height at midlength is greater than, or subequal to, the width at midlength.[1/] Only 2 species in the area, namely *C. granulatus* and *C. karubar*, belong to the other group, in which the dactylus of legs is laterally flattened, and the height at midlength is less than the width at midlength.

Similar families occurring in the area

Members of the genus *Chaceon* can only be confused with some members of the Goneplacidae which also have a squarish carapace (the only commercial species of Goneplacidae in the area, *Carcinoplax longimanus*, has an ovoid carapace). In addition, the large size of geryons (usually exceeding 14 cm carapace width), the relatively long legs, the T-shaped cross-section of the dactylus of walking legs, and their occurrence in deep waters (deeper than 200 m), easily separates them from the goneplacids (no geryons are known from shallow waters).

Key to species of *Chaceon* occurring in the area

1a. Dorsal surface of carapace smooth to gently rugose, not granulose; branchial and posterolateral regions not swollen; dorsoventrally flattened, height at midlength 0.8 times or less than width at midlength . . . . . → ***2***

1b. Dorsal surface of carapace granulose; branchial and posterolateral regions raised; dactylus of legs laterally flattened, height at midlength subequal to or greater than width at midlength (0.9 times and more) . . . . . → ***4***

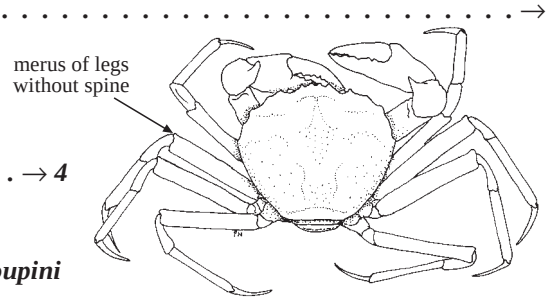


Fig. 1 ***Chaceon poupini***

2a. Merus of walking leg unarmed, without distinct dorsal distal spine or tooth (Fig. 1) . . . . . ***Chaceon poupini***

2b. Merus of walking leg with dorsal distal spine or tooth . . . . . → ***3***

1/ Three other species belonging to the same group have been reported from other places in the Pacific: *Chaceon yaldwyni* Manning, Dawson, and Webber, 1989 (New Zealand), *C. imperialis* Manning, 1992 (Emperor Seamount Chain), and *C. manningi* Ng, Lee, and Yu, 1994 (Tung-Sa Islands, South China Sea).

3a. Anterolateral margin of adults with spiniform teeth (Fig. 2). . . . . ***Chaceon australis***

3b. Anterolateral margins of adults with low, lobiform teeth (Fig. 3) . . . . . ***Chaceon bicolor***

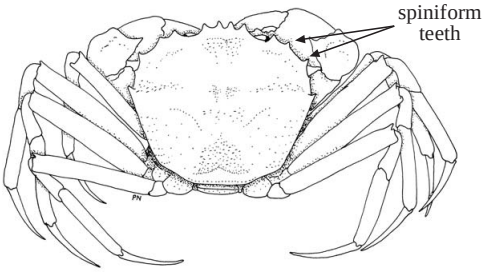


Fig. 2 ***Chaceon australis***

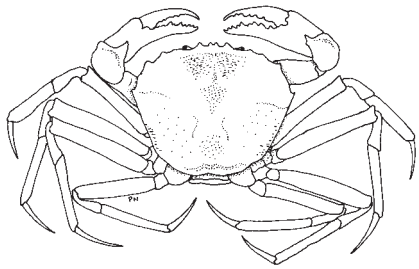


Fig. 3 ***Chaceon bicolor***

4a. Outer surface of chelipedal carpus with spine or projection on outer surface; merus of legs with distinct dorsal distal spine or tooth (Fig. 4) . . . . . ***Chaceon karubar***

4b. Outer surface of chelipedal carpus unarmed; merus of legs unarmed, without distinct dorsal distal spine or tooth (Fig. 5) . . . . . ***Chaceon granulatus***

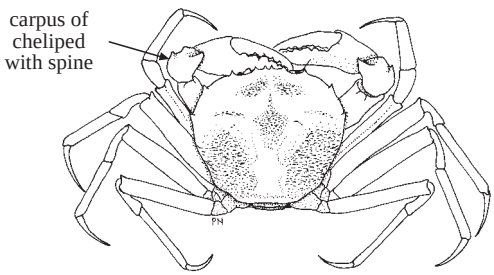


Fig. 4 ***Chaceon karubar***

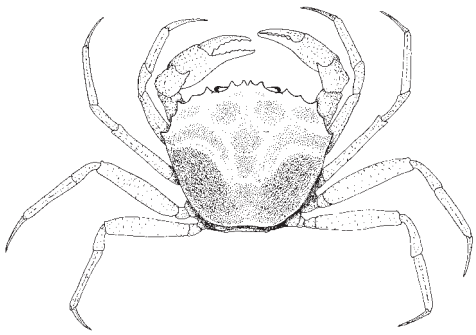


Fig. 5 ***Chaceon granulatus***

List of species of interest to fisheries occurring in the area

The symbol is given when species accounts are included.

- *Chaceon australis* Manning, 1993
- *Chaceon bicolor* Manning and Holthuis, 1989
- *Chaceon granulatus* (Sakai, 1978)
- *Chaceon karubar* Manning, 1993
- *Chaceon poupini* Manning, 1992

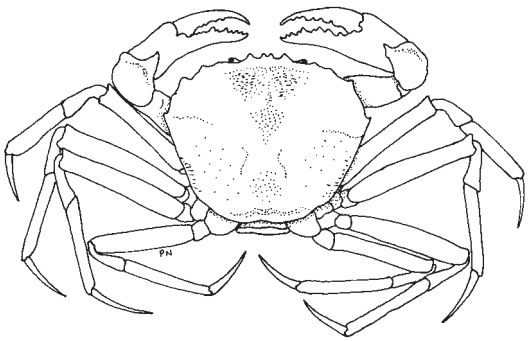
References

Manning, R.B. and L.B. Holthuis. 1981. West African Brachyuran Crabs (Crustacea: Decapoda). *Smithson. Contrib. Zool*., 306:1-379.

Manning, R.B. and L.B. Holthuis. 1989. Two new genera and nine new species of geryonid crabs (Crustacea: Decapoda: Geryonidae). *Proc. Biol. Soc. Wash.*, 102:50-77.

Ng, P.K.L. and R.B. Manning. 1998. A new deepwater crab from the Palau Islands, Micronesia (Decapoda: Brachyura: Geryonidae). *Proc. Biol. Soc. Wash.*, 111:in press.

Chaceon bicolor Manning and Holthuis, 1989

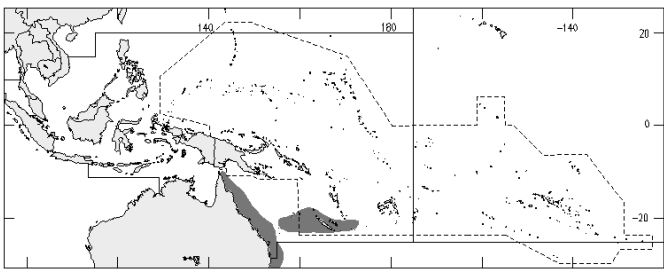


Frequent synonyms / misidentifications: None / None.

FAO name: En - Pacific golden crab.

Diagnostic characters: Carapace hexagonal; dorsal surface not inflated; anterolateral teeth low. Merus of legs long, slender. Dactylus of legs not laterally flattened, height at midlength greater than or subequal to width at midlength. **Colour:** reddish tan to purplish black (anterior half of carapace may be differently coloured than posterior half), sometimes cream-white throughout.

Size: Maximum carapace width 18 cm (males) and 15 cm (females).



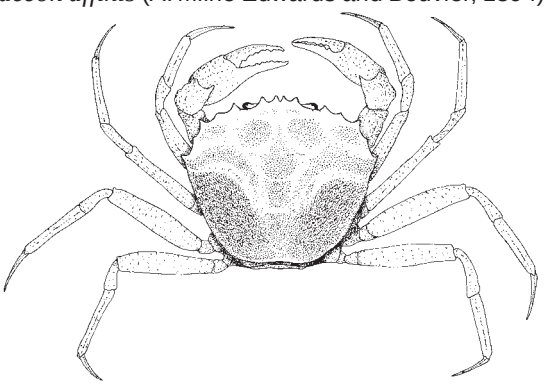
Habitat, biology, and fisheries: Like most of the known species of the genus, *Chaceon bicolor* lives on muddy substrates in deeper waters at depths between 200 and 1 600 m, and apparently burrows sometimes into the sediment. Occasionally caught throughout its range, especially in Australia. Taken in bottom trawls and lobster pots, and is believed to be commercially valuable in the future, being supposedly quite abundant in some areas.

Distribution: New Caledonia, northwest and eastern Australia, and Loyalty Islands.

Chaceon granulatus (Sakai, 1978)

Frequent synonyms / misidentifications: None / *Chaceon affinis* (A. Milne Edwards and Bouvier, 1894).

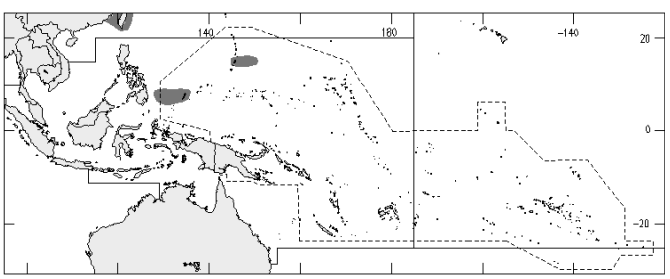
FAO name: En - Japanese golden crab.



Diagnostic characters: Carapace hexagonal; dorsal surface (especially branchial regions) distinctly inflated; anterolateral teeth low in adults. Merus of legs long, slender, with dorsal subdistal tooth; dactylus of legs laterally flattened, height at midlength less than width at midlength. **Colour:** uniform tan to cream colour overall.

Size: Maximum carapace width 30 cm.

Habitat, biology, and fisheries: On soft substrates in deep waters from 300 to 1 500 m. Caught on a regular basis in Japan, but never in large numbers. When it does appear in markets, it commands high prices (up to US$60 to US$80 for a fresh crab of 20 cm width). Also caught for sale in Palau.



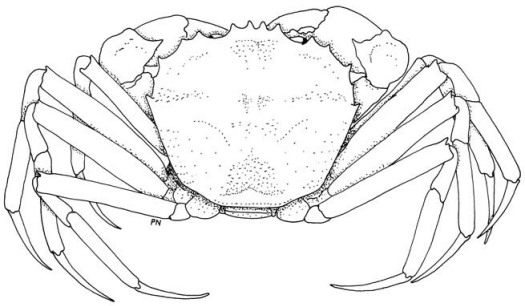
Distribution: Japan, China, Taiwan Province of China, and Palau.

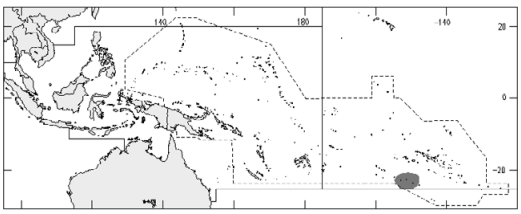
Remarks: Only 3 Pacific species of *Chaceon*, *C. granulatus*, *C. karubar*, and *C. manningi* belong to the group in which the dactylus of legs is laterally flattened, and the height at midlength is less than the width at midlength. Specimens from Saipan and Palau which have been identified with *C. granulatus* possibly belong to separate species, but studies on these are still ongoing. For the moment, crabs from these 2 islands are tentatively identified as *C. granulatus*. The Palau specimens were recently recognized as belonging to a new species.

Chaceon australis Manning, 1993

En - Austral golden crab.

Maximum carapace width 10 cm. Carapace pink and tan in life. Occurs in deeper waters at depths of about 900 m. Not collected commercially for food so far, but has good fishery potential with the future development of deep-water fisheries, due to its large size. Known only from the Austral Islands.

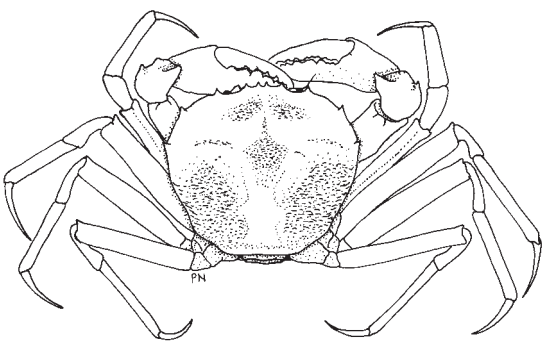


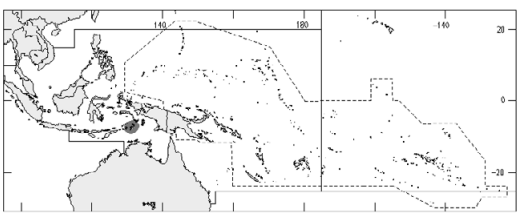


Chaceon karubar Manning, 1993

En - Indonesian golden crab.

Maximum carapace width 19 cm. In deeper waters at depths of about 550 m. Not collected commercially for food so far, but has a good fishery potential because of its large size. Known only from the Tanimbar Islands in Indonesia.

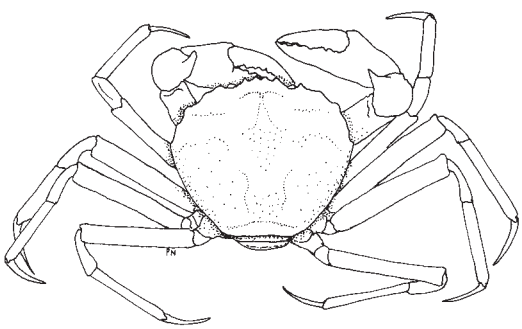


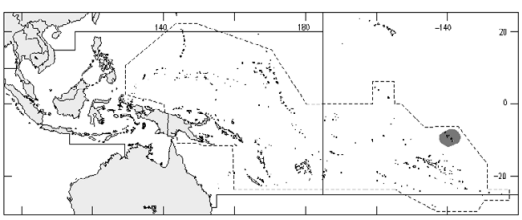


Chaceon poupini Manning, 1992

En - Polynesian golden crab.

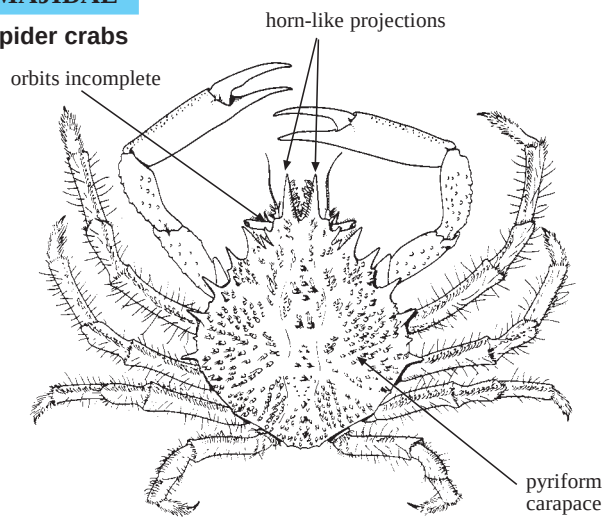
Maximum carapace width 14 cm. Colour uniform red in life. Occurs in deeper waters at depths from 600 to 1 000 m. Not collected commercially for food so far, but has a good fishery potential because of its large size. Known only from the Marquesas Islands.





MAJIDAE

Spider crabs



Diagnostic characters: Carapace pyriform (pear-shaped), circular to subovate, anterior 1/2 to 1/3 usually distinctly narrower than posterior part; dorsal surface gently convex, spinulose, granulose, and/or ridged; front narrow, often with 2 long horn-like projections (rostra); **orbits poorly developed to absent**; anterolateral margins of carapace often armed with well-developed spines. Legs spinulose and/or granulose, often with stiff setae. All male abdominal segments usually freely movable in most species.

Habitat, biology, and fisheries:[1/] Benthic crabs. Most species of minor or no importance to fisheries, with only the larger species of *Schizophrys* being occasionally collected in the Western Central Pacific.

Similar families occurring in the area

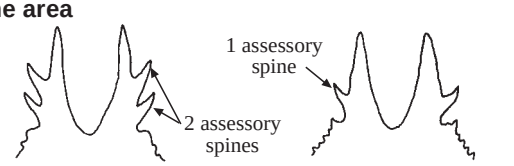
None. The generally pyriform (pear-like) shape of many majids easily distinguishes them from other families. Their orbits are usually poorly demarcated to incomplete and this feature is often quite diagnostic. In addition, many species have hook-like setae on their bodies and appendages with which they use to attach various materials for camouflage.

The Hymenosomatidae (crown crabs, non-commercial) closely resemble many majids, but are easily distinguished by their very small size (small species at 2 mm adult carapace width, being contenders with the pinnotherids for the smallest crabs in the world), the absence of hook-like setae, and having only 5 abdominal segments (excluding the telson).

Key to species of interest to fisheries occurring in the area

1a. Two accessory spines at base of each rostral horn (Fig. 1a) . . . . . ***Schizophrys dama***

1b. One accessory spine at base of each rostral horn (Fig. 1b) . . . . . ***Schizophrys aspera***



a) *Schizophrys dama* **b) *Schizophrys aspera***

Fig. 1 rostral horn (dorsal view)

List of species of interest to fisheries occurring in the area

The symbol 🕷 is given when species accounts are included.

🕷 *Schizophrys aspera* (H. Milne Edwards, 1834)
🕷 *Schizophrys dama* (Herbst, 1804)

References

Griffin, D.J.G. 1966. A review of the Australian majid spider crabs (Crustacea, Brachyura). *Australian Zoologist*, 13:259-298.

Griffin, D.J.G. and H.A. Tranter. 1986. The Decapoda Brachyura of the Siboga Expedition. VII. Majidae. *Siboga Exped. Monogr.*, 39c(4):1-335.

1/ The most important majids in fisheries are the large crabs of the genus *Chionoecetes* which occur in cold northern waters only. Near the area, the "Japanese giant spider crab" (*Macrocheira kaempferi*), known only from Japan and Taiwan Province of China, is occasionally collected for food. This is the largest crab in the world, reaching a carapace width of 30 cm and with legs spanning 2.5 m from tip to tip. The only other majid crab of fishery importance near the area is the southern spider crab (*Jacquinotia edwardsii*) from New Zealand, with several tonnes a month being landed.

Schizophrys aspera (H. Milne Edwards, 1834)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Common decorator crab.

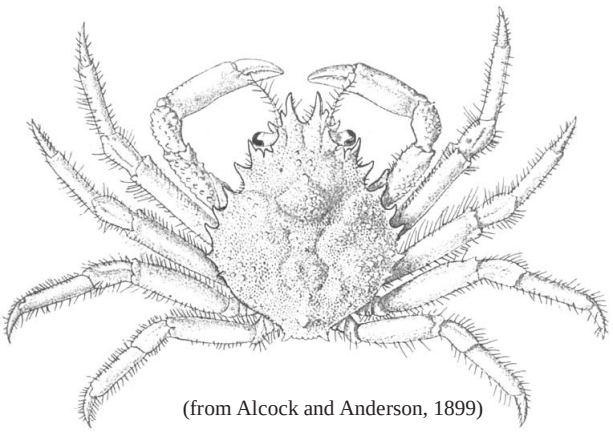
Diagnostic characters: Carapace pear-shaped, with 2 pronounced rostral horns. **Colour:** brown overall.

Size: Maximum carapace width 6 cm.

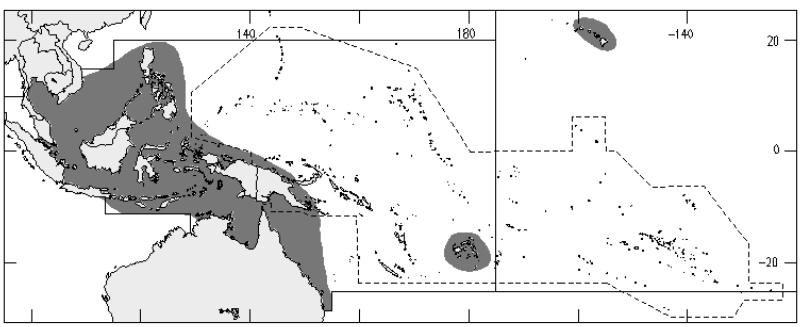
Habitat, biology, and fisheries: Found on rocks, especially near reefs, from intertidal areas to a depth of 40 m. Usually caught incidentally by hand, sometimes in crab pots. Only of local commercial importance.

Distribution: Indo-West Pacific, eastwards to Hawaii.

Remarks: *Schizophrys aspera* can be confused with *S. dama*, which is easily distinguished by the 2 accessory spines near the base of each rostral horns (only 1 spine in *S. aspera*).



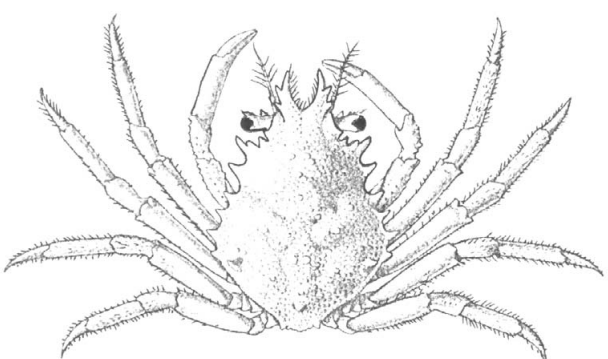
(from Alcock and Anderson, 1899)



Schizophrys dama (Herbst, 1804)

En - Pronghorn decorator crab.

Maximum carapace width 6 cm. A subtidal coral reef species, occasionally invades rocky and sandy areas. Collected incidentally by hand or with nets, but nowhere commercially important. Southeast Asia to New Guinea and Australia.



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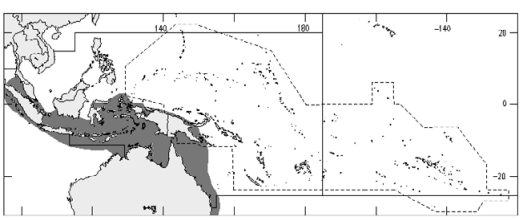
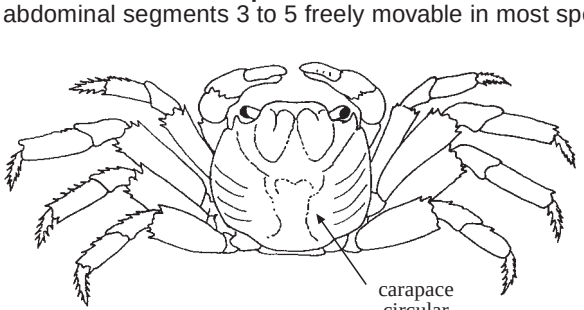


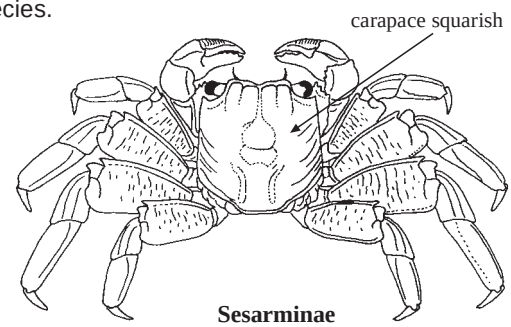
GRAPSIDAE

Sally-light-foots, vinegar crabs, and paddler crabs

Diagnostic characters: Carapace squarish, transversely rectangular, trapezoidal, or circular; dorsal surface flat to gently convex, with low oblique or transverse ridges; front much broader than orbits; **orbits occupying almost entire anterior border** (excluding front); antero- and posterolateral margins of carapace usually not clearly demarcated, lateral margins appearing almost straight or gently convex, usually armed with 1 or 2 teeth anteriorly, sometimes unarmed. **Rhomboidal gap usually present between third maxillipeds**, often with mandibles exposed. Dactylus of legs with distinct spines. Male abdominal segments 3 to 5 freely movable in most species.



Grapsinae

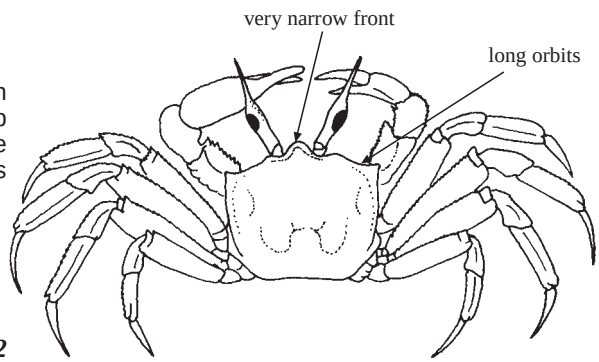


Sesarminae

Habitat, biology, and fisheries: Swimming, climbing, or terrestrial crabs, with the majority of species occurring in intertidal areas or semiterrestrial habitats. Many also occur in estuarine waters and a few species live exclusively in fresh water. Most species are of minor commercial importance, with species of the genera *Episesarma* and *Varuna* being most often collected for food.[1/]

Similar families occurring in the area

Ocypodidae: with a much narrower frontal margin of the carapace; always lack a rhomboidal gap between their third maxillipeds; crabs walk on the tip of dactyli of legs, not on the sides of dactyli (as seen in grapsids).

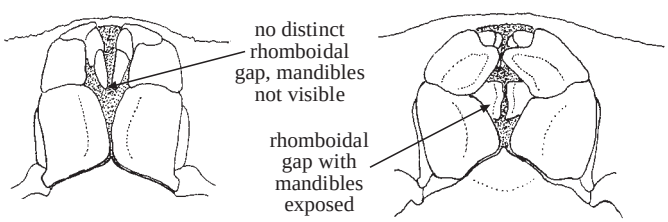


Ocypodidae

Key to the subfamilies of Grapsidae

1a. No distinct rhomboidal gap between third maxillipeds (Fig. 1a) . . . . . → ***2***

1b. Distinct rhomboidal gap between third maxillipeds (Fig. 1b) . . . . . → ***3***



a) Varuninae, Plagusiinae **b) Sesarminae, Grapsinae**

Fig. 1 third maxillipeds

1/ The most important grapsids commercially are the "mitten crabs" of the genus *Eriocheir* (Varuninae) from China, Taiwan Province of China, Japan, and Korea (see Guo et al., 1997). Costing up to US$ 20 each, these relatively large grapsids are netted in enormous numbers when they migrate from fresh waters to the sea to spawn. They are much sought after for their ripe ovaries.

2a. Carapace squarish; frontal margin entire, without lobes or teeth; third maxilliped with broad exopod and long flagellum (Fig. 2a); male abdomen with all segments movable (Fig. 3a) . . . . . **Varuninae**

2b. Carapace circular; third maxilliped with slender exopod and no flagellum (Fig. 2b); male abdomen with segments 3 to 6 immovable, with suture between segments 3 and 4 still evident (Fig. 3b) . . . . . **Plagusiinae**

(a single species of interest to fisheries, *Plagusia tuberculata*, occurring in the area)

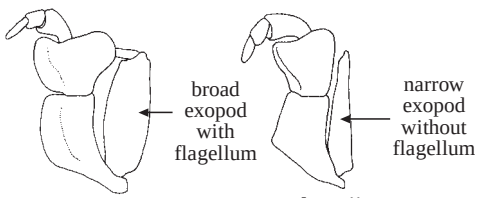


Fig. 2 third maxilliped

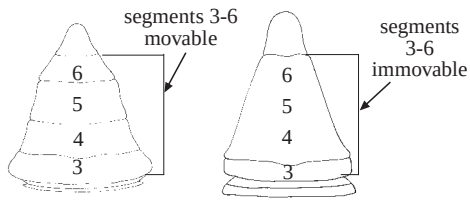


Fig. 3 male abdomen

3a. Merus and ischium of third maxillipeds with ridge (Fig. 4a); pterygostomial region with network-like (reticulated) pattern of very short, stiff setae (Fig. 5a); carapace usually squarish . . . . . **Sesarminae**

3b. Merus and ischium of third maxillipeds without hairy oblique ridge (Fig. 4b); pterygostomial region may be setose but no network-like pattern discernible (Fig. 5b); carapace usually circular . . . . . **Grapsinae**

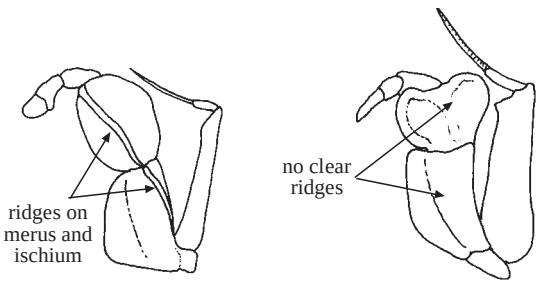


Fig. 4 third maxilliped

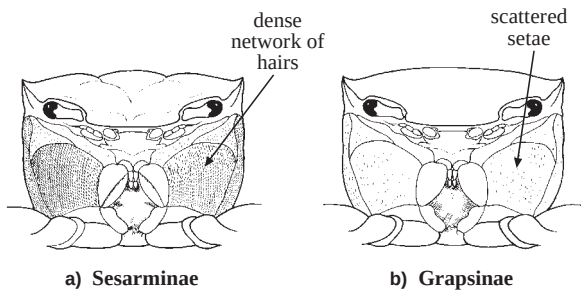


Fig. 5 body in frontal view

Key to food species of Grapsinae occurring in the area

1a. Front gently deflexed, margin weakly serrated (Fig. 6a); inner angle of carpus of cheliped with acutely triangular spine (Fig. 7a); pectinated fingertips of chela longitudinally broad (Fig. 8a); adult male sixth abdominal segment shorter than fifth segment (Fig. 9a) . . . . . ***Grapsus albolineatus***

1b. Front strongly deflexed and appears almost vertical from frontal view, margin serrated (Fig. 6b); inner angle of carpus of cheliped with subtruncate base (Fig. 7b); pectinated fingertips of chela longitudinally narrow (Fig. 8b); adult male sixth abdominal segment distinctly longer than or subequal in length to fifth segment (Fig. 9b) . . . . . ***Grapsus tenuicrustatus***

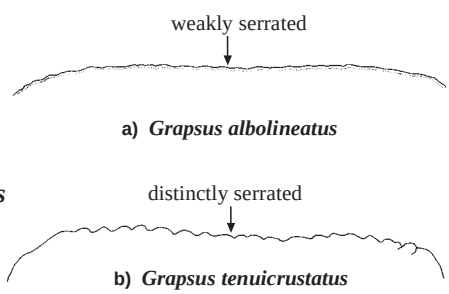
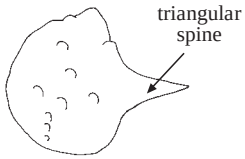
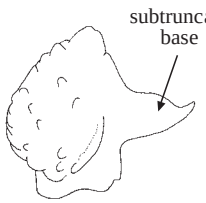


Fig. 6 frontal margin of carapace

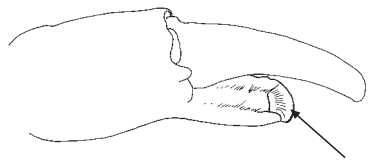


a) *Grapsus albolineatus*

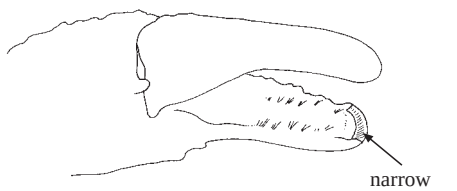


b) *Grapsus tenuicrustatus*

Fig. 7 carpus of cheliped

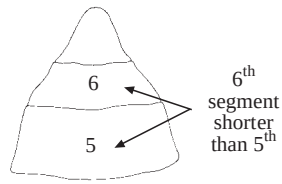


a) *Grapsus albolineatus*

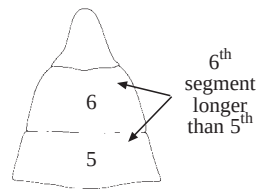


b) *Grapsus tenuicrustatus*

Fig. 8 chela



a) *Grapsus albolineatus*



b) *Grapsus tenuicrustatus*

Fig. 9 male abdomen

Key to food species of Sesarminae occurring in the area

1a. Tubercles on dorsal margin of dactylus of chela numbering 64 to 76 (Fig. 10a); male first gonopod with broad, truncate pectinated tip (Fig. 11a); most of outer surface of palm and proximal part of dactylus purple to reddish, dactylus white distally, pollex orangish red to pink . . . . . ***Episesarma chengtongense***

1b. Tubercles on dorsal margin of dactylus of chela numbering less than 61; male first gonopod tip not as above; outer surface of palm not coloured as above . . . . . → ***2***

2a. Tubercles on dorsal margin of dactylus of chela similarly sized throughout length, numbering 40 to 50 (Fig. 10b); male first gonopod with broad, rounded pectinated tip (Fig. 11b); outer surface of palm light brown with white fingertips . . . . . ***Episesarma palawanense***

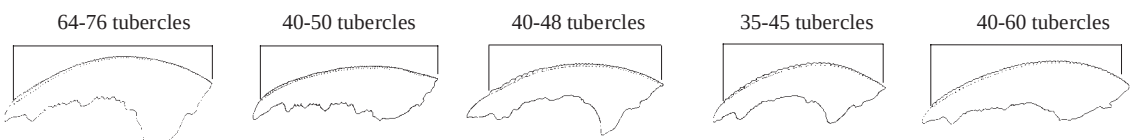
2b. Tubercles on dorsal margin of dactylus of chela increasing in size towards finger tip; male first gonopod not as above; outer surface of palm light brown with white fingertips or coloured in other ways . . . . . → ***3***

3a. Outer surface of palm violet at the proximal part, distal part and fingers white; tubercles on dorsal margin of dactylus of chela 40 to 48 (Fig. 10c); male first gonopod with relatively narrow truncate pectinated tip (Fig. 11c) . . . . . ***Episesarma versicolor***

3b. Outer surface of palm uniformly red or brown; tubercles on dorsal margin of dactylus of chela 35 to 60; male first gonopod tip not as above . . . . . → ***4***

4a. Tubercles on dorsal margin of dactylus of chela numbering 35 to 45 (Fig. 10d); male first gonopod with relatively broad, bent pectinated tip (Fig. 11d); outer surface of palm uniformly red to chestnut brown . . . . . ***Episesarma singaporense***

4b. Tubercles on dorsal margin of dactylus of chela numbering 40 to 60 (Fig. 10e); male first gonopod with relatively narrow, bent pectinated tip (Fig. 11e); outer surface of palm light brown with white fingertips . . . . . ***Episesarma mederi***



a) *Episesarma chengtongense* b) *Episesarma palawanense* c) *Episesarma versicolor* d) *Episesarma singaporense* e) *Episesarma mederi*

Fig. 10 dactylus of chela (lateral view)

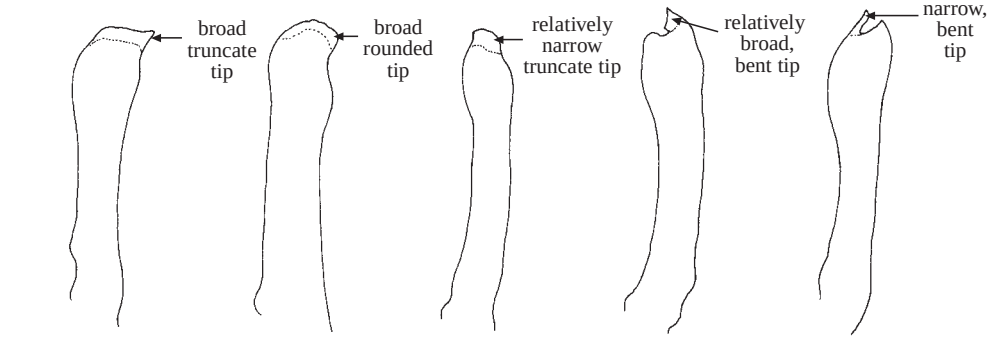


Fig. 11 male first gonopod

Key to food species of Varuninae occurring in the area

1a. Distal process of male first gonopod with 1 process distinctly longer than the other (Fig. 12a); occurs mainly in continental shelf waters . . . . . ***Varuna yui***

1b. Distal process of male first gonopod with both processes subequal in size (Fig. 12b); occurs mainly in areas with more oceanic waters . . . . ***Varuna litterata***

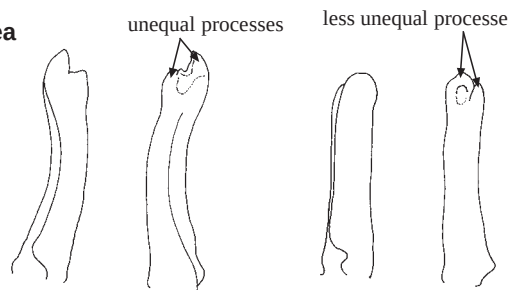


Fig. 12 male first gonopod

List of species of interest to fisheries occurring in the area

The symbol is given when species accounts are included.

Subfamily GRAPSINAE

Grapsus albolineatus Lamarck, 1818
Grapsus tenuicrustatus (Herbst, 1783)

Subfamily PLAGUSIINAE

Plagusia tuberculata Lamarck, 1818

Subfamily SESARMINAE

Episesarma mederi (A. Milne Edwards, 1854)
Episesarma chengtongense (Serène and Soh, 1967)
Episesarma palawanense (Rathbun, 1914)
Episesarma singaporense (Tweedie, 1936)
Episesarma versicolor (Tweedie, 1940)

Subfamily VARUNINAE

Varuna litterata (Fabricius, 1798)
Varuna yui Hwang and Takeda, 1984

References

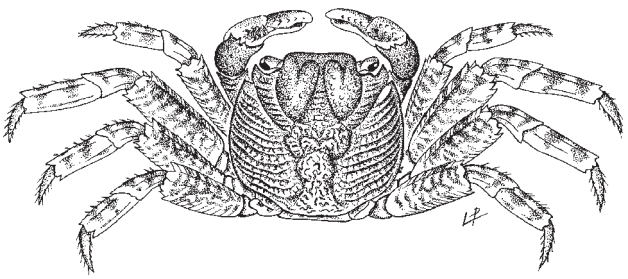
Alcock, A. 1900. Materials for a carcinological fauna of India. No. 6. The Brachyura Catometopa or Grapsoidea. *J. Asiat. Soc. Bengal*, 69, pt. 2(3):279-486.

Crosnier, A. 1965. Crustacés Décapodes. Grapsidae et Ocypodidae. *Faune de Madagascar*, 18:1-143.

Grapsus albolineatus Lamarck, 1818

Frequent synonyms / misidentifications: *Grapsus strigosus* (Herbst, 1799) / None.

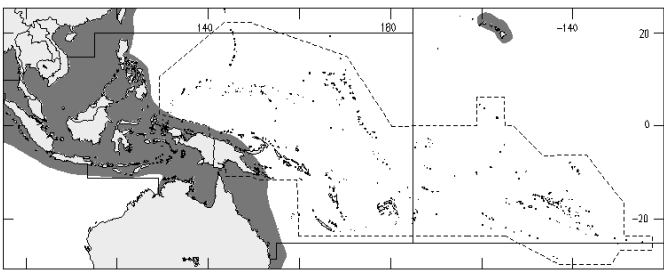
FAO name: En - Mottled Sally-light-foot.



Diagnostic characters: Carapace rounded; front straight, entire; anterolateral margins rounded, each with 1 tooth; lateral regions with numerous oblique striae. Fingertips strongly spooned. **Colour:** carapace with green and white transverse markings.

Size: Maximum carapace width 5 cm.

Habitat, biology, and fisheries: Found out of the water, on rocks in the splash zone. Collected only incidentally and consumed by local residents only. Usually caught by hand or with special nets.



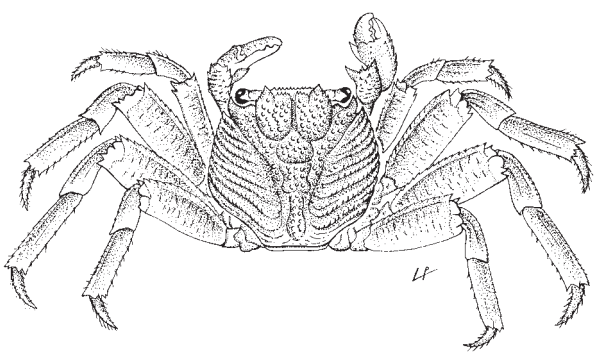
Distribution: Indo-West Pacific.

Remarks: Several other *Grapsus* species live in the region, but the most common are *G. albolineatus* and *G. tenuicrustatus* (see below). These 2 species, however, can easily be separated (see key).

Grapsus tenuicrustatus (Herbst, 1783)

Frequent synonyms / misidentifications: None / None.

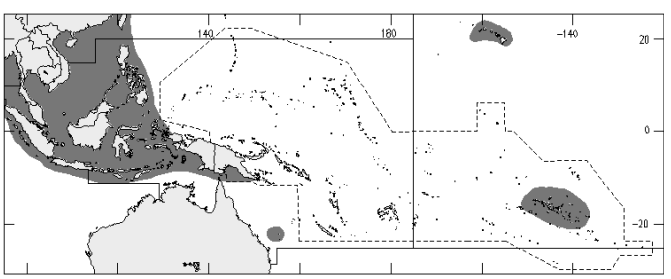
FAO name: En - Natal Sally-light-foot.



Diagnostic characters: Carapace rounded; front straight, finely serrated; anterolateral margins rounded, each with 1 tooth; lateral regions with numerous oblique striae. Fingertips slightly spooned. **Colour:** carapace with green and white transverse markings.

Size: Maximum carapace width 8 cm.

Habitat, biology, and fisheries: Found out of the water, on rocks in the splash zone. Collected only incidentally and consumed by local residents. Usually caught by hand or with special nets. Probably the most common representative of *Grapsus* among several species occurring in the area.

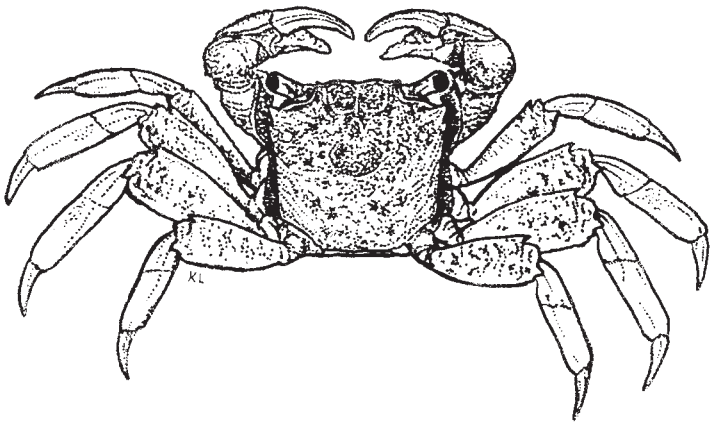


Distribution: Indo-West Pacific, including French Polynesia and Hawaii.

Episesarma versicolor (Tweedie, 1940)

Frequent synonyms / misidentifications: None / None.

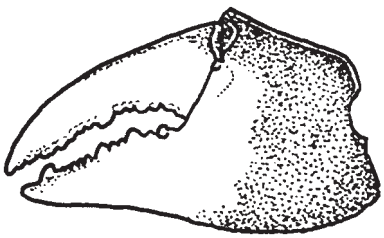
FAO name: En - Violet vinegar crab.



Diagnostic characters: Carapace squarish, with 1 small anterolateral tooth; dorsal surface relatively flat; regions well defined, covered with short, stiff setae. Dorsal margin of dactylar finger with numerous (40 to 48) tubercles, forming a stridulatory organ. **Colour:** carapace brown to brownish grey; outer surface of palm with proximal parts violet, distal parts and fingers white.

Size: Maximum carapace width 5 cm (for *Episesarma* spp.).

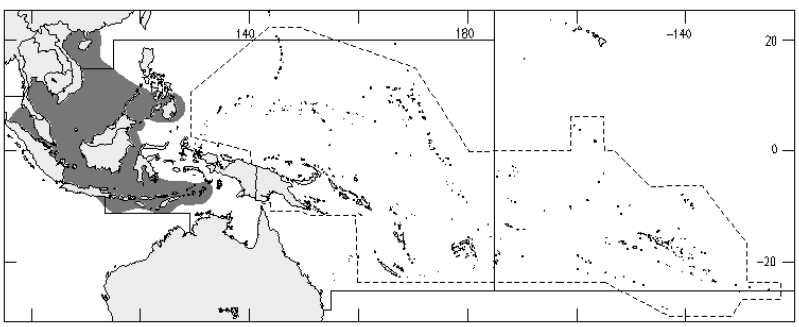
Habitat, biology, and fisheries: All members of *Episesarma* are mangrove crabs, digging burrows at the base of trees or at mud lobster (*Thalassina*) mounds, and are predominantly herbivorous. There are several species of *Episesarma* known from Southeast Asia, all of which are harvested to varying degrees. They are collected in large numbers for food in many Southeast Asian countries and some southern Chinese communities. The crabs are collected by hand, often pickled in vinegar and/or salt solutions and are then eaten as they are with rice, or deep fried. In northern Australia, an undescribed species of *Episesarma* is eaten by the aborigines (P. Davie, pers. comm.).



outer surface of chela

Distribution: Southeast Asia and southern China.

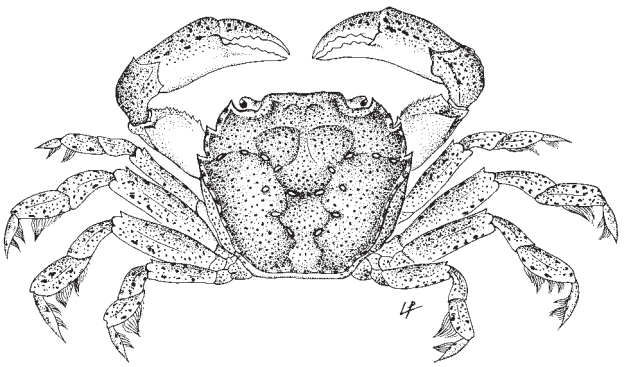
Remarks: Four other species of *Episesarma* in Southeast Asia are large and common enough to be collected for food. These are *E. singaporense*, *E. mederi*, *E. chengtongense*, and *E. palawanense* (see abbreviated species accounts below). They are easily distinguished by various carapace and cheliped characters, and on the basis of live colours.



Varuna litterata (Fabricius, 1798)

Frequent synonyms / misidentifications: None / None.

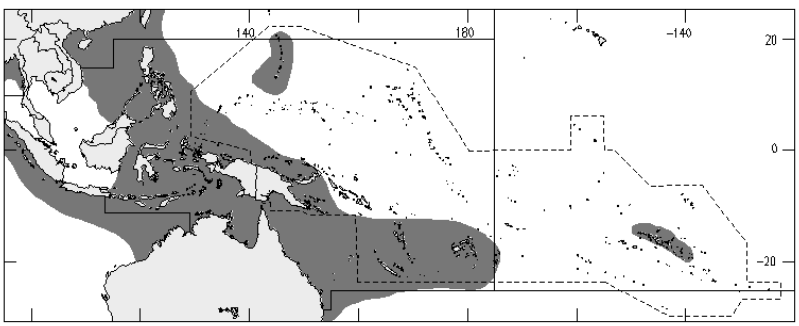
FAO name: En - Oceanic paddler crab.



Diagnostic characters: Carapace squarish, surface smooth; front straight; anterolateral margins each with 3 very broad, low but sharp teeth. Dactylus, propodus, and carpus of legs laterally flattened, fringed with long, closely packed setae. **Colour:** light brown to brownish grey on dorsal surfaces.

Size: Maximum carapace width 5 cm (males).

Habitat, biology, and fisheries: *Varuna litterata* prefers areas faced by more oceanic waters whereas *V. yui* is only known from the continental shelf waters of Southeast Asia and neighbouring areas. Both species occur together in the Philippines. *V. litterata* and *V. yui* are generally estuarine crabs that usually prefer slow-moving or almost stagnant bodies of water. Both species, however, can be found up to 20 km from the sea in completely fresh water. Large or ovigerous specimens can be found in intertidal areas, frequently associated with floating clumps of brown algae, *Sargassum* spp. Collected in good numbers in most Southeast Asian countries for food. Usually collected by hand, but also caught by traps, seines, and fish corrals. Like *Episesarma*, the species of *Varuna* in the area are usually pickled in vinegar and/or salt solutions. They are then eaten as such or deeply fried. They are also collected for their tasty ovaries and are especially common in markets during their breeding period.



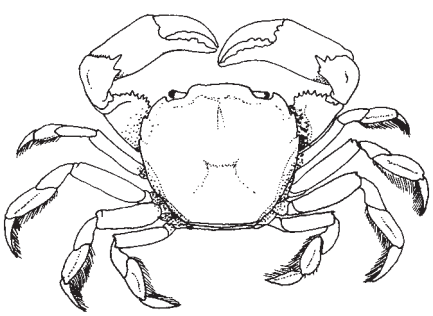
Distribution: Widely distributed in the Indo-West Pacific.

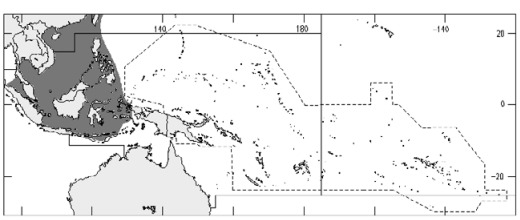
Remarks: The 2 species of *Varuna* in the area, *V. litterata* and *V. yui* (see abbreviated species account below), are very similar externally, and can only be distinguished effectively by means of their male gonopods.

Varuna yui Hwang and Takeda, 1984

En - Sundaic paddler crab.

Maximum carapace width 5 cm. In estuarine waters up to 20 km inland in completely fresh water. Collected in large numbers in most Southeast Asian countries for local consumption. Usually collected by hand, but also caught by traps, seines, and fish corrals. In continental shelf waters of the Sunda Shelf up to southern China and Philippines, occurring together with *Varuna litterata* in the latter 2 localities. *V. yui* is the dominant species of the genus in the Sunda Shelf.

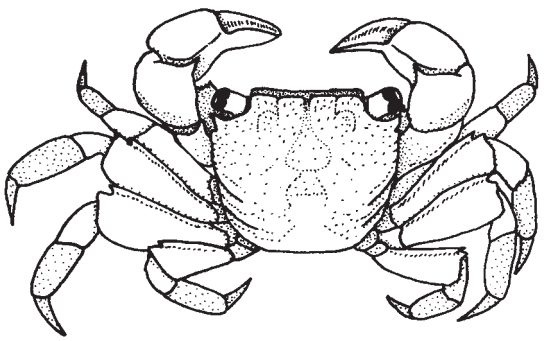


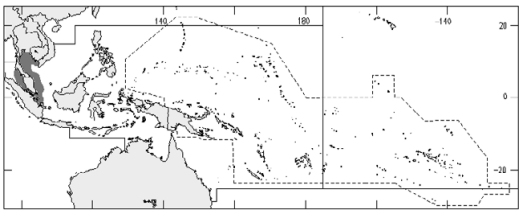


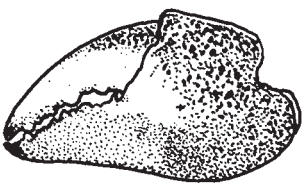
Episesarma chengtongense (Serène and Soh, 1967)

En - Pinkfingered vinegar crab.

Maximum carapace width 5 cm. Found only in mangroves. Collected by hand for food, and usually sold fresh or pickled in vinegar. Occurs in southern China and various parts of Southeast Asia.





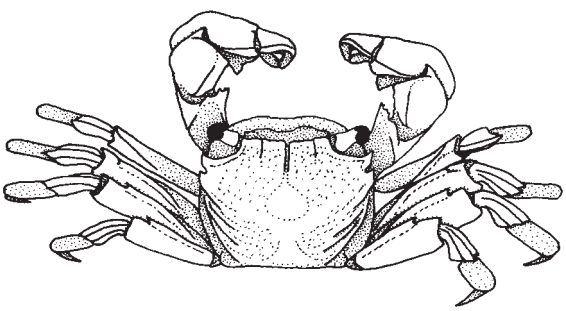


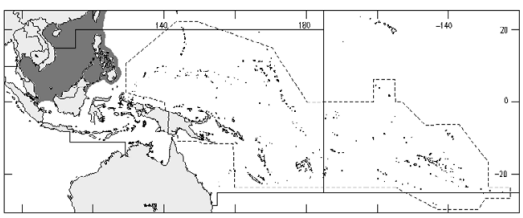
outer surface of chela

Episesarma mederi (A. Milne Edwards, 1854)

En - Thai vinegar crab.

Maximum carapace width 4 cm. Inhabits mangroves and forested muddy habitats. Collected by hand in large numbers for food, and usually sold fresh or pickled in vinegar. Occurs in southern China and various parts of Southeast Asia.

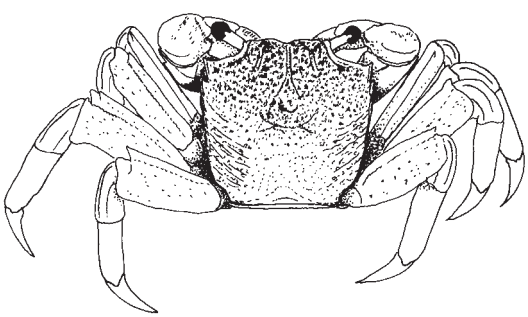


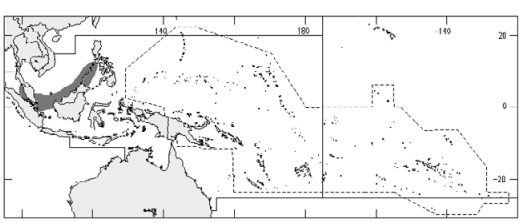


Episesarma palawanense (Rathbun, 1914)

En - Rathbun's vinegar crab.

Maximum carapace width 4 cm. Inhabits mangroves. Collected by hand for food, and usually sold fresh. Occurs in various parts of Southeast Asia.

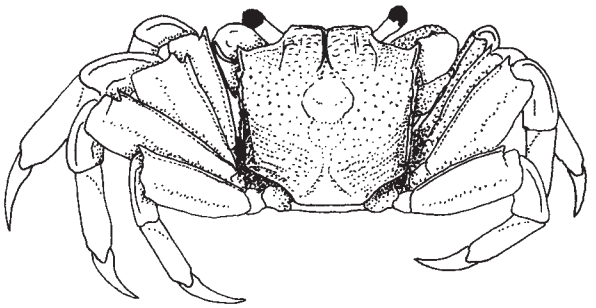


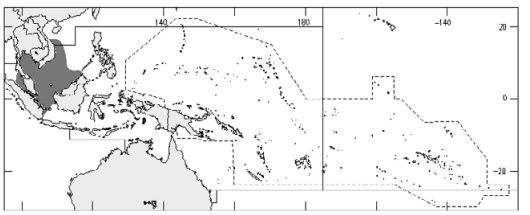


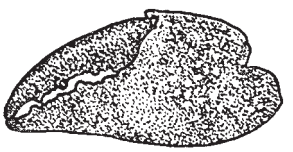
Episesarma singaporense (Tweedie, 1936)

En - Singapore vinegar crab.

Maximum carapace width 4 cm. Inhabits mangroves. Collected by hand in good numbers for food, and is usually sold fresh in markets or pickled in vinegar. Occurs in parts of Southeast Asia.





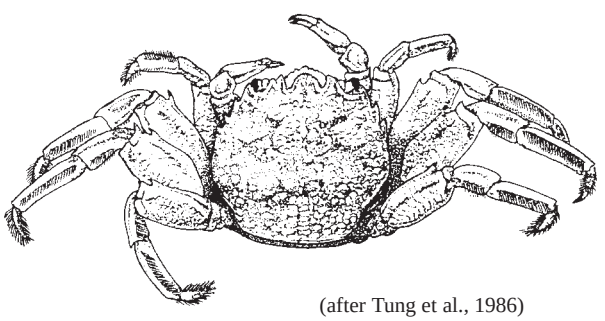


outer surface of chela

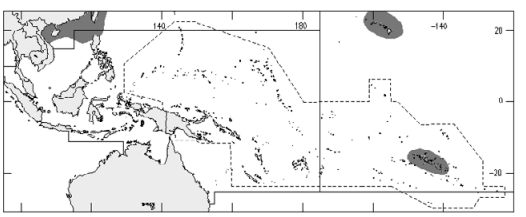
Plagusia tuberculata Lamarck, 1818

En - Tuberculated Sally-light-foot.

Maximum carapace width about 4 cm. On rocks just above the splash zone. Collected by hand and traps for food in rural communities, and usually pickled in vinegar or sauce as a food supplement. Indo Pacific in distribution, reaching New Zealand, Hawaii, French Polynesia, and California in the eastern Pacific.



(after Tung et al., 1986)



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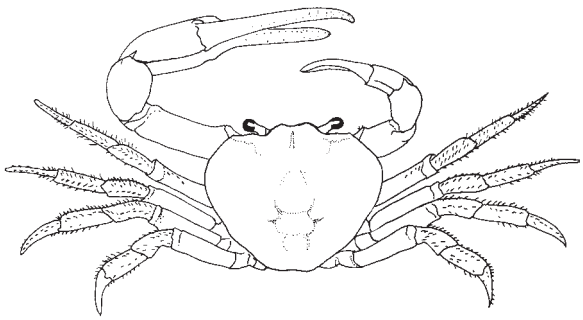
GECARCINIDAE

Land crabs

Diagnostic characters: Carapace circular to transversely ovate; dorsal surface smooth, strongly convex longitudinally and transversely; frontal margin entire; anterolateral margins unarmed or each with a single tooth. **Rhomboidal gap present between third maxillipeds**. Legs stout, dactylus longitudinally ridged, often with dense, stiff setae, margins with spines. All male abdominal segments distinct, movable.



Habitat, biology, and fisheries: Terrestrial crabs. Although gercarcinids can be found many kilometres inland, they must return to the sea to spawn and release their planktonic larvae. The most frequently collected food species in the area is *Cardisoma carnifex*.

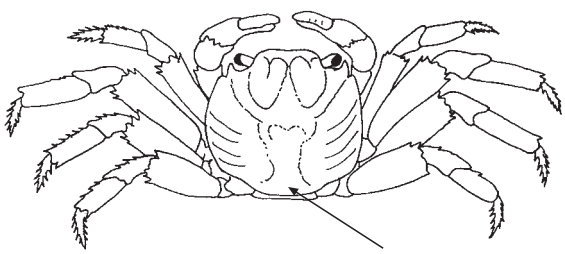
Similar families occurring in the area

The swollen carapace and terrestrial habitats of the gecarcinids make them a very distinctive group. In this respect they may be confused with several fresh-water and terrestrial genera of Gecarcinucidae, Potamidae, and Parathelphusidae (species of the latter 2 are collected for food in many parts of Southeast Asia and Indo-China).

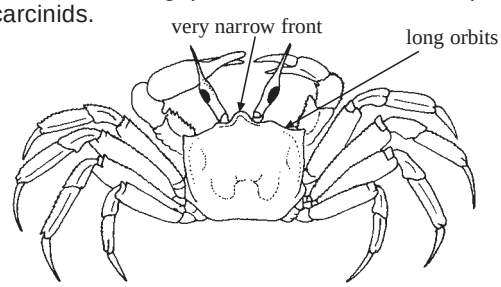
Potamidae, Gecarcinucidae, Parathelphusidae (= Sundathelphusidae): several genera of these exclusive fresh-water families may resemble gecarcinids, but are readily distinguished by the lack of a rhomboidal gap between the third maxillipeds.

Grapsidae: also have a rhomboidal gap between the third maxillipeds, but most species possess a much flatter dorsal carapace surface compared to gecarcinids.

Ocypodidae: also have many terrestrial members, but lack a rhomboidal gap between the third maxillipeds and generally do not have as thick a shell as seen in gecarcinids.



Grapsidae

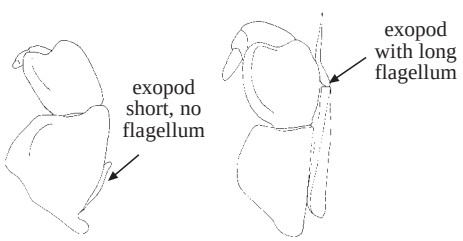


Ocypodidae

Key to species of interest to fisheries occurring in the area

1a. Exopod of third maxilliped without flagellum (Fig. 1a); orbits oblique, eyes small, never reaching first anterolateral tooth (Fig. 2). . . . . ***Gecarcoidea lalandii***

1b. Exopod of third maxilliped with long flagellum (Fig. 1b); orbits horizontal, eyes well developed, reaching to just before first anterolateral tooth. . . . . → *2*



a) ***Gecarcoidea lalandii*** b) ***Cardisoma* spp.**

Fig. 1 third maxilliped

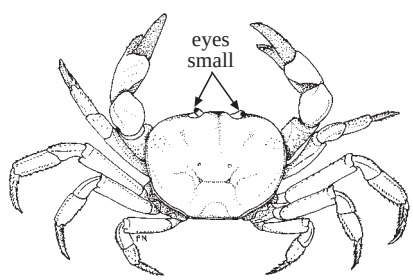


Fig. 2 *Gecarcoidea lalandii*

2a. Legs very long (Fig. 3) . . . . . ***Cardisoma longipes***
2b. Legs of normal length . . . . . → ***3***

3a. Surface of carapace with numerous scattered flattened to rounded granules (Fig. 4) . . . . . ***Cardisoma rotundum***
3b. Surface of carapace smooth . . . . . → ***4***

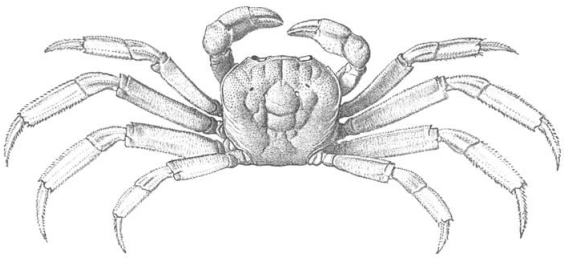


Fig. 3 ***Cardisoma longipes***
(from A. Milne Edwards, 1873)

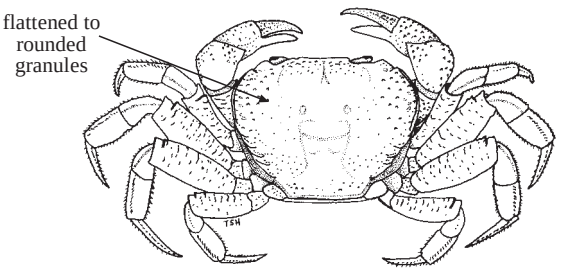


Fig. 4 ***Cardisoma rotundum***

4a. Carapace transversely ovate; face (pterygostomial and sub-branchial regions) with large setose area which covers anterior part of the branchiostegal region; stiff setae present on merus of legs; males with 2 equally enlarged chelae; carapace bluish brown to blue coloration in life (Fig. 5) . . . . . ***Cardisoma hirtipes***
4b. Carapace circular; face (pterygostomial and sub-branchial regions) with small setose area which does not reach branchiostegal region; short (or no) setae on merus of legs; males with 1 cheliped several times size of other; carapace brown in life (Fig. 6) . . . . . ***Cardisoma carnifex***

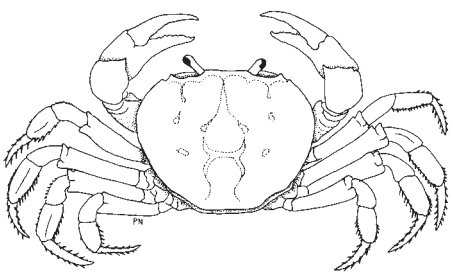


Fig. 5 ***Cardisoma hirtipes***

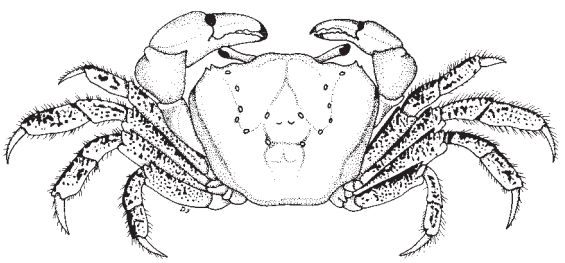


Fig. 6 ***Cardisoma carnifex***

List of species of interest to fisheries occurring in the area

The symbol 🕷 is given when species accounts are included.

🕷 *Cardisoma carnifex* (Herbst, 1794)
🕷 *Cardisoma hirtipes* Dana, 1852
🕷 *Cardisoma longipes* (A. Milne Edwards, 1873)
🕷 *Cardisoma rotundum* (Quoy and Gaimard, 1824)
🕷 *Gecarcoidea lalandii* (H. Milne Edwards, 1837)

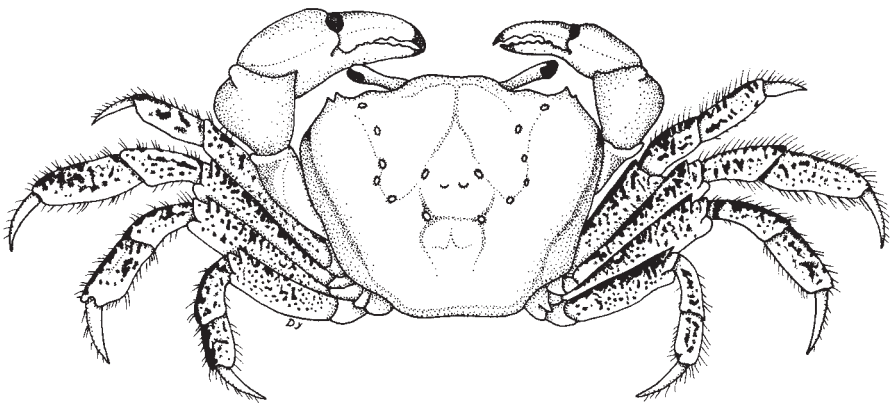
References

Burggren, W.W. and B.R. McMahon (eds). 1988. *The biology of land crabs*. Cambridge University Press, 479 p.
Türkay, M. 1974. Die Gecarcinidae Asiens und Ozeaniens (Crustacea: Decapoda). *Senckenb. Biol.*, 55:223-259.

Cardisoma carnifex (Herbst, 1794)

Frequent synonyms / misidentifications: *Cardisoma urvillei* H. Milne Edwards, 1853; *C. obesum* Dana, 1851 / None.

FAO name: En - Brown land crab.

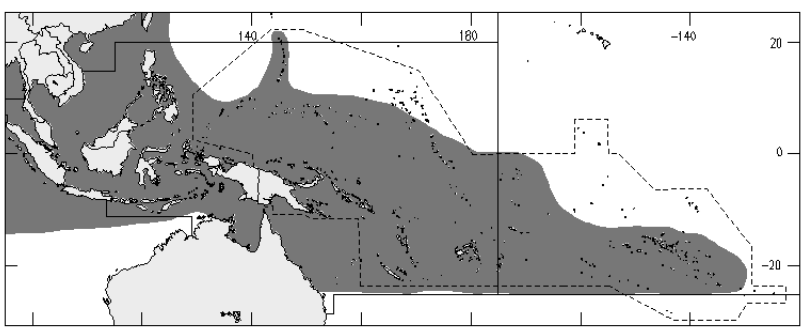


Diagnostic characters: Carapace subovate, swollen, surface smooth; setose area on pterygostomial and subbranchial regions small, not extending to branchiostegal region. Third maxilliped with well-developed flagellum on exopod, entirely covered by setae. Adult males with one chela greatly enlarged. Merus of legs not distinctly lined with stiff setae. **Colour:** brown to brownish grey.

Size: Maximum carapace width 12 cm (males).

Habitat, biology, and fisheries: In back mangroves or similar brackish-water habitats. Completely terrestrial crabs, living near the sea and excavating deep burrows. The larvae are released into the sea and return back to land upon completion of their development. *Cardisoma carnifex* is collected in substantial numbers whenever it is common, but has a comparatively low market value. It is usually caught by hand at night, or with special traps placed at the mouth of its burrow. The crabs are sold live. There have been reports that some land crabs are poisonous but this is almost certainly associated with their diet, as these herbivorous crabs sometimes consume poisonous plants. Once they are kept for short periods and their guts are empty however, they are safe for human consumption. Three other species of *Cardisoma* are found in the area, *C. hirtipes* Dana, 1852, *C. rotundum* and *C. longipes* (A. Milne Edwards, 1873) (see abbreviated species accounts below), but these are only of minor food value, being much less common than *C. carnifex*.

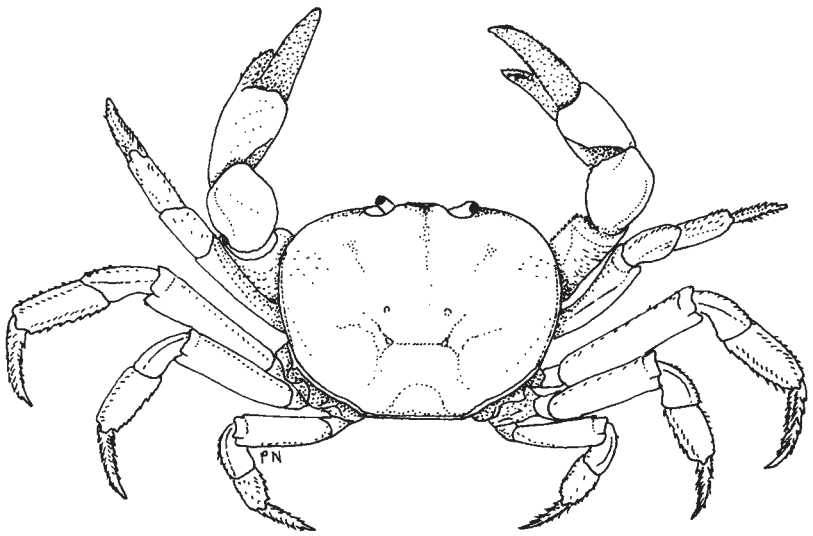
Distribution: Indo-West Pacific.



Gecarcoidea lalandii (H. Milne Edwards, 1837)

Frequent synonyms / misidentifications: *Hylaeocarcinus humei* Wood Mason, 1873; *Pelocarcinus marchei* A. Milne Edwards, 1890; *P. cailloti* A. Milne Edwards, 1890; *Limnocarcinus intermedius* De Man, 1879 / None.

FAO name: En - Purple land crab.



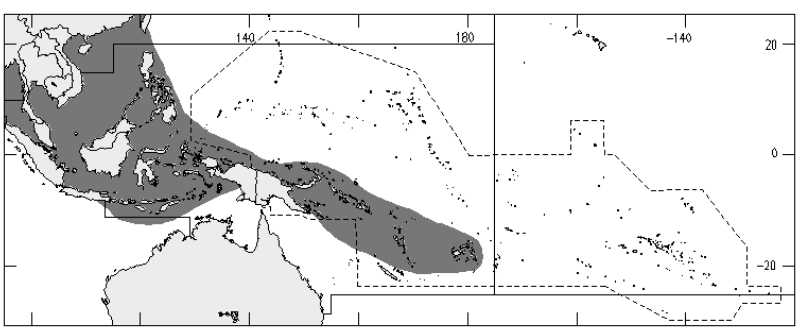
Diagnostic characters: Carapace distinctly transversely ovate, swollen, surfaces smooth; orbits relatively small, eyes slanted obliquely in adults; third maxilliped without any flagellum on exopod. **Colour:** purplish brown to purple and reddish purple.

Size: Maximum carapace width 13 cm (males).

Habitat, biology, and fisheries: Fully terrestrial, can be found many kilometres away from the sea. Normally inhabits shallow burrows or under trees and rocks in undisturbed forests in isolated islands, where they may be very common. The crabs release their larvae into the sea, which return to land upon completion of their development. *Gecarcoidea lalandii* is only occasionally collected for food, much the same as *Cardisoma carnifex*. Caught by hand or traps throughout their range, and sold live. Its market value, however, is comparatively low.

Distribution: Throughout Indo-West Pacific.

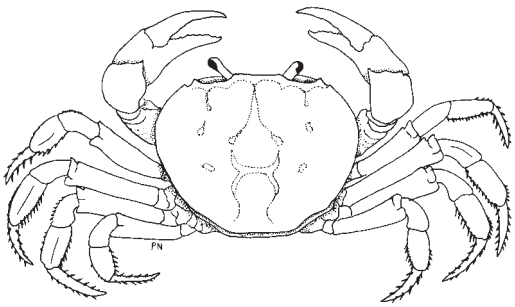
Remarks: Another species of the genus occurs in the area, *G. natalis* (Pocock, 1898), known only from Christmas and Cocos-Keeling islands. The 2 species are easily distinguished by their coloration: *G. lalandii* is purple whereas *G. natalis* is bright red.

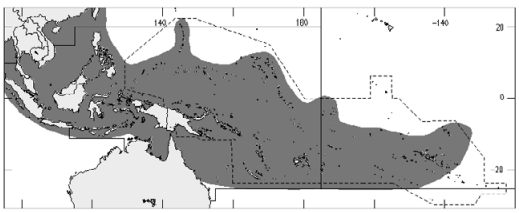


Cardisoma hirtipes Dana, 1852

En - Blue land crab.

Maximum carapace width 12 cm. On more sandy areas behind beaches, usually near the sea. Occasionally collected for food by hand or traps, when common. Widely distributed in the Indo-West Pacific.

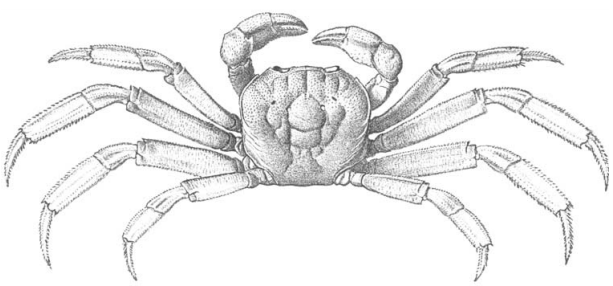




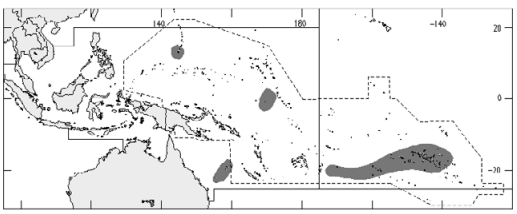
Cardisoma longipes (A. Milne Edwards, 1873)

En - Longlegged land crab.

Maximum carapace width 6 cm. On small isolated islands, in caves or holes. Rarely collected for food, due to its small size and general scarcity. Guam, New Caledonia, Niue, Cook Islands, Tuamotu, Ocean Island, and Kandavu.



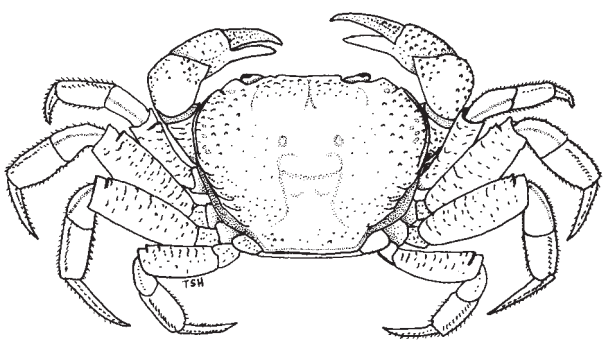
(from A. Milne Edwards, 1873)

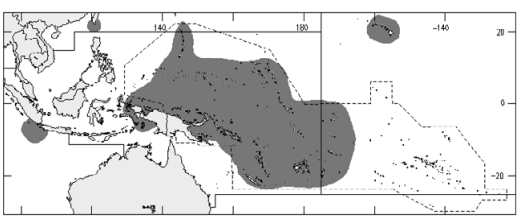


Cardisoma rotundum (Quoy and Gaimard, 1824)

En - Rugose land crab.

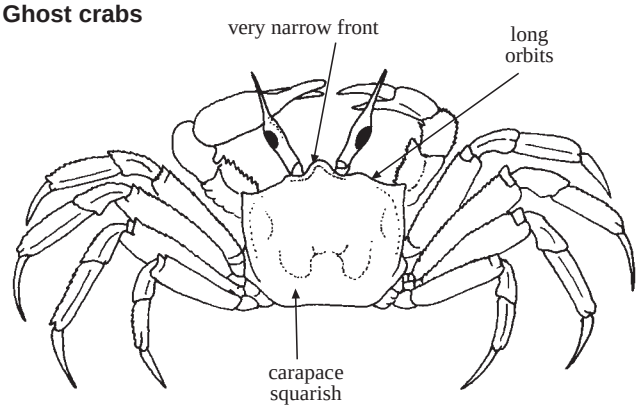
Maximum carapace width 7.5 cm. On more sandy areas adjacent to reefs. A relatively small, not common species, rarely collected for food. Occurs mainly in islands of the South Seas, reaching to southern Taiwan Province of China and southern Japan, and the eastern Indian Ocean.





OCYPODIDAE

Ghost crabs



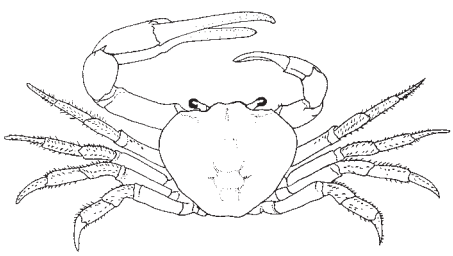
Diagnostic characters: Carapace squarish, transversely rectangular, trapezoidal or transversely ovate; dorsal surface gently convex, usually smooth or with grooves; **frontal margin entire, relatively narrow; orbits broad, occupying almost entire anterior border** (excluding the front), antero- and posterolateral margins of carapace usually not clearly demarcated, lateral margins appearing almost straight or gently convex, lateral margins unarmed. **Eyestalks long, longer than width of orbit**. No rhomboidal gap between third maxillipeds. Dactylus of legs with numerous stiff setae. **Ventral surface of abdomen or base of legs may have tufts of fine setae**. All male abdominal segments distinct, movable.

Habitat, biology, and fisheries: Terrestrial crabs. Most species are very small and are generally of minor importance to fisheries. Two larger species of *Ocypode* are occasionally caught for food, with *O. ceratophthalma* being most often collected.

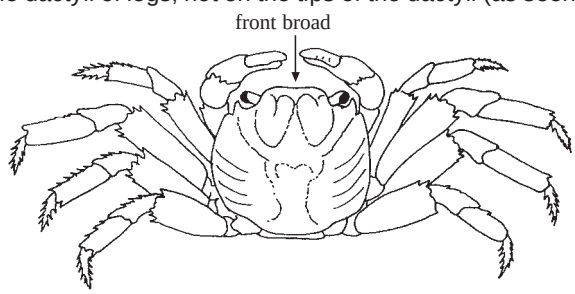
Similar families occurring in the area

Gecarcinidae: a rhomboidal gap present between third maxillipeds (no rhomboidal gap in ocypodids).

Grapsidae: a rhomboidal gap usually present between the third maxillipeds; frontal margin of carapace less narrow as in ocypodids; crabs walk on the sides of the dactyli of legs, not on the tips of the dactyli (as seen in ocypodids).



Gecarcinidae

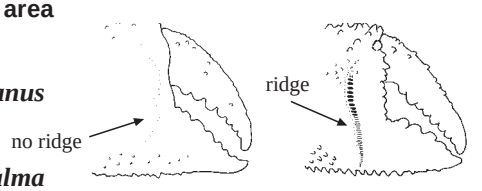


Grapsidae

Key to species of interest to fisheries occurring in the area

1a. Inner surface of palm without stridulating (sound-producing) ridge (Fig. 1a); eyes rounded . . . . . ***Ocypode cordimanus***

1b. Inner surface of palm with stridulating ridge (Fig. 1b); eye with long process above tip . . . . . ***Ocypode ceratophthalma***



a) *Ocypode cordimanus* **b) *Ocypode ceratophthalma***

Fig. 1 distal end of cheliped (inner surface)

List of species of interest to fisheries occurring in the area

The symbol 🕷 is given when species accounts are included.

🕷 *Ocypode ceratophthalma* (Pallas, 1872)

🕷 *Ocypode cordimanus* Desmarest, 1825

References

Alcock, A. 1900. Materials for a carcinological fauna of India. No. 6. The Brachyura Catometopa or Grapsoidea. *J. Asiat. Soc. Bengal*, 69, pt. 2 (3):270-486.

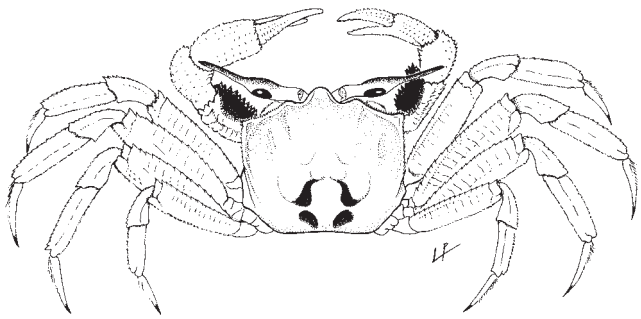
Crosnier, A. 1965. Crustacés Décapodes. Grapsidae et Ocypodidae. *Faune de Madagascar*, 18:1-143.

Ocypode ceratophthalma (Pallas, 1872)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Horned ghost crab.

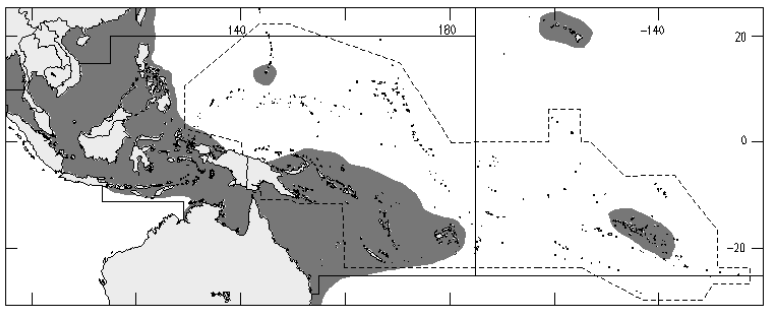
Diagnostic characters: Carapace squarish; anterolateral margins unarmed; eyes in adults with long projection above cornea; inner surface of palm with transverse stridulatory ridge. **Colour:** carapace bluish grey, with median parts brown; chelipeds and distal half of legs white.



Size: Maximum carapace width 5 cm.

Habitat, biology, and fisheries: A terrestrial species that lives in the lower part of the supralittoral zone, on sandy beaches. Excavates deep burrows. Caught mainly by hand, often at night when the crabs are more active. It is sometimes dug up. Only of local economic importance, rarely sold in markets. Usually fried for human consumption.

Distribution: Indo-West Pacific.

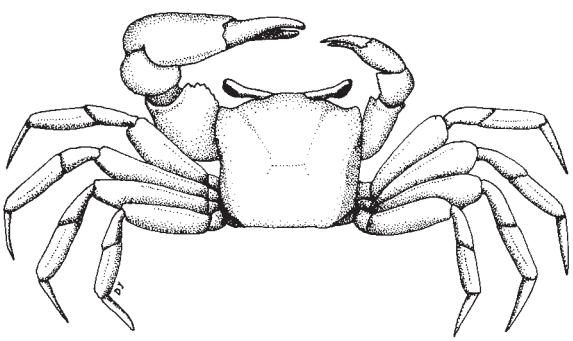


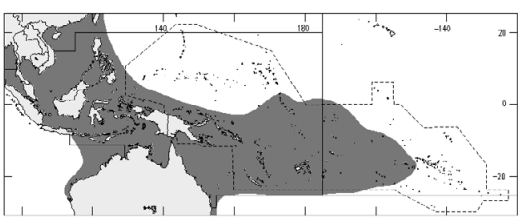
Remarks: The only other species in the area of similar size is *Ocypode cordimanus* Desmarest, 1825 (see below), readily distinguishable from *O. ceratophthalma* by lacking the "horned" eyes, lacking the stridulatory ridge on the palm, and the generally paler coloration.

Ocypode cordimanus Desmarest, 1825

En - Common ghost crab.

Maximum carapace width 4.5 cm. Inhabits higher supralittoral habitats not exposed to the sea, where it digs deep burrows. Collected by hand for human consumption in some places, but rarely seen in markets. Indo-West Pacfic, from South Africa to French Polynesia.



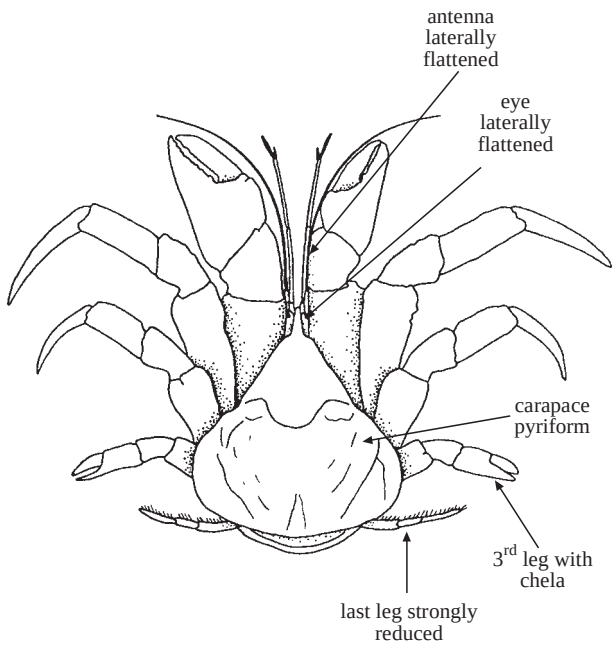


Infraorder ANOMURA

COENOBITIDAE

Land hermit crabs and coconut crabs

Diagnostic characters: Carapace relatively well calcified; eyestalk laterally flattened; eyes usually held subparallel to each other. Antennae laterally flattened. **Coxae of third maxillipeds close to each other, without distinct gap between them**. Chelipeds short, stocky, equal or unequal; when unequal, left chela larger. First 2 pairs walking legs, last 2 pairs reduced, chelate. **Abdomen bilaterally asymmetrical, not clearly divided into segments**. Either hermit crabs or distinctly crab-like animals with abdomen tucked under carapace; **uropods modified into a "rasp" used for clinging interior of gastropod shells (except in adult *Birgus latro*)**.



Habitat, biology, and fisheries: All members of the Coenobitidae are fully terrestrial, but they must return to the sea to release their larvae. Most species live in gastropod shells. None of the species, other than the "coconut crab" *Birgus latro*, have any fishery value, although many species of land hermit crabs (genus *Coenobita*) are regularly collected for the pet trade.

Similar families occurring in the area

Only the hermit crabs of the families Diogenidae and Paguridae may be confused with coenobitids, but their habitats are exclusively aquatic, not terrestrial. In addition, the laterally flattened antennae are highly diagnostic for the Coenobitidae.

References

Brown, I. W. and D. R. Fielder (eds). 1991. *The coconut crab: aspects of Birgus latro biology and ecology in Vanuatu*. Canberra, Australian Centre for International Agricultural Research (ACIAR), Monograph Number 8:i-x, 128 p.

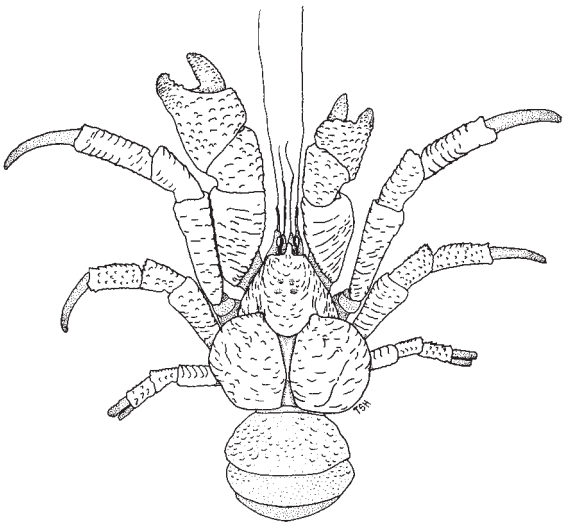
Miyake, S. 1965. *The Crustacea Anomura of Sagami Bay*. Tokyo, Biological Laboratory of the Imperial Household, 161 p.

A single species of interest to fisheries occurring in the area.

Birgus latro (Linnaeus, 1767)

Frequent synonyms / misidentifications: None / None.

FAO name: En - Coconut crab.



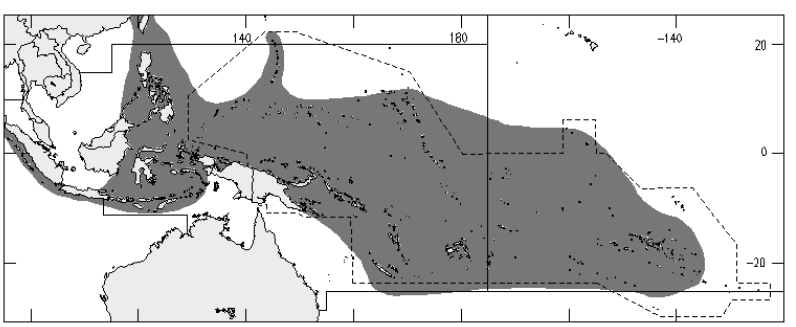
Diagnostic characters: Surface of carapace with numerous scale-like ridges. Antennae laterally flattened. Eyes laterally flattened. Abdomen large, tucked underneath carapace. First 2 pairs legs; third pair of legs short, chelate; last pair of legs very small, chelate, tucked underneath the swollen abdomen; surfaces of chelipeds and legs with numerous distinct transverse ridges. **Colour:** carapace bluish grey to purplish brown.

Size: Maximum carapace length 15 cm (or 35 cm, if the outstretched chelipeds are included in the measurement); weight up to 2.5 kg.

Habitat, biology, and fisheries: *Birgus latro* is actually a highly modified, fully terrestrial hermit crab, and young crabs do in fact inhabit gastropod shells, as seen in other members of the family Coenobitidae. As they grow, they discard the shell and tuck their hardended abdomen (normally soft in hermit crabs) under their carapace. Adults are fully terrestrial and breathe by means of a special "pseudo-lung". They must, however, return to the sea to release their planktonic zoeae. The coconut crab tends to occur on small isolated islands, in areas washed by oceanic waters. It is generally a scavenger, but also has a preference for coconuts and fruits. One of its common names ("palm thief") is derived from its habit of stealing shiny objects from human habitations. *Birgus latro* is the largest known land arthropod.

The coconut crab is a very valuable species and is sold live in markets, where large specimens may command prices of up to US$100. It has always been eaten throughout its wide Indo-West Pacific range, but its population has nowadays seen a very sharp decline where demand for the species skyrocketed in countries like Taiwan and Hong Kong. The very high price it commands in these markets has contributed to the serious decline of the species, which has been exterminated from many islands. It is now gradually becoming protected throughout much of its range. The species is collected by hand or with baited traps.

Distribution: Indo-West Pacific, reaching eastwards to French Polynesia. The only widely distributed species in the genus.



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HOLOTHURIANS

(Sea cucumbers, Class Holothuroidea)

by C. Conand

GENERAL REMARKS

Notes on the phylum Echinodermata

The holothurians or sea cucumbers belong to the Echinodermata which form a very distinct phylum in the animal kingdom. Echinoderms are characterized by the possession of a radial symmetry (generally **pentamerous)**, an intradermic skeleton consisting of closely fitted plates, articulated plates, or **ossicles**, and a peculiar water vascular system of tubes filled with fluid. The phylum is divided into 5 classes of very different appearance (Fig. 1): the crinoids (or feather stars), holothuroids (or sea cucumbers), echinoids (or sea urchins), asteroids (or sea stars), and ophiuroids (or brittle stars). Echinoderms are almost exclusively marine, although a few species are found in brackish water.

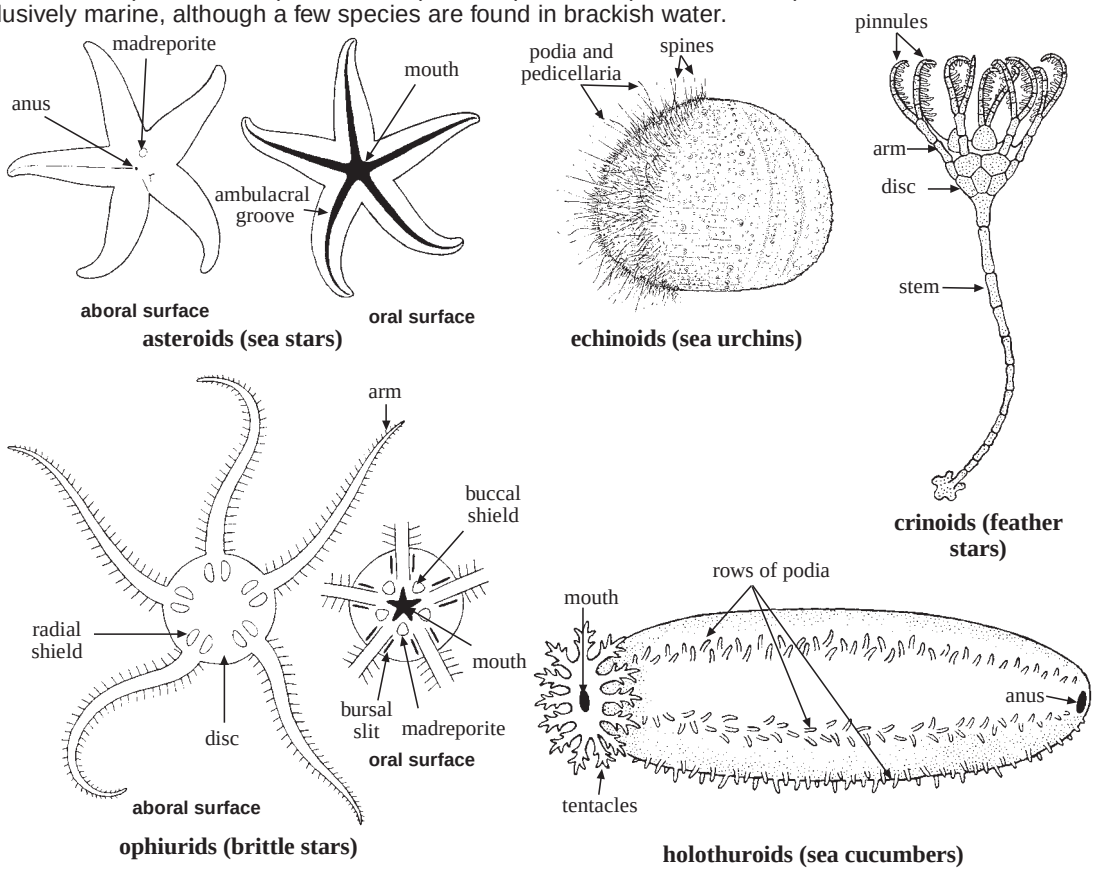


Fig. 1 the five classes of echinoderms

The body is of variable shape, rounded to cylindrical, or star-like, and subdivided into 10 areas (Fig. 2): 5 **radii** (or ambulacra) alternating with 5 **interradii** (or interambulacra). The radii correspond to the arms of the asteroids, ophiuroids, and crinoids, and to the rows of podia or papillae found in sea urchins and sea cucumbers. Some groups show a secondary bilateral symmetry. The holothurians are elongate orally-aborally and lie upon one side. Asteroids, echinoids, and ophiurids have the oral surface on the underside of body.

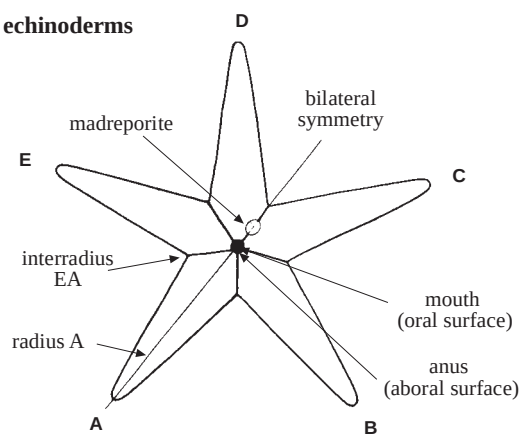


Fig. 2 schematic presentation of an echinoderm (following the Carpenter system for orientation)

The endoskeleton is produced by the dermis. It may be composed of closely fitted plates forming a rigid test or shell as in most echinoids, or articulated plates giving flexibility as in asteroids, ophiuroids, and crinoids, or consisting of calcareous spicules dispersed in the body wall, as seen in holothuroids. Spines and tubercules are parts of the endoskeleton and are covered by the epidermis. In addition, the body wall is composed of extracellular collagen-based material, the viscosity of which is controlled and provides rigidity or flexibility.

The general cavity (or coelomic cavity) contains the viscera. The water vascular system or **aquiferous system**, consists of a circumoral ring, from which arise radially water canals forming many extensions, the tube feet or **podia**. The **madreporite** is a plate with tiny pores which allows the communication with the environment. It is always situated in an interradial position and serves for the orientation: the opposite radius is called A and is followed, in a clockwise direction, by radii named B, C, D, and E (according to the "Carpenter system" for orientation, see Fig. 2).

Despite the differences between the classes, there are several common features in the digestive system of echinoderms. This system is conspicuously developed and attached by mesenteries to the body wall. Its shape is simple, either bag-like as in ophiuroids, or tube-like, looping in the general cavity as in crinoids, echinoids, and holothuroids. In asteroids, it forms conspicuous specialized organs. Structural variations appear progressively along the gut. A hemal system is associated with the digestive system. Its importance varies among the different classes.

The respiratory exchange partly occurs by means of the podia, and partly by specialized organs that differ among the classes.

The genital system is composed of a single gonad in holothuroids, a genital cord sending extensions to the pinnules of the arms in crinoids, and 5 gonads in the other classes. Sexes are generally separated, but cannot be distinguished externally. In most species, mature gametes are released into the sea. After fertilization, the development often passes planktonic larval stages with a bilateral symmetry, until the larvae metamorphose into benthic juveniles.

Species identification is done by examination of preserved specimens, mostly based on characters of the skeleton. Echinoderms should be preserved in alcohol, as formalin may dissolve the calcareous skeleton. In addition to the morphological characters, the colour, size, and ecology of live specimens can be useful for identification.

To date, approximately 6 000 described echinoderm species are known worldwide, living in all kinds of marine bottoms where they represent an important component of the benthic biomass. About 1 000 littoral species are known to occur in the Indo-West Pacific.

Among the 5 classes of echinoderms, only echinoids and holothuroids are of interest to fisheries. The holothurian fishery of the Western Central Pacific is the largest of the world (Conand, 1997).

External morphology of holothurians

Holothurians have an orally-aborally elongated body (Fig. 1). The body is formed like a short or long cylinder, with the mouth (at the anterior end) encircled by **tentacles**, and the **anus (**at the posterior end) often edged by papillae. The pentamerous symmetry is sometimes recognizable by the presence of 5 meridional **ambulacra** bearing **podia**. Holothurians often lay on the substrate with their ventral surface or **trivium**, formed by the radii A, B, and E in the Carpenter system for orientation. This creeping sole bears the locomotory podia, while on the dorsal surface, or **bivium**, the podia are often represented by papillae. Consequently, a secondary bilateral symmetry is evident. The body shape is different in the orders Apoda, members of which are vermiform, and Molpadida, members of which have a tail-like region bearing the anus. In the order Elasipoda, some extraordinary forms are found, with modified papillae making up sails.

The **mouth** is terminal or displaced dorsally, surrounded by a thin buccal membrane, and generally bordered by a circle of **tentacles** (Fig. 1). Tentacles are buccal podia containing extensions from the water vascular system. Their number varies between 10 and 30, generally being a multiple of 5. In the **Aspidochirotida** all tentacles are of the same size, but in the **Dendrochirotida** some tentacles are generally smaller. The shape of the tentacles differs among the various orders and is used as a key character (Fig. 3). In the Dendrochirotida they are **dendritic** (branching in an arborescent manner) and can reach a large size when extended. The Aspidochirotida and most Elasipoda have **peltate** tentacles, each with a central stalk. The Apoda have **pinnate** tentacles, with a central axis bearing series of digitations. The Molpadida have **digitate** tentacles, consisting of short projections with small terminal fingers. In all cases they are very retractile, particularly in the Dendrochirotida which have an **introvert** where the tentacles insert. The tentacles and the introvert can be contracted into the interior by a set of retractor muscles. These muscles also occur in a few Apoda and Molpadida, but not in the other orders.

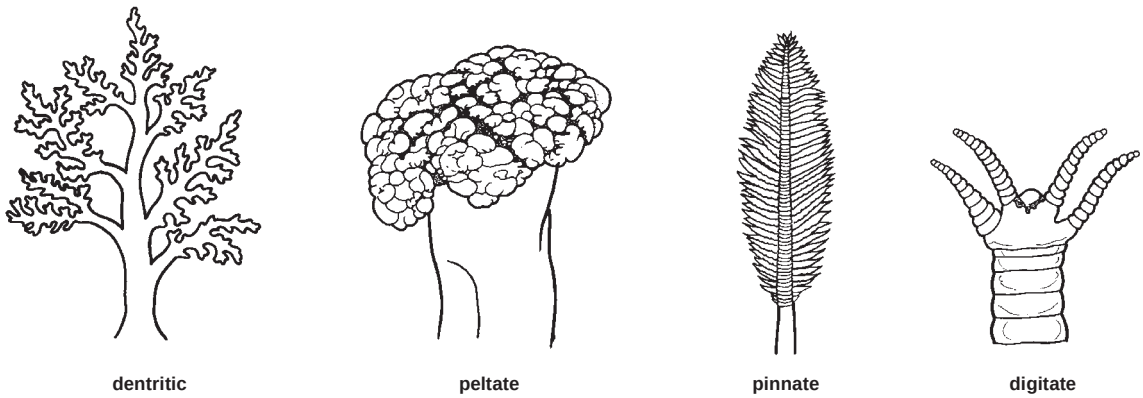


Fig. 3 basic types of tentacles

The body surface is thick, slimy in many species and wears warts, tubercules, or **papillae**. **Podia** appear on the body wall in 3 orders, but they are lacking in the Apoda and rare in the Molpadida. They typically have the form of locomotory tube feet: hollow tubular projections from the body wall form a stem, which allows the podium to lengthen, flex, or retract. It contains a branch of the water-vascular system and generally does not terminate in a concave sucker (as it is still often called), but in a flat disc, which allows the podium to adhere to the substratum during locomotion. Epidermal cells produce adhesive secretions. Internally the disc is supported by a large skeletal ossicle. Podia also can have the shape of papillae. The tube feet are rarely arranged in 5 regular rows, but generally they loose the discs on the dorsal surface and spread into the interradial areas. The **anus** is often displaced dorsally, encircled by small papillae or **anal teeth**. The coloration varies between species and sometimes also between individuals of the same species. The creeping sole is often brighter and lighter than the dorsal surface.

Body wall

The body wall is thin in Apodida and Molpadida, but thicker in the other orders, particularly in the Aspidochirota. It constitutes the part of the body that is processed for human consumption and therefore commercial species are characterized by a thick body wall. Its structure consists of a thin cuticle over the epidermis and a thick dermis underneath. The dermis is composed of connective tissue, enclosing the endoskeletal spicules or ossicles (see next paragraph). Below the dermis, a layer of circular muscles form a cylinder generally interrupted by 5 longitudinal muscle bands situated in the radial positions.

Spicules

Also called ossicles or deposits, spicules (Fig. 4) are characteristic of the class and of primary importance for identification. These are fenestrated (or perforated) calcareous bits of microscopic size. There is a wide variety of simple to complex shapes. **Rods** can be simple or branching, smooth, warty, or spiny. They can bear knobs at their ends, or are a characteristic C- or S-shape. Fenestrated **plates** also come in various forms. **Buttons** are oval ossicles, perforated with a varying number of holes arranged in 2 rows. **Tables** are more complicated. They appear as a perforated disc, bearing an erect **spire** (or tower) and show many variations according to the arrangement of its constituents. **Rosettes** are short rods subdivided into short branches. **Baskets** are concave, perforated plates. **Anchors** are peculiar of the family Synaptidae (order Apoda). They are orientated in the body wall, so that they support the attachment to the substrate during crawling, in the absence of podia. They are attached to an accompanying perforated plate. **Wheels** are characteristic of the family Chirodotidae (order Apoda) and are also found in the Elasipoda, which are best characterized by the presence of special spiny branched spicules. Miliary bodies (**grains**) are very tiny spicules found in some Stichopodidae. Apart from the body wall, spicules are found in the tentacles, the podia, and also in the mesenteries or other internal organs. Their developmental stages can differ from the definitive shapes in the adults and thus can make species identification difficult.

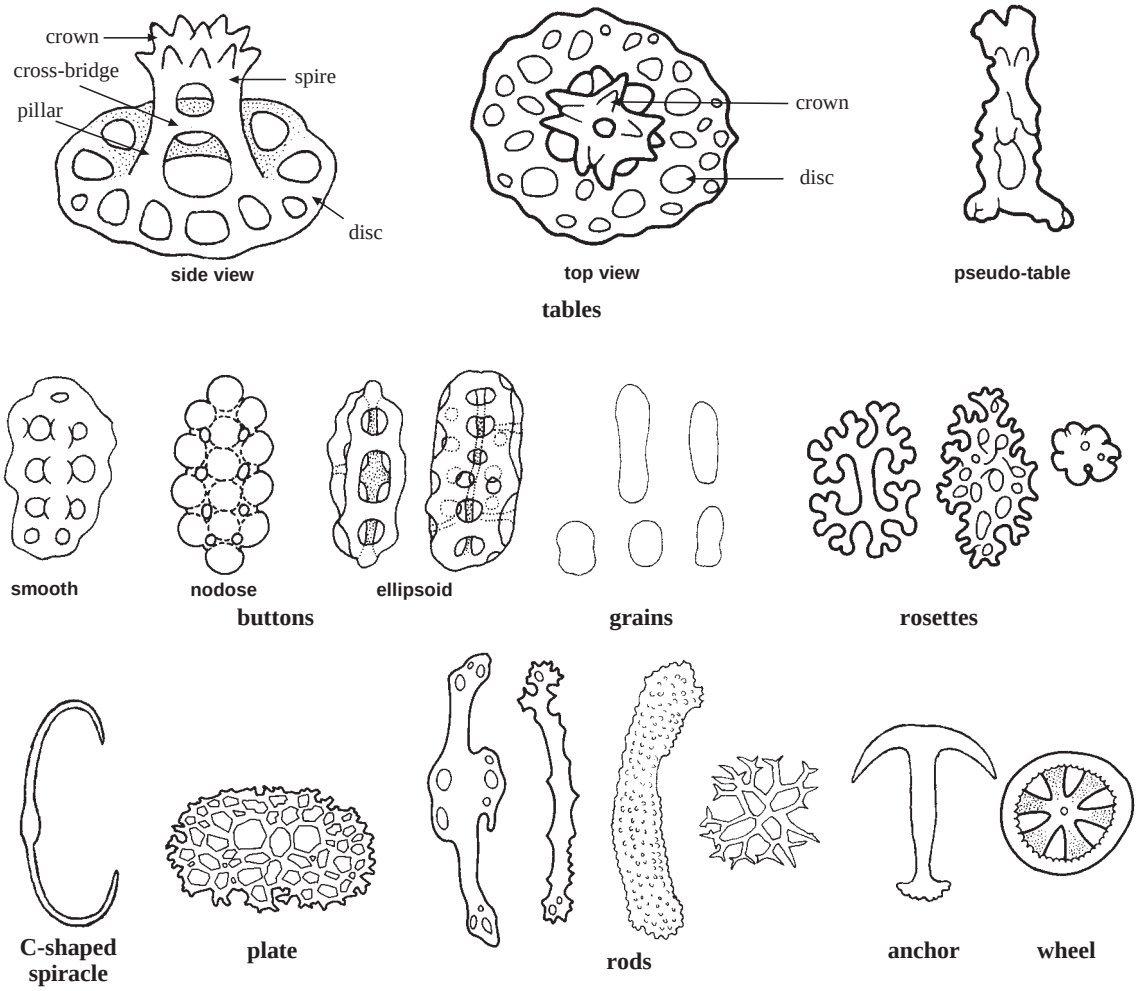


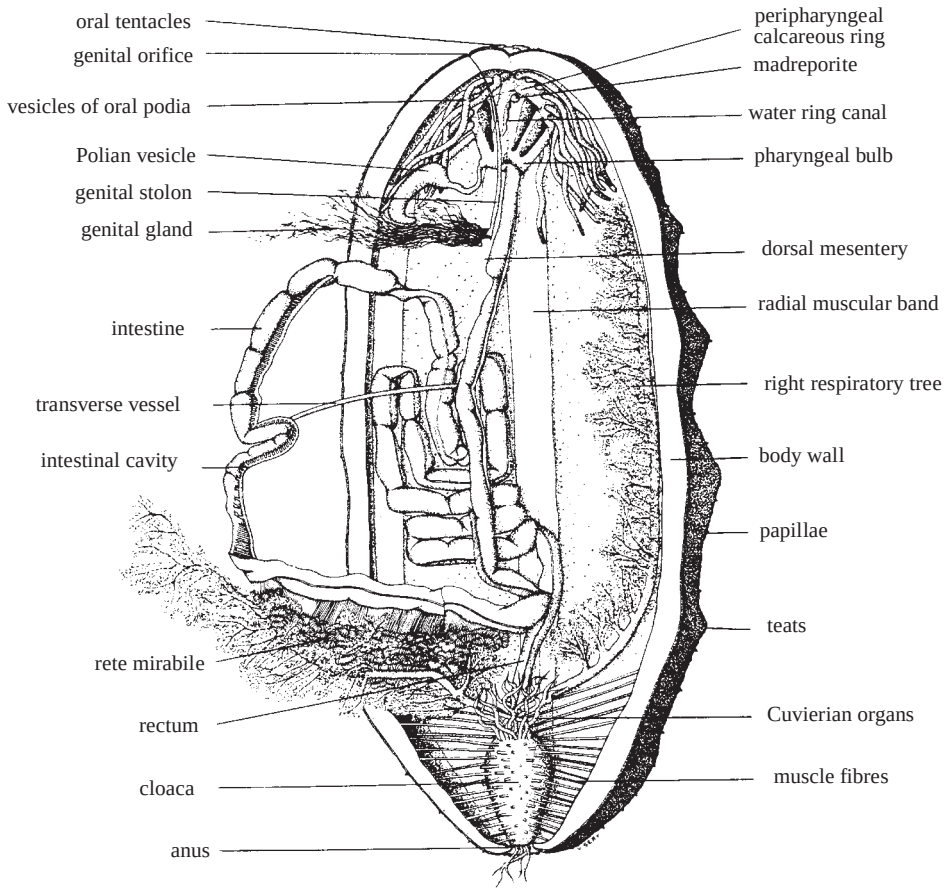
Fig. 4 basic types of spicules

Calcareous ring

A ring of usually 10 calcified plates encircles the pharynx. It is composed of alternating larger radial plates, opposite to the ambulacra, and smaller interradial plates. The plates may be simple or composed of smaller pieces. Longitudinal muscles attach to the radial plates.

Digestive system and connected organs

The gut is composed of a pharynx, an esophagus, a stomach, all of which are short structures, and a very long intestine (Fig. 5). The intestine consists of 3 portions, a descending, an ascending, and finally a descending loop which connects to both the rectum and the **cloaca** opening outwards through the anus. When present, **respiratory trees** are connected to the cloaca. The oxygenated water enters the body by these water lungs, which are found in all orders except the Apoda. **Cuvierian tubules**, present in several species of Aspidochirota, are generally considered as defensive structures. They are composed of sticky tubules attached to the base of the respiratory trees and can be expelled in some *Holothuria* and *Bohadschia* species through the cloaca towards the source of irritation.



(from Conand, 1986)

Fig. 5 anatomy of a holothuroid (*Holothuria nobilis*)

Reproductive system

In contrast to other echinoderms, the reproductive system of holothurians consists of a single **gonad** or genital gland (Fig. 5). The gonad is situated dorsal (interambulacrum CD) and composed of either 2 tufts of tubules, or only 1 tuft in many species of the family Holothuriidae. The sexes are generally separated and show little dimorphism unless in the period of maturing. The gonad is attached to the dorsal mesentery through which the **gonoduct** or genital stolon opening passes, leading to the outside by the **gonopore** (genital orifice) or a genital papilla. In most species, the mature gametes are freely released into the sea water. The spawning behaviour, observed in many Aspidochirota species, involves an upright posture of males and females followed by a swaying back and forth, while the gametes are being released.

Water vascular system, perivisceral coelom, and hemal system

The **water vascular system** (Fig. 5) is a coelomic space bordered by a mesothelium. It consists of the lumen of the buccal tentacles and the tube feet, a **water ring** around the esophagus, the **radial canals**, the **madreporic canal**, and the **Polian vesicles**. The perivisceral coelom is a large cavity containing watery proteinaceous coelomic fluid and different forms of cells (coelomocytes). The hemal system is well developed and composed of large hemal vessels along the gut, sinus, and lacunae. The hemal vessels associated with the gut can form a complex meshwork with the left respiratory tree, the **rete mirabile**, suggesting different functions of nutrient and gas transfers.

Habitat and biology

Holothurians are found throughout all oceans, at all latitudes, from the shore down to abyssal plains. They are usually benthic (living on the bottom); some species live on hard substrates, rocks, coral reefs, or as epizoites on plants or invertebrates; most of the species inhabit soft bottoms, on their surface or in the sediment. Among the commercial coastal holothurians, the Aspidochirota are predominant in the tropics, while the Dendrochirota are more common in temperate areas. The Aspidochirota from the tropical western

Pacific generally show a distribution reflecting the organization of the reef and lagoonal systems. Six different categories of species have therefore been defined, being characteristic of the main biotopes in which they occur: coral slopes (and passages), inner lagoons, inner reef flats, outer reef flats, outer lagoons, and coastal bays. The density and biomass increase from the outer reef slopes to the inner reef flats and coastal areas. Although there is much variation between the different sites, coral-slope species generally show lower densities and relatively large individual sizes, while species occurring on inner reef flats and inner lagoons show intermediate values, and those living on outer reef flats come in higher densities of smaller individuals. Most Aspidochirota species have comparatively few animal predators and their major effects in the reef communities are related to their deposit-feeding habits, as they are able to rework large amounts of sediments (bioturbation).

Fisheries

Holothurians have been harvested commercially for at least a thousand years, occasionally for the raw body wall or viscera, but mostly in order to be processed into a dry product called **bêche-de-mer**, **trépang**, or hai-sum, which is considered a delicacy by the Chinese. Harvesting in the tropics is usually done by hand, while collecting at low tide or by free-diving from small boats. The processing methods for bêche-de-mer include different stages of boiling, gutting, and drying, with variable procedures according to the species. Bêche-de-mer is then exported from the producer country to a central market such as Hong Kong, and then re-exported to the Chinese consumers. The economic significance of these artisanal fisheries is particularly important in less developed countries. The recent developments of these activities have led to a global increase of the catches, especially with a strong increase of the Hong Kong and Chinese markets, and the participation of new producer countries, with a shift of the exploited species, probably due to overcollecting.

Around 300 shallow-water species of holothurians are known to occur in the area, but only a few of them are of commercial interest. From 1990 to 1995, the reported yearly production of sea cucumbers in the Western Central Pacific ranged from around 6 800 to 9 000 t (FAO Yearbook of Fishery Statistics).

Identification note

As in other echinoderms, species identification is mostly done by examination of the skeletal parts of preserved specimens. Holothurians should be preserved in alcohol (70 %), as formalin may dissolve the calcareous skeleton. The calcareous ring can be readily observed after dissection.

The spicules, which are deeply hidden in the body wall, can be obtained by the following method:

1. Small pieces of body-wall tissue are removed from the bivium and the trivium, as well as the oral tentacles and podia, and dissected and macerated in sodium hypochlorite (bleach), or sodium hydroxide, in order to dissolve the organic material.
2. After washing in distilled water, the spicules are rinsed in alcohol and can be processed with a drop of a mountant (Canada balsam).
3. After processing, the spicules can be observed either on permanent slides with a light microscope, or prepared for scanning electron microscope.

GLOSSARY OF TECHNICAL TERMS

Anal teeth - radial calcareous papillae encircling the anus.

Bêche-de-mer - term used in the tropical Pacific for the processed product of sea cucumbers (see also **trepang**).

Bivium - the dorsal part of the body in the pentaradiate symmetry, with 2 radii.

Calacareous ring - internal collar of plates, generally 10, surrounding the pharynx.

Cloaca - anal cavity where the intestine ends.

Cuvierian tubules - threads becoming sticky when thrown out of the anus; used as a defense mechanism.

Dendritic - branching in an arborescent manner; used as descriptive term for the shape of tentacles in Dendrochirotida.

Digitate - finger-like.

Digitations - finger-like structures.

Fenestrated - having small window-like openings or holes.

Interradii (or interambulacra) - in the pentaradiate symmetry, the 5 areas between the rows of podia or papillae (Fig. 2).

Papillae - conical lumps on the surface of the body wall.

Pentamerous - having 5 radiating parts, resulting in a **pentaradiate symmetry**.

Peltate - with a central stalk.

Pinnate - feather-like.

Podia (or tube feet) - water-filled tubes used for locomotion.

Radii (or ambulacra) - in the pentaradiate symmetry, the 5 areas with podia or papillae.

Respiratory tree - arborescent organ (1 pair), opening in the cloaca.

Spicules - or ossicles, microscopic carbonate skeleton particles in the body wall, useful for species identification; they come in various shapes (Fig. 4).

Teats - large papillae.

Tentacles - buccal podia (Fig. 3).

Trépang - Malaysian name for sea cucumber, also used for the processed product (see also **bêche-de-mer**)

Trivium - the ventral surface of body in the pentaradiate symmetry, with 3 radii.

KEY TO THE SHALLOW-WATER ORDERS OF THE CLASS HOLOTHUROIDEA

1a. Podia absent; body vermiform; body wall thin, often translucent; dominant spicules in form of anchors with associated anchor plates tentacles pinnate; pharynx without retractor muscle; no respiratory tree . . . . . **Apodida**

1b. Podia present; body-wall moderately thick; body wall with dominant spicules in form of tables, perforated plates, buttons, rods, or rosettes . . . . . → **2**

2a. Tentacles peltate or pelyo-digitate; anterior end of body not introverted and associated with retractor muscles . . . . . **Aspidochirotida**
(the only order with commercial species in the area)

2b. Tentacles branched (dendritic); anterior end of body introverted, associated with retractor muscles . . . . . **Dendrochirotida**

ORDER ASPIDOCHIROTIDA

Diagnostic characters: Tentacles peltate, constituting a short stem ending in a disc covered by small digitations. Body wall bearing podia and/or papillae. Calcareous ring without posterior prolongation. Pharynx without special retractor muscles, but can be retracted within a fold of skin. Tentacle ampullae present. Respiratory trees well developed. Cuvierian organs present or absent. Dominant spicules in form of tables, buttons, rods, rosettes, or grains.

Key to the shallow-water families of Aspidochirotida occurring in the area

1a. Body with trivium (sole) usually flattened and dorsal bivium convex; gonads forming a single tuft appended to the left dorsal mesentery; Cuvierian organs present or absent; dominant spicules of form of tables, buttons (simple or modified), and rods (excluding C- and S-shaped rods) . . . . . **Holothuriidae** (p. 1165)

1b. Body square-shaped or trapezoidal in cross-section; Cuvierian organs always absent; gonads forming 2 tufts appended on each side of the dorsal mesentery; dominant spicules in form of branched rods and C-and S-shaped rods . . . . . **Stichopodidae** (p. 1185)

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HOLOTHURIIDAE

Diagnostic characters: Body dome-shaped in cross-section, with trivium (or sole) usually flattened and dorsal bivium convex and covered with papillae. Gonads forming a single tuft appended to the left dorsal mesentery. Tentacular ampullae present, long, and slender. Cuvierian organs present or absent. Dominant spicules in form of tables, buttons (simple or modified), and rods (excluding C-and S-shaped rods).

Key to the genera and subgenera of Holothuriidae occurring in the area (after Clark and Rowe, 1971)

1a. Body wall very thick; podia and papillae short, more or less regularly arranged on bivium and trivium; spicules in form of rods, ovules, rosettes, but never as tables or buttons . . . . . → ***2***

1b. Body wall thin to thick; podia irregularly arranged on the bivium and scattered papillae on the trivium; spicules in various forms, with tables and/or buttons present . . . **(*Holothuria*)** → ***4***

2a. Tentacles 20 to 30; podia ventral, irregularly arranged on the interradii or more regularly on the radii; 5 calcified anal teeth around anus; spicules in form of spinose rods and rosettes . . . . . ***Actinopyga***

2b. Tentacles 20 to 25; podia ventral, usually irregularly arranged, rarely on the radii; no calcified anal teeth around anus, occasionally 5 groups of papillae; spicules in form of spinose and/or branched rods and rosettes . . . . . → ***3***

3a. Podia on bivium arranged in 3 rows; spicules comprise rocket-shaped forms . . . . ***Pearsonothuria***

3b. Podia on bivium not arranged in 3 rows; spicules not comprising rocket-shaped forms . . . ***Bohadschia***

4a. Spicules in form of well-developed tables, rods and perforated plates, never as buttons . . . . . → **5**

4b. Spicules in form of tables, occurring alone or along with buttons, rods, or rosettes . . . . . → **7**

5a. Spicules never in form of rosettes; tables with no or reduced disc, bearing spines terminating in form of a maltese cross; body cylindrical; body wall soft . . . . . ***Holothuria* (*Semperothuria*)**

5b. Spicules in form of rosettes . . . . . → ***6***

6a. Podia in 3 rows on trivium; small papillae dispersed on bivium; spicules in form of rosettes, and tables with reduced disc, bearing a spine ending in a maltese cross (when viewed from above) . . . . . ***Holothuria* (*Halodeima*)**

6b. Podia not very numerous, irregularly arranged in 10 rows (radial and interradial); papillae on bivium irregularly arranged in 10 rows; spicules in form of rosettes, and tables with disc in a "cup and saucer form", bearing a low, wide spire ending in a spinose crown . . . . . ***Holothuria* (*Acanthotrapeza*)**

7a. Spicules in form of smooth buttons or pseudo-buttons; tables variously developed . . . . . → ***8***

7b. Spicules in form of buttons, always knobby, occasionally in form of ellipsoids; tables strongly developed . . . . . → ***10***

8a. Tables well developed, their disc usually squarish with smooth rim and 8 holes, occasionally strongly perforated . . . . . ***Holothuria* (*Thymiosycia*)**

8b. Tables moderately developed, their disc with usually notched rim; buttons of variable shape . . . . . → ***9***

9a. Tentacles 16 to 30; tables with notched rim and a low spire terminating in a ring of irregular spines; pseudo-buttons abundant, irregular; collar of papillae present around base of tentacles and anus . . . . . ***Holothuria* (*Lessonothuria*)**

9b. Tentacles 18 to 20; some tables often with narrow disc, spire reduced; other tables having a well-developed disc and spire with 4 columns; buttons irregular; no collar of papillae around base of tentacles . . . . . ***Holothuria* (*Mertensiothuria*)**

10a. Buttons never modified to form fenestrated ellipsoids . . . . . → ***11***

10b. Buttons modified to form fenestrated ellipsoids, and buttons . . . . . → ***12***

11a. Tables with wavy disc, bearing a small spire ending in small spines, giving the table a tack-like shape, with a large central hole surrounded by peripheral holes variable in number; presence of buttons, pseudo-buttons, and small irregular C-, S-, or O-shaped spicules . . . . . ***Holothuria* (*Stichothuria*)**

11b. Tables well developed, with smooth disc, spire ending in a cluster of small spines, never giving the table a tack-like shape; presence of buttons with irregular knobs . . ***Holothuria* (*Metriatyla*)**

12a. Calcified anal papillae absent; collar of papillae around base of tentacles present or absent . . . . . → ***13***

12b. Calcified anal papillae present; no collar of papillae around base of tentacles; body wall very thick and rigid; tables with wavy disc, bearing a low and massive spire ending in a very spinose crown . . . . . ***Holothuria* (*Microthele*)**

13a. Collar of papillae around base of tentacles; anal teeth present or absent; tables with notched disc and a low to moderate spire, ending in a cluster of very small, or numerous spines; a fringe of rather large papillae between bivium and trivium . . . ***Holothuria* (*Theelothuria*)**

13b. No collar of papillae around base of tentacles; anal teeth absent; tables with knobby disc and low spire, ending in a cluster of spines; buttons knobby, occasionally modified to fenestrated ellipsoids. . . . . ***Holothuria* (*Cystipus*)**

List of species of interest to fisheries occurring in the area

The symbol ⟿ is given when species accounts are included.

⟿ *Actinopyga echinites* (Jaeger, 1833)
⟿ *Actinopyga mauritiana* (Quoy and Gaimard, 1833)
⟿ *Actinopyga miliaris* (Quoy and Gaimard, 1833)
⟿ *Actinopyga palauensis* Panning, 1944
⟿ *Actinopyga spinea* Cherbonnier, 1980

⟿ *Bohadschia argus* Jaeger, 1833
⟿ *Bohadschia similis* (Semper,1868)
⟿ *Bohadschia vitiensis* (Semper, 1868)

⟿ *Holothuria (Acanthotrapeza) coluber* Semper, 1868
⟿ *Holothuria (Halodeima) atra* Jaeger, 1833
⟿ *Holothuria (Halodeima) edulis* Lesson, 1830
⟿ *Holothuria (Mertensiothuria) leucospilota* (Brandt, 1835)
⟿ *Holothuria (Metriatyla) scabra* Jaeger, 1833 [including *H. (M.) scabra* var. *versicolor* (Conand, 1986)]
⟿ *Holothuria (Microthele) fuscogilva* Cherbonnier, 1980
⟿ *Holothuria (Microthele) fuscopunctata* Jaeger, 1833
⟿ *Holothuria (Microthele) nobilis* (Selenka, 1867)

⟿ *Pearsonothuria graeffei* (Semper, 1868)

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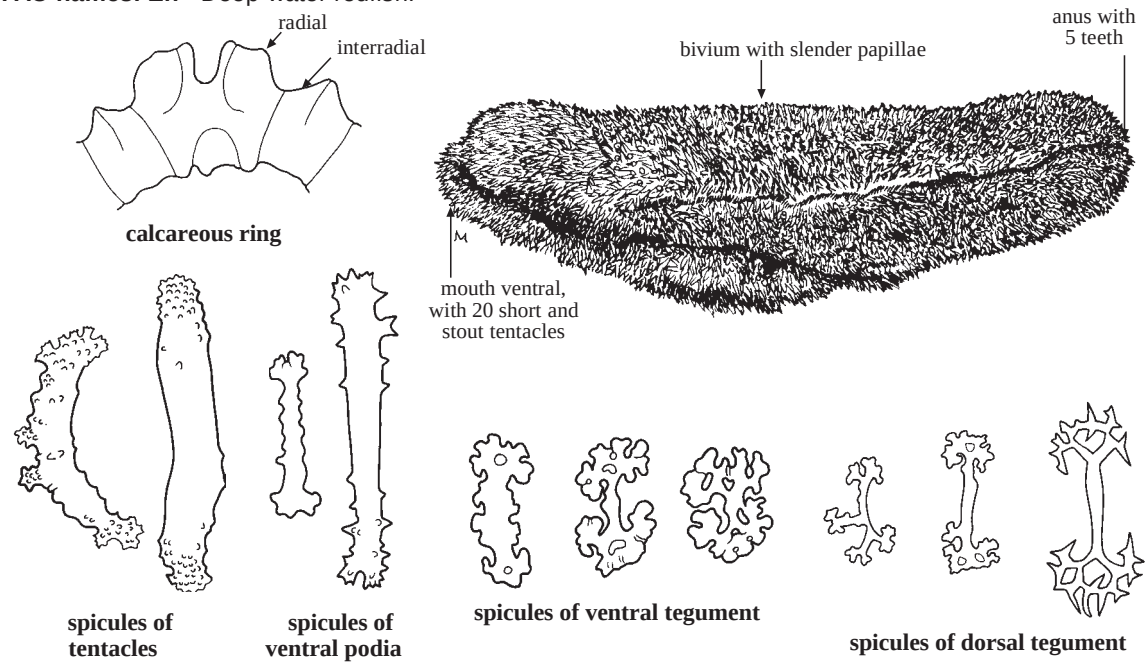
Actinopyga echinites (Jaeger, 1833)

Frequent synonyms / misidentifications: None / *Actinopyga mauritiana* (Quoy and Gaimard, 1833).

FAO names: En - Deep-water redfish.

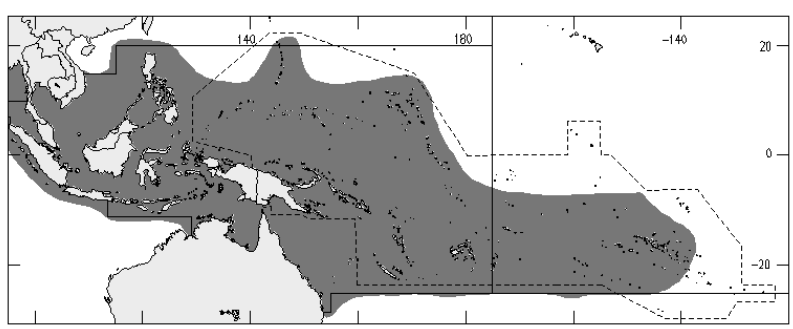


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body elongate, arched dorsally (bivium) and flattened ventrally (trivium). Bivium sometimes wrinkled and covered by sediment, wider in the middle and tapering towards both ends. **Papillae on bivium long and slender**; podia on trivium arranged more or less regularly in 3 rows; calcareous disc of podia around 350 µm in diameter. **Mouth** ventral, **surrounded by 20 short, stout tentacles**. Anus surrounded by **5 anal teeth**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules few (10), short, pink, and never expelled. **Colour:** bivium brown, varying from light to dark among specimens; trivium lighter, sometimes orange, with yellow podia. **Spicules:** ventral tegument with a variety of small rosettes and rods, occasionally perforated; dorsal tegument with larger rosettes and branched plates; ventral podia with some straight, spinous rods; tentacles with rods large, straight, or curved, and very spiny at their extremities.

Size: Maximum length about 35 cm, commonly to about 20 cm; mean live weight 0.3 kg (up to 1 kg); body-wall thickness about 7 mm.

Habitat, biology, and fisheries: Dwelling in moderately shallow waters (despite its English common name), rarely found in depths of more than 12 m; mostly on reef flats of fringing and lagoon-islet reefs. Abundant in seagrass beds, on rubble reef flats, and compact flats where populations can reach high densities (up to 1/m^2). Sexual reproduction during the warm season. A species with a high potential fecundity and early sexual maturity. Harvested in artisanal fisheries throughout the area. Collected by hand while wading on the reefs at low tide. The processed product is not distinguished from those of other *Actinopyga* species and has a moderate commercial value.

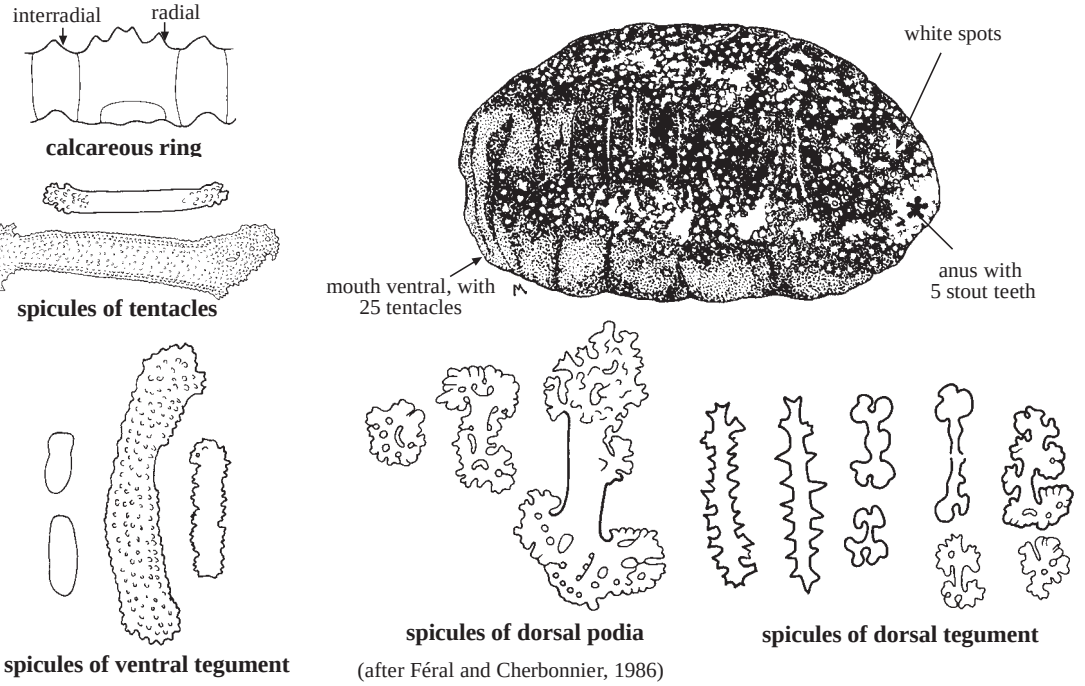


Distribution: Widespread in the tropical Indo-Pacific, including the Red Sea, but excluding the Persian Gulf and Hawaii.

Actinopyga mauritiana (Quoy and Gaimard, 1833)

Frequent synonyms / misidentifications: None / *Actinopyga echinites* (Jaeger, 1833).

FAO names: En - Surf redfish; **Fr** - Holothurie brune des brisants.

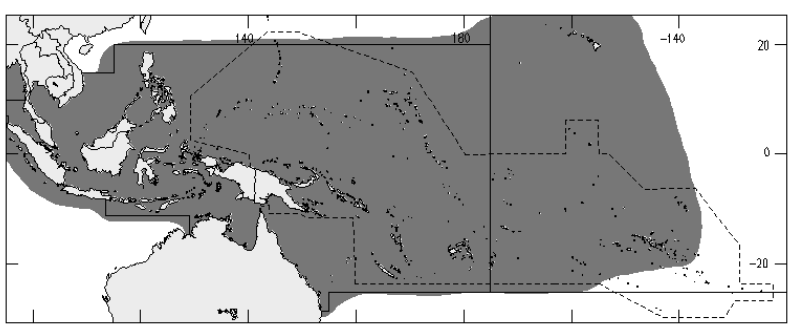


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body elongate, arched dorsally (bivium) and flattened ventrally (trivium). Bivium sometimes wrinkled, wider in the middle and tapering towards both ends. Papillae on bivium long and slender; podia numerous on trivium, stout and crowded on the radii and interradii; calcareous disc of podia around 500 µm in diameter. **Mouth** ventral, **surrounded by 25 short and stout tentacles**, with a large collar of long papillae at their base. Anus surrounded by **5 stout anal teeth**. Calcareous ring showing large radial pieces and interradials with a triangular top. Cuvierian tubules few (10), short, pink and never expelled. **Colour:** bivium variable, usually dark brown, **with more or less distinct whitish spots**; trivium lighter, occasionally white to pink, with yellow podia. **Spicules:** ventral tegument with round and biscuit-like grains, rods bearing small spines, and denticulate pseudo-plates; dorsal tegument without grains, but with rosettes and denticulate rods; podia with some spinous rods and large rosettes; tentacles with large rods bearing small spines.

Size: Maximum length about 35 cm, commonly to 20 cm; mean live weight about 0.3 kg (up to 1 kg); body-wall thickness about 6 mm.

Habitat, biology, and fisheries: Dwelling in very shallow waters, rarely found in depths of more than 20 m; mostly on outer reef flats of barrier reefs and fringing reefs exposed to strong hydrodynamism. Most abundant in the surf zone where populations can reach high densities (more than 1/m^2). Sexual reproduction takes place during the warm season. A species with a high potential fecundity and early sexual maturity. Harvested in artisanal fisheries throughout the area, but probably less frequently than other species of *Actinopyga*. Collected by hand while wading on the reef at low tide. The processed product is not distinguished from those of other *Actinopyga* species and has a moderate commercial value.

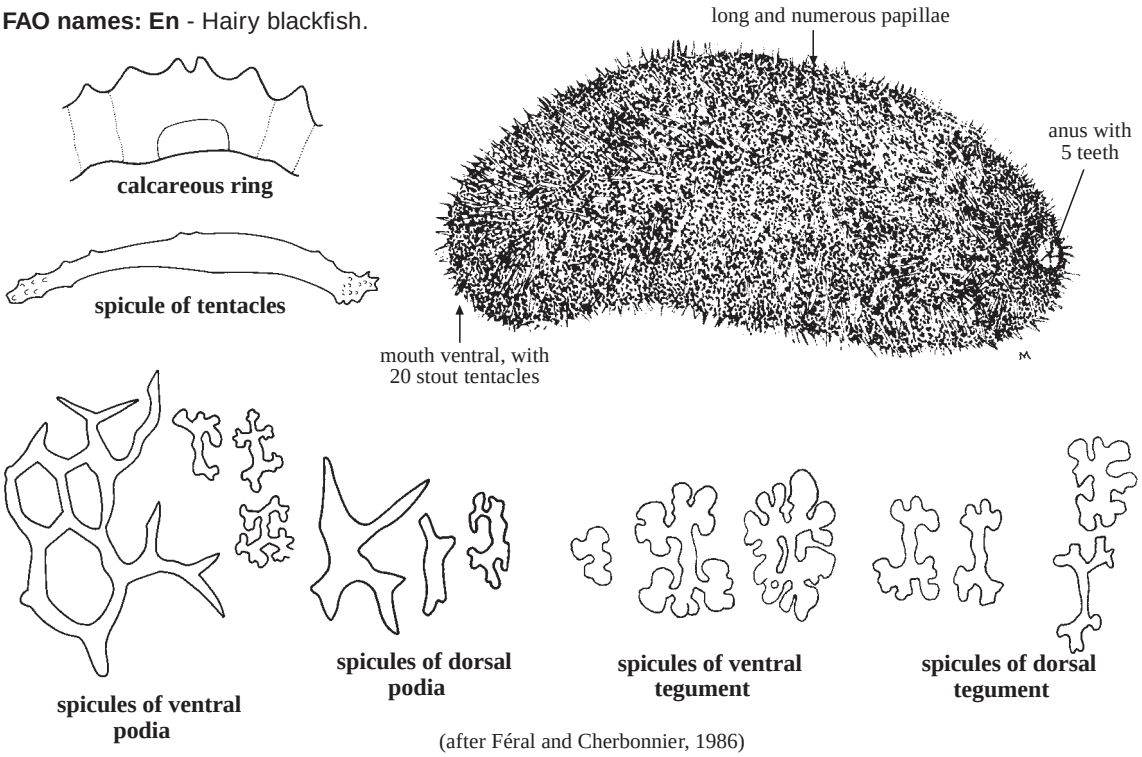


Distribution: Widespread in the tropical Indo-Pacific.

Actinopyga miliaris (Quoy and Gaimard, 1833)

Frequent synonyms / misidentifications: None / *Actinopyga palauensis* Panning, 1944; *A. spinea* Cherbonnier, 1980; other black species of *Actinopyga*.

FAO names: En - Hairy blackfish.

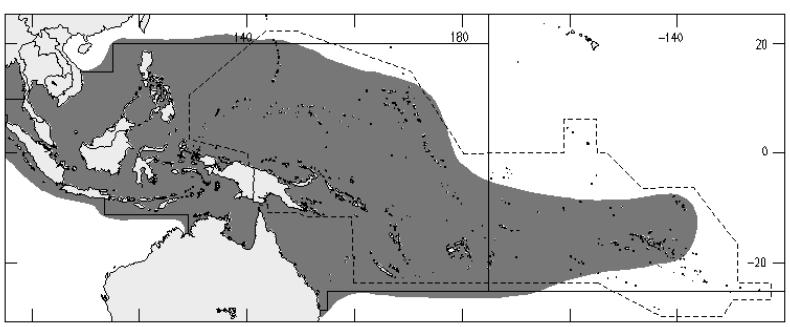


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body elongate, cylindrical, slightly arched dorsally (bivium) and flattened ventrally (trivium). Bivium generally covered by mucus and fine sediment. **Papillae on bivium numerous, long and slender**; long and thick podia on trivium arranged more or less regularly in tight rows on the radii; calcareous disc of podia around 700 µm in diameter. **Mouth** ventral, **surrounded by 20 stout tentacles**. Anus surrounded by 5 strong, triangular **anal teeth**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. **Colour:** bivium black; trivium lighter, dark brown. **Spicules:** ventral tegument with a variety simple or more complicated rosettes; dorsal tegument with rosettes; ventral and dorsal podia with some rosettes; podia and papillae containing large spicules; tentacles with large rods.

Size: Maximum length about 35 cm, commonly to about 25 cm; mean live weight about 0.4 kg (up to 1 kg); body-wall thickness about 6 mm.

Habitat, biology, and fisheries: Dwelling in moderately shallow waters, rarely found in depths of more than 10 m; mostly on reef flats of fringing and lagoon-islet reefs, never on barrier reefs. Abundant in seagrass beds and on rubble reef flats where populations can reach high densities (up to 1/m^2). Known to feed on epiphytes and seagrass leaves. Biology poorly known. Harvested in artisanal fisheries throughout the area. Collected by hand while wading on the reefs at low tide, or by divers. The processed product is not distinguished from those of other *Actinopyga* species and and has a moderate commercial value.

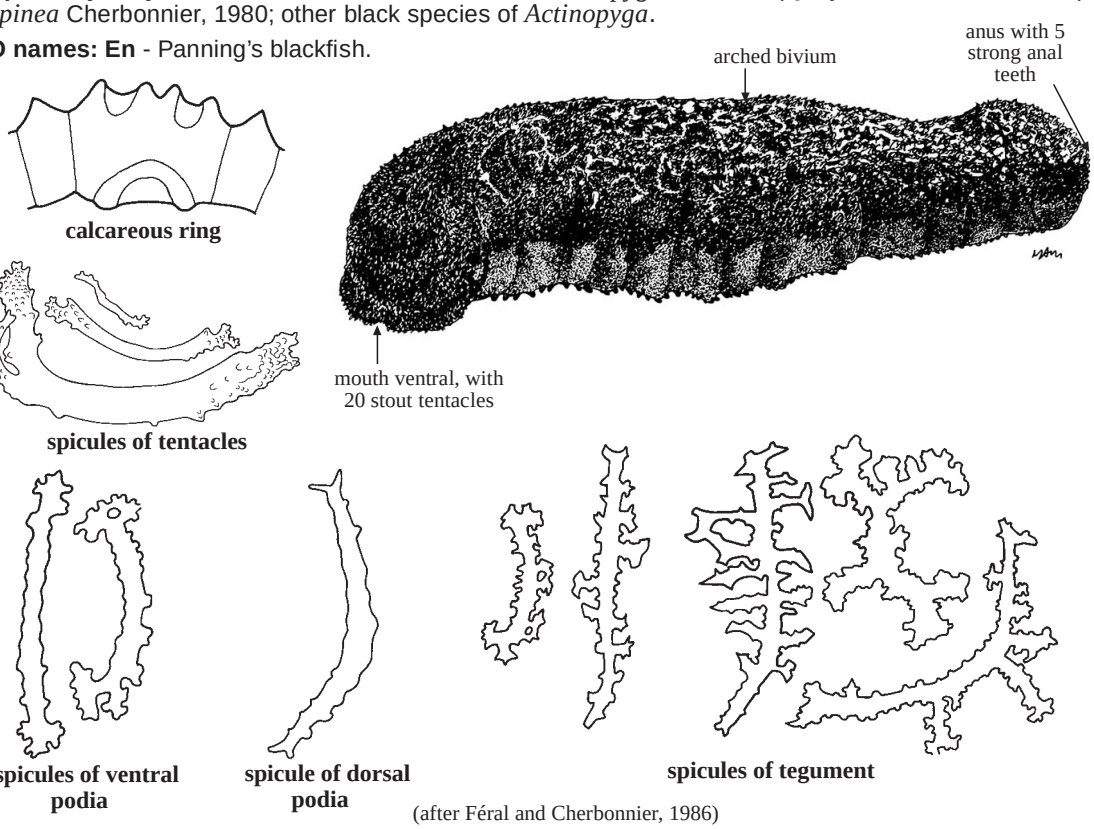


Distribution: Widespread in the tropical Indo-Pacific, including the Red Sea, but excluding the Persian Gulf and Hawaii.

Actinopyga palauensis Panning, 1944

Frequent synonyms / misidentifications: None / *Actinopyga miliaris* (Quoy and Gaimard, 1833); *A. spinea* Cherbonnier, 1980; other black species of *Actinopyga*.

FAO names: En - Panning's blackfish.

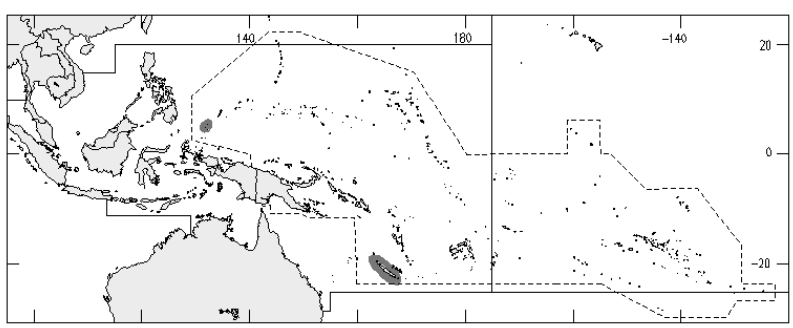


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body elongate, cylindrical, **slightly arched dorsally** (bivium) and flattened ventrally (trivium). Bivium generally covered by mucus and fine sediment. Papillae on bivium small and conical; long and thick podia on bivium arranged more or less regularly in tight rows on the radii; calcareous disc of podia around 350 µm in diameter. **Mouth** ventral, **surrounded by 20 stout tentacles**. Anus surrounded by **5 strong, triangular anal teeth**. Calcareous ring with large radial pieces showing an arch at their base, and narrow interradials. **Colour:** bivium black; trivium lighter, dark brown. **Spicules:** ventral and dorsal tegument with a variety of shredded rods and X-shaped spicules; ventral podia and dorsal papillae with spiny rods; tentacles with large rods (up to 700 µm).

Size: Maximum length about 40 cm, commonly to about 30 cm; mean live weight 0.5 kg (up to 1.2 kg); body-wall thickness about 6 mm.

Habitat, biology, and fisheries: Occurs in moderately shallow waters, rarely in depths of more than 25 m; never found on reef flats, but on flagstones of reef slopes. Populations reach medium densities (up to 0.1/m^2). A poorly known species. Probably collected by divers for artisanal fisheries, but not intensively so, as it is found in lower densities and has a deeper distribution than other "blackfish" species. The processed product is not distinguished from those of other *Actinopyga* species and has a moderate commercial value.

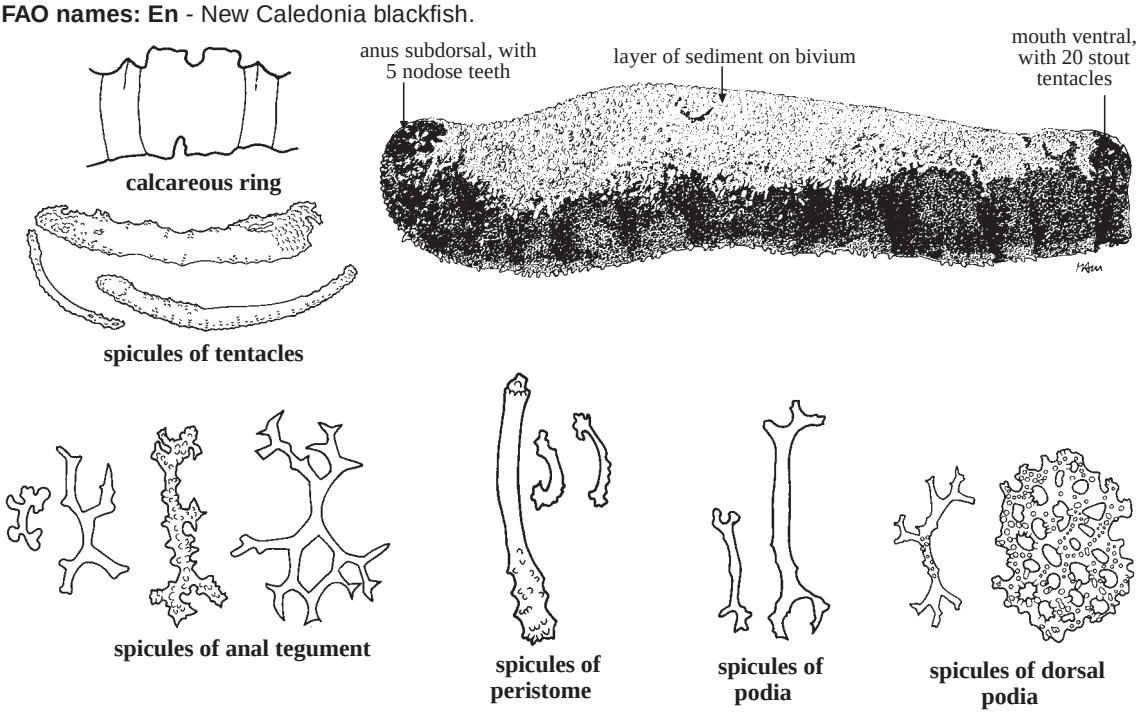


Distribution: Known only from Palau and New Caledonia.

Actinopyga spinea Cherbonnier, 1980

Frequent synonyms / misidentifications: None / *Actinopyga miliaris* (Quoy and Gaimard, 1833); *A. palauensis* Panning, 1944; other black species of *Actinopyga*.

FAO names: En - New Caledonia blackfish.



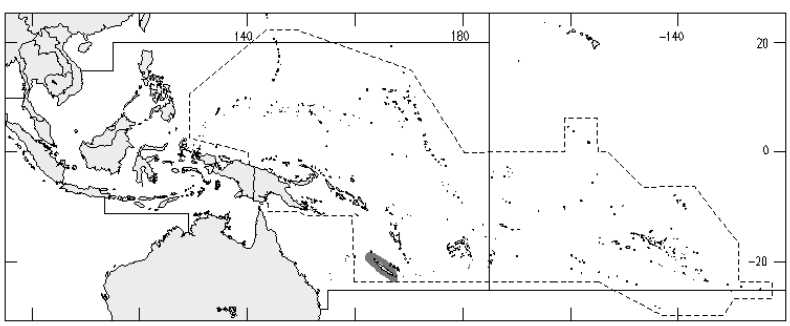
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body elongate, cylindrical, slightly arched dorsally (bivium) and flattened ventrally (trivium). **Bivium generally covered by fine sediment**. Papillae on bivium small, slender, and conical; cylindrical and thick podia on trivium arranged irregularly on the radii and interradii; calcareous disc of podia around 700 µm in diameter. **Mouth** ventral, **surrounded by 20 stout tentacles**. Anus subdorsal, surrounded by **5 strong, triangular, and nodose anal teeth**. Calcareous ring thick, with large radial pieces and narrow interradials. Cuvierian tubules absent. **Colour:** bivium black; trivium dark brown. **Spicules:** sparse in the ventral and dorsal tegument, abundant only near the mouth, anus, and tentacles; a few rods in the dorsal tegument give rise to numerous rosettes, rods, and various plates; small to large plates provided with holes and spines near the anus; tentacles with rods straight or arched, bearing small spines.

Size: Maximum length about 38 cm, commonly to about 27 cm; mean live weight about 0.7 kg (up to 1.2 kg); body-wall thickness about 5 mm.

Habitat, biology, and fisheries: In moderately shallow water from depths of 5 to 30 m, on the lagoon floor, sometimes burrowed in sandy-muddy sediments. Populations reach medium densities (up to 0.1/m^2). A poorly known species. May be collected by divers for artisanal fisheries along with other "blackfish" species, but not intensively so, since it is found in comparatively low densities and has a deeper distribution. The processed product is not distinguished from those of other *Actinopyga* species and probably has a moderate commercial value.

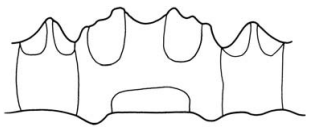
Distribution: Known only from New Caledonia.



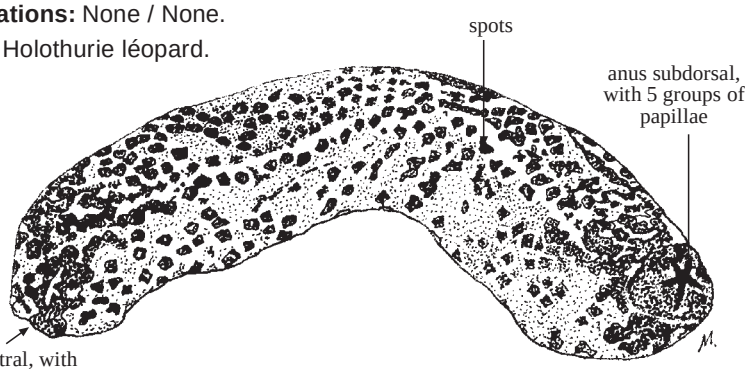
Bohadschia argus Jaeger, 1833

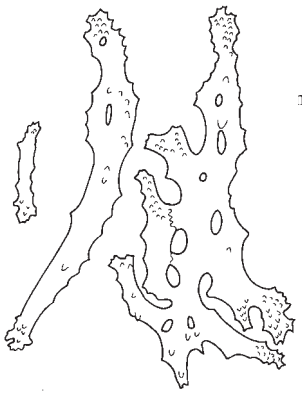
Frequent synonyms / misidentifications: None / None.

FAO names: En - Leopard fish; **Fr** - Holothurie léopard.

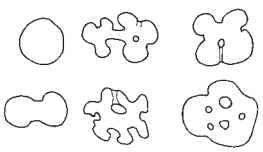


calcareous ring

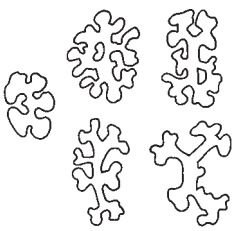




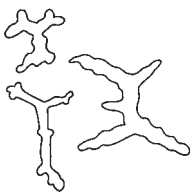
spicules of tentacles



spicules of ventral tegument



spicules of dorsal tegument



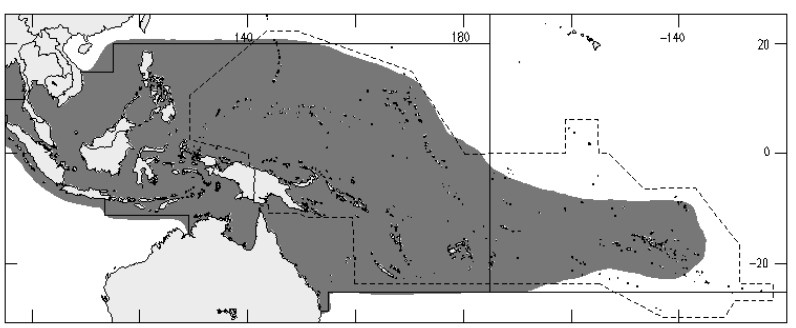
spicules of podia

(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, arched dorsally (bivium) and flattened ventrally (trivium). Bivium smooth. Podia on bivium small, conical, and irregularly arranged; podia on trivium numerous, short, and arranged on the radii and interradii; calcareous disc of podia around 400 µm in diameter. **Mouth** ventral, **surrounded by 20 short, dark tentacles**. **Anus nearly dorsal, surrounded by 5 groups of papillae**. Calcareous ring with large radial pieces and narrow interradials. **Cuvierian tubules numerous and large**. **Colour:** bivium whitish to brown, variable among specimens and showing **characteristic dark eye-like spots**, with a podia placed in their middle and encircled with a light colour; trivium lighter, yellow to brown; some specimens uniformly brown with yellow spots. **Spicules:** ventral tegument with various simple rosettes and biscuit-like nodules, occasionally with small holes; dorsal tegument with rosettes only; ventral podia with short rods; dorsal podia with X-shaped rods; tentacles with spiny rods and large irregular plates.

Size: Maximum length about 60 cm, commonly to about 36 cm; mean live weight about 1.8 kg (up to 2.2 kg); body-wall thickness about 10 mm.

Habitat, biology, and fisheries: Found in shallow waters, rarely in depths of more than 30 m; a typical reef species, generally on barrier reef flats and slopes, or outer lagoons on white sand. Populations never reach high densities (generally between 0.001 and 0.01/m^2). Symbiotic pearlfish (Carapidae, Ophidiiformes) are often found in the respiratory tree or the general cavity. Biology poorly known. Sexual reproduction probably takes place during the warm season. Occasionally collected in artisanal fisheries, although the sticky Cuvierian tubules make the collection and processing disagreeable. Collected by divers. The processed product is not distinguished from those of other *Bohadschia* species and is of little commercial value.

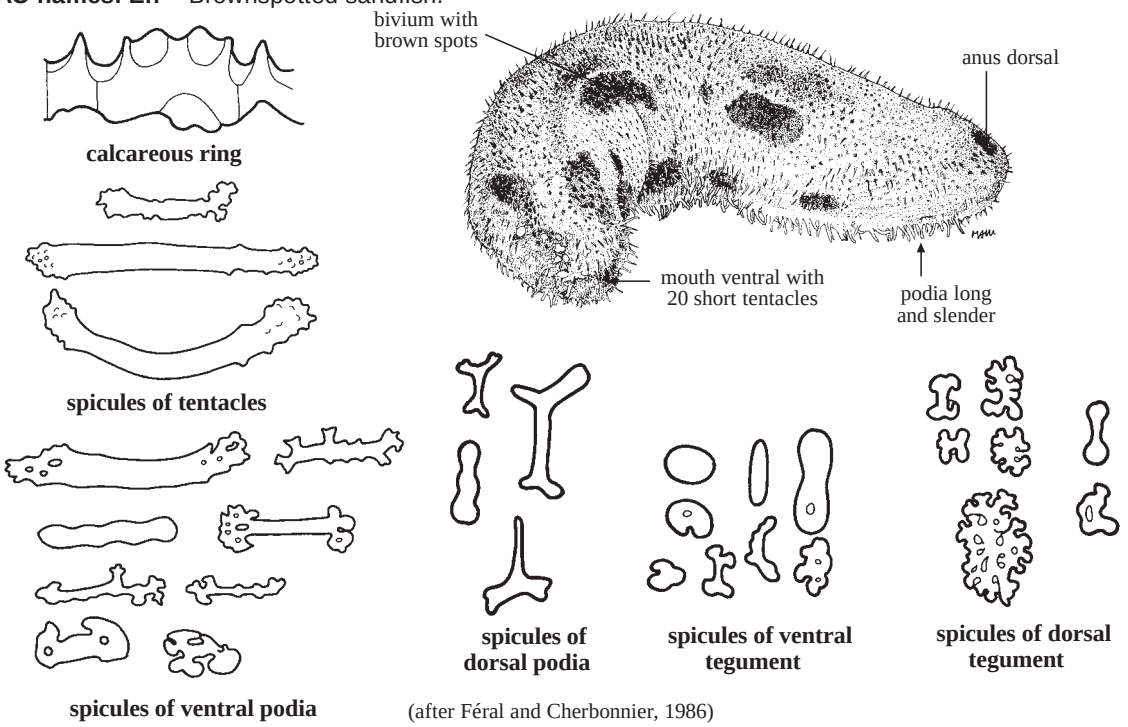


Distribution: Widespread in the tropical Indo-Pacific, including the Red Sea, but excluding Hawaii.

Bohadschia similis (Semper,1868)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Brownspotted sandfish.



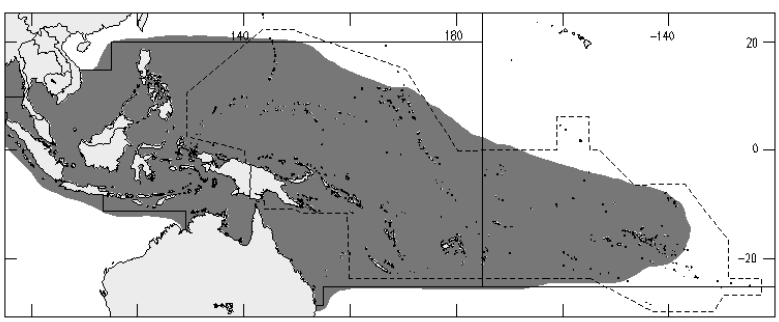
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, flattened ventrally (trivium). Bivium smooth and rigid. **Podia on bivium long, slender**, conical, and irregularly arranged; podia on trivium more numerous, shorter and irregularly arranged on the radii and interradii; calcareous disc of podia around 400 µm in diameter. **Mouth** ventral, **surrounded by 20 short tentacles. Anus nearly dorsal, surrounded by 5 groups of radial papillae**. Calcareous ring with large radial pieces and narrow interradials having sharp tops. Cuvierian tubules long and large. **Colour:** variable among specimens and localities; bivium beige to light brown, showing characteristic brown spots; trivium lighter, yellowish. **Spicules:** ventral tegument with simple nodules with or without holes and sparse rods giving rise to rosettes; dorsal tegument with rosettes and small biscuit-like plates; ventral podia with variable rods; dorsal podia with X-shaped rods; tops of tentacles with spiny rods.

Size: Maximum length about 26 cm, commonly to about 18 cm; mean live weight about 0.3 kg (up to 0.8 kg); body-wall thickness about 4 mm.

Habitat, biology, and fisheries: Found in very shallow waters, rarely in depths of more than 3 m; occurs in coastal lagoons or inner reef flats, generally burrowing in sandy-muddy bottoms. Populations can reach densities of 0.03/m^2. Biology poorly known. May be harvested along with other reef flat species, such as *Holothuria scabra*, when they occur together, but the sticky Cuvierian tubules make the collection and processing disagreeable. Collected by divers. The processed product is not distinguished from those of other *Bohadschia* species and is of little commercial value.

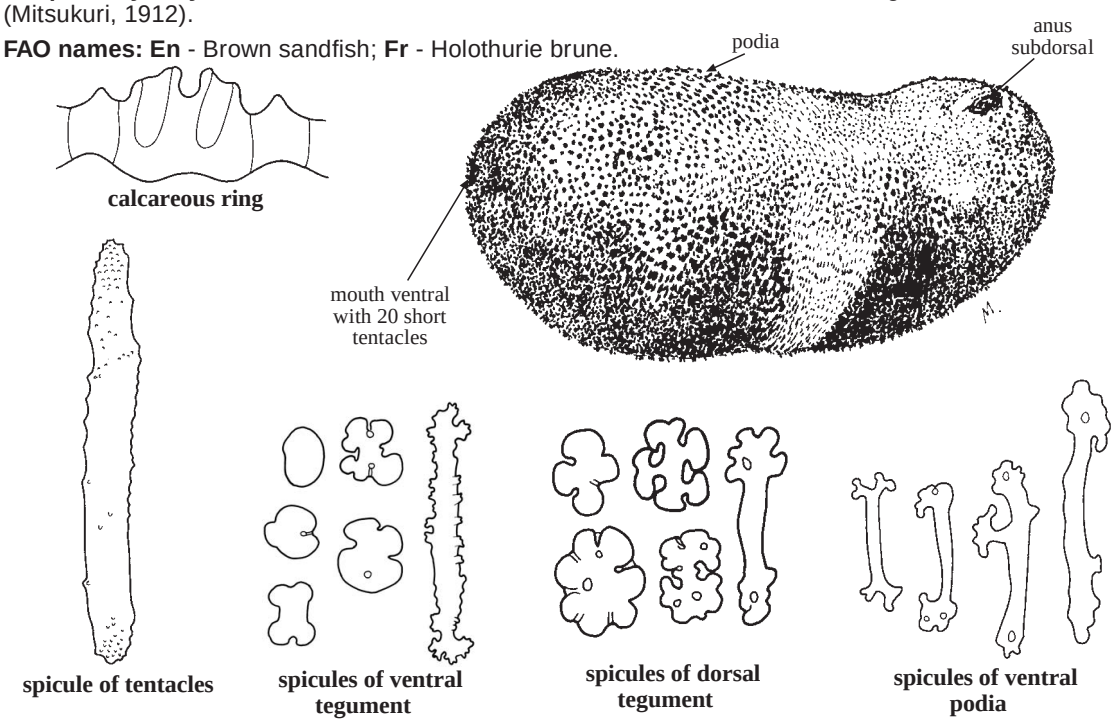
Distribution: Widespread in the tropical Pacific, excluding Hawaii; reported from the Mascarene Islands, but not from elsewhere in the Indian Ocean.



Bohadschia vitiensis (Semper, 1867)

Frequent synonyms / misidentifications: None / *Bohadschia marmorata* Jaeger, 1833; *B. bivittata* (Mitsukuri, 1912).

FAO names: En - Brown sandfish; **Fr** - Holothurie brune.



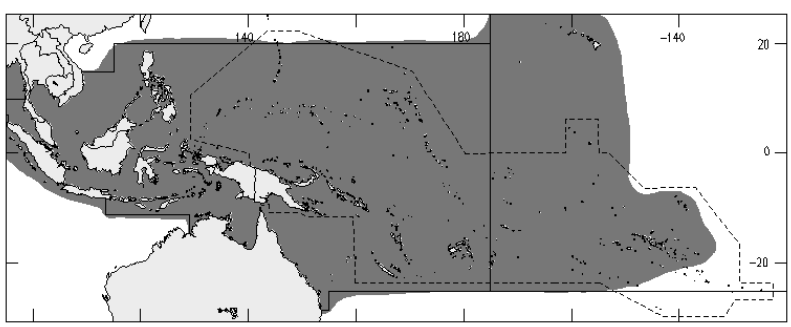
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, arched dorsally (bivium) and flattened ventrally (trivium); calcareous disc of podia around 300 µm in diameter. Mouth ventral, **surrounded by 20 small, short and yellowish tentacles**. **Anus nearly dorsal**. Calcareous ring with large radial pieces and narrow interradials. **Cuvierian tubules numerous and thick**. **Colour:** bivium yellow with brown bands; trivium lighter; **podia on bivium and trivium encircled by a characteristic brown spot**. **Spicules:** ventral tegument with a variety of pseudo-rosettes and biscuit-like nodules; dorsal tegument with rosettes and a few rods; ventral podia with various rods; tentacles with rods, straight or slightly curved and very spiny.

Size: Maximum length about 40 cm, commonly to about 32 cm; mean live weight about 1.2 kg (up to 1.6 kg); body-wall thickness about 7 mm.

Habitat, biology, and fisheries: Found in moderately shallow waters, rarely in depths of more than 20 m; mostly on coastal lagoons and inner reef flats; abundant in sandy-muddy sediments where it burrows most of the time. Population densities generally less than 0.02/m^2. May be harvested with other reef flat species, such as *Bohadschia similis* and *Holothuria scabra*, when they occur together, but the sticky Cuvierian tubules make the collection and processing disagreeable. Collected by hand at low tide, or by divers. The processed product is not distinguished from those of other *Bohadschia* species and is of little commercial value.

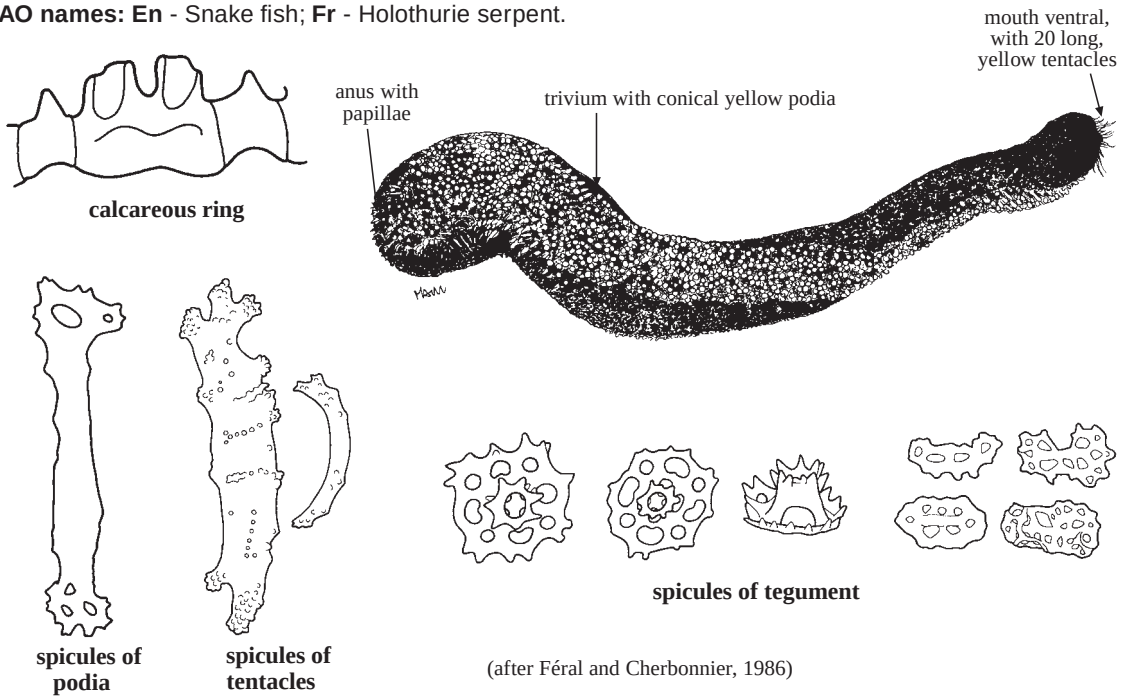
Distribution: Widespread in the tropical Indo-Pacific.



Holothuria (Acanthotrapeza) coluber Semper, 1868

Frequent synonyms / misidentifications: None / None.

FAO names: En - Snake fish; **Fr** - Holothurie serpent.



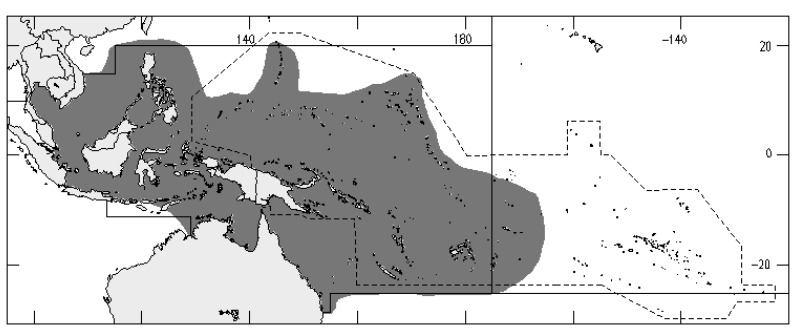
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, very elongate, larger near the posterior end. Tegument very tough. Short papillae on bivium emerging from warts; **podia on trivium conical, stout, yellow**, arranged in 10 rows on the radii and interradii; calcareous disc of podia around 400 µm in diameter. **Mouth** ventral, **surrounded by 20 very long, stout tentacles of characteristic yellow colour**; mouth also surrounded by a collar of small papillae. **Anus surrounded by 5 groups of 3 small papillae**. Calcareous ring with large and high radial pieces and narrow interradials. Cuvierian tubules absent. **Colour:** black, with yellow podia. **Spicules:** tegument with tables and pseudo-buttons; tables with circular disc showing 8 holes, bearing a spire of 4 pillars, with spiny crown, hollow in the middle; pseudo-buttons plate-like with denticulate border; rods in the podia and papillae smooth, with holes at their ends; tentacles with nodulous rods.

Size: Maximum length about 60 cm, commonly to about 40 cm; mean live weight about 0.3 kg (up to 1 kg); body-wall thickness about 4 mm.

Habitat, biology, and fisheries: Dwelling in moderately shallow water, rarely found in depths of more than 15 m; mostly on inner reef flats of fringing and lagoon-islet reefs and shallow coastal lagoons; abundant on sandy-muddy grounds with rubble or coral patches, where it hides the posterior part of body. Population densities between 0.01 and 0.2/m^2. Biology very poorly known. Not known to be traditionally harvested, but in recent times, due to increasing demand, this species also appears in the processed products of some Pacific Islands. Collected by hand while wading on the reefs at low tide, or by divers. The processed product is of low commercial value.

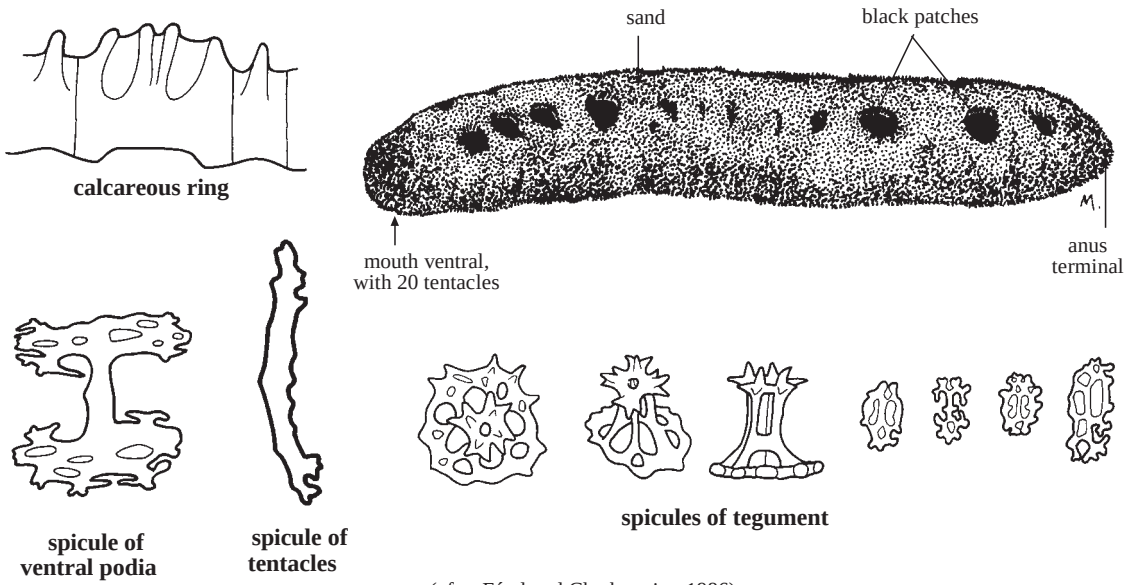
Distribution: Widespread in the tropical Pacific, excluding Hawaii; not recorded in the Indian Ocean.



Holothuria (Halodeima) atra Jaeger, 1833

Frequent synonyms / misidentifications: None / *Holothuria leucospilota* (Brandt, 1835).

FAO names: En - Lollyfish.

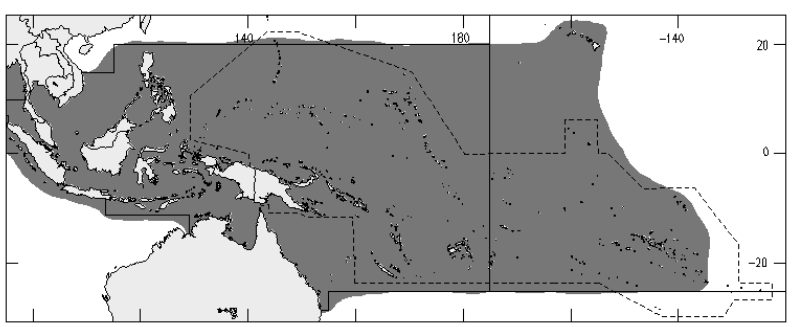


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, elongate, with rounded ends. Tegument smooth**, often covered by sand, but also showing round patches lacking sand**. A red toxic fluid is secreted upon rubbing the body surface vigorously. Podia on bivium sparsely distributed, ending in a small disc around 150 µm in diameter; podia on trivium numerous, short and stout, distributed on the radii and the interradii, their calcareous disc around 500 µm in diameter. **Mouth** ventral, **surrounded by 20 black tentacles. Anus terminal**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. **Colour: entirely black**. **Spicules:** tegument with tables and rosettes; tables with circular disc showing 8 holes (4 central and 4 smaller holes in between) and a spire of 4 pillars, ending in a maltese crown; rosettes small and simple, more abundant in ventral tegument; ventral podia without rods, but with pseudo-plates; dorsal podia and papillae with short rods, showing denticulate borders.

Size: Maximum length about 45 cm, commonly to about 20 cm; mean live weight about 0.2 kg (up to 1 kg); body-wall thickness about 4 mm.

Habitat, biology, and fisheries: The most common shallow-water species in the area, rarely found in depths of more than 20 m; mostly on inner and outer reef flats and back reefs or shallow coastal lagoons; abundant on sandy-muddy grounds with rubble or coral patches and in seagrass beds. The mean population density is around 0.5/m^2, but can exceed 4/m^2. Inshore shallow-water populations are denser, composed of smaller individuals, and reproduce mostly by transversal fission, while in deeper or outer reef populations the individuals are more scattered, larger, and reproduce sexually. Traditionally harvested, but the processed product is of low commercial value. In recent times, due to increasing demand, this species also appears in the processed products of many Pacific Islands. Collected by hand at low tide while wading on the reefs, or by divers.

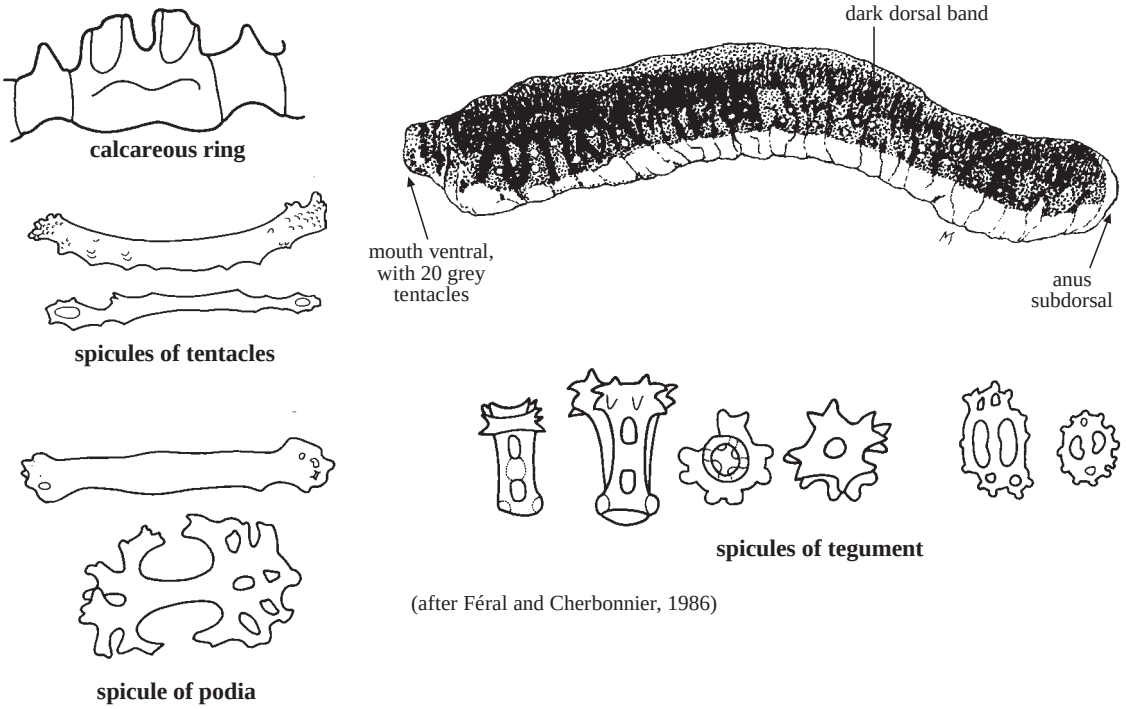


Distribution: Widespread in the tropical Indo-Pacific.

Holothuria (Halodeima) edulis Lesson, 1830

Frequent synonyms / misidentifications: None / None.

FAO names: En - Pinkfish; **Fr** - Trépang rose.



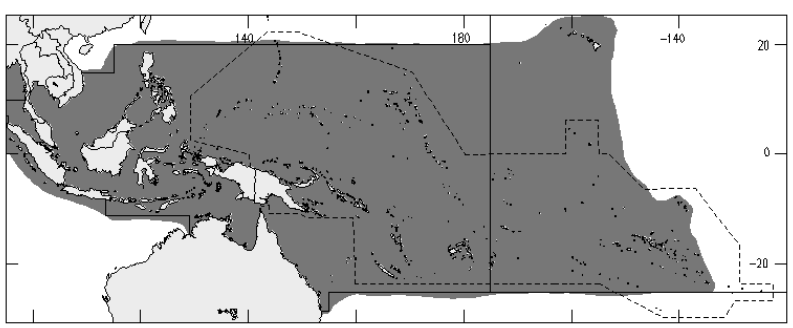
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body cylindrical, elongate, with rounded ends. Tegument rough. Podia sparse on bivium, ending in a small disc of around 100 µm diameter; podia on trivium numerous, short and stout, distributed on the radii and interradii, their calcareous disc around 460 µm in diameter. **Mouth** ventral, **surrounded by 20 grey tentacles. Anus subdorsal.** Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. **Colour:** a **characteristic black or dark medio-dorsal band**; coloration lighter laterally; trivium lighter, with small, dark dots. **Spicules:** tegument with tables and rosettes; tables with circular small disc, having a single hole in the middle, and bearing a spire ending in spines which may form a maltese crown; presence of rosettes with 4 holes (2 small and 2 larger holes); a second form of rosettes with 6 holes and small perforated plates mostly found in the dorsal tegument; ventral podia with large plates and rods; dorsal podia with nodose rods or showing holes at their ends.

Size: Maximum length about 35 cm, commonly to about 20 cm; mean live weight about 0.2 kg (up to 0.3 kg); body-wall thickness about 3 mm.

Habitat, biology, and fisheries: A common shallow-water species in the area, rarely found in depths of more than 30 m; mostly on inner and outer flats of coastal reefs, back reefs, or shallow coastal lagoons. Specimens from barrier reefs have been reported to have a brown bivium and a whitish trivium. Most abundant on sandy-muddy grounds with rubble or coral patches and in seagrass beds. Mean population density around 0.01/m^2 (not exceeding 0.1/m^2). Not traditionally harvested. The processed product looks similar to that of *Holothuria atra* and is of low commercial value.

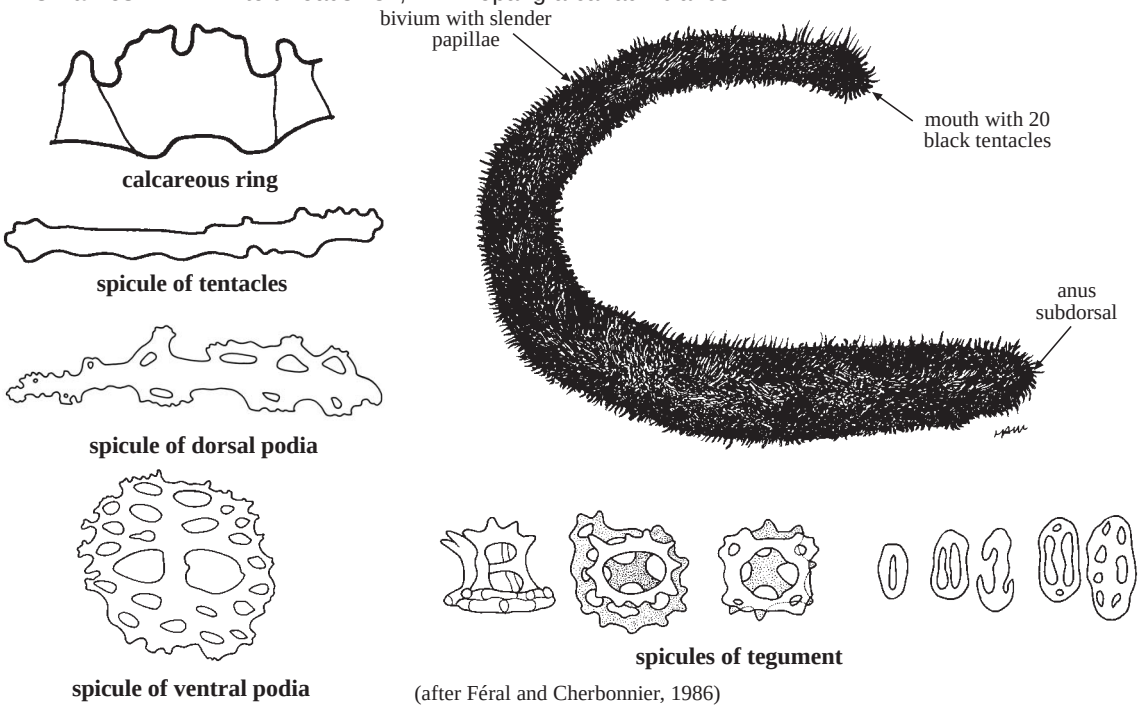
Distribution: Widespread in the tropical Indo-Pacific.



Holothuria (Mertensiothuria) leucospilota (Brandt, 1835)

Frequent synonyms / misidentifications: None / *Holothuria atra* Jaeger, 1833; *H. coluber* Semper, 1868.

FAO names: En - White threads fish; **Fr** - Trépang à canaux blancs.

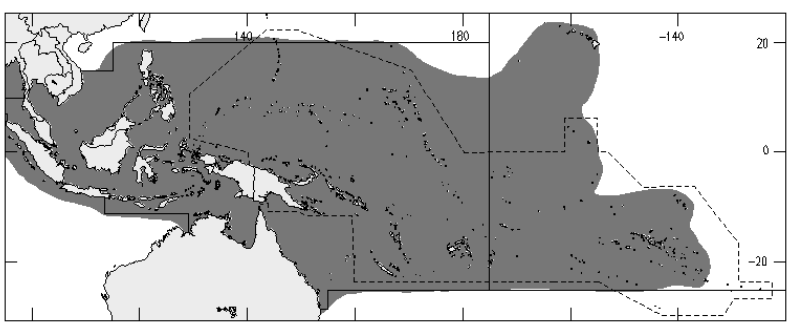


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body very elongate, narrower anteriorly than posteriorly. Tegument very smooth. Podia and papillae randomly distributed on bivium, the podia ending in a disc of around 480 µm diameter; podia on bivium numerous, short and stout, distributed on the radii and interradii, their calcareous disc around 700 µm in diameter. **Mouth** ventral, **surrounded by 20 black tentacles**. **Anus subdorsal**. Calcareous ring with large radial pieces and triangular interradials. **Cuvierian tubules very thin and long**. **Colour: entirely black**. **Spicules:** dorsal and ventral tegument with tables and buttons; tables with circular large disc, having 8 holes (or more), spire with 4 pillars, and ending in a crown with large central hole; buttons regular, with 6 or 8 holes, or irregular; plates large in ventral podia, with many holes; dorsal podia also with long rods; tentacles containing few rods.

Size: Maximum length about 55 cm, commonly to about 35 cm; mean live weight about 0.3 kg (up to 8 kg); body-wall thickness about 3 mm.

Habitat, biology, and fisheries: A common shallow-water species in the area, rarely found in depths of more than 10 m; mostly on outer and inner reef flats, back reefs, and shallow coastal lagoons. Abundant in seagrass beds, sandy-muddy grounds with rubble or coral patches where it hides the posterior part of body. Mean population density around 0.05/m^2 (can exceed 0.5/m^2). Inshore, shallow-water populations are denser, composed of smaller individuals and reproduce mostly by transversal fission, while in deeper or outer reef populations the individuals are more scattered, larger, and reproduce sexually. Not traditionally harvested, due to the thin tegument and the presence of Cuvierian tubules, but may be confused with other commercial black species of *Holothuria*.

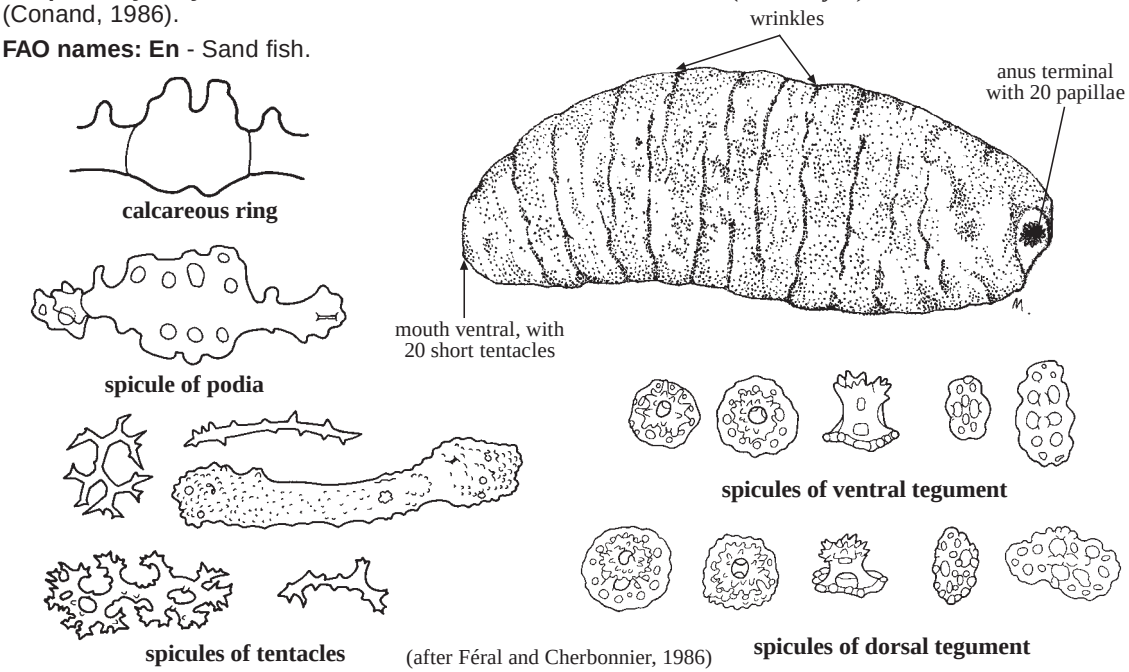


Distribution: Widespread in the tropical Indo-Pacific.

Holothuria (Metriatyla) scabra Jaeger, 1833

Frequent synonyms / misidentifications: None / *Holothuria (Metriatyla) scabra* var. *versicolor* (Conand, 1986).

FAO names: En - Sand fish.

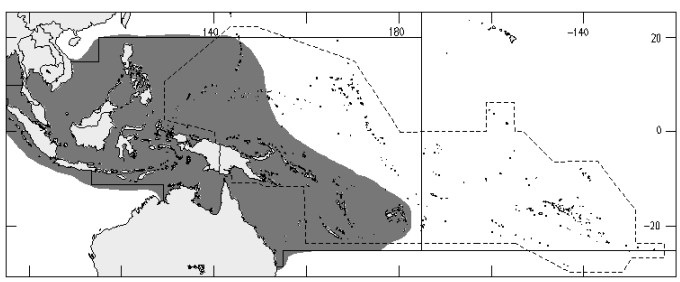


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body oval, arched dorsally (bivium) and flattened ventrally (trivium). **Bivium with characteristic wrinkles**, covered by sediment when the animal is coming out of the bottom. **Bivium with small papillae within black dots**, and black podia ending in a disc of around 220 µm diameter; podia on trivium arranged irregularly, their calcareous disc around 350 µm in diameter. **Mouth** ventral, **surrounded by a collar of papillae and 20 grey, short and stout tentacles**. **Anus terminal, surrounded by a circle of 5 groups of radial papillae**. Calcareous ring with a large medio-ventral radial piece. Cuvierian tubules absent. **Colour:** highly variable; bivium whitish to dark brown, occasionally with dark transverse markings; trivium lighter, generally whitish. **Spicules:** very numerous; ventral tegument with tables and buttons, the tables having a moderately small disc, perforated by a varying number of holes of variable size, the spire with 4 pillars and a cross-like bridge, ending in a spiny crown with a hole in the middle; knobby buttons generally have 6 holes, occasionally more; small rods and denticulate plates also present; tables and buttons in dorsal tegument: tables with a nodose disc, much larger than in ventral tegument; buttons variable, larger, and more perforated than those in ventral tegument; ventral and dorsal podia with long and large spinose rods; tentacles with long spiny rods, small smooth rods, and large denticulate plates.

Size: Maximum length about 35 cm, commonly to about 22 cm; mean live weight about 0.3 kg (up to 1 kg); body-wall thickness about 6 mm.

Habitat, biology, and fisheries: Found in shallow waters, rarely in depths of more than 10 m; mostly on inner reef flats of fringing and lagoon-islet reefs, coastal areas under terrigenous influence, and near mangroves. Burrows in mud and sandy-muddy bottoms where the populations can reach high densities (up to 1/m^2). Sexual reproduction takes place during the warm season. A species with a high potential fecundity and early sexual maturity. Provides the principal share of the tropical Indo-Pacific production of bêche-de-mer and is harvested throughout the area in artisanal fisheries. Collected by hand while wading on the reefs at low tide. The processing method is particular of this species: the sea cucumbers are buried overnight, and the next day the numerous spicules are removed by brushing the tegument. The processed product is of major commercial value and at present highly demanded.

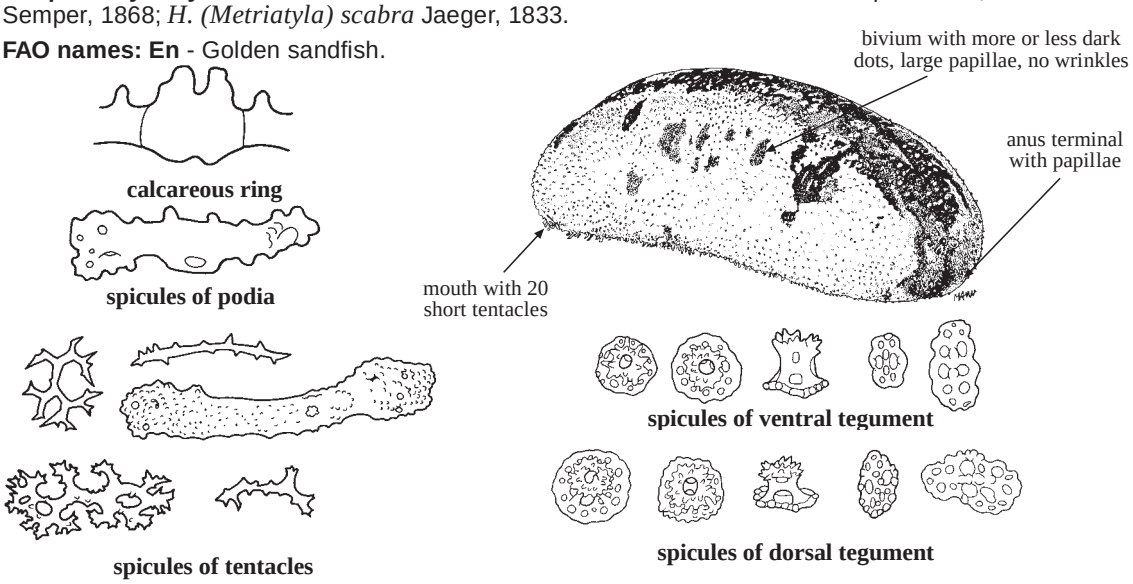


Distribution: Widespread in the tropical Indo-Pacific, excluding Hawaii.

Holothuria (Metriatyla) scabra* var. *versicolor (Conand, 1986)

Frequent synonyms / misidentifications: None / *Holothuria albiventer* Semper, 1868; *H. acculeata* Semper, 1868; *H. (Metriatyla) scabra* Jaeger, 1833.

FAO names: En - Golden sandfish.

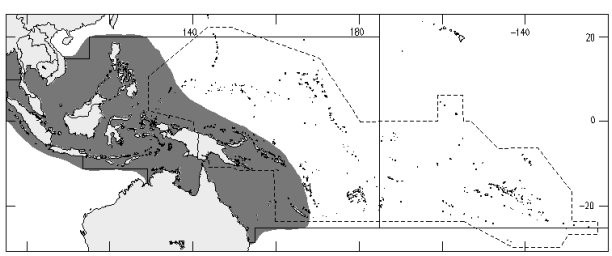


Diagnostic characters: Body oval, arched dorsally (bivium) and flattened ventrally (trivium). **Bivium without characteristic wrinkles** (as in the typical *Holothuria scabra*), sometimes covered by sediment when the animal is coming out of the bottom. **Bivium with large papillae** as well as black podia ending in a disc of around 220 µm diameter; podia on trivium arranged irregularly, their calcareous disc around 350 µm in diameter. **Mouth** ventral, **surrounded by a collar of papillae and 20 grey, short and stout tentacles. Anus terminal, surrounded by a circle of 5 groups of radial papillae.** Calcareous ring with a large medio-ventral radial piece. Cuvierian tubules absent. **Colour:** variable; 3 main patterns can be recognized: speckled, with moderate black areas, or black overall. **Spicules:** very numerous; ventral tegument with tables and buttons, the tables having a moderately small disc, perforated by a various number of holes of variable size, the spire with 4 pillars and a cross-like bridge, ending in a spiny crown with a hole in the middle; knobby buttons generally have 6 holes, occasionally more; small rods and denticulate plates also present; tables and buttons in dorsal tegument: tables with a nodose disc, much larger than in ventral tegument; buttons variable, larger, and more perforated than those in ventral tegument; ventral and dorsal podia with long and large spinose rods; tentacles with long spiny rods, small smooth rods, and large denticulate plates.

Size: Maximum length about 45 cm, commonly to about 30 cm; mean live weight about 1.1 kg (up to 2.8 kg); body-wall thickness about 7 mm.

Habitat, biology, and fisheries: Generally inhabits shallow waters, but often found in depths of more than 20 m (deeper than the typical *H. scabra*); on inner reef flats and coastal lagoons, frequently on flagstones; burrows in mud and sandy-muddy bottoms. Population densities are less than in the typical *H. scabra*, with a mean of around 0.01/m^2. Sexual reproduction takes place during the warm season. It has a high potential fecundity. Harvested in some artisanal fisheries throughout the area, in places where its habitat occurs. Collected by hand at low tide while wading on the reefs. Processed with the same method used with the typical *H. scabra*: the sea cucumbers are buried overnight and the next day the numerous spicules are removed by brushing the tegument. The processed product is different in appearance from the typical *H. scabra*, having a golden colour. Of major commercial value, the processed product is at present highly demanded.

Distribution: Widespread in the tropical Pacific, excluding coral reef islands.

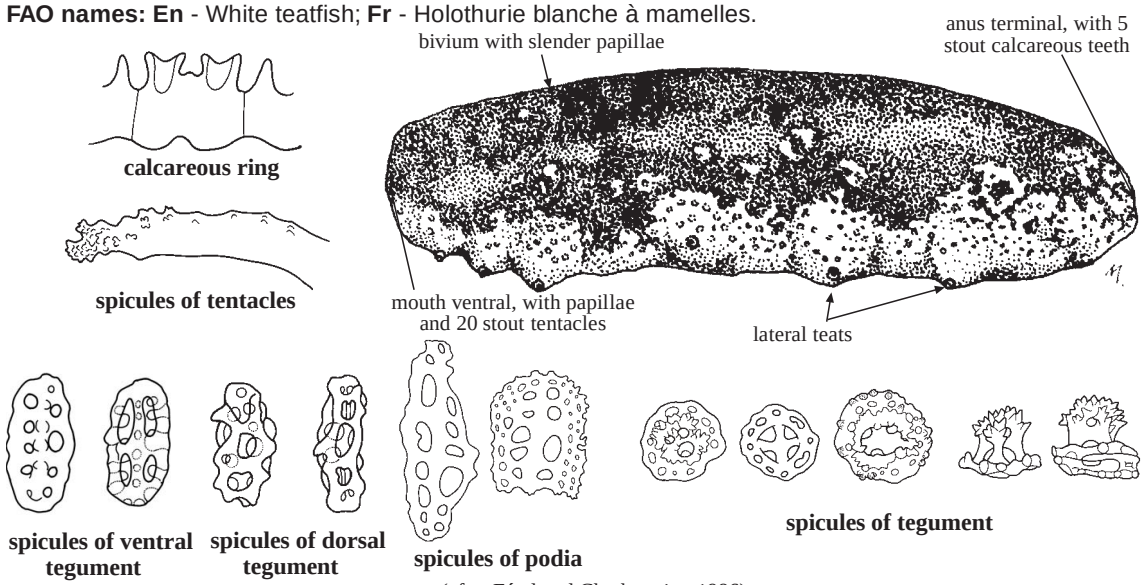


Remarks: Despite distinct differences in its ecology and biology, when compared to the typical *H. scabra*, this form is currently considered a variety, due to the lack of known differences in the spicules and internal anatomy. The name of this variety, *versicolor*, is due to the dorsal tegument which shows various colour patterns. Generally grows larger than the typical *H. scabra*.

Holothuria (Microthele) fuscogilva Cherbonnier, 1980

Frequent synonyms / misidentifications: None / *Holothuria nobilis* (Selenka, 1867); *H. maculata*.

FAO names: En - White teatfish; **Fr** - Holothurie blanche à mamelles.



(after Féral and Cherbonnier, 1986)

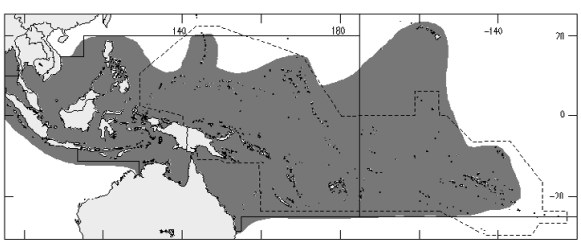
Diagnostic characters: Body suboval, stout, firm and rigid, arched dorsally (bivium) and flattened ventrally (trivium). **Bivium with characteristic large lateral papillae (teats)** and often covered by sand. Bivium with small papillae as well as podia ending in a disc of around 450 µm diameter; podia on trivium stout, arranged irregularly, their calcareous disc around 600 µm in diameter. **Mouth** ventral, **surrounded by a collar of long yellowish papillae and 20 grey, stout tentacles**. **Anus surrounded by 5 stout calcareous teeth**. Calcareous ring with large radial pieces (slightly different from *Holothuria nobilis*). **Cuvierian tubules absent**. **Colour:** variable; **bivium brown with more or less distinct whitish spots**, becoming larger on sides; trivium lighter, generally whitish. **Spicules:** in form of tables and buttons; dorsal and ventral tegument with 2 kinds of tables; one form of table having an undulated disc with 10 to 15 irregular holes, supporting a massive spire with 4 pillars, ending in a very large, spiny, perforated crown; the other form of table, more frequent in the dorsal tegument, have a larger disc, with more holes and a spire ending in a crown composed of 2 or 3 rows of stout spines and 5 or 6 spiny pillars; ventraltegument buttons simple, with 8 holes or more complicated as fenestrated ellipsoids; dorsal-tegument buttons only as fenestrated ellipsoids; ventral and dorsal podia with large plates, multiperforated; tentacles with spiny ending rods (up to 700 µm).

Size: Maximum length about 57 cm, commonly to about 42 cm; mean live weight about 2.4 kg (up to 4 kg); body-wall thickness about 12 mm.

Habitat, biology, and fisheries: With a deeper distribution than *H. nobilis*, mostly found in depths between 10 and 40 m; generally occurs on outer barrier reefs and passes, but also known to inhabit shallow seagrass beds. Populations do not reach densities as high as *H. nobilis*, with medium densities around 0.001/m^2. Sexual reproduction takes place during the warm season. A species with a low potential fecundity and late sexual maturity. Harvested in artisanal fisheries throughout the area, in places where its habitat occurs. Collected by skin diving or using diving gear (if not banned), making the populations vulnerable due to overexploitation. The processed product is of major commercial value and very highly demanded at present, even though the stocks have declined within the area.

Distribution: Widespread in the tropical Indo-Pacific.

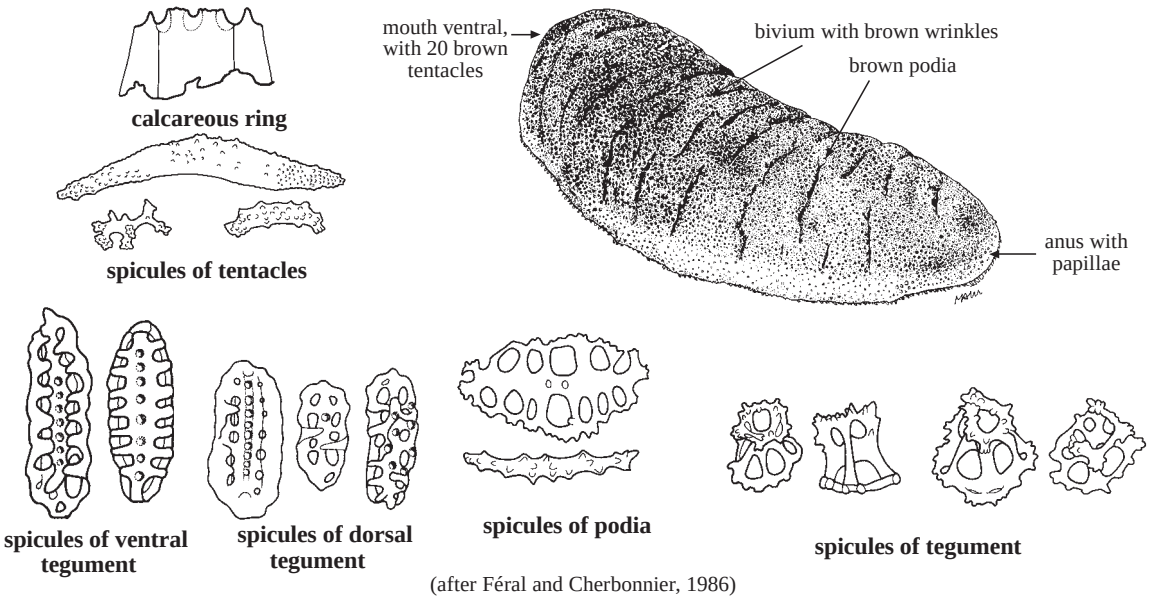
Remarks: Although described only some years ago, this species, previously considered to be identical to *H. nobilis*. However, for a long time it was well known by fishermen from various Pacific islands, which give it a different name than *H. nobilis*, based on the colour. It differs from *H. nobilis* by the colour of the tegument, the absence of Cuvierian tubules, and the shape of spicules. Their habitats are also different.



Holothuria (Microthele) fuscopunctata Jaeger, 1833

Frequent synonyms / misidentifications: *Holothuria axiologa* H.L. Clark, 1921 / None.

FAO names: En - Elephant trunkfish; **Fr** - Holothurie trompe d'éléphant.

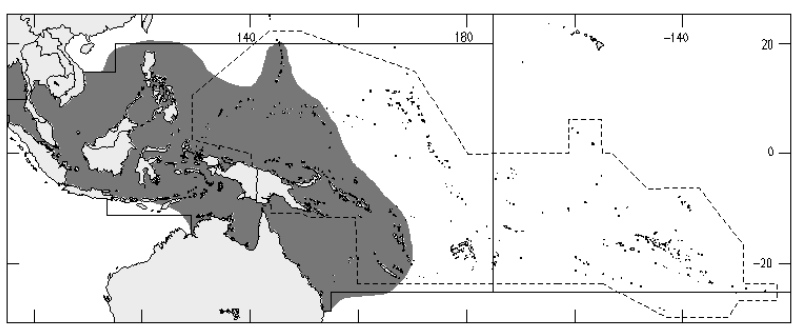


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body suboval, stout, firm and rigid, arched dorsally (bivium) and flattened ventrally (trivium); **bivium with characteristic brown wrinkles**. **Podia on bivium small, brown**, with a disc of around 200 µm diameter; podia on trivium more densely distributed on the median radius and more sparsely distributed on the other radii and interradii, with their calcareous disc around 300 µm in diameter. Mouth ventral, with 20 brown, stout tentacles. **Anus surrounded by 5 radial groups of 3 or 4 papillae** and a black band. Calcareous ring with large radial pieces and narrower interradials. **Cuvierian tubules absent**. Cloaca large and black. **Colour: bivium golden brown, with numerous brown spots; trivium whitish**; mature gonads bright yellow. **Spicules:** in form of tables and buttons; tables of dorsal and ventral tegument similar in shape and moderately sparse, disc small, irregular, with 4 to 6 irregular holes, supporting a short spire, ending in an irregular crown of smooth spines; ventral-tegument buttons elongated ellipsoids, with 12 to 16 holes and median nodules; dorsal-tegument buttons generally more regular and less perforated; ventral and dorsal podia with large plates, multiperforated and indentated; tentacles containing both large very spiny rods and short nodose rods.

Size: Maximum length about 70 cm, commonly to about 36 cm; mean live weight about 1.5 kg (up to 4.5 kg); body-wall thickness about 10 mm.

Habitat, biology, and fisheries: Commonly found in reef slopes and lagoons, also seen in shallow seagrass beds; mostly in depths of less than 25 m. Population densities around 0.005/m^2. Sexual reproduction takes place during the warm season. A species with a low potential fecundity and late sexual maturity. Occasionally harvested in artisanal fisheries throughout the area. Collected by skin diving or using diving gear (if not banned), making the populations very vulnerable, due to overexploitation. The processed product is of minor commercial value.

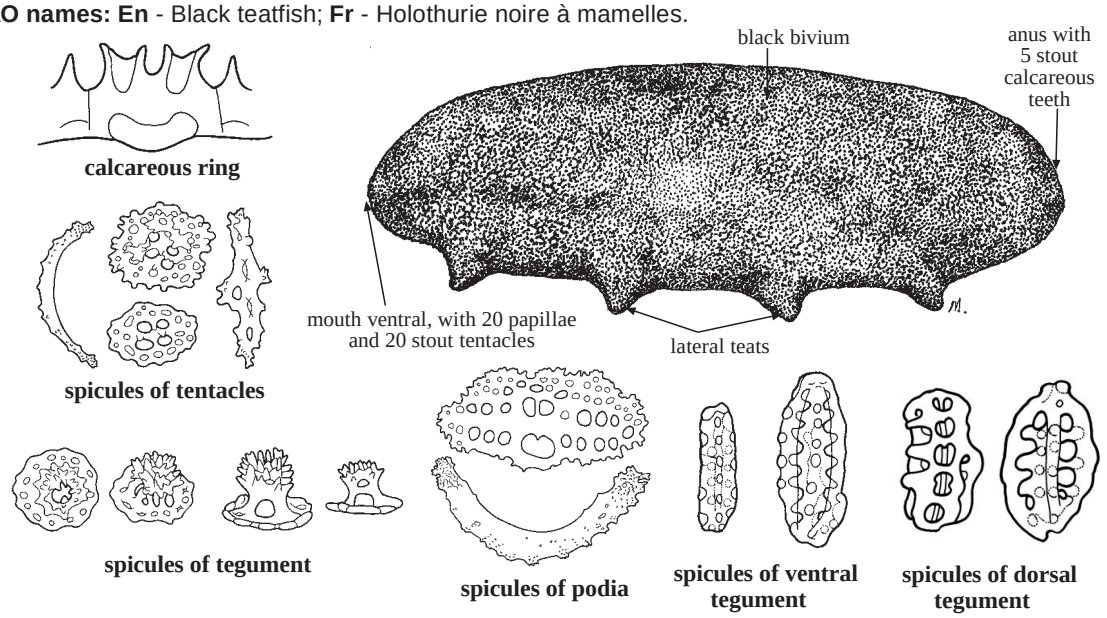


Distribution: In the tropical Indian Ocean known only from Madagascar; in the tropical Pacific, in the west from Australia and Sulawesi eastwards to Marianna Islands, Palau, and New Caledonia.

Holothuria (Microthele) nobilis (Selenka, 1867)

Frequent synonyms / misidentifications: *Holothuria guamensis* Quoy and Gaimard, 1833 / *Holothuria fuscogilva* Cherbonnier, 1980.

FAO names: En - Black teatfish; **Fr** - Holothurie noire à mamelles.

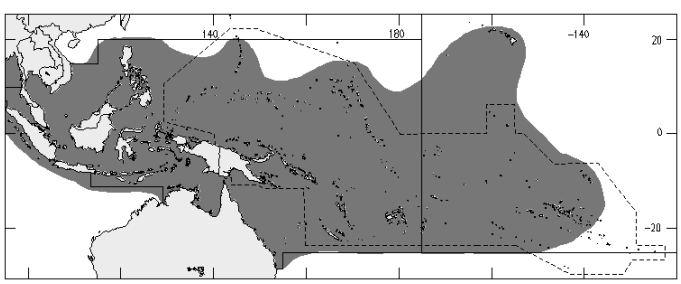


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body suboval, stout, firm and rigid, arched dorsally (bivium), and flattened ventrally (trivium). **Bivium with characteristic large lateral papillae (teats)** and often covered by sand. Bivium with small papillae as well as podia ending in a disc around 220 µm in diameter; podia on trivium stout, arranged irregularly, their calcareous disc around 700 µm in diameter. **Mouth** ventral, **surrounded by 2 rows of black papillae and 20 grey, stout tentacles**. **Anus surrounded by short papillae and 5 stout calcareous teeth**. Calcareous ring with large wing-shaped radial pieces and narrow sharp interradials (slightly different from *Holothuria fuscogilva*). **Cuvierian tubules** present, but never expelled. **Colour:** less variable than in *H. fuscogilva*; **bivium dark brown to black**; trivium lighter, generally greyish. **Spicules:** in form of tables and buttons; only one kind of tables in the dorsal and ventral tegument; tables with undulated, circular disc with 12 to 16 holes, supporting a massive spire with 4 pillars and a cross bridge, ending in a large, spiny crown; ventral-tegument buttons in form of fenestrated ellipsoids; dorsal-tegument buttons shorter, larger, and less fenestrated; ventral podia with numerous spiny rods and large multiperforated plates; tentacles with spiny rods, large plates, small plates, and pseudo-plates.

Size: Maximum length about 55 cm, commonly to about 37 cm; mean live weight about 1.7 kg (up to 4 kg); body-wall thickness about 12 mm.

Habitat, biology, and fisheries: Inhabits shallower waters than *H. fuscogilva*, mostly found from the surface to a depth of 20 m; generally occurs on reef flats, slopes, and in shallow seagrass beds. Populations reach higher densities than *H. fuscogilva*, with medium densities of around 0.002/m^2. Characterized by a sexual reproduction that takes place during the cold season. It has a medium potential fecundity. Harvested in artisanal fisheries throughout the area, in places were its habitat occurs. Collected by hand at low tide, by skin diving or using diving gear (if not banned), making the populations very vulnerable, due to overexploitation. The processed product is of major commercial value and very highly demanded at present, even though the stocks have declined within the area.



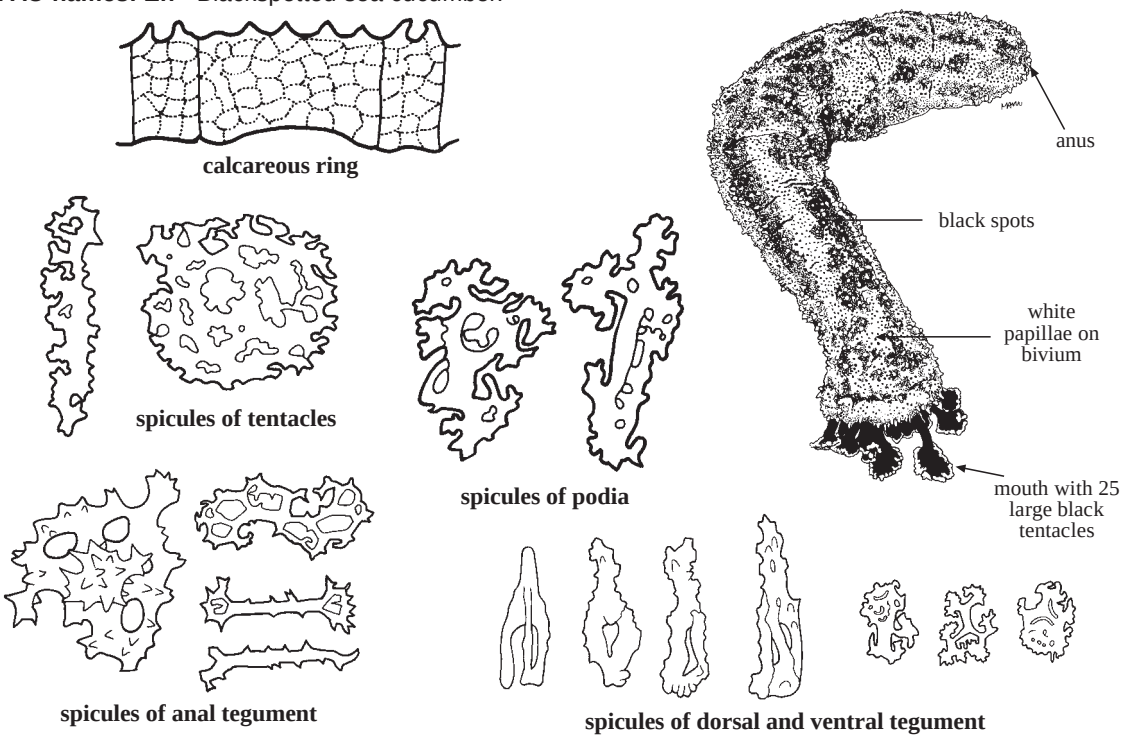
Distribution: Widespread in the tropical Indo-Pacific.

Remarks: Differs from *H. fuscogilva* by the colour of the tegument, the presence of Cuvierian tubules, and the shape of spicules. Their habitats are also different.

Pearsonothuria graeffei (Semper, 1868)

Frequent synonyms / misidentifications: *Bohadschia graeffei* (Semper, 1868) / None.

FAO names: En - Blackspotted sea cucumber.

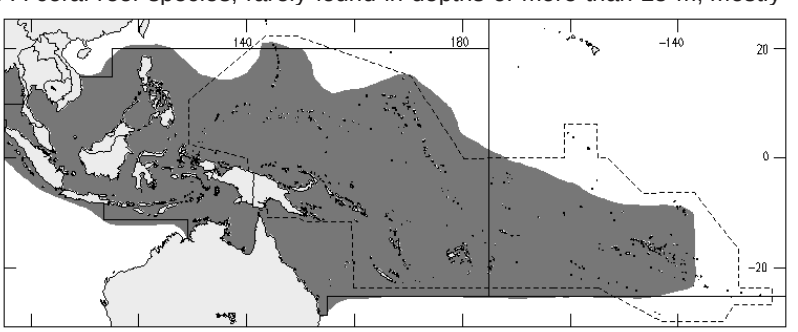


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body subcylindrical, arched dorsally (bivium) and slightly flattened ventrally (trivium). **White conical papillae sparsely distributed on bivium**; podia on trivium long and large, their calcareous disc around 240 µm in diameter. **Mouth** ventral, **surrounded by 25 large, black tentacles. Anus nearly dorsal**. Calcareous ring with irregular pieces. Cuvierian tubules numerous, but never expelled. **Colour:** bivium whitish with large, brown dots and **numerous small black spots**; trivium grey, also with small black spots. **Spicules:** dorsal and ventral tegument with pseudo-tables and rosettes; pseudo-tables consisting of large base with a large hole, and a spiny spire; rosettes numerous, those in the tegument simple, but more complicated in the dorsal papillae and ventral podia; also present around the anus are rods, small plates, and tables with a very spiny crown; tentacles containing a few rods and large plates derived from rosettes.

Size: Maximum length about 45 cm, commonly to about 35 cm; mean live weight about 0.7 kg (up to 1.3 kg); body-wall thickness about 4 mm.

Habitat, biology, and fisheries: A coral reef species, rarely found in depths of more than 25 m; mostly found on reef slopes, close to the coast; abundant on corals mixed with calcareous red algae. Population densities generally less than 0.005/m^2. Not harvested for bêche-de-mer production.



Distribution: Widespread in the tropical Indo-Pacific, excluding the Persian Gulf and Hawaii.

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STICHOPODIDAE

Diagnostic characters: Body square-shaped or trapezoidal in cross-section. Cuvierian organs absent. Gonads forming 2 tufts appended on each side of the dorsal mesentery. Dominant spicules in form of branched rods and C-and S-shaped rods.

Key to the genera of Stichopodidae occurring in the area (after Clark and Rowe, 1971)

1a. Bivium covered with large papillae, leaf-shaped, simple or branched, and without podia regularly arranged longitudinally; spicules never developod as tables, but numerous grains, dichotomously branched rods . . . . . ***Thelenota***

1b. Bivium covered with tubercules and papillae, at least on sides; trivium more or less covered by podia; spicules developod as tables, branched rods, and C-and S-shaped rods . . . . . ***Stichopus***

List of species of interest to fisheries occurring in the area

The symbol ⁂ is given when species accounts are included.

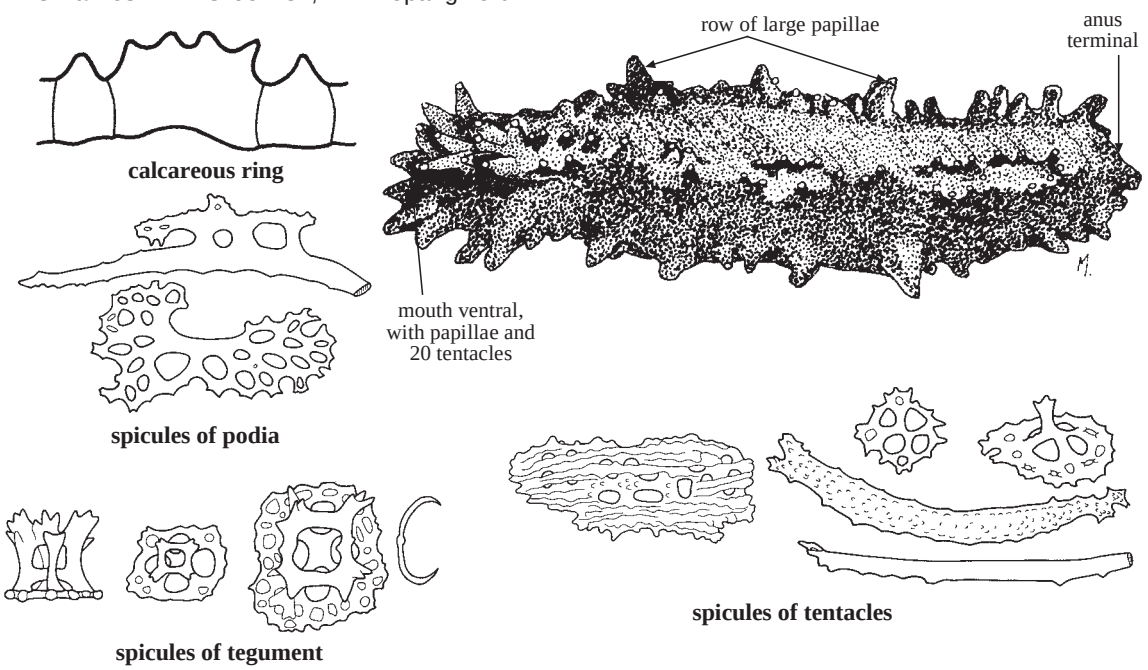
⁂ *Stichopus chloronotus* Brandt, 1835
⁂ *Stichopus horrens* Selenka, 1867
⁂ *Stichopus variegatus* Semper, 1868

⁂ *Thelenota ananas* (Jaeger, 1833)
⁂ *Thelenota anax* Clark, 1921

Stichopus chloronotus Brandt, 1835

Frequent synonyms / misidentifications: None / None.

FAO names: En - Greenfish; **Fr** - Trépang vert.



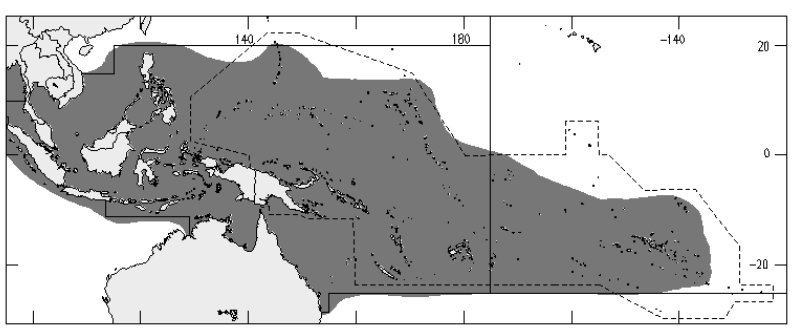
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body firm, rigid with quadrangular section, flattened ventrally (trivium); body wall easily disintegrates outside sea water. **Radii of bivium with characteristic double row of large papillae**, each radius ending in a small red or orange papilla. Trivium delimited by characteristic double row of large papillae; stout podia arranged regularly on 3 radial bands, with 10 rows in the medio-ventral band and 5 in the lateral. **Mouth** ventral, **surrounded by a row of papillae and 20 green, stout tentacles. Anus terminal**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. Cloaca large and greenish. **Colour:** bivium dark green to black; trivium lighter. **Spicules:** presence of very characteristic tables with a narrow disc showing 4 holes, bearing a spire generally ending in a moderately spiny crown; tables with larger disc and simpler crown also present; presence of many C-shaped spicules; rosettes absent; tables in dorsal with have a large multiperforated disc, bearing a large spire; ventral papillae with long, smooth rods; ventral podia with denticulate rods and large multiperforated plates; tentacles with smooth and granular rods.

Size: Maximum length about 35 cm, commonly to about 18 cm; mean live weight about 0.1 kg (up to 0.4 kg); body-wall thickness about 2 mm.

Habitat, biology, and fisheries: A reef species, mostly found in shallow areas from near the surface to a depth of 15 m; generally occurs on reef flats and upper slopes. Populations reaching high densities on hard substrates, with a mean of around 0.04/m^2. Shallow-water populations are generally smaller in size than those found in deeper waters. Biology poorly known. Probably harvested in some artisanal fisheries of the area. Collected by hand at low tide, or by divers. The processed product is of low commercial value.

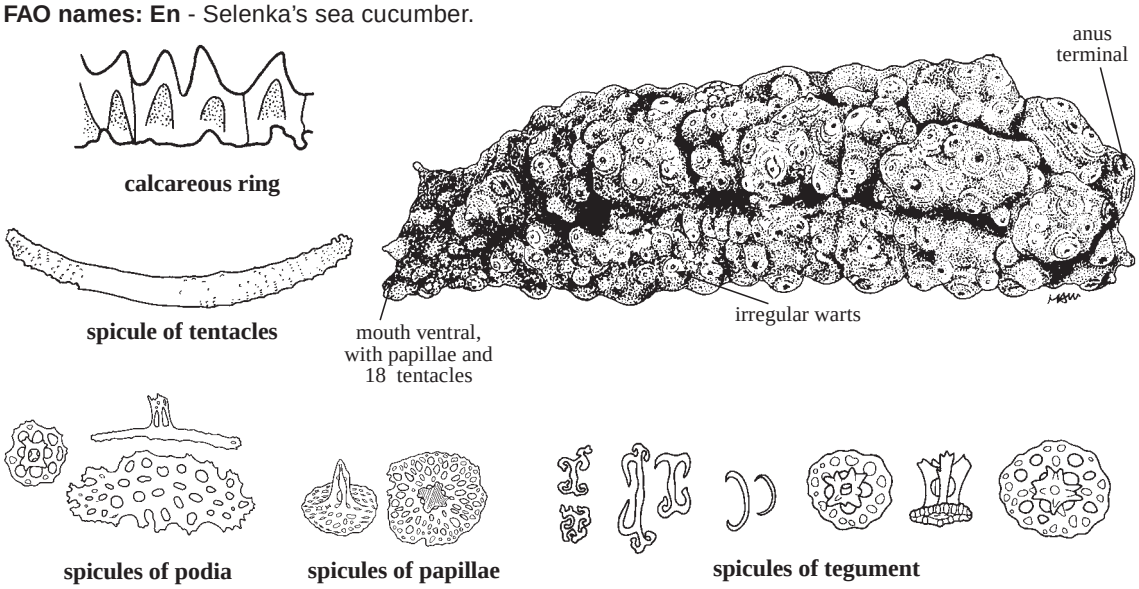
Distribution: Widespread in the tropical Indo-Pacific, excluding the Persian Gulf and Hawaii.



Stichopus horrens Selenka, 1867

Frequent synonyms / misidentifications: *Stichopus godeffroyi* Semper, 1868 / None.

FAO names: En - Selenka's sea cucumber.

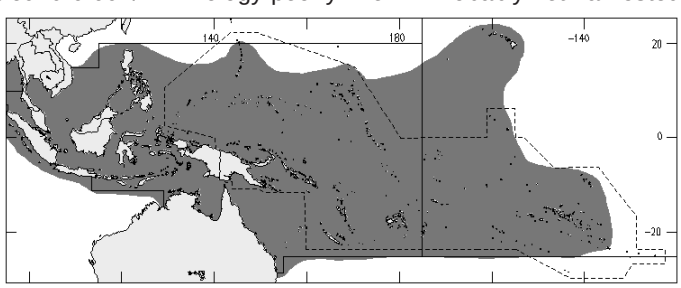


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body firm, rigid, squarish in cross-section, flattened ventrally (trivium); body wall easily disintegrates outside sea water. **Bivium covered with irregular warts**, arranged in 10 longitudinal rows; warts larger near mouth. Trivium delimited by a characteristic double row of large papillae (4 to 5 mm); stout podia arranged in 4 rows, on 3 radial bands, their disc about 350 µm in diameter. **Mouth** ventral, **surrounded by a half row of papillae and 18 brown, short tentacles. Anus terminal**. Calcareous ring with a deeply indented radial pieces and triangular interradials. Cuvierian tubules absent. **Colour:** bivium whitish to grey, with brown irregular dots; trivium lighter. **Spicules:** very characteristic rosettes, X-shaped, or elongate, numerous in the tegument; presence of numerous C-shaped spicules of 3 sizes; ventral tegument with tables of 2 sizes; some tables have a circular disc with 4 central and about 15 peripheral holes, bearing a spire with 4 pillars ending in a moderately spiny and cross-shaped crown; tables with a larger disc also present, more perforated, with a higher, spiny crown; only the first kind of table found in the dorsal tegument; tables in papillae provided with large multiperforated disc, with a long, conical, smooth spire, ending in a single point; ventral papillae containing long, smooth rods; ventral podia have long rods, with a central apophysis, and large, elongate, multiperforated plates; tentacles with large rods, either curved with few spines, or straight and very spiny.

Size: Maximum length about 40 cm, commonly to about 20 cm; mean live weight about 0.2 kg (up to 0.5 kg); body-wall thickness about 2 mm.

Habitat, biology, and fisheries: A reef species, mostly found in shallow areas from near the surface to a depth of 15 m; generally occurs in rubbles, or hidden in reef flats. A nocturnal species. Populations not reaching high densities, with a mean of around 0.007/m^2. Biology poorly known. Probably not harvested, as the tegument disintegrates too quickly. An aquaculture programme for this species is presently being carried out, for stock enhancement purposes.

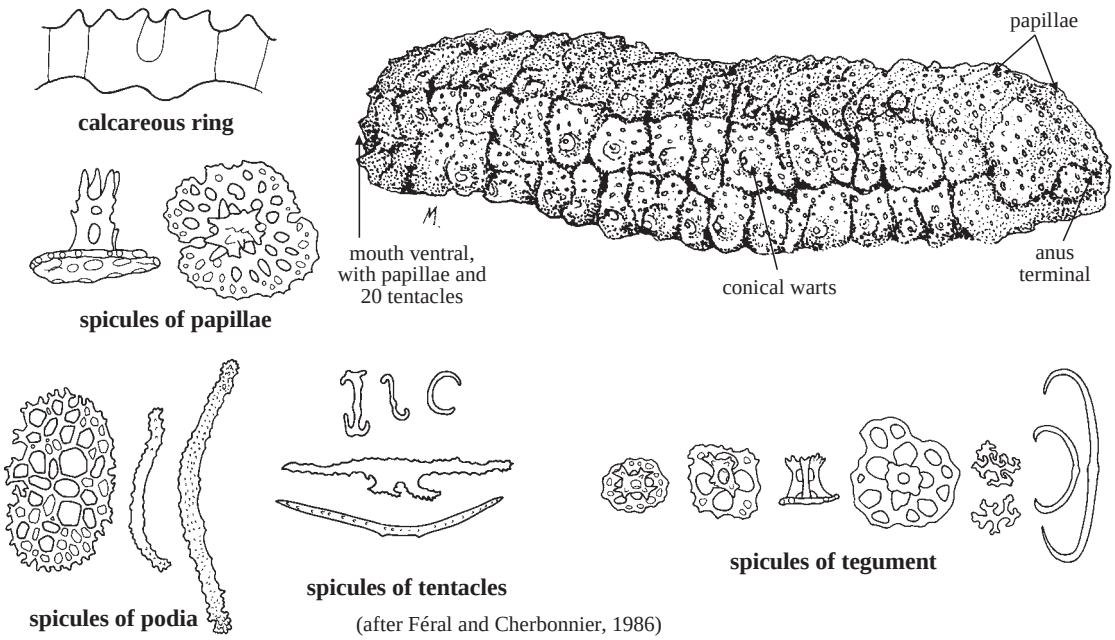


Distribution: Widespread in the tropical Indo-Pacific.

Stichopus variegatus Semper, 1868

FAO names: En - Curryfish; **Fr** - Trépang curry.

Frequent synonyms / misidentifications: None / None.

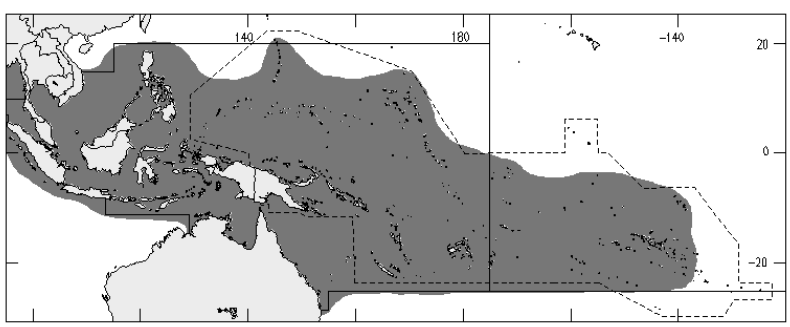


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body firm, rigid, squarish in cross-section, flattened ventrally (trivium). Body wall easily disintegrates outside sea water. **Bivium covered with irregular conical warts, arranged in 8 longitudinal rows, with smaller papillae in between**. Trivium with yellow to pink podia, arranged in rows on the radii, their disc about 380 µm in diameter. **Mouth** ventral, **surrounded by a circle of conical papillae and 20 yellowish tentacles. Anus terminal**. Calcareous ring with a deeply indented radial pieces and small interradials. Cuvierian tubules absent. **Colour:** variable on bivium, yellow to greenish, with black spots; trivium lighter. **Spicules:** tables in the tegument with 2 forms of discs, some being undulated, with 8 to 20 holes, while others form a denticulate disc with 4 central holes and a variable number of peripheral holes; spire of tables with 4 pillars ending in a moderately spiny and perforated crown; some tables with large disc and irregular crown also present; tables in papillae have a very large multiperforated disc; rosettes cross-shaped, branching; X-shaped spicules occur in 3 different sizes; ventral podia with spiny rods and large multiperforated plates showing pentagonal holes; tentacles with long, narrow, and spiny rods and X-, S-, and C-shaped small spicules.

Size: Maximum length about 50 cm, commonly to about 35 cm; mean live weight about 1 kg (up to 2.5 kg); body-wall thickness about 8 mm.

Habitat, biology, and fisheries: A shallow-water species, found in coastal reefs and lagoons, mostly from near the surface to a depth of 25 m. Generally occurs in seagrass beds, rubbles, and muddy-sand bottoms. Populations not reaching high densities, with a mean of around 0.005/m^2. Sexual reproduction takes place during the warm season. A species with a low potential fecundity and late sexual maturity. Probably rarely collected as the tegument disintegrates very easily, resulting in a low commercial value of the species.

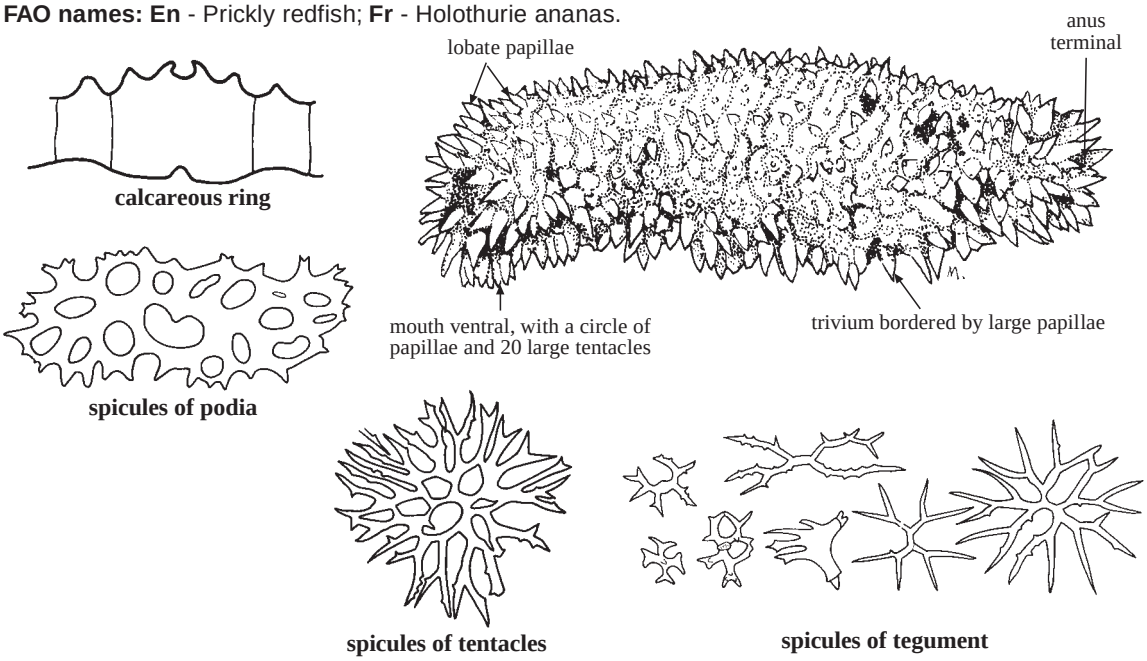


Distribution: Widespread in the tropical Indo-Pacific, excluding Hawaii.

Thelenota ananas (Jaeger, 1833)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Prickly redfish; **Fr** - Holothurie ananas.

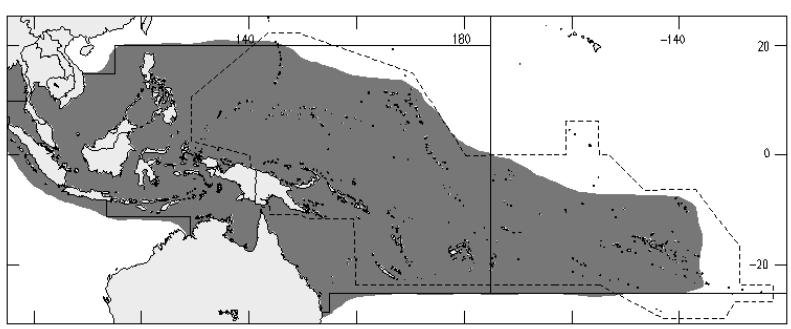


(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body firm, rigid, flattened ventrally (trivium). **Bivium entirely covered with characteristic, large, leaf-shaped, lobate papillae**. Trivium with brown to pink podia, more numerous on the radii, their disc about 400 µm in diameter. **Mouth** ventral, **surrounded by a circle of conical papillae** which are larger on dorsal side, **and 20 large, brown tentacles. Anus terminal**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. **Colour:** variable on bivium, reddish orange to brown; trivium generally red; mature gonads deep purple. **Spicules:** tegument with cross-shaped spicules, spiny branched spicules (sometimes with median pillar), perforated plates, pseudo-tables, and grains; branched spicules larger in dorsal tegument and papillae; ventral podia with branched spicules, long rods, and large, multiperforated plates; tentacles with characteristic branched spicules, in form of a "rose-window".

Size: Maximum length about 80 cm, commonly to about 45 cm; mean live weight about 2.5 kg (up to 7 kg); body-wall thickness about 15 mm.

Habitat, biology, and fisheries: A common reef species, mostly found from near the surface to a depth of 25 m; generally occurs on hard bottoms, large rubble and coral patches, on reef slopes and near passes. Populations not reaching very high densities, with a mean of around 0.003/m^2. Sexual reproduction takes place during the warm season. A species with a low potential fecundity and late sexual maturity. Symbiotic pearlfish (Carapidae, Ophidiiformes) are often found in its general cavity. Harvested by hand. Collected by skin diving or using diving gear (if not not banned), making the populations very vulnerable, due to overexploitation. The processed product is of major quality and the demand is still high.

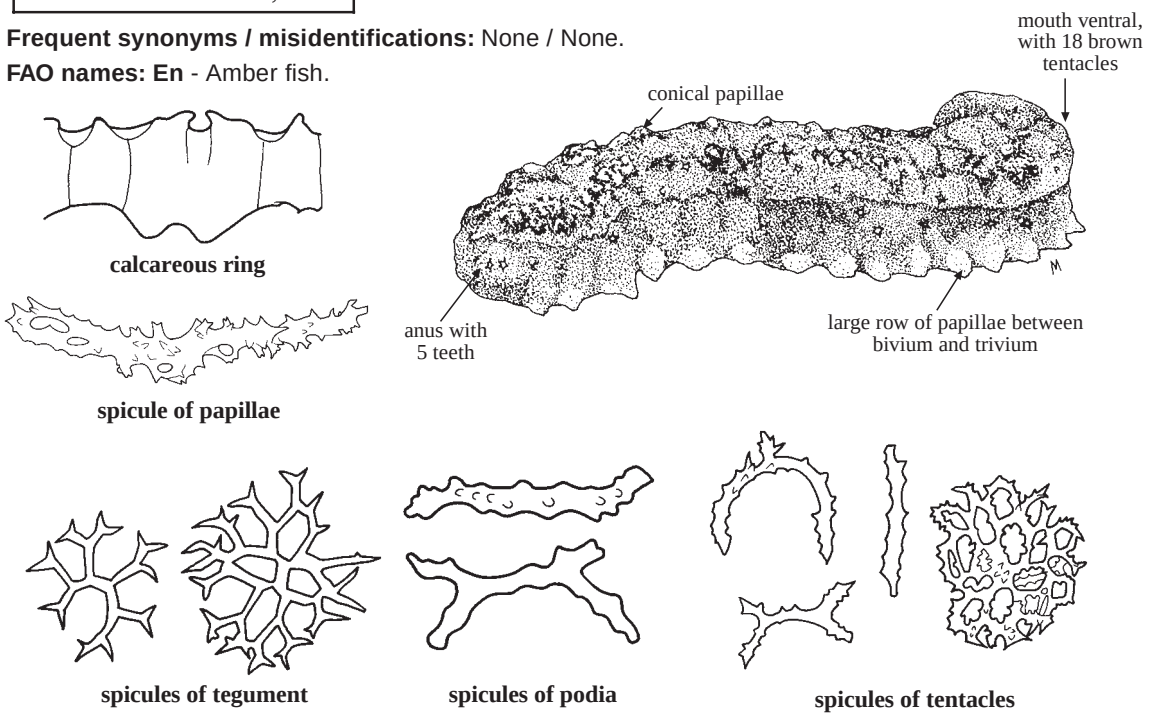


Distribution: Widespread in the tropical Indo-Pacific, excluding Hawaii.

Thelenota anax Clark, 1921

Frequent synonyms / misidentifications: None / None.

FAO names: En - Amber fish.



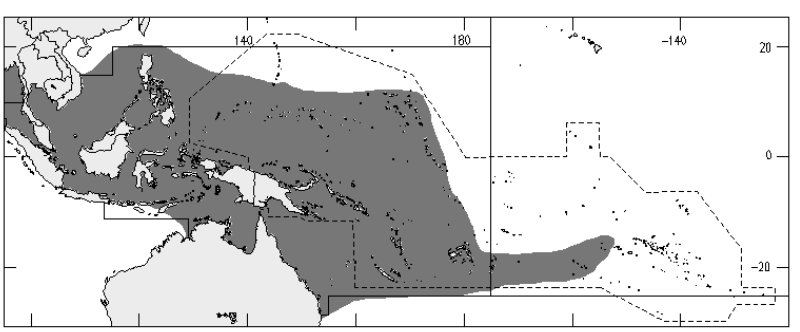
(after Féral and Cherbonnier, 1986)

Diagnostic characters: Body firm, rigid, squarish in cross-section, flattened ventrally (trivium). **Bivium entirely covered with numerous characteristic, conical papillae** and minute podia; **bivium demarcated from the trivium by a row of large papillae**. Podia numerous on trivium, with large disc, about 600 µm in diameter. **Mouth** ventral, **surrounded by a circle of 18 large brown tentacles. Anus terminal**. Calcareous ring with large radial pieces and narrow interradials. Cuvierian tubules absent. Cloaca large. **Colour:** bivium cream, with large beige dots; trivium generally beige; mature gonads deep purple. **Spicules:** tegument with branched spicules showing polygonal holes, and spicules in form of a "rose window", mostly abundant in the tentacles; tentacles also with straight, curved, or X-shaped rods; ventral podia with short, smooth rods; dorsal papillae with sparse, very long, spiny rods.

Size: Maximum length about 80 cm, commonly to about 55 cm; mean live weight about 3.5 kg (up to 6 kg); body-wall thickness about 15 mm.

Habitat, biology, and fisheries: A rare reef species, mostly found at depths between 10 and 30 m; generally occurs on hard grounds, large rubbles and sand patches, on reef slopes, outer lagoon and near passes. Populations not reaching high densities, with a mean of around 0.001/m^2. Biology poorly known. Rarely harvested until few years ago, being generally found in low densities. Collected by skin diving or using diving gear (if not banned), making the populations presently very vulnerable, due to overexploitation. The processed product is probably of low to moderate commercial value and the exploitation of this species should be avoided.

Distribution: In the tropical Indian Ocean known from the Glorieuses Islands; in the tropical Pacific, from northern Australia to Enewetok, Guam, the China Sea, and the Ryukyu Islands southwards to New Caledonia, Fiji, and the Society Islands.



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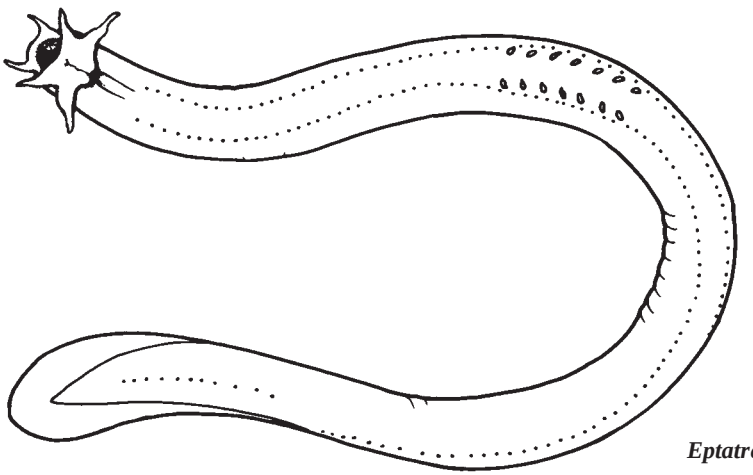
HAGFISHES

by B. Fernholm and J.R. Paxton

MYXINIDAE

Hagfishes

Diagnostic characters: Moderate-sized to large (to 100 cm), **very elongate with eel-shaped body. Mouth with laterally biting horny teeth; no jaws. Eye reduced. Anterior single nostril surrounded by 4 tentacles. No operculum; 1 to 16 pairs of external gill openings. Two ventrolateral rows of slime glands. No paired fins; median fins without rays. No scales. Skeleton cartilaginous. Colour:** pink to brown.



Eptatretus cirrhatus

Habitat, biology, and fisheries: Benthic fishes, often burrowing in mud, from inshore to deepsea. Feed as scavengers, mostly on dead or disabled fishes. Rare to common, most efficiently taken in baited traps, of recent commercial interest for skin (eelskin) industry based in Korea.

Remarks: Six genera with about 60 species throughout the world's oceans in tropical and temperate latitudes; tropical species occur in deep water. A revision of the family is needed; the best recent overview is that of Fernholm (1998).

Similar families occurring in the area

None. The laterally biting horny teeth, the separate external gill openings, and the absence of fins with rays are not found, either singly or in combination, in any other fish in the area.

List of species occurring in the area

Eptatretus carlhubbsi McMillan and Wisner, 1984
Eptatretus cirrhatus (Forster, 1801)
Eptatretus strahani McMillan and Wisner, 1984
Eptatretus spp. nov. (to be described by Fernholm from Papua New Guinea and the Philippines)

Reference

Fernholm, B. 1998. Hagfish systematics. In *The biology of hagfishes,* edited by J.M. Jorgensen et al. London, Chapman and Hall, pp. 33-44.

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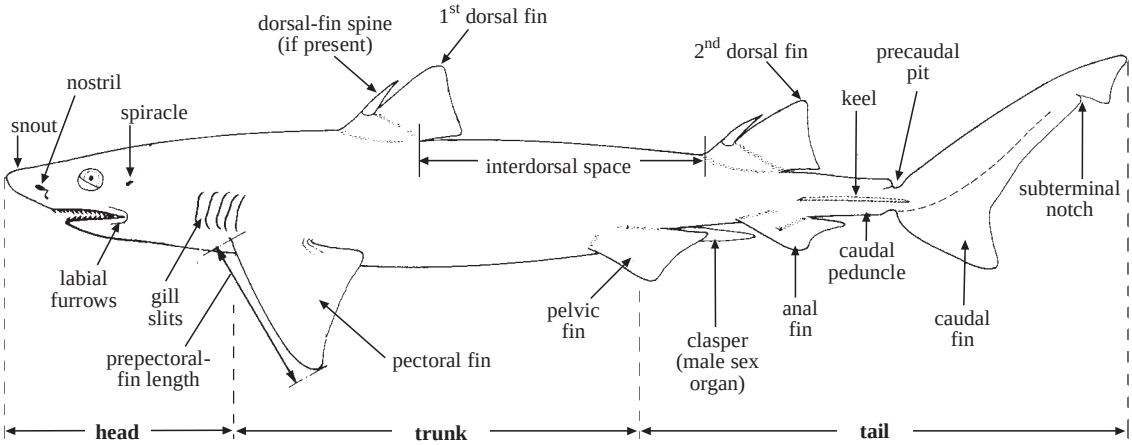
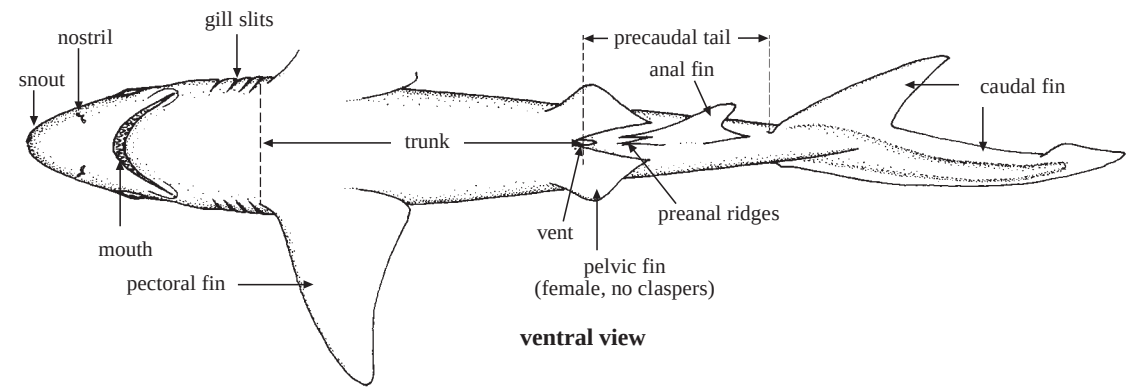
SHARKS

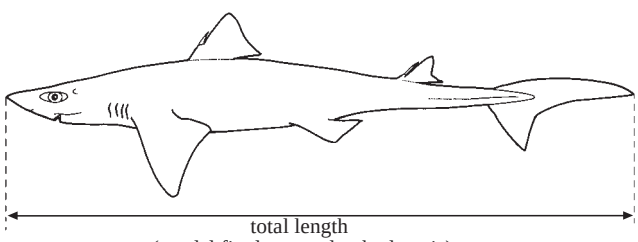
TECHNICAL TERMS AND MEASUREMENTS

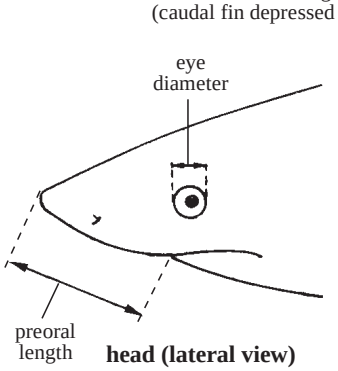
(distance in straight line)



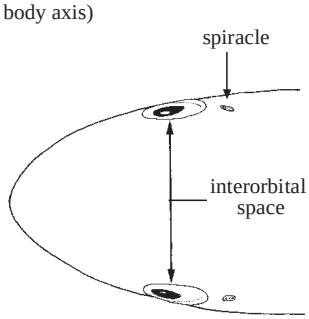


ventral view

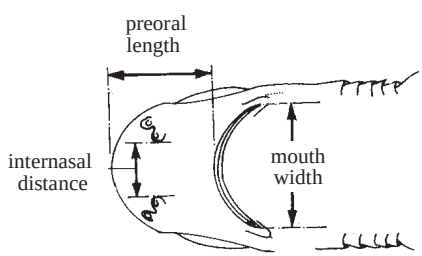




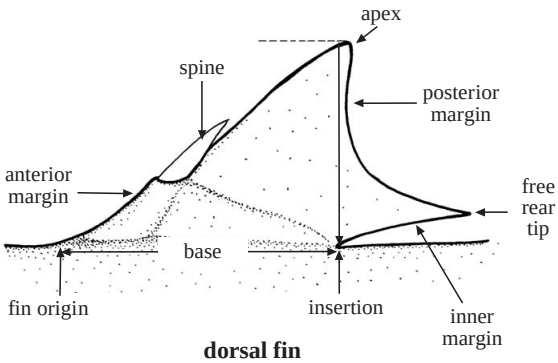
head (lateral view)



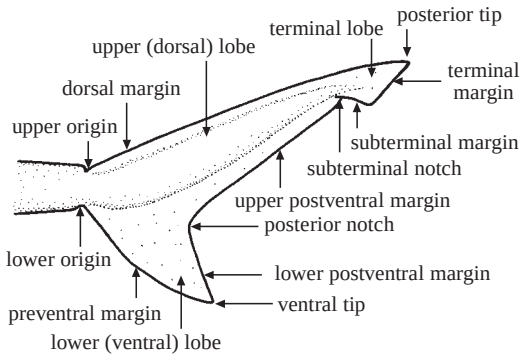
head (dorsal view)



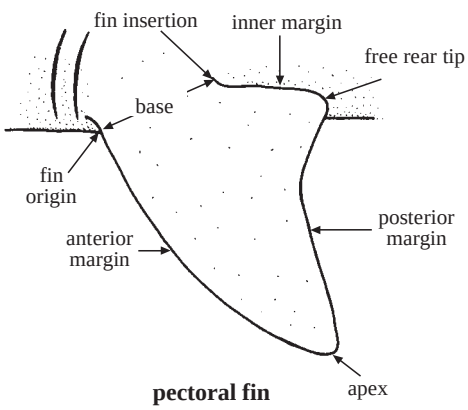
head (ventral view)



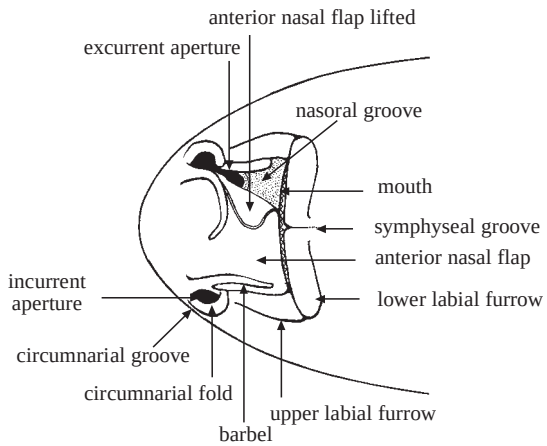
dorsal fin



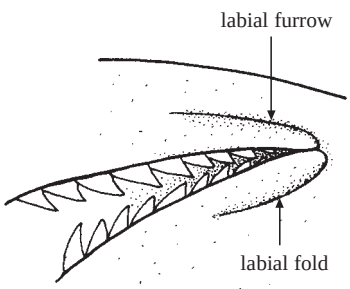
caudal fin



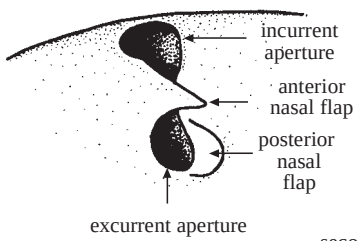
pectoral fin



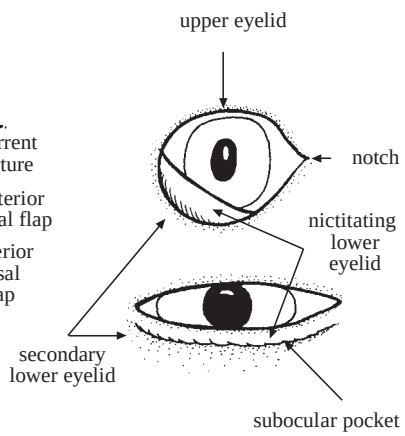
head of an orectoloboid shark (ventral view)



mouth corner



nostril



eye

GENERAL REMARKS

by L.J.V. Compagno

Sharks include a variety of usually cylindrical, elongated, or moderately depressed fishes which differ from the closely related rays or batoids in having lateral gill openings (or gill slits) and pectoral fins not fused to the sides of the head over the gill openings. The greatly depressed angelsharks (family Squatinidae) might be mistaken for rays at first sight; they have large, broad, ray-like pectoral fins that extend as triangular lobes alongside the gill openings, but are not connected to the head above them. Sharks have eyes on the dorsal surface or sides of the head and spiracles (when present) on its dorsal or dorsolateral surfaces. The tail and caudal fin are always well developed and serve to propel the animal by lateral undulations; the pectoral fins are mostly not used for propulsion through the water but aid in stabilizing and steering the shark. There are usually 5 gill openings on each side of the head, rarely 6 or 7. The mouth is usually ventral or subterminal on the head, but terminal or nearly so in a few species. Most sharks have 2 (rarely 1) dorsal fins, sometimes with spines on their front edges; an anal fin is usually present, but missing in several families. The teeth on the jaws are set in numerous transverse rows and are constantly replaced from inside the mouth. All shark species are more or less covered by small (occasionally enlarged) tooth-like placoid scales or dermal denticles.

Male sharks have cylindrical copulatory organs or claspers on their pelvic fins, used for internal fertilization of eggs in females; about 1/3 of the species of sharks have females that deposit eggs in rectangular or conical capsules, formed of a horn-like material (oviparity); the remainder are livebearers. Some livebearing sharks, including many houndsharks (Triakidae), most requiem sharks (Carcharhinidae), and all weasel sharks (Hemigaleidae) and hammerheads (Sphyrnidae) are viviparous (placental viviparous), with yolk sacs of fetuses forming a placenta with the maternal uterus for nutrient transfer; other livebearinq sharks are ovoviviparous (aplacental viviparous), without a placenta. Ovoviviparous lamnoid sharks of the families Odontaspididae, Alopiidae, Lamnidae, and Pseudocarchariidae practice uterine cannibalism, in which one or more fetuses in each uterus resorb their yolk sacs and then devour eggs passed down the oviducts for nutriment (oophagy) and grow to considerable size with massive yolk stomachs before birth. In the Odontaspididae (*Carcharias taurus*) the largest fetus kills and eats its siblings (adelphophagy) and only 1 fetus survives in utero, while several young may cohabit the uterus in the other families. Members of 2 families of carcharhinoid sharks (Proscylliidae and Pseudotriakidae) practice oophagy, but fill their yolk sacs with yolk that they consume. Mature sharks vary in total length from about 15 to 19 cm (dwarf species of Squalidae and Proscylliidae) to 12.1 m or more (whale shark, family Rhincodontidae) and range in weight from between 10 and 20 g to several metric tons. Most sharks are of small or moderate size; about 50% are small, between 15 cm and 1 m; 32% between 1 and 2 m; 14% between 2 and 4 m; and only 4% are over 4 m in total length.

All sharks are predators, with their prey ranging widely, from planktonic crustaceans and benthic invertebrates to pelagic cephalopods, small to large bony fishes, other sharks and rays, marine mammals, and other marine and terrestrial vertebrates. Sharks are primarily marine, but a few requiem sharks (Carcharhinidae, members of the genera *Carcharhinus* and *Glyphis*) have broad salinity tolerances, and one species (bull shark, *Carcharhinus leucas*) is wide-ranging in tropical lakes and rivers with sea access as well as shallow inshore waters. No sharks are known to be confined to fresh water, unlike several species of stingrays (families Dasyatidae and Potamotrygonidae). Sharks are widely distributed in all oceans, from the Arctic to subantarctic islands, and from close inshore on reefs, off beaches, and in shallow, enclosed bays to the lower continental slopes, the abyssal plains, sea mounts and ridges, and the high seas. They are most diverse in continental waters of tropical and warm-temperate seas, from inshore waters down to upper continental slopes, but are less so in colder waters, at great depths (below 1 500 to 2 000 m), in the open ocean and off oceanic islands. The richest shark faunas occur in the Indo-West Pacific from South Africa and the Red Sea to Australia and Japan. The Western Central Pacific (Fishing Area 71 and the southwestern part of Fishing Area 77) has one of the most diverse shark faunas in the world, including approximately 23 families, 69 genera, and between 164 and 188 species. Worldwide there are 33 families, 101 genera, and between 379 to 478 species of sharks (estimate as of 8 August 1995). Several genera and families are poorly known and require further taxonomic study. Many species of sharks are endemic to the area and have restricted ranges within it, several species (including inshore species) are known from 1 or a few museum specimens only, and a wealth of new species have been revealed in deep water, offshore continental, and even inshore habitats in the past forty years (many of which are still undescribed). Undoubtedly more new species and many records of described species will be discovered with further collecting in poorly known parts of the area. Knowledge of the coastal shark fauna of Area 71 beyond Australia is very sketchy, and many maritime countries need further surveys to determine which species occur there. The deep-water shark fauna is very poorly known in the area, except for off northern Australia and a few other localities (such as New Caledonia) where systematic deep-water exploration for fisheries resources is proceeding apace. Basic knowledge of the biology of many species is often very deficient or entirely lacking, and can be supplemented by new information gathered by fisheries workers in the area.

The shark attack hazard has been grossly exaggerated in recent years. Large carcharhinids, sphyrnids and lamnids, and less frequently other sharks, pose a potential threat to people in the water or boats. Large gill nets have been regularly set in the vicinity of popular bathing beaches off Queensland, Australia during the past 3 decades to reduce the number of potentially dangerous sharks. This 'shark meshing' has presumably reduced shark attacks there although few attacks were recorded off Queensland prior to the onset of meshing (unlike New South Wales, where the practice originated, and off South Africa). About 9% of known shark species are definitely known to be dangerous (that is, are known to have been implicated in at least 1 shark attack worldwide), and about 10% more are large enough and sufficiently well-armed to be potentially so; the rest are mostly too small and poorly armed to be a hazard to people. 'Dangerous' is highly relative; perhaps less than 100 shark attacks (and less than 20 fatalities) occur worldwide each year. Sharks are not very dangerous compared to any number of other causes of death or injury to people, including drownings and near-drownings and large terrestrial predators. The 3 shark species most frequently implicated in shark attacks (white shark, tiger shark, and bull shark) do not automatically attack when confronted by people in the water. Great white sharks usually do not attack in such situations. And if biting does occur it is usually restricted to single bites delivered with minimal force. 'Man-eating' does not appear to be an important source of nutrients for any shark. Unfortunately, the shark attack issue has tended to obscure the 'human attack' problem and its implications for shark conservation in the face of burgeoning fisheries driven by the expanding world human population and enormous markets for shark products. It was recognized over the past 4 decades that aspects of the life history strategy of sharks (long lives, long maturation times, and low fecundity, plus relatively large size) made them very vulnerable to overexploitation, and that several targeted shark fisheries had suddenly collapsed after recruitment had been impaired by overexploitation of the breeding stocks. However, only in the past 5 years has there been widespread concern about world trends in fisheries for sharks and other cartilaginous fishes. After the second world war world fisheries for chondrichthyan fishes essentially tripled in reported catches to FAO, which has not kept pace with the approximately fourfold increases in total fisheries worldwide. Much of the catch is as bycatch in fisheries driven by larger catches of exploitation-resistant bony fishes with far higher fecundity. World catches of cartilaginous fishes reported to FAO have leveled off in the 5-year period 1988 to 1992 to about 690 thousand metric tonnes, which may indicate that there is little scope for further increases in catches. Some sharks have been accorded limited or total protection in a number of developed countries, yet on a world basis shark exploitation is mostly unregulated and out of control nationally and regionally. In the next decade international agreements, including CITES listings, will likely occur to protect a variety of sharks and other cartilaginous fishes from excessive exploitation.

In the Western Central Pacific, sharks are used mainly for human food; shark meat is marketed fresh, frozen, and especially dried-salted. Sharks are utilized on the oriental market for fins; also for liver oil, fishmeal, and possibly for leather, although details of utilization in the area are sketchy. The total catch of sharks reported from Fishing Area 71 is uncertain; total catches of cartilaginous fishes in the area was approximately 119 000 t in 1995, of which about 59 000 t were reported as rays (batoids), 52 000 t mixed sharks and rays and about 8 000 t were sharks. If the mixed sharks and rays included 55% sharks the 1995 shark catch is roughly 37 000 t; the actual landings of sharks in the area are doubtlessly much higher. Catches in the section of Area 77 included in this work were relatively small and may add roughly 6 000 t of chondrichthyans to the 1995 total. The present area had the second highest catches of cartilaginous fishes worldwide in 1995, being surpassed only by FAO Area 51 (Western Indian Ocean, with 145 000 t). The present area includes Indonesia, which in 1995 had the second highest cartilaginous fish catch of any nation (75 000 t, compared to India with 86 000 t), the next highest countries being Pakistan, Taiwan Province of China, and the USA. Malaysia had a catch of about 19 000 t, Thailand and Philippines had catches of about 9 000 t each, and the Korean Republic took about 10 000 t in the area in 1995. Data on gear used in the area is sketchy, but line gear (including pelagic longlines), fixed and floating gill nets, bottom trawls, fixed fish traps, and purse seines are used to target sharks or take sharks as a bycatch. Sharks are taken in artisanal fisheries, by local inshore and offshore commercial fisheries, and by large fishing fleets in offshore waters. Requiem sharks (Carcharhinidae) are especially important, but considerable numbers of threshers (Alopiidae) and makos (Lamnidae, genus *Isurus* are fished offshore, and a number of other families, including longtailed carpetsharks (Hemiscylliidae), zebra sharks (Stegostomatidae), nurse sharks (Ginglymostomatidae), weasel sharks (Hemigaleidae), and hammerheads (Sphyrnidae) are commonly taken in inshore fisheries. Dogfish (family Squalidae) are important in offshore deep-set longline fisheries targeting sharks for liver oil.

KEY TO FAMILIES OCCURRING IN THE AREA

1a. No anal fin (Figs 1 to 4) . . . . . → **2**

1b. Anal fin present . . . . . → **5**

2a. Body strongly depressed and ray-like; pectoral fins greatly enlarged, with anterior triangular lobes that overlap gill slits; mouth terminal (Fig. 1) . . . . . **Squatinidae** (p. 1235)

2b. Body cylindrical, compressed, or slightly depressed, not ray-like; pectoral fins small, without anterior lobes; mouth ventral . . . . . → **3**

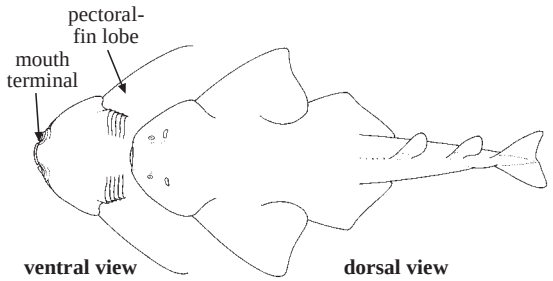


Fig. 1 Squatinidae

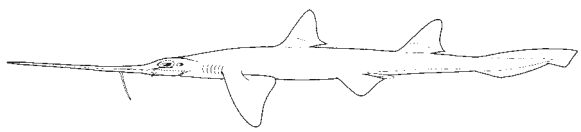


Fig. 2 Pristiophoridae

3a. Snout flattened and elongated, saw-like (Fig. 2) . . . . . **Pristiophoridae** (p. 1233)

3b. Snout normal, not saw-like . . . . . → **4**

4a. First dorsal fin behind pelvic-fin origins; dermal denticles moderately large or very large, thorn-like (Fig. 3) . . . . . **Echinorhinidae** (p. 1211)

4b. First dorsal fin partially or entirely in front of pelvic-fin origins (Fig. 4); dermal denticles small to moderately large, variable in shape . . . . . **Squalidae** (p.1213)

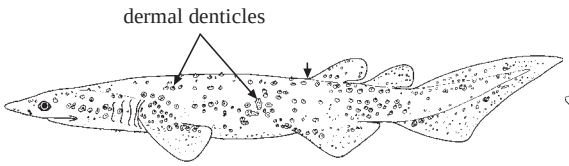


Fig. 3 Echinorhinidae

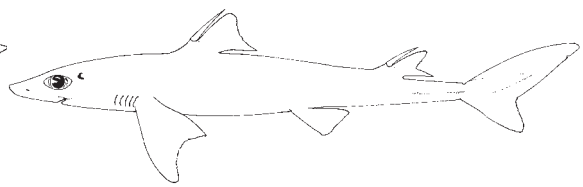


Fig. 4 Squalidae

5a. Only 1 dorsal fin, far posterior on back; 6 or 7 gill slits on each side (Fig. 5) . . . . . **Hexanchidae** (p. 1208)

5b. Two dorsal fins (except the scyliorhinid *Pentanchus profundicolus* with 1 dorsal fin); 5 gill slits on each side . . . . . → **6**

6a. A strong spine on each dorsal fin (Fig. 6) . . . . . **Heterodontidae** (p. 1238)

6b. Dorsal fins without spine . . . . . → **7**

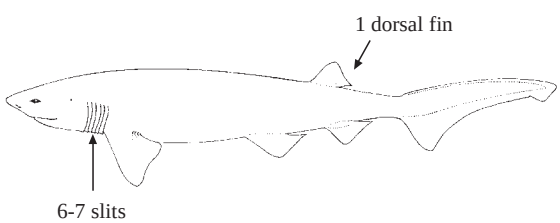


Fig. 5 Hexanchidae

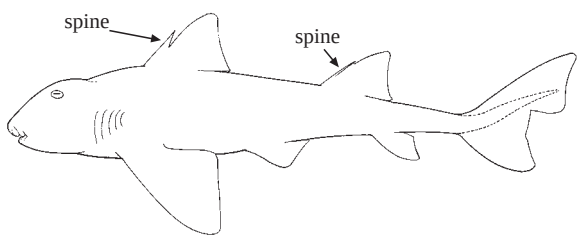


Fig. 6 Heterodontidae

7a. Head with lateral expansions or blades, like a double-edged axe (Fig. 7) . . . **Sphyrnidae** (p. 1361)
7b. Head normal, not expanded laterally . . . . . → **8**

8a. Eyes behind mouth; deep nasoral grooves connecting nostrils and mouth (Fig. 8a) . . . . . → **9**
8b. Eyes partly or entirely over mouth; nasoral grooves usually absent (Fig. 8b), when present (*Atelomycterus* in family Scyliorhinidae) broad and shallow . . . . . → **15**

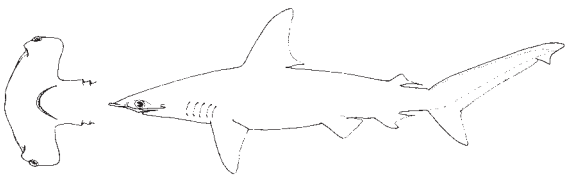


Fig. 7 Sphyrnidae

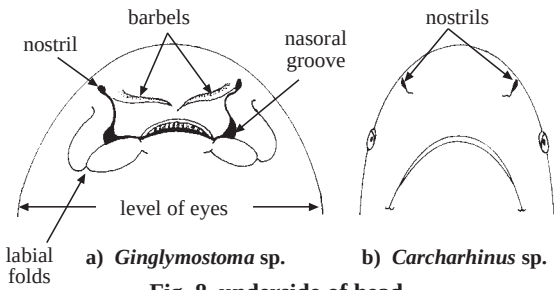


Fig. 8 underside of head

9a. Mouth huge and nearly terminal; external gill slits very large, internal gill slits inside mouth cavity with filter screens; caudal peduncle with strong lateral keels; caudal fin with a strong ventral lobe, but without a strong terminal lobe and subterminal notch (Fig. 9) . . . . . **Rhincodontidae (= Rhiniodontidae)** (p. 1263)
9b. Mouth smaller and subterminal; external gill slits small, internal gill slits without filter screens; caudal peduncle without strong lateral keels; caudal fin with a weak ventral lobe or none, but with a strong terminal lobe and subterminal notch (Fig. 10) . . . . . → **10**

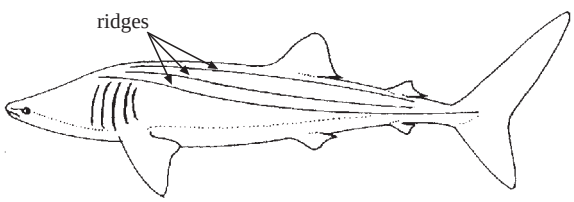


Fig. 9 Rhincodontidae

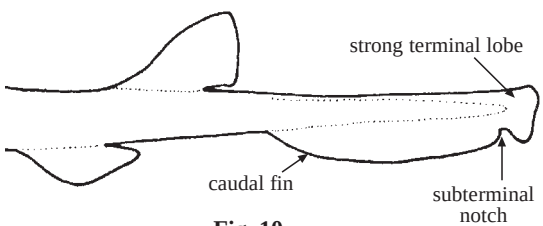


Fig. 10

10a. Caudal fin about as long as rest of shark (Fig. 11) . . . . . **Stegostomatidae** (p. 1262)
10b. Caudal fin much shorter than rest of shark . . . . . → **11**

11a. Head and body greatly flattened, head with skin flaps on sides; 2 rows of large, fang-like teeth at symphysis of upper jaw and 3 in lower jaw (Fig. 12) . . . . . **Orectolobidae** (p. 1245)
11b. Head and body cylindrical or moderately flattened, head without skin flaps; teeth small, not enlarged and fang-like at symphysis . . . . . → **12**

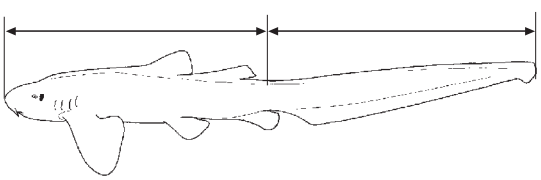


Fig. 11 Stegostomatidae

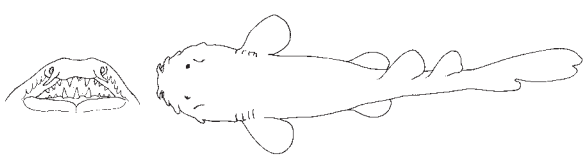


Fig. 12 Orectolobidae

12a. No lobe and groove around outer edges of nostrils (Fig. 13) . . . . **Ginglymostomatidae** (p. 1260)
12b. A lobe and groove around outer edges of nostrils (Fig. 14) . . . . . → **13**

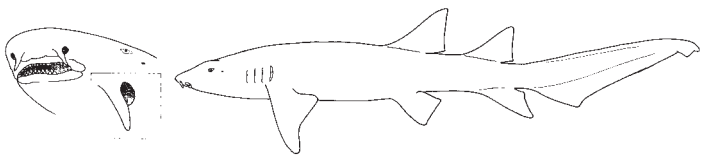


Fig. 13 Ginglymostomatidae

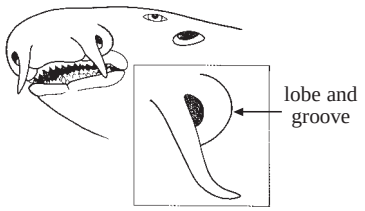


Fig. 14

13a. Spiracles minute; origin of anal fin well in front of second dorsal-fin origin, separated from lower caudal-fin origin by space equal or greater than its base length (Fig. 15) . . . . . **Parascylliidae** (p. 1241)
13b. Spiracles large; origin of anal fin well behind second dorsal-fin origin, separated from lower caudal-fin origin by space less than its base length . . . . . → **14**

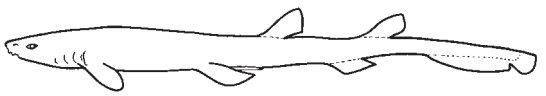


Fig. 15 Parascylliidae

14a. Nasal barbels very large; anal fin high and angular; distance from vent to lower caudal-fin origin shorter than distance from snout to vent (Fig. 16) . . . . **Brachaeluridae** (p. 1243)
14b. Nasal barbels short; anal fin low, rounded and keel-like; distance from vent to lower caudal-fin origin longer than distance from snout to vent (Fig. 17) . . . . . **Hemiscylliidae** (p. 1249)

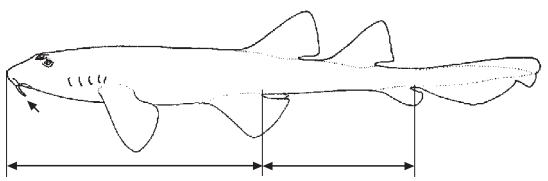


Fig. 16 Brachaeluridae

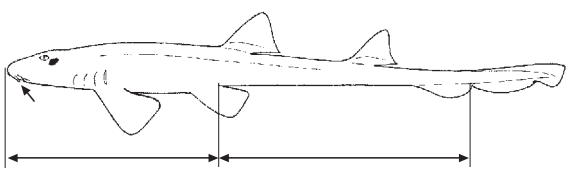


Fig. 17 Hemiscylliidae

15a. A strong keel present on each side of caudal peduncle; caudal fin crescentic and nearly symmetrical, with a long lower lobe (Fig. 18) . . . . . **Lamnidae** (p. 1274)
15b. No keels on caudal peduncle, or weak ones (*Pseudocarcharias* in Pseudocarchariidae, *Galeocerdo* and *Prionace* in Carcharhinidae); caudal fin asymmetrical, not crescentic, with ventral lobe relatively short or absent . . . . . → **16**

16a. Caudal fin about as long as rest of shark (Fig. 19) . . . . . **Alopiidae** (p. 1269)
16b. Caudal fin less than half the length of rest of shark . . . . . → **17**

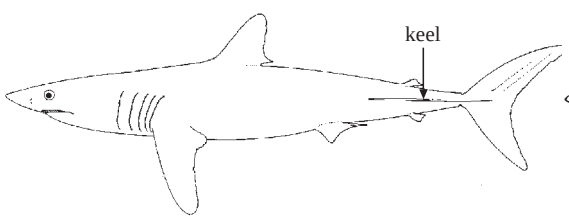


Fig. 18 Lamnidae

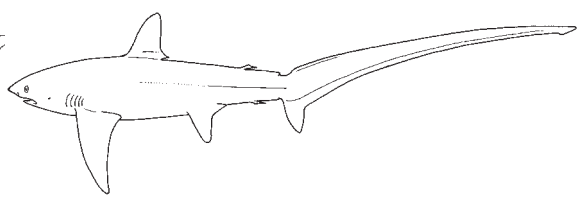


Fig. 19 Alopiidae

17a. No nictitating eyelids (Fig. 20a), largest teeth in mouth are 2 or 3 rows of anteriors on either side of lower jaw symphysis; upper anteriors separated from large lateral teeth at sides of jaw by a gap that may have 1 or more rows of small intermediate teeth (Fig. 20b); all gill slits in front of pectoral fins (Figs 22 and 23) . . . . . → **18**

17b. Nictitating eyelids present (Fig. 21a); largest teeth in mouth are well lateral on dental band, not on either side of symphysis; no gap or intermediate teeth separating large anterior teeth from still larger teeth in upper jaw (Fig. 21b); last 1 or 2 gill slits over pectoral-fin bases . . . . . → **19**

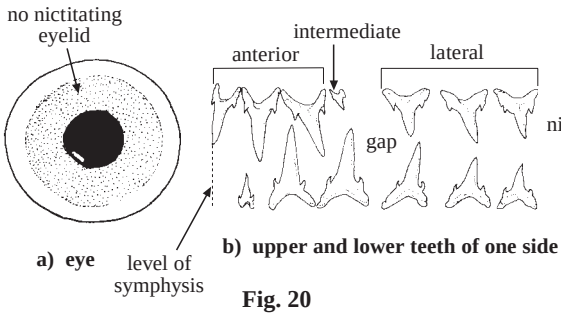


Fig. 20

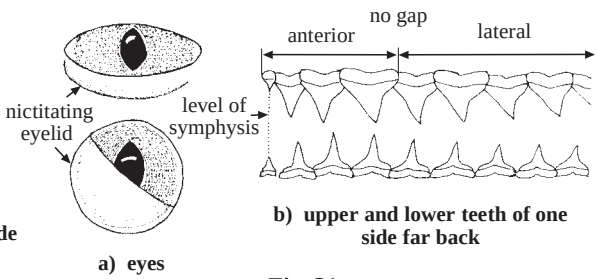


Fig. 21

18a. Eyes very large; gill slits extending onto upper surface of head; both upper and lower precaudal pits present; a low keel on each side of caudal peduncle (Fig. 22) . . . . . **Pseudocarchariidae** (p. 1268)

18b. Eyes smaller; gill slits not extending onto upper surface of head; lower precaudal pit absent; no keels on caudal peduncle (Fig. 23) . . . . . **Odontaspididae** (p. 1264)

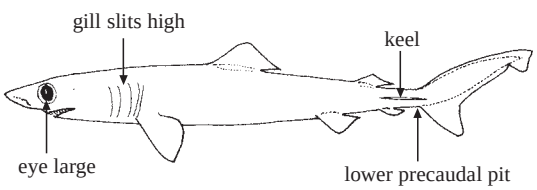


Fig. 22 Pseudocarchariidae

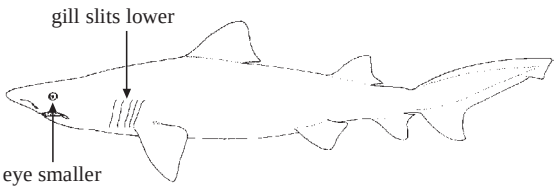


Fig. 23 Odontaspididae

19a. Origin of first dorsal fin over or behind pelvic-fin bases (Fig. 24) . . . . . **Scyliorhinidae** (p. 1279)

19b. Origin of first dorsal fin well ahead of pelvic-fin bases . . . . . → **20**

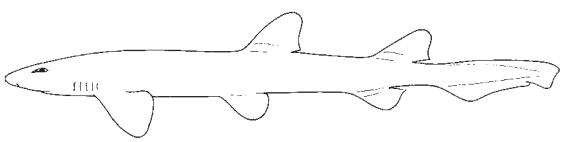


Fig. 24 Scyliorhinidae

20a. No precaudal pits, dorsal caudal-fin margin smooth (Fig. 25) . . . . . → **21**

20b. Precaudal pits and rippled dorsal caudal margin present (ripples sometimes irregular in *Scoliodon* and *Triaenodon* of family Carcharhinidae) (Fig. 26) . . . . . → **23**

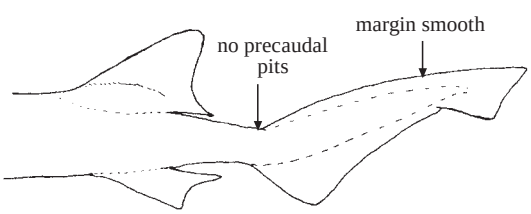


Fig. 25

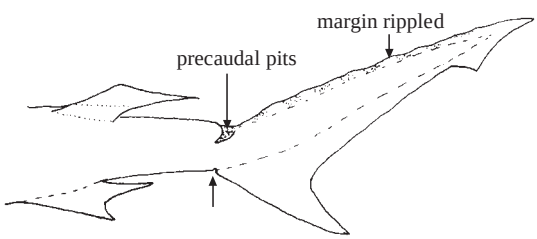


Fig. 26

21a. First dorsal fin long, about the length of caudal fin, and formed as a low, rounded keel; adults with over 200 rows of teeth in each jaw; spiracles nearly or quite as long as eyes (Fig. 27) . . . **Pseudotriakidae** (p. 1296)

21b. First dorsal fin short, about 2/3 of caudal fin or less; subtriangular in shape; adults with less than 110 rows of teeth in each jaw; spiracles much smaller than eyes . . . . . → **22**

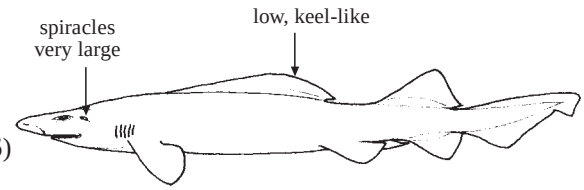


Fig. 27 Pseudotriakidae

22a. Labial furrows very short or absent, confined to extreme mouth corners; posterior teeth comb-like; base of first dorsal fin closer to pelvic-fin bases than to pectoral-fin bases (Fig. 28) . . . . . **Proscylliidae** (p. 1293)

22b. Labial furrows longer, extending anteriorly for a greater or lesser distance on lips; posterior teeth not comb-like; base of first dorsal fin either equidistant between pectoral and pelvic-fin bases or closer to pectoral-fin bases (Fig. 29) . . . . . **Triakidae** (p. 1297)

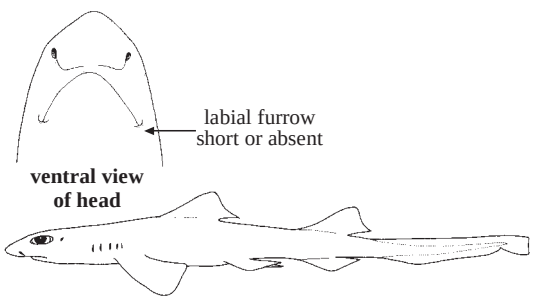


Fig. 28 Proscylliidae

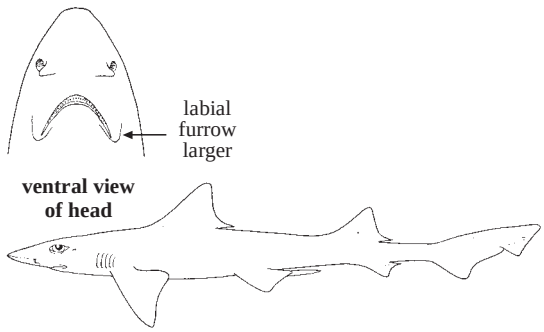


Fig. 29 Triakidae

23a. Intestine with a spiral valve (Fig. 30a) having 4 to 6 turns . . . . . **Hemigaleidae** (p. 1305)

23b. Intestine with a scroll valve (Figs 30b and 32) . . . . . **Carcharhinidae** (p. 1312)

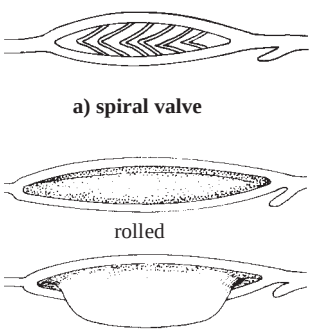


Fig. 30

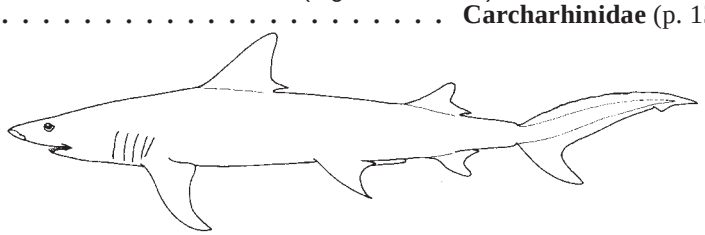


Fig. 31 Hemigaleidae

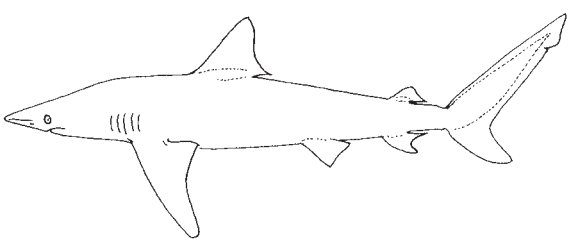


Fig. 32 Carcharhinidae

LIST OF FAMILIES AND SPECIES OCCURRING IN THE AREA

The symbol ✓ is given when species accounts are included. A question mark indicates that presence in the area is uncertain.

HEXANCHIDAE: Sixgill and sevengill sharks, cow sharks
✓ *Heptranchias perlo* (Bonnaterre, 1788)

✓ *Hexanchus griseus* (Bonnaterre, 1788)
✓ *Hexanchus nakamurai* Teng, 1962

ECHINORHINIDAE: Bramble sharks
✓ *Echinorhinus brucus* (Bonnaterre, 1788)
✓ *Echinorhinus cookei* Pietschmann, 1928

SQUALIDAE: Dogfish sharks
✓ *Centrophorus atromarginatus* Garman, 1906
✓ *Centrophorus granulosus* (Bloch and Schneider, 1801)
? *Centrophorus isodon* (Chu, Meng, and Liu, 1981)
? *Centrophorus lusitanicus* Bocage and Capello, 1864
✓ *Centrophorus moluccensis* Bleeker, 1860
✓ *Centrophorus niaukang* Teng, 1959
✓ *Centrophorus squamosus* (Bonnaterre, 1788)
Centrophorus sp. [New Caledonia]

Centroscyllium cf. *kamoharai* Abe, 1966

Centroscymnus coelolepis Bocage and Capello, 1864

✓ *Cirrhigaleus barbifer* Tanaka, 1912

✓ *Dalatias licha* (Bonnaterre, 1788)

? *Deania calcea* (Lowe, 1839)
✓ *Deania profundorum* (Smith and Radcliffe, 1912)
✓ *Deania quadrispinosa* (McCulloch, 1915)

? *Etmopterus baxteri* Garrick, 1957
✓ *Etmopterus brachyurus* Smith and Radcliffe, 1912
? *Etmopterus decacuspidatus* Chan, 1966
? *Etmopterus granulosus* (Günther, 1880)
✓ *Etmopterus lucifer* Jordan and Snyder, 1902
✓ *Etmopterus molleri* Whitley, 1939
? *Etmopterus princeps* Collett, 1904
✓ *Etmopterus splendidus* Yano, 1988
? *Etmopterus unicolor* (Engelhardt, 1912)
? *Etmopterus* sp. C [Last and Stevens, 1994]
✓ *Etmopterus* sp. D [Last and Stevens, 1994]
✓ *Etmopterus* sp. F [Last and Stevens, 1994]

✓ *Euprotomicrus bispinatus* (Quoy and Gaimard, 1824)

✓ *Isistius brasiliensis* (Quoy and Gaimard, 1824)

✓ *Scymnodon squamulosus* (Günther, 1877)

? *Somniosus pacificus* Bigelow and Schroeder, 1944

✓ *Squaliolus aliae* Teng, 1959
✓ *Squaliolus laticaudus* Smith and Radcliffe, 1912

✓ *Squalus japonicus* Ishikawa, 1908
✓ *Squalus megalops* (Macleay, 1881)
✓ *Squalus melanurus* Fourmanoir and Rivaton, 1979
✓ *Squalus mitsukurii* Jordan and Snyder, 1903
✓ *Squalus rancureli* Fourmanoir and Rivanton, 1979
✓ *Squalus* sp. A [Last and Stevens, 1994]
✓ *Squalus* sp. B [Last and Stevens, 1994]
✓ *Squalus* sp. F [Last and Stevens, 1994]

PRISTIOPHORIDAE: Sawsharks
- *Pristiophorus* sp. B [Last and Stevens, 1994] (Australia)
- *Pristiophorus* sp. (Philippines)

SQUATINIDAE: Angelsharks
- *Squatina australis* Regan, 1906
- *Squatina japonica* Bleeker, 1858
- *Squatina* sp. A [Last and Stevens, 1994]

HETERODONTIDAE: Bullhead sharks
- *Heterodontus galeatus* (Günther, 1870)
- *Heterodontus portusjacksoni* (Meyer, 1793)
- *Heterodontus zebra* (Gray, 1831)

PARASCYLLIIDAE: Collared carpetsharks
- *Cirrhoscyllium expolitum* Smith and Radcliffe, 1913
- *Parascyllium collare* Ramsay and Ogilby, 1888

BRACHAELURIDAE: Blind sharks
- *Brachaelurus waddi* (Bloch and Schneider, 1801)
- *Heteroscyllium colcloughi* (Ogilby, 1908)

ORECTOLOBIDAE: Wobbegongs
- *Eucrossorhinus dasypogon* (Bleeker, 1867)
- *Orectolobus japonicus* Regan, 1906
- *Orectolobus maculatus* (Bonnaterre, 1788)
- *Orectolobus ornatus* (de Vis, 1883)
- *Orectolobus wardi* Whitley, 1939

HEMISCYLLIIDAE: Longtail carpetsharks
- *Chiloscyllium griseum* Müller and Henle, 1839
- *Chiloscyllium hasselti* Bleeker, 1852
- *Chiloscyllium indicum* (Gmelin, 1789)
- *Chiloscyllium plagiosum* (Bennett, 1830)
- *Chiloscyllium punctatum* Müller and Henle, 1838
- *Hemiscyllium freycineti* (Quoy and Gaimard, 1824)
- *Hemiscyllium hallstromi* Whitley, 1967
- *Hemiscyllium ocellatum* (Bonnaterre, 1788)
- *Hemiscyllium strahani* Whitley, 1967
- *Hemiscyllium trispeculare* Richardson, 1845

GINGLYMOSTOMATIDAE: Nurse sharks
- *Nebrius ferrugineus* (Lesson, 1830)

STEGOSTOMATIDAE: Zebra sharks
- *Stegostoma fasciatum* (Hermann, 1783)

RHINCODONTIDAE: Whale sharks
- *Rhincodon typus* Smith, 1828

ODONTASPIDIDAE: Sand tiger sharks
- *Carcharias taurus* Rafinesque, 1810
- ? *Odontaspis ferox* (Risso, 1810)

PSEUDOCARCHARIIDAE: Crocodile sharks
- *Pseudocarcharias kamoharai* (Matsubara, 1936)

ALOPIIDAE: Thresher sharks
- *Alopias pelagicus* Nakamura, 1935
- *Alopias superciliosus* (Lowe, 1839)
- *Alopias vulpinus* (Bonnaterra, 1788)

LAMNIDAE: Mackerel sharks
- *Carcharodon carcharias* (Linnaeus, 1758)

- *Isurus oxyrinchus* Rafinesque, 1810
- *Isurus paucus* Guitart Manday, 1966

SCYLIORHINIDAE: Catsharks
- ? *Apristurus acanutus* Chu, Meng, and Li in Meng, Chu, and Li, 1985
- ? *Apristurus gibbosus* Meng, Chu, and Li, 1985
- *Apristurus herklotsi* (Fowler, 1934)
- *Apristurus longicephalus* Nakaya, 1975
- ? *Apristurus macrostomus* Meng, Chu, and Li, 1985
- ? *Apristurus micropterygeus* Meng, Chu, and Li in Chu, Meng, and Li, 1986
- *Apristurus sibogae* (Weber, 1913)
- ? *Apristurus sinensis* Chu and Hu in Chu, Meng, Hu, and Li, 1981
- *Apristurus spongiceps* (Gilbert, 1895)
- *Apristurus verweyi* (Fowler, 1934)

Apristurus sp. A [Last and Stevens, 1994]
Apristurus sp. B [Last and Stevens, 1994]
Apristurus sp. G [Last and Stevens, 1994]
Apristurus sp. [Seret] (New Caledonia)
Apristurus sp. [Seret] (Philippines)
Apristurus sp. [Seret] (Indonesia)

Asymbolus sp. E [Last and Stevens, 1994]
Asymbolus sp. [Seret] (New Caledonia)

- *Atelomycterus fasciatus* Compagno and Stevens, 1993
- *Atelomycterus macleayi* Whitley, 1939
- *Atelomycterus marmoratus* (Bennett, 1830)

- *Aulohalaelurus kanakorum* Seret, 1990

- *Cephaloscyllium fasciatum* Chan, 1966

Cephaloscyllium sp. [Compagno, 1984, 1988]
Cephaloscyllium sp. [J.Randall, pers. comm. 1994] (Papua New Guinea)
Cephaloscyllium sp. [Seret] (New Caledonia)
Cephaloscyllium sp. B [Last and Stevens, 1994]
Cephaloscyllium sp. C [Last and Stevens, 1994]
Cephaloscyllium sp. D [Last and Stevens, 1994]
Cephaloscyllium sp. E [Last and Stevens, 1994]

- *Galeus boardmani* (Whitley, 1928)
- *Galeus eastmani* (Jordan and Snyder, 1904)
- *Galeus gracilis* Compagno and Stevens, 1993
- *Galeus sauteri* (Jordan and Richardson, 1909)
- *Galeus schultzi* Springer, 1979

Galeus sp. B. [Last and Stevens, 1994]

- ? *Halaelurus immaculatus* Chu and Meng, 1982
- *Halaelurus boesemani* Springer and D'Aubrey, 1972
- ? *Halaelurus buergeri* (Müller and Henle, 1838)

- *Parmaturus melanobranchius* (Chan, 1966)

Parmaturus sp. A [Last and Stevens, 1994]
- ? *Parmaturus* sp. [Seret] (Indonesia)

- *Pentanchus profundicolus* Smith and Radcliffe, 1912

- *Scyliorhinus garmani* (Fowler, 1934)
- *Scyliorhinus torazame* (Tanaka, 1908)

PROSCYLLIIDAE: Finback catsharks
- *Eridacnis radcliffei* Smith, 1913

- *Gollum attenuatus* (Garrick, 1954)

- *Proscyllium habereri* Hilgendorf, 1904

PSEUDOTRIAKIDAE: False catsharks
- *Pseudotriakis microdon* Capello, 1968

TRIAKIDAE: Houndsharks
- *Galeorhinus galeus* (Linnaeus, 1758)
- *Gogolia filewoodi* Compagno, 1973
- *Hemitriakis abdita* Compagno and Stevens, 1993
- ? *Hemitriakis japanica* (Müller and Henle, 1839)
- *Hemitriakis leucoperiptera* Herre, 1923
  Hemitriakis sp. [Compagno, 1988] (Philippines)
- *Hypogaleus hyugaensis* (Miyosi, 1939)
- *Iago garricki* Fourmanoir, 1979
- *Mustelus antarcticus* Günther, 1870
- *Mustelus griseus* Pitschmann, 1908
- *Mustelus manazo* Bleeker, 1854
  Mustelus cf. *manazo* [Seret, pers. comm. 1994]
  Mustelus sp. A [Last and Stevens, 1994]
  Mustelus sp. B [Last and Stevens, 1994]
- ? *Triakis scyllium* Müller and Henle, 1839

HEMIGALEIDAE: Weasel sharks
- *Chaenogaleus macrostoma* (Bleeker, 1852)
- *Hemigaleus microstoma* Bleeker, 1852
  Hemigaleus sp. aff. "*microstoma*"
- *Hemipristis elongata* (Klunzinger, 1871)
- *Paragaleus tengi* (Chen, 1963)

CARCHARHINIDAE: Requiem sharks
- *Carcharhinus albimarginatus* (Rüppell, 1837)
- *Carcharhinus altimus* (Springer, 1950)
- *Carcharhinus amblyrhynchos* (Bleeker, 1856)
- *Carcharhinus amboinensis* (Müller and Henle, 1839)
- *Carcharhinus borneensis* (Bleeker, 1859)
- *Carcharhinus brachyurus* (Günther, 1870)
- *Carcharhinus brevipinna* (Müller and Henle, 1839)
- *Carcharhinus cautus* (Whitley, 1945)
- *Carcharhinus dussumieri* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus falciformis* (Bibron in Müller and Henle, 1839)
- *Carcharhinus fitzroyensis* (Whitley, 1943)
- *Carcharhinus galapagensis* (Snodgrass and Heller, 1905)
- *Carcharhinus hemiodon* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus leucas* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus limbatus* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus longimanus* Poey, 1861)
- *Carcharhinus melanopterus* (Quoy and Gaimard, 1824)
- *Carcharhinus obscurus* (LeSueur, 1818)
- *Carcharhinus plumbeus* (Nardo, 1827)
- *Carcharhinus sealei* (Pietschmann, 1916)
- *Carcharhinus sorrah* (Valenciennes in Müller and Henle, 1839)
- *Carcharhinus tilstoni* (Whitley, 1950)
- *Carcharhinus* sp. (= "*Carcharhinus porosus*")
- *Galeocerdo cuvier* (Peron and LeSueur in LeSueur, 1822)
- *Glyphis* sp. A [Last and Stevens, 1994] (Queensland)
- *Glyphis* sp. B [Compagno] (Borneo)
- *Glyphis* sp. C [Compagno] (New Guinea, Australia)
- *Lamiopsis temmincki* (Müller and Henle, 1839)

- *Loxodon macrorhinus* Müller and Henle, 1839
- *Negaprion acutidens* (Rüppell, 1837)
- *Prionace glauca* (Linnaeus, 1758)
- *Rhizoprionodon acutus* (Rüppell, 1837)
- *Rhizoprionodon oligolinx* Springer, 1964
- *Rhizoprionodon taylori* (Ogilby, 1915)
- *Scoliodon laticaudus* Müller and Henle, 1838
- *Triaenodon obesus* (Rüppell, 1837)

SPHYRNIDAE: Hammerhead sharks

- *Eusphyra blochii* (Cuvier, 1817)
- *Sphyrna lewini* (Griffith and Smith in Cuvier, Griffith and Smith, 1834)
- *Sphyrna mokarran* (Rüppell, 1837)
- *Sphyrna zygaena* (Linnaeus, 1758)

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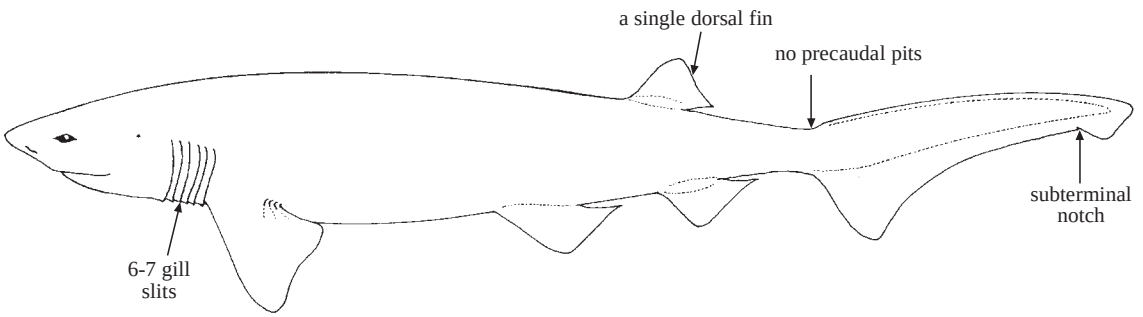
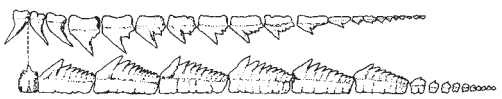
HEXANCHIDAE

Cowsharks, sixgill, and sevengill sharks

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Small to large sharks with slender to stout bodies. Head with **6 or 7 pairs of long gill slits**, the last pair in front of pectoral-fin origins**, the first pair not connected across throat;** short dermal gill rakers present on inner gill slits; spiracles present, small; nostrils without barbels or nasoral grooves; no nictitating lower eyelids; snout short, acutely to bluntly pointed; mouth very long and extending far behind eyes; **teeth of upper and lower jaws unlike at sides of mouth,** uppers small, narrow, with a main cusp and often smaller cusplets, **lowers very large, broad, compressed, and saw-like,** with a series of cusps or large cusplets. A single dorsal fin, posterior to pelvic fins; anal fin present; caudal fin much less than 1/2 the total length, strongly asymmetrical, with a pronounced subterminal notch but lower lobe very short. Caudal peduncle not depressed, without keels; no precaudal pits. Intestinal valve of spiral type. **Colour:** grey, blackish, or brown above, lighter below.





teeth of left side (*Hexanchus griseus*)

intestinal valve of spiral type

Habitat, biology, and fisheries: These are moderately abundant, inshore to deep-water sharks, found in shallow bays down to the continental slopes and submarine canyons, near the bottom or well above it. They feed on a wide variety of bony fishes, other sharks, batoid fishes, marine mammals, cephalopods, and crustaceans. Cow sharks are comparatively unimportant but regular components of shark fisheries and bycatches of other fisheries and are incidentally caught in trawls. They may bite aggressively during capture but only the larger species are potentially dangerous, particularly when provoked.

Similar families occurring in the area

None. No other sharks in the area have a single dorsal fin and 6 or 7 gill slits.

Key to the species of Hexanchidae occurring in the area

1a. Seven gill slits (Fig. 1) . . . . . ***Heptranchias perlo***

1b. Six gill slits (Figs 2 and 3) . . . . . → ***2***

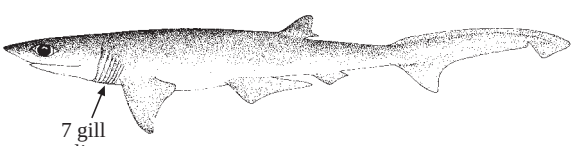


Fig. 1 ***Heptranchias perlo***

2a. Lower jaw with 6 rows of large comb-like teeth on each side; dorsal-fin base separated from upper caudal-fin origin by a distance about equal to, or slightly greater than its length (Fig. 2); size very large, up to 4.8 m . . . . . ***Hexanchus griseus***

2b. Lower jaw with 5 rows of large comb-like teeth on each side; dorsal-fin base separated from upper caudal-fin origin by a distance much greater that its length (Fig. 3); size smaller, up to 1.8 m . . . . . ***Hexanchus nakamurai***

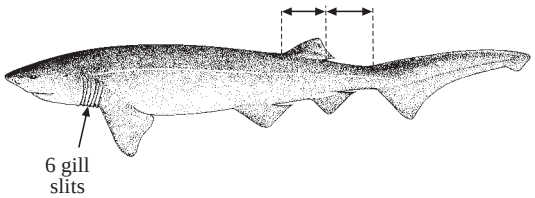


Fig. 2 ***Hexanchus griseus***

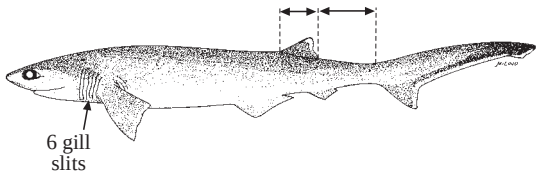


Fig. 3 ***Hexanchus nakamurai***

(after Last and Stevens, 1994)

List of species occurring in the area

The symbol is given when species accounts are included.

Heptranchias perlo (Bonnaterre, 1788)

Hexanchus griseus (Bonnaterre, 1788)

Hexanchus nakamurai Teng, 1962

References

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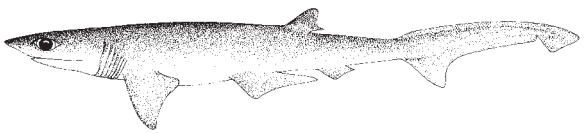
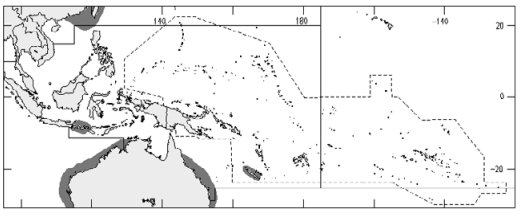
Heptranchias perlo (Bonnaterre, 1788)

En - Sharpnose sevengill shark; **Fr** - Requin perlon; **Sp** - Cañabota bocadulce.

Maximum total length about 1.37 m. On the bottom of the outer continental and insular shelves and upper slopes in depths of 100 to 400 m, also inshore and down to 1000 m. Feeds on bony fish and squid. Caught as bycatch in bottom trawls, but of minor importance to fisheries. Almost circumglobal in tropical and temperate seas, except for the eastern North Pacific, with a primarily continental distribution.

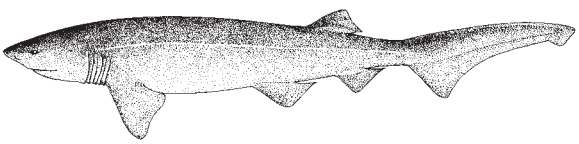


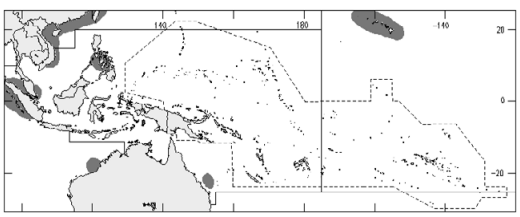


Hexanchus griseus (Bonnaterre, 1788)

En - Bluntnose sixgill shark; **Fr** - Requin grise; **Sp** - Cañabota gris (Cañabota).

Maximum total length about 4.8 m. On the outer continental and insular shelves and upper slopes down to at least 1 875 m. Benthic or pelagic, sluggish, bottom-dwelling; feeds on a wide range of marine organisms. Caught in bottom trawls and with hook-and-line; utilized fresh, frozen, and dried salted, also for fishmeal and oil. Almost circumglobal in tropical and temperate seas, found off continents, oceanic islands, and on sea mounts in the Atlantic, Mediterranean Sea, and Indo-Pacific.

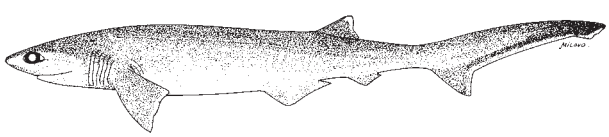




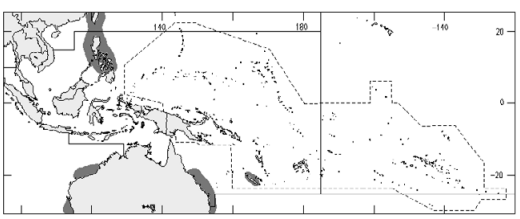
Hexanchus nakamurai Teng, 1962

En - Bigeye sixgill shark.

Maximum total length about 1.8 m. On the continental and insular shelves and upper slopes, usually near the bottom at depths from 90 to 600 m. Probably feeds on bony fish and crustaceans. Eastern Central America and Caribbean Sea, eastern Atlantic from France to Morocco, including the Mediterranean Sea, Indo-West Pacific off eastern and southern Africa and Japan, Taiwan Province of China, Philippines, New Caledonia, and Australia.



(after Last and Stevens, 1994)

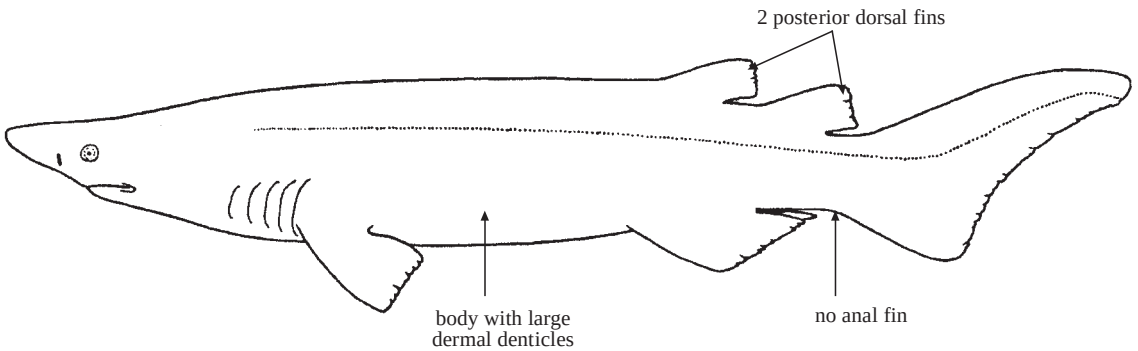


ECHINORHINIDAE

Bramble sharks

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Large sharks with cylindrical bodies without abdominal ridges. Head moderately depressed; last (fifth) gill slits abruptly expanded in width; spiracles present, very small, well behind eyes; nostrils far apart from each other; snout short; mouth broadly arched, with **very short labial furrows** that do not encircle mouth; **teeth alike in both jaws, strongly compressed and blade-like, with a cusp and up to 3 side cusplets in adults**, but with a cusp only in young**. Two small spineless posterior dorsal fins,** both smaller than the pelvic fins, **situated close** together, the origin of the first dorsal fin behind the pelvic-fin origin; **anal fin absent**; caudal fin without a subterminal notch. **Dermal denticles moderately large to very large, thorn-like**. Intestine valve of spiral type. **Colour:** greyish brown dorsally, pale to white below.



Habitat, biology, and fisheries: These are large, poorly known wide-ranging, deep-water sharks, with a spotty but virtually circumglobal distribution on continental and insular shelves and slopes, on or near the bottom. They are ovoviviparous and feed on a variety of benthic and neritic fishes, as well as crabs, octopuses, and squids. The 2 known species are uncommon to rare in most areas where they occur and hence are of minimal interest to fisheries. They generally form a bycatch of other fisheries, including those for other sharks, and are taken on line gear, deepset gill nets, and more commonly in bottom trawls, sometimes caught on rod and reel by sports anglers. Very sluggish harmless sharks, never recorded as attacking people.

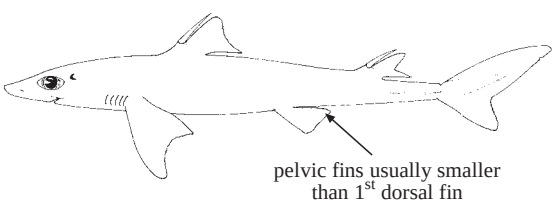
Remarks: This family is sometimes placed as a synonym of Squalidae, but morphological studies indicate that it is very distinct from the Squalidae. It has a single living genus, *Echinorhinus*.

Similar families occurring in the area

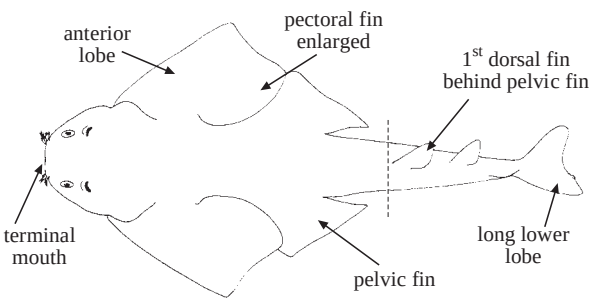
Squalidae and Pristiophoridae: fifth gill slits not abruptly larger than first to fourth; spiracles larger; first dorsal-fin origin well anterior to pelvic-fin origins; pelvic fins usually about as large as second dorsal fin or smaller; Pristiophoridae also with rostral saw and barbels.

Squatinidae: trunk much flattened dorsoventrally; mouth terminal; eyes on upper surface of head; teeth not blade-like, with a single cusp and no cusplets; origin of first dorsal fin posterior to pelvic-fin bases; anterior margins of pectoral fins expanded as triangular lobes past the gill slits and partly concealing them; both the pectoral and pelvic fins very large and wing-like; caudal fin nearly symmetrical, but with lower lobe longer than upper lobe.

All other shark families: anal fin present.



Squalidae

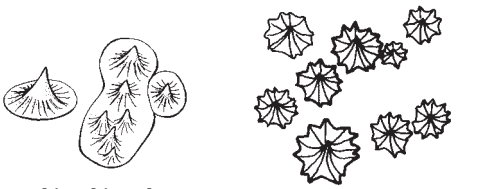


Squatinidae

Key to the species of Echinorhinidae occurring in the area

1a. Denticles on body few, irregulary distributed, relatively large, not stellate, some fused into compound plates with multiple cusps (Fig. 1a) . . . . . ***Echinorhinus brucus***

1b. Denticles on body numerous, regulary distributed, relatively small, stellate, not fused into plates with multiple cusps (Fig. 1b) . . . . . ***Echinorhinus cookei***



a) ***Echinorhinus brucus*** **b)** ***Echinorhinus cookei***

Fig. 1 dermal denticles

List of species occurring in the area

The symbol is given when species accounts are included.

Echinorhinus brucus (Bonnaterre, 1788)
Echinorhinus cookei Pietschmann, 1928

References

Compagno, L.J.V. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish. Synop.*, (125)Vol.4,Pt.1: 249 p.

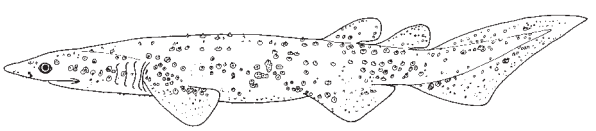
Garrick, J.A.F. 1960. Studies on New Zealand Elasmobranchii. Part 10. The genus "*Echinorhinus*", with an account of a second species, "*E. cookei*". *Trans. R. Soc. N.Z.*, 88(1):105-117.

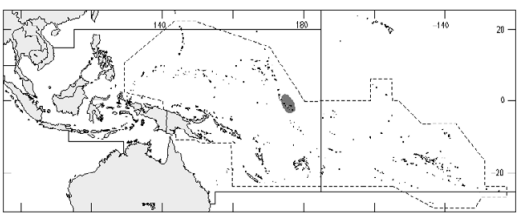
Springer, S. and R.A. Waller. 1969. "*Hexanchus vitulus*", a new sixgill shark from the Bahamas. *Bull. Mar. Sci.*, 19(1):159-174.

Echinorhinus brucus (Bonnaterre, 1788)

En - Bramble shark; **Fr** - Squale bouclé; **Sp** - Tiburón de clavos.

Maximum total length about 3.1 m. A large, sluggish, primarily deep-water shark of the continental and insular shelves and upper slopes at depths from the intertidal to 900 m. Bottom-dwelling; feeds on small bony fishes, other sharks, and crabs. Of minor importance to fisheries in the area; caught in bottom trawls. Wide-ranging in tropical and temperate areas in the Atlantic, Mediterranean Sea, Indian Ocean, and western Pacific.

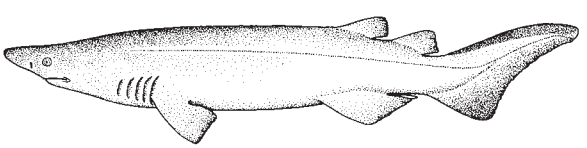


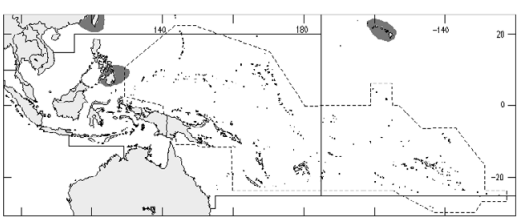


Echinorhinus cookei Pietschmann, 1928

En - Pickly shark; **Fr** - Squale bouclé du Pacifique; **Sp** - Tiburón negro espinoso.

Maximum total length about 4 m. A large, sluggish bottom-living shark, occurring on continental and insular shelves and upper slopes at depths from 11 to least 424 m. Feeds on a variety of fishes, including other sharks, also octopuses and squids. Of minor importance to fisheries; occasionally taken by line gear, gill nets and bottom trawls. Tropical and temperate areas of the western and Central Pacific, also occurring in the eastern Pacific from Oregon to the Gulf of California and in Peru and Chile.





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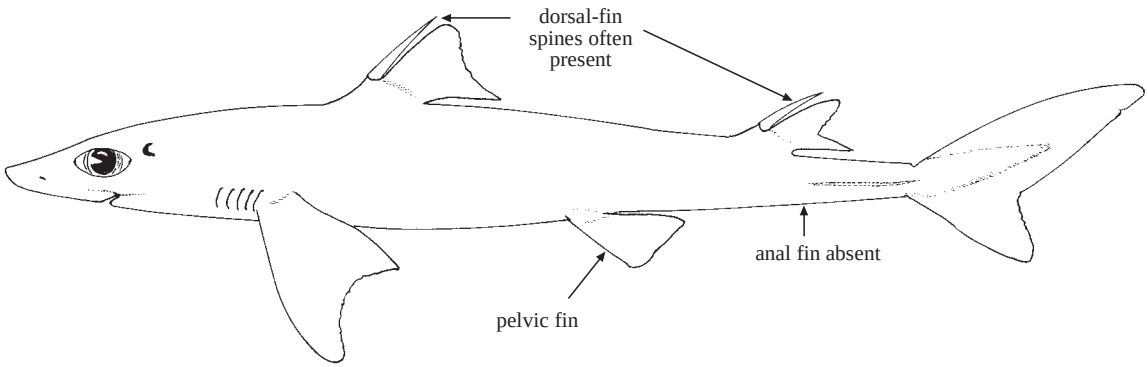
SQUALIDAE

Dogfish sharks

by L.J.V. Compagno and V.H. Niem

Diagnostic characters: Small to moderately large sharks, with cylindrical or slightly compressed bodies, either without ridges between pectoral and pelvic fins or with inconspicuous ridges (*Centroscymnus, Dalatias, Scymnodon*). **Head with 5 gill slits, all anterior to pectoral fins**, the fifth not abruptly longer than the others**; spiracles always present, moderately large; eyes on sides of head, without nictitating eyelids**; nostrils usually well apart from each other; snout short to moderately long, not formed as a rostral saw; no barbels on snout; mouth arched or transverse; teeth strong-cusped, alike or dissimilar in both jaws, with or without cusplets. **Two dorsal fins with a long to very short spine sometimes present** (tip of latter may be concealed by skin), on their anterior margins; origin of first dorsal fin varying in position from a little (*Isistius*) in front of pelvic-fin origins to over pectoral-fin bases; pelvic fins equal to or smaller than second dorsal fin; **no anal fin**; caudal fin strongly asymmetrical to nearly symmetrical, with a lower lobe varying from virtually absent to very strong. Dermal denticles usually close-set, not greatly enlarged and plate-like. Intestinal valve of spiral type. **Colour:** back greyish in shallow-water species, dark to black in those from deep water; several species have light organs (in the area, members of the genera *Etmopterus, Euprotomicrus, Squaliolus,* and *Isistius*).



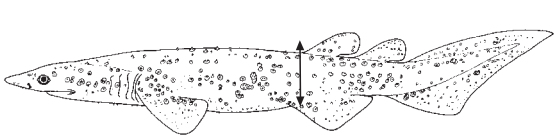
Habitat, biology, and fisheries: Dogfish sharks occurring in warm-temperate and tropical areas are mostly confined to deeper water (50 m and more); those occurring in cold-temperate water are usually shallow-water forms. Dogfish sharks often form schools; they feed mainly on fishes, and may cause damage to fishing gear when preying on the catch. One species in the area, the “cookiecutter shark” (*Isistius brasiliensis*) is semiparasitic, attaching to large fishes, whales and dolphins with its suctorial lips and gouging conical plugs of flesh out of its victims. In the western Pacific, dogfish sharks support important deep-water line fisheries, for their squalene-rich livers. The family has mainly potential importance as a fishery resource for food and liver oil.

Remarks: Ongoing research on the systematics of this family suggests that it should be divided into several families. The traditional arrangement is retained here as a temporary expedient.

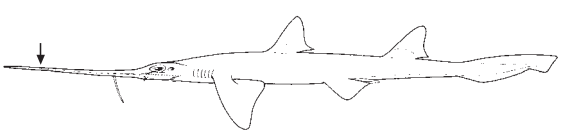
Similar families occurring in the area

Echinorhinidae: body set with sparse, large, plate-like denticles; spiracles small; fifth pair of gill slits abruptly longer than others; first dorsal-fin origin over or posterior to pelvic-fin origins; pelvic fins much larger than second dorsal fin.

Pristiophoridae: snout elongated into a flattened blade, with lateral teeth; barbels present in front of nostrils.



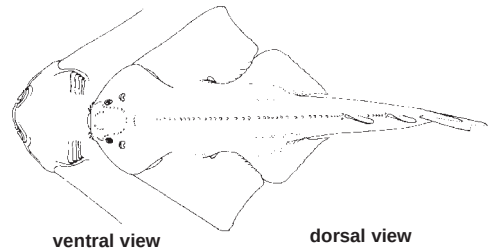
Echinorhinidae



Pristiophoridae

Squatinidae: trunk much flattened dorsoventrally; eyes on upper side of head; anterior margins of pectoral fins extending forward past gill openings and partly concealing them; pelvic fins also very broad, wing-like.

All other shark families: anal fin present.



Squatinidae

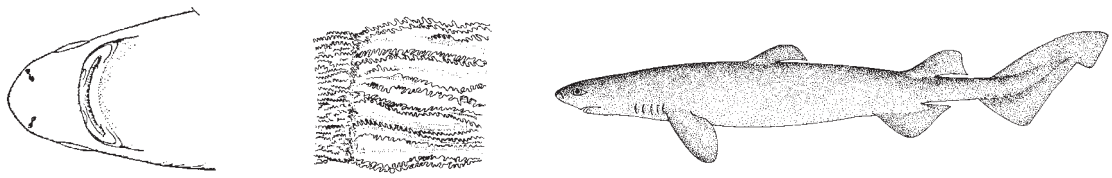
Key to the species of Squalidae occurring in the area

1a. Second dorsal fin, and usually first dorsal fin (except in *Squaliolus*), without a spine . . . . . → ***2***

1b. Spines present on both dorsal fins . . . . . → ***7***

2a. Lips fringed (Fig. 1a); edges of lower teeth serrated (Fig. 2a) . . . . . ***Dalatias licha***

2b. Lips not fringed; edges of lower teeth smooth . . . . . → ***3***

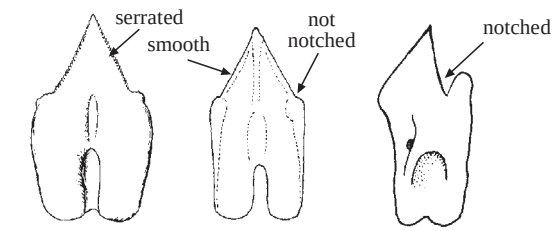


a) ventral view of head **b) fringed lips** **c) lateral view**

Fig. 1 ***Dalatias licha***

3a. Cusps of lower teeth erect, distal edges not notched (Fig. 2b); lips expanded and suctorial; rear end of first dorsal-fin base about over pelvic-fin origins (Fig. 3) . . ***Isistius brasiliensis***

3b. Cusps of lower teeth oblique, distal edges notched (Fig. 2c); lips not expanded and suctorial; rear end of first dorsal-fin base well in front of pelvic-fin origins . . . . . → ***4***



a) ***Dalatias licha*** **b)** ***Isistius brasiliensis*** **c)** ***Euprotomicrus bispinatus***

Fig. 2 lower tooth

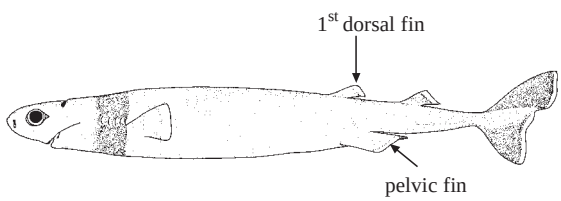


Fig. 3 ***Isistius brasiliensis***

4a. Second dorsal-fin base as long as first dorsal-fin base; upper caudal-fin lobe not shortened, caudal fin not paddle-shaped (Fig. 4); giant benthic sharks, adults to over 4 m total length and possibly born at a size over 35 cm . . . . . ***Somniosus pacificus***
(occurrence in the area uncertain)

4b. Second dorsal-fin base at least twice as long as first dorsal-fin base; upper caudal-fin lobe shortened, caudal fin paddle-shaped (Fig. 5); dwarf oceanic sharks, adults not exceeding 15 to 27 cm total length . . . . . → ***5***

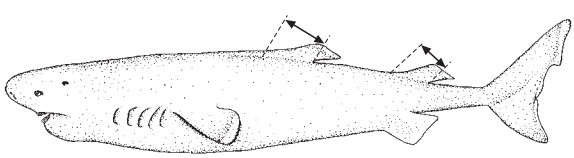


Fig. 4 ***Somniosus pacificus***

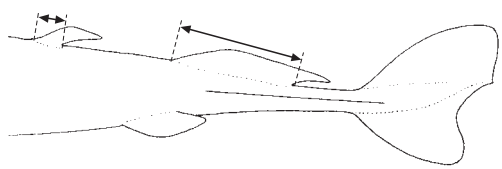


Fig. 5

5a. First dorsal fin without spine; fin length less than 1/3 the length of second dorsal fin; first dorsal-fin base closer to pelvic fins than to pectoral fins; snout bulbously conical, snout length about 2/5 of head length (Fig. 6) . . . . . ***Euprotomicrus bispinatus***

5b. First dorsal fin with a spine, sometimes partly hidden by skin; fin length about 1/2 the length of second dorsal fin; first dorsal-fin base closer to pectoral fins than to pelvic fins; snout pointed, snout length about 1/2 length of head (Fig. 7) . . . . . **(*Squaliolus*)** → ***6***

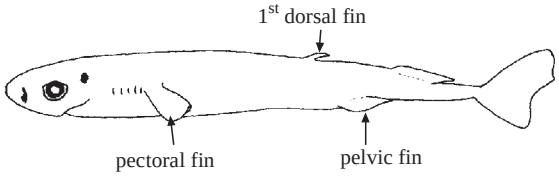


Fig. 6 ***Euprotomicrus bispinatus***

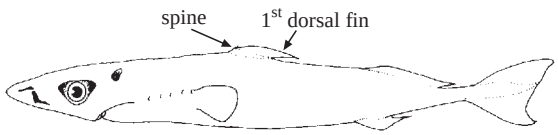


Fig. 7 ***Squaliolus***

6a. Eye large, diameter 73 to 86% of interorbital width; upper margin of eyelid nearly straight; upper lip without papillae . . . . . ***Squaliolus laticaudus***

6b. Eye smaller, diameter 46 to 70 % of interorbital width; upper margin of eye angular, chevron-shaped; upper lip with a pair of prominent lateral papillae (rarely indistinct) . . ***Squaliolus aliae***

7a. Teeth comb-like in both jaws, with a cusp and 1 or more cusplets, not blade-like; skin and muscle of body extremely soft, scabby, semi-gelatinous, and delicate, usually badly damaged by capture . . . . . ***Centroscyllium* cf. *kamoharai***

7b. Teeth compressed and blade-like in lower jaw, with a single erect to oblique cusp, upper teeth comb-like (*Etmopterus)*, blade-like (*Squalus*), or cuspidate and without cusplets; skin and muscle of body more or less firm. . . . . → ***8***

8a. Teeth nearly alike in both jaws, the lowers not greatly enlarged; both with strongly oblique nearly horizontal cusps (Fig. 8); fin spines without grooves on sides, no subterminal notch on caudal fin; caudal peduncle with a strong keel and usually an upper precaudal pit . . . . . **(*Squalus*)** → ***9***

8b. Teeth more or less unlike in both jaws, the lowers much larger than uppers, the latter with erect to oblique cusps; fin spines with grooves on sides; subterminal notch on caudal fin; caudal peduncle without keels or precaudal pits . . . . . → ***16***

Fig. 8 upper and lower tooth (*Squalus*)

9a. Preoral snout greatly elongated, about 2.1 to 2.7 times mouth width (Fig. 9), preorbital snout 2 to 2.5 times eye length in adults . . . . . → ***10***

9b. Preoral snout short to moderately elongated, 1.7 times mouth width or less, preorbital snout less than 2 times eye length in adults . . . . . → ***11***

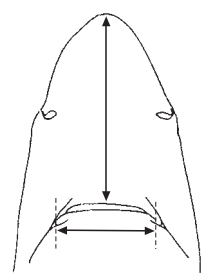


Fig. 9 ventral view of head

10a. Lower caudal-fin lobe with a conspicuous black tip; mouth larger, 2.1 in preoral snout and equal to internarial space (Fig. 10). . . . . ***Squalus melanurus***

10b. Lower caudal-fin lobe with a conspicuous white tip; mouth smaller, 2.7 in preoral snout and about 3/4 of internarial space (Fig. 11) . . . . . ***Squalus rancureli***

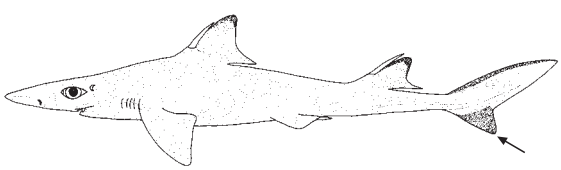


Fig. 10 ***Squalus melanurus***

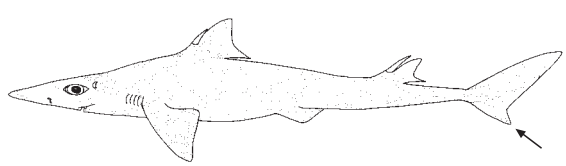


Fig. 11 ***Squalus rancureli***

11a. Diagonal distance from centre of snout tip to inner edge of nostril greater than distance from nostril to upper labial furrow (Fig. 12a) . . . . . → ***12***

11b. Diagonal distance from centre of snout tip to inner edge of nostril less than or about equal to distance from nostril to upper labial furrow (Fig. 12b) . . . . . → ***14***

12a. Snout acutely pointed; eye closer to first gill opening than snout tip (Fig. 13) . . . ***Squalus japonicus***

12b. Snout narrowly parabolic; eye slightly closer to snout tip than first gill opening . . . . . → ***13***

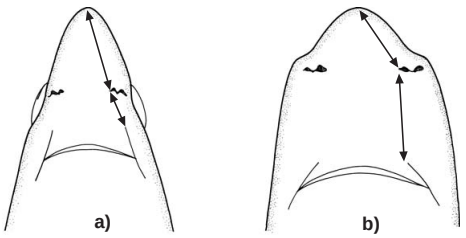


Fig. 12 ventral view of head

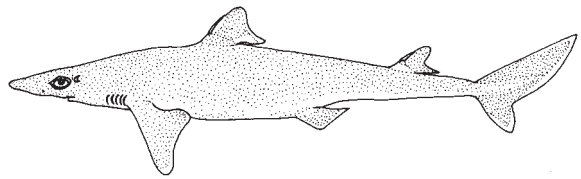


Fig. 13 ***Squalus japonicus***

13a. Head relatively narrow, direct preorbital distance longer than interorbital distance; monospondylous vertebrae 38 to 42 or more (Fig. 14) . . . . . ***Squalus* sp. F**

13b. Head relatively broad, direct preorbital distance shorter than interorbital distance; monospondylous vertebrae 43 to 46 (Fig. 15) . . . . . ***Squalus mitsukurii***

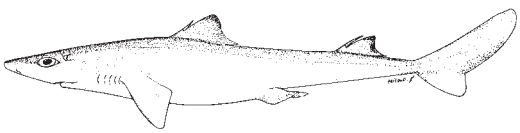


Fig. 14 ***Squalus* sp. F**

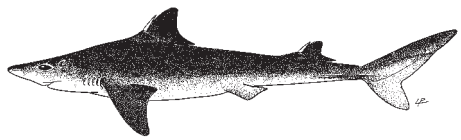


Fig. 15 ***Squalus mitsukurii***

14a. First dorsal fin raked backwards slightly (Fig. 16a); denticles lanceolate (Fig. 17a); precaudal vertebrae 78 to 82 (Fig. 18) . . . . . ***Squalus megalops***

14b. First dorsal fin more upright (Fig. 16b); denticles with 3 posterior cusps (Figs 17b, c); more than 82 precaudal vertebrae . . . . . → ***15***

Fig. 16 first dorsal fin

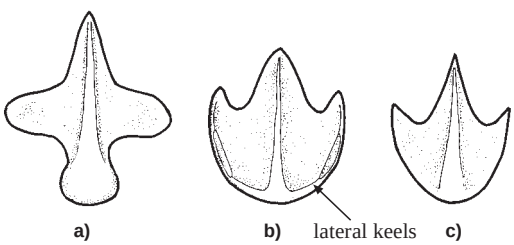


Fig. 17

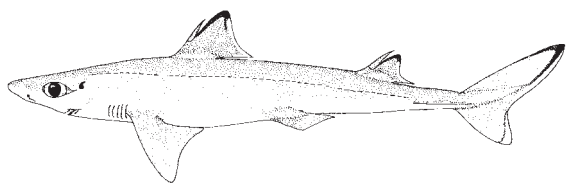


Fig. 18 ***Squalus megalops***

15a. Dorsal-fin spines slender (Fig. 19); a dark bar along base of lower caudal-fin lobe (Fig.19), more prominent in juveniles; denticle crowns without lateral keels (Fig. 17b); precaudal vertebrae mostly 94 to 96 . . . . . ***Squalus* sp. A**

15b. Dorsal-fin spines robust (Fig. 20); no dark bar on base of lower caudal-fin lobe (Fig. 20); denticle crowns with lateral keels (Fig. 17c); precaudal vertebrae 90 to 93 . . . . . ***Squalus* sp. B**

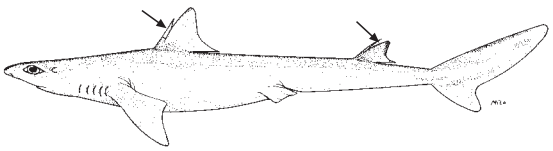


Fig. 19 ***Squalus* sp. A**

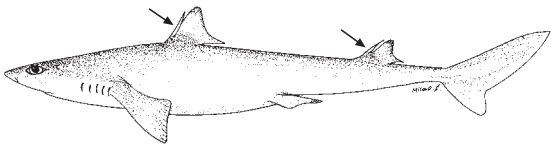


Fig. 20 ***Squalus* sp. B**

16a. Upper teeth with slender primary cusp and 1 or more cusplets on each side (Fig. 21b); second dorsal fin noticably larger than first . . . . . **(*Etmopterus*)** → ***28***

16b. Upper teeth with slender to thick primary cusps but with no cusplets; second dorsal fin as large or noticably smaller than first . . . . . → ***17***

17a. Snout greatly elongated, its length greater than distance from centre of mouth to pectoral-fin origins (Fig. 22a); dermal denticles of back pitchfork-shaped, crowns on tall, slender pedicels (Fig. 22b) . . . . . **(*Deania*)** → ***18***

17b. Snout short to moderately elongated, its length equal or usually less than distance from centre of mouth to pectoral-fin origins; dermal denticles with short pedicels and broad crowns, not pitchfork-shaped . . . . . → ***20***

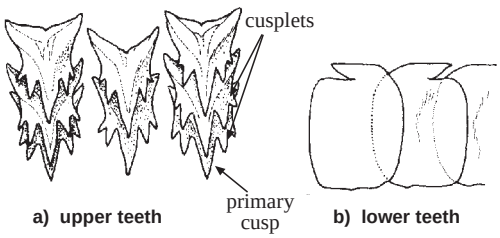


Fig. 21 ***Etmopterus***

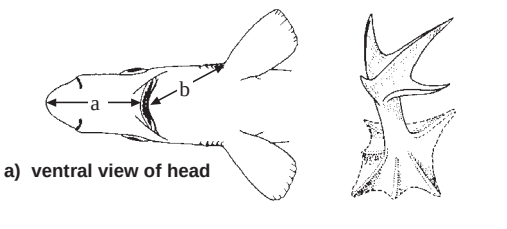


Fig. 22 ***Deania***

18a. A subcaudal keel on the lower surface of the caudal peduncle (Fig. 23) . . . . . ***Deania profundorum***

18b. No subcaudal keel on the lower caudal peduncle (Figs 24 and 25) . . . . . →***19***

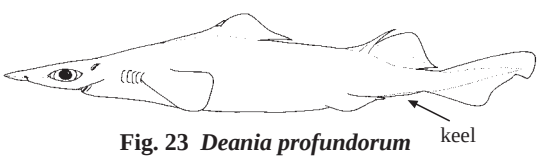


Fig. 23 ***Deania profundorum***

19a. First dorsal fin rather high, angular, and short, distance from its spine origin to its free tip about 2/3 of distance from rear origin of second dorsal-fin spine to free rear tip of its fin (Fig. 24) . . . . . ***Deania quadrispinosa***

19b. First dorsal fin rather low, rounded, and long, distance from its spine origin to its free rear tip greater than distance from origin of second dorsal-fin spine to free rear tip of its fin (Fig. 25) . . . . . ***Deania calcea***

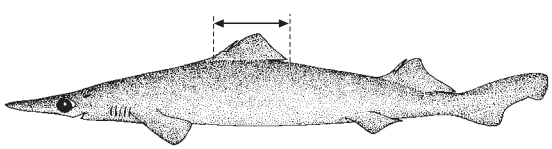


Fig. 24 ***Deania quadrispinosum***

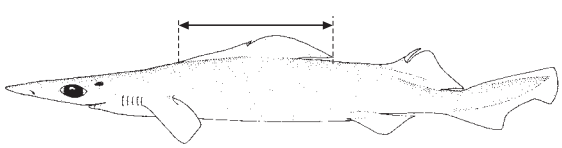


Fig. 25 ***Deania calcae***

20a. Upper teeth relatively broad and low-cusped, the lowers low and wide (Fig. 26); dorsal-fin spines prominent and strong; origin of first dorsal-fin spine over or just posterior to inner margins of pectoral fins; inner corners of pectoral fins angular or greatly elongated (Fig. 26b) . . . . . **(*Centrophorus*)** → ***21***

20b. Upper teeth lanceolate and high; dorsal-fin spines very small, the first dorsal spine well posterior to pectoral fin tips; inner corners of pectoral fins short and broadly rounded on their posterior ends . . . . . → ***27***

21a. Dermal denticles on sides of body with leaf-like, overlapping crowns on elevated narrow pedicels extending above the denticle bases, and with 3 or more medial and lateral cusps on their posterior ends. (Fig. 27) . . . . . ***Centrophorus squamosus***

21b. Dermal denticles on sides of body with flat sessile, not overlapping crowns atop the denticle bases, without separate pedicels and with or without a posterior medial cusp (Fig. 28) . . . . . → ***22***

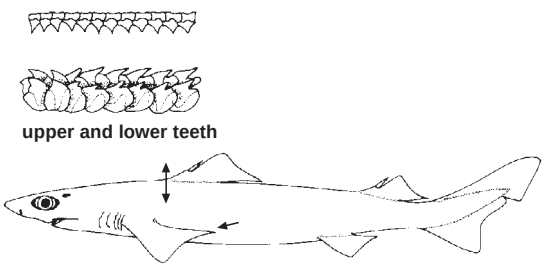


Fig. 26 *Centrophorus*

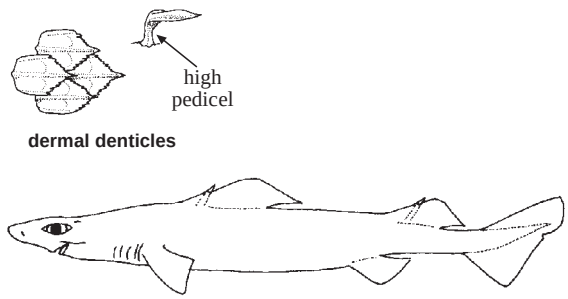
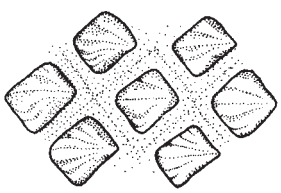
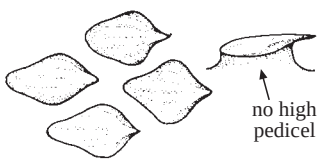


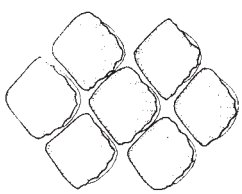
Fig. 27 *Centrophorus squamosus*



a) *Centrophorus moluccensis*



b) *Centrophorus lusitanicus*



c) *Centrophorus granulosus*

Fig. 28 dermal denticles

22a. Second dorsal fin very small, 1/2 height of first dorsal fin or less, with spine origin usually well posterior to pelvic fin rear tips (Fig. 29). . . . . ***Centrophorus moluccensis***

22b. Second dorsal fin larger, nearly or quite as high than first dorsal fin, with spine origin usually over pelvic fin inner margins . . . . . → ***23***

23a. Snout elongated and narrow, preoral length greater than width of head at mouth (Fig. 30) . . . . . ***Centrophorus isodon***

23b. Snout shorter and broadly parabolic, preoral length less than width of head at mouth . . . . . → ***24***
(occurrence in the area uncertain)

Fig. 29 *Centrophorus moluccensis*

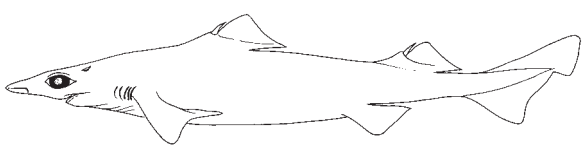


Fig. 30 *Centrophorus isodon*

24a. Free rear tips of pectoral fins moderately elongated and attenuated, not extending behind first dorsal-fin spine; postdorsal space short, about 6% of total length; cusps of lateral trunk denticles acutely angular in adults; body colour dark grey (Fig. 31) . . . . . ***Centrophorus niaukang***

24b. Free rear tips of pectoral fins greatly elongated, usually extending well behind first dorsal spine; postdorsal space longer, about 7.5 to 8% of total length; cusps of lateral trunk denticles obtusely angular to absent in adults; body colour medium to light grey . . . . . → ***25***

25a. First dorsal fin greatly elongated, base about 1.6 to 2 times base of second dorsal fin and over 16% of total length; postventral caudal margin nearly straight in adults (Fig. 32) . . . . . ***Centrophorus lusitanicus***
(occurrence in the area uncertain)

25b. First dorsal fin moderately elongated, base about 1.3 times base of second dorsal fin and less than 16% of total length; postventral caudal margin deeply notched in adults (Figs 33 and 34) . . . . . → ***26***

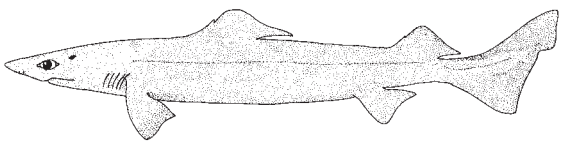


Fig. 31 ***Centrophorus niaukang***

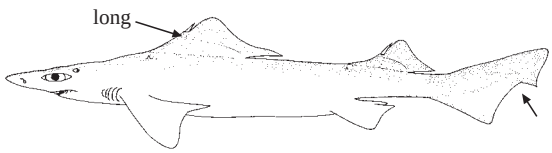


Fig. 32 ***Centrophorus lusitanicus***

26a. Adults with tips of dorsal fins dusky, not prominently marked (Fig. 33) . . ***Centrophorus granulosus***

26b. Adults with tips of dorsal fins black, prominently marked from base of fins (Fig. 34) . . . . . ***Centrophorus atromarginatus***

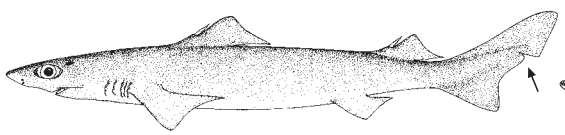


Fig. 33 ***Centrophorus granulosus***

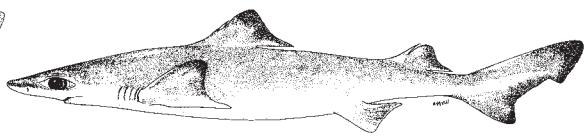


Fig. 34 ***Centrophorus atromarginatus***

27a. Lower teeth with comparatively low, more or less oblique cusps; denticles on sides of body smooth, without ridges (Fig. 35) . . . . . ***Centroscymnus coelolepis***

27b. Lower teeth with comparatively high, more or less erect cusps; denticles on sides of body with cross-ridges as well as transverse ridges (Fig. 36) . . . . . ***Scymnodon squamulosus***

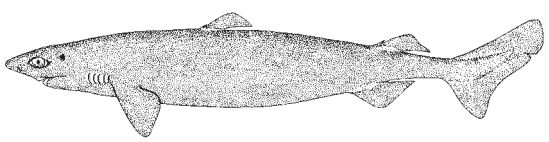


Fig. 35 ***Centrophorus coelolepis***

Fig. 36 ***Scymnodon squamulosus***

28a. Upper teeth with 4 or 5 pairs of cusplets on each side (Fig. 37) . . . . . ***Etmopterus decacuspidatus***
(occurrence in the area uncertain)

28b. Upper teeth usually with 3 or fewer pairs of cusplets on each side . . . . . → ***29***

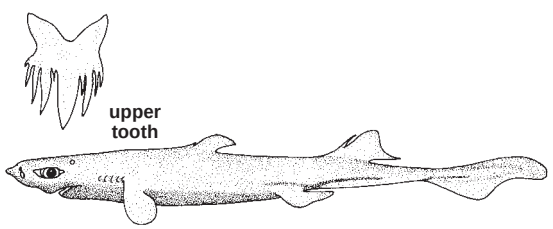


Fig. 37 ***Etmopterus decacuspidatus***

29a. Denticles on sides of body in regular lines . . . . . → ***30***

29b. Denticles on sides of body randomly arranged, not in regular lines . . . . . → ***33***

30a. First dorsal-fin origin well anterior to pectoral fin free rear tip; black flank marking on side of tail base with short, truncated posterior lobe; additional oval dark marking near base of caudal fin, but no transverse marking across midlength of caudal fin (Fig. 38) . . . . . ***Etmopterus splendidus*** and ***Etmopterus*** **sp. C**

30b. First dorsal-fin origin over or posterior to pectoral fin free rear tip; black flank marking on side of tail base with long, narrow posterior lobe with pointed tip; no oval dark marking near base of caudal fin, but with a transverse marking across midlength of caudal fin . . . . . → ***31***

31a. Second dorsal fin with bluntly rounded apex and shallowly concave posterior margin; black flank marking on side of tail with base under second dorsal-fin spine base; posterior branch of flank marking rather broad and short, shorter than anterior branch (Fig. 39) . . . . . ***Etmopterus lucifer***

31b. Second dorsal fin with angular apex and deeply concave posterior margin; black flank marking on side of tail with base anterior to second dorsal-fin spine base; posterior branch of flank marking very narrow and greatly expanded, longer than anterior branch . . . . → ***32***

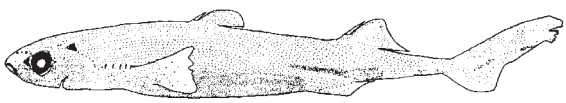


Fig. 38 ***Etmopterus splendidus***

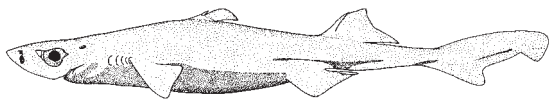


Fig. 39 ***Etmopterus lucifer***

32a. Dermal denticles usually present on outer web of second dorsal fin; black longitudinal marking on caudal-fin base longer than black longitudinal marking along midlength of caudal fin, basal marking with angular rear tip (Fig. 40) . . . . . ***Etmopterus brachyurus***

32b. Dermal denticles absent on outer web of second dorsal fin; black longitudinal marking on caudal-fin base shorter than black longitudinal marking along midlength of caudal fin, basal marking with rounded rear tip (Fig. 41) . . . . . ***Etmopterus molleri***

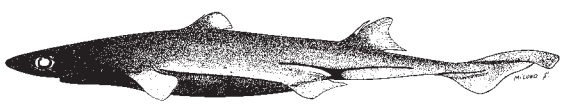


Fig. 40 ***Etmopterus brachyurus***

Fig. 41 ***Etmopterus molleri***

33a. Caudal peduncle long, distance from pelvic-fin insertions to lower caudal-fin origin as long as head (snout to fifth gill openings); flanks with prominent rows of dark dashes (Fig. 42) . . . . . ***Etmopterus*** **sp. F**

33b. Caudal peduncle shorter, distance from pelvic-fin insertions to lower caudal-fin origin shorter than prebranchial head (snout to first gill openings); flanks with or without rows of dark dashes . . . . . → ***34***

34a. Upper surface pale, sharply delineated from dark under surface, flank and caudal markings distinct (Fig. 43) . . . . . ***Etmopterus*** **sp. D**

34b. Upper surface dark, not sharply delineated from dark under surface, flank and caudal markings indistinct or absent . . . . . → ***35***

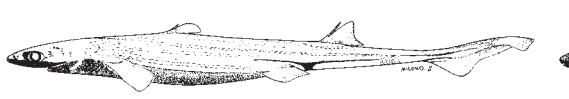


Fig. 42 ***Etmopterus*** **sp. F**

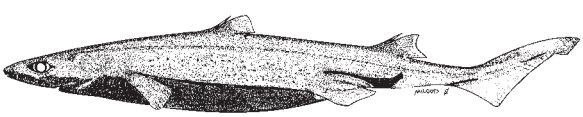


Fig. 43 ***Etmopterus*** **sp. D**

35a. Interdorsal space longer than distance from snout tip to pectoral-fin insertions; distance from second dorsal-fin insertion to upper caudal-fin origin about 1/3 as long as interdorsal space . . . . . ***Etmopterus baxteri*** and ***Etmopterus "granulosus"***

35b. Interdorsal space about equal to head length; distance from second dorsal-fin insertion to upper caudal-fin origin about 1/2 the length of interdorsal space . . . . . → ***36***

36a. Dermal denticles on sides with fairly thick cusps (Fig. 44) . . . . . ***Etmopterus princeps***

36b. Dermal denticles on sides with slender, bristle-like cusps (Fig. 45) . . . . . ***Etmopterus unicolor***
(occurrence in the area uncertain)

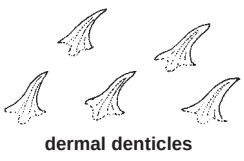
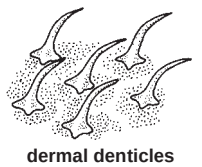


Fig. 44 ***Etmopterus princeps***



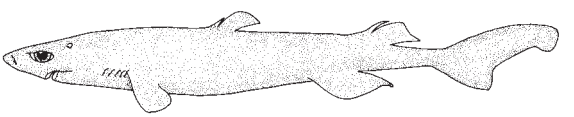


Fig. 45 ***Etmopterus unicolor***

List of species occurring in the area

The symbol ✦ is given when species accounts are included.

✦ *Centrophorus atromarginatus* Garman, 1906
✦ *Centrophorus granulosus* (Bloch and Schneider, 1801)
? *Centrophorus isodon* (Chu, Meng, and Liu, 1981)[1/]
? *Centrophorus lusitanicus* Bocage and Capello, 1864[2/]
✦ *Centrophorus moluccensis* Bleeker, 1860
✦ *Centrophorus niaukang* Teng, 1959
✦ *Centrophorus squamosus* (Bonnaterre, 1788)
Centrophorus sp. [New Caledonia][3/]

Centroscyllium cf. *kamoharai* Abe, 1966[4/]

Centroscymnus coelolepis Bocage and Capello, 1864

✦ *Cirrhigaleus barbifer* Tanaka, 1912

✦ *Dalatias licha* (Bonnaterre, 1788)

? *Deania calcea* (Lowe, 1839)
✦ *Deania profundorum* (Smith and Radcliffe, 1912)
✦ *Deania quadrispinosa* (McCulloch, 1915)

? *Etmopterus baxteri* Garrick, 1957[5/]
✦ *Etmopterus brachyurus* Smith and Radcliffe, 1912
? *Etmopterus decacuspidatus* Chan, 1966[6/]
? *Etmopterus granulosus* (Günther, 1880)[7/]
✦ *Etmopterus lucifer* Jordan and Snyder, 1902

1/ Described from Xisha (Paracel) Islands and off the Zujiang River mouth, Hong Kong, in the South China Sea just adjacent to the area; a similar species, possibly identical, occurs off the Maldive Islands, Sri Lanka, and the Philippines.
2/ Uncertain in the area but should be watched for. Often confused with *Centrophorus niaukang* and *C. granulosus*.
3/ This species could not be placed in the present key. Status uncertain. Described from the upper insular slopes of New Zealand somewhat south of the area.
4/ Recently collected in deep water (1 037 to 1 100 m) off Luzon, Philippines; close to this species but possibly distinct.
5/ This species has been synonymized with *Etmopterus granulosus*, but this is possibly incorrect.
6/ Known from the South China Sea just north of the area between the Viet Nam coast and Hainan Island, China.
7/ Presence in the western Pacific uncertain.

Etmopterus molleri Whitley, 1939
? *Etmopterus princeps* Collett, 1904[8/]
Etmopterus splendidus Yano, 1988
? *Etmopterus unicolor* (Engelhardt, 1912)[9/]
? *Etmopterus* sp. C [Last and Stevens, 1994]
Etmopterus sp. D [Last and Stevens, 1994]
Etmopterus sp. F [Last and Stevens, 1994]

Euprotomicrus bispinatus (Quoy and Gaimard, 1824)

Isistius brasiliensis (Quoy and Gaimard, 1824)

Scymnodon squamulosus (Günther, 1877)[10/]

? *Somniosus pacificus* Bigelow and Schroeder, 1944[11/]

Squaliolus aliae Teng, 1959
Squaliolus laticaudus Smith and Radcliffe, 1912

Squalus japonicus Ishikawa, 1908
Squalus megalops (Macleay, 1881)
Squalus melanurus Fourmanoir and Rivaton, 1979
Squalus mitsukurii Jordan and Snyder, 1903
Squalus rancureli Fourmanoir and Rivanton, 1979
Squalus sp. A [Last and Stevens, 1994]
Squalus sp. B [Last and Stevens, 1994]
Squalus sp. F [Last and Stevens, 1994]

References

Bigelow, H.B. and W.C. Schroeder. 1957. A study of the sharks of the suborder Squaloidea. *Bull. Mus. Comp. Zool. Harv. Univ.*, 117(1):150 p.

Compagno, L.J.V. 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1. Hexanchiformes to Lamniformes. *FAO Fish. Synop.*, (125)Vol.4,Pt.1:249 p.

Last P.R. and J.D. Stevens. 1993. *Sharks and rays of Australia*. Australia, CSIRO, 513 p.

Shirai, S. 1992. *Squalean phylogeny. A new framework of "squaloid" sharks and related taxa*. Sapporo, Hokkaido Univ. Press, 151 p.

8/ This species was nominally recorded from New Caledonia, but its status there needs clarification. Other large species of lanternsharks, including *Etmopterus baxteri* and *E. unicolor* may be involved instead.
9/ Described from Japan; a large lanternshark from the south coast of Australia termed *Etmopterus* sp. B by Last and Stevens (1994) and presently known to extend to just south of the area may be synonymous with *E. unicolor*.
10/ Placed in a separate genus, *Zameus*, by some authors.
11/ Some records in the South Pacific (Tasmania, off New Zealand and somewhat south of the area, and possibly Macquarie Island). Assignment of large southern hemisphere *Somniosus* to the North Pacific *S. pacificus* is tentative.

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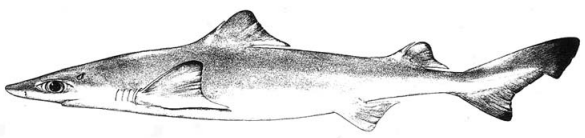
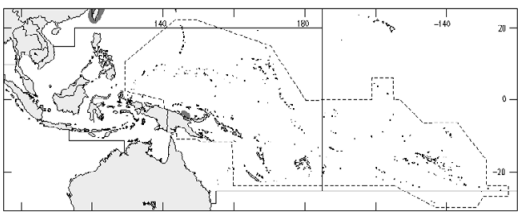
Centrophorus atromarginatus Garman, 1913

En - Blackfin gulper shark.

Maximum total length at least 87 cm. A little-known deep-water dogfish, often confused with *Centrophorus granulosus*, from the upper continental slopes from 183 to at least 450 m. Probably taken in bottom trawls. Described from Japan (Suruga Gulf); also known from Taiwan Province of China, northern Papua New Guinea, and the Gulf of Aden.

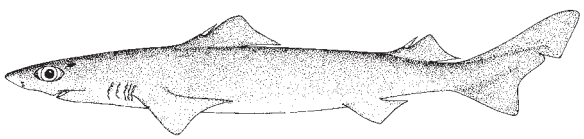


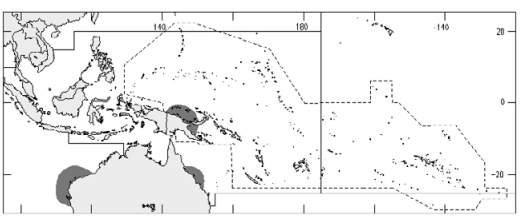


Centrophorus granulosus (Bloch and Schneider, 1801)

En - Gulper shark; **Fr** - Squale-chagrin commun; **Sp** - Quelvacho.

Maximum total length at least 96 cm. On the outer continental shelves and slopes near the bottom in depths from 100 to 1 200 m. Feeds mainly on bony fishes. Mode of utilization and fishing gear uncertain. Western North Atlantic (Gulf of Mexico), eastern Atlantic from France to South Africa, the Mediterranean Sea, western Indian Ocean (South Africa, Mozambique, and Aldabra Islands) and the western Pacific from Japan, Papua New Guinea, and tropical Australia.

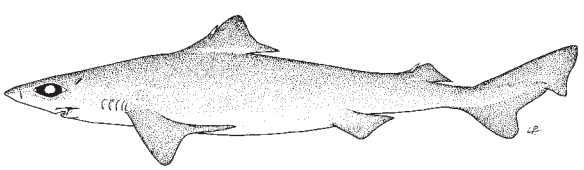


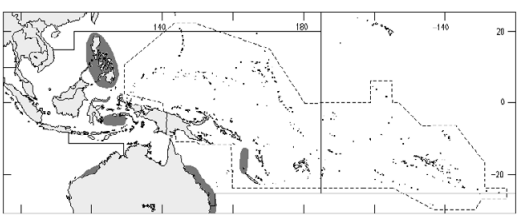


Centrophorus moluccensis Bleeker, 1860

En - Smallfin gulper shark; **Fr** - Squale-chagrin cagaou; **Sp** - Quelvacho de aleta corta.

Maximum total length about 1 m. On the outer continental shelves and upper slopes at depths from 130 to 820 m. Bottom-dwelling; feeds primarily on bony fishes, as well as other dogfish sharks, cephalopods, and shrimps. Probably taken in bottom trawls; utilized at least for fishmeal. Western Indian Ocean from South Africa to Mozambique, India, and western Pacific from Japan to Indonesia (Amboina), the Philippines, New Caledonia, and Australia.

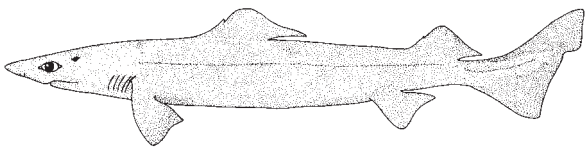


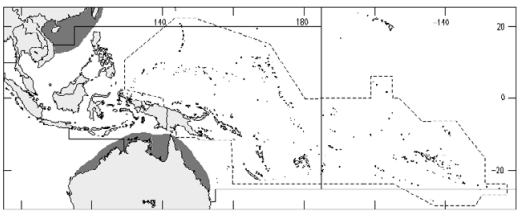


Centrophorus niaukang Teng, 1959

En - Taiwan gulper shark; **Fr** - Squale-chagrin quelvacho; **Sp** - Quelvacho chino.

Maximum total length at least 1.6 m, probably the largest gulper shark. On the outer continental shelves and upper slopes at depths from 250 to 720 m and probably deeper. Bottom-dwelling; little known. Taken in bottom trawls and on deep-set longlines; utilized for fishmeal and for human consumption. North Atlantic, southwestern Indian Ocean from South Africa and Mozambique, possibly the Maldives, and western Pacific from Japan, South China Sea in the northwestern part of the area, and probably Australia. Often confused with *Centrophorus granulosus* and *C. lusitanicus*.

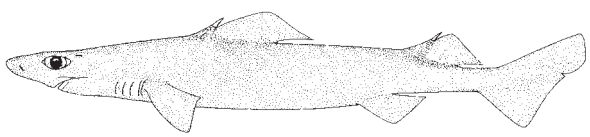


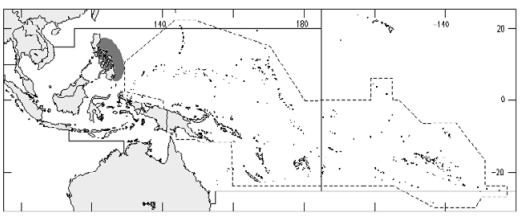


Centrophorus squamosus (Bonnaterre, 1788)

En - Leafscale gulper shark; **Fr** - Squale-chagrin de l'Atlantique; **Sp** - Quelvacho negro.

Maximum total length about 1.6 m. On the continental slopes at depths from 230 to 2 400 m near the bottom, also pelagically in the upper 1 250 m of water 4 000 m deep. Caught with bottom trawls, line gear, and fixed bottom nets; dried and salted for human consumption, also used for fishmeal. Eastern Atlantic from Iceland to South Africa, western Indian Ocean (South Africa, Aldabra Islands) and western Pacific from Japan, the Philippines, New Zealand, and southeastern Australia.

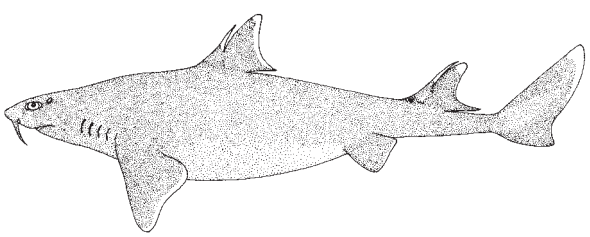


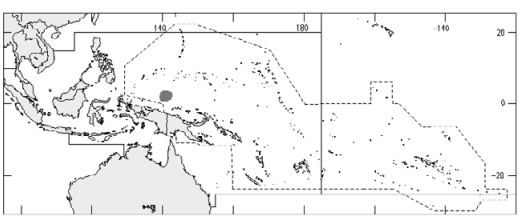


Cirrhigaleus barbifer Tanaka, 1912

En - Mandarin dogfish; **Fr** - Squale moustache; **Sp** - Tollo mandarín.

Maximum total length about 1.26 m. On or near the bottom of the uppermost continental and insular slopes, and probably the outer continental-insular shelves at depths of 146 to 640 m. Probably feeds mostly on bottom fishes and some invertebrates. High in squalene oil, but at present not utilized commercially. Western Pacific from Japan, Torres Island, New Zealand, and Australia (New South Wales).

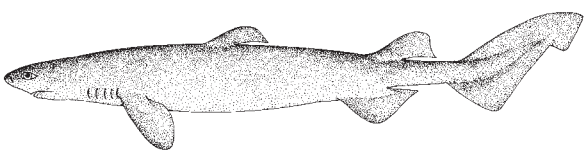


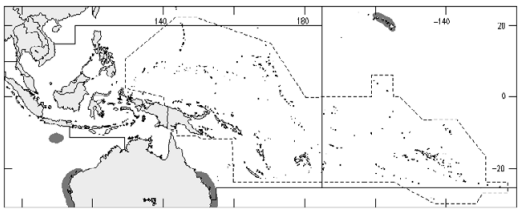


Dalatias licha (Bonnaterre, 1788)

En - Kitefin shark; **Fr** - Squale liche; **Sp** - Carocho.

Maximum total length least 1.6 m. Occurs on the bottom and in the midwater of the outer continental and insular shelves from depths of 40 to 1 800 m. Feeds on bony fish, as well as sharks, skates, cephalopods, and crustaceans. Caught for its squalene-rich liver, leather and meat, also for fishmeal. Western Atlantic (Georges Bank and Gulf of Mexico), eastern Atlantic from Scotland to Cameroon, the Mediterranean, western Indian Ocean (southern Africa), and western and Central Pacific from Japan, Australia, New Zealand, and Hawaii.

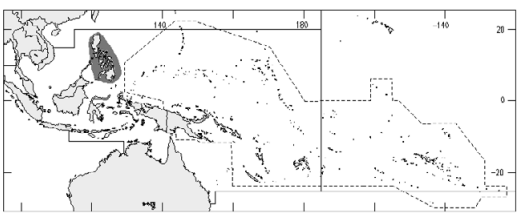




Deania profundorum (Smith and Radcliffe, 1912)

En - Arrowhead dogfish; **Fr** - Squale-savate lutin; **Sp** - Tollo flecha.

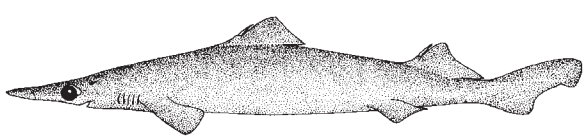
Maximum total length about 76 cm. On the upper continental and insular slopes, found on or near the bottom at depths from 280 to 1 790 m. Feeds on small bony fishes, including lanternfish, squid, and crustaceans. Interest to fisheries unknown. Western North Atlantic (North Carolina), eastern Atlantic from West Sahara to Namibia, western Indian Ocean from South Africa and the western Pacific (Philippines).

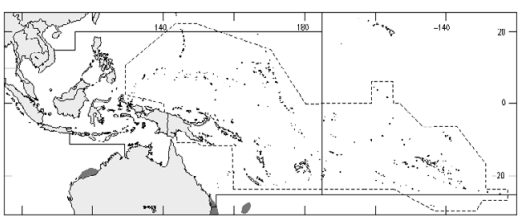


Deania quadrispinosa (McCulloch, 1915)

En - Longsnout dogfish; **Fr** - Squale-savate à long nez; **Sp** - Tollo trompalarga.

Maximum total length about 1.15 m. On the outer continental shelves and upper slopes at depths of 150 to 820 m, mostly below 400 m. Feeds on small bony fishes. Taken in bottom trawls, but with minor importance to fisheries. Southern Africa from Namibia to Mozambique, western Pacific off western and southern Australia, and New Zealand.

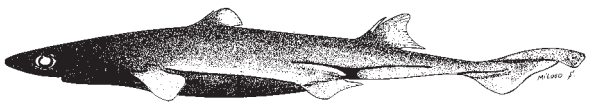




Etmopterus brachyurus Smith and Radcliffe, 1912

En - Shorttail lanternshark; **Fr** - Sagre porte-feu à queue courte; **Sp** - Tollo lucero mocho.

Maximum total length about 50 cm. Occurs on or near the bottom at depths of 400 to 610 m. Without interest to fisheries at present. Japan, the Philippines, and probably elsewhere in the western Pacific. Records from southern Africa possibly based on other species. Often confused with *Etmopterus molleri* and *E. lucifer*.



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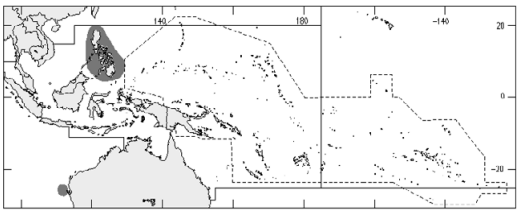
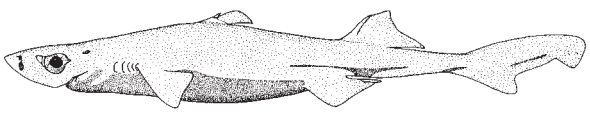
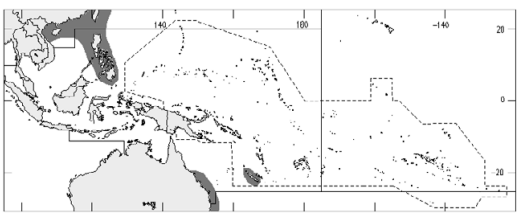


Etmopterus lucifer Jordan and Snyder, 1902

En - Blackbelly lanternshark; **Fr** - Sagre lucifer; **Sp** - Tollo lucero diablo.

Maximum total length about 47 cm. On the outer continental and insular shelves and upper slopes on or near the bottom, at depths of 183 to 1 000 m. Feeds mostly on squids and small bony fishes, including lanternfish, and also shrimps. Interest to fisheries unknown at present. South Atlantic from Uruguay, Argentina, and possibly Namibia, also southern Africa and the western Pacific from Japan, New Caledonia, southern Australia, and New Zealand. Some records probably based on *Etmopterus molleri* and *E. brachyurus*.



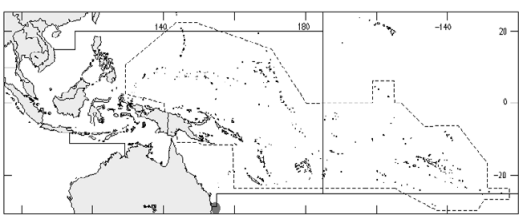


Etmopterus molleri Whitley, 1939

En - Slendertail lanternshark.

Maximum total length about 46 cm. Probably demersal on the upper continental slope in depths of about 250 to 480 m. Only recently recognized as distinct from *Etmopterus lucifer*. Biology and distribution poorly known. Without interest to fisheries. Known from Japan, eastern Australia, and New Zealand.

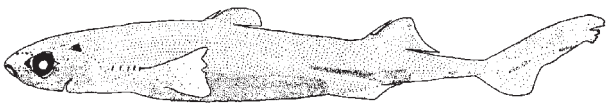
(after Last and Stevens, 1994)

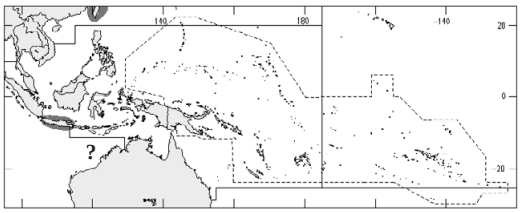


Etmopterus splendidus Yano, 1988

En - Splendid lanternshark.

Maximum total length about 30 cm. Probably demersal on the outer continental shelves and upper slopes at depths of 120 to 210 m. Biology little known, feeds on squid. Known from Japan, Taiwan Province of China, Java, and possibly northwestern Australia if *Etmopterus* sp. C [Last and Stevens, 1994] is identical to it.

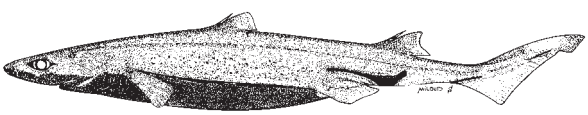




***Etmopterus* sp. D** [Last and Stevens, 1994]

En - Pink lanternshark.

Maximum total length at least 41 cm. Occurs near the bottom on the upper continental slope in depths of 800 to 880 m. Biology and distribution almost unknown. Without interest to fisheries at present. So far recorded only from off Cairns, northern Queensland.



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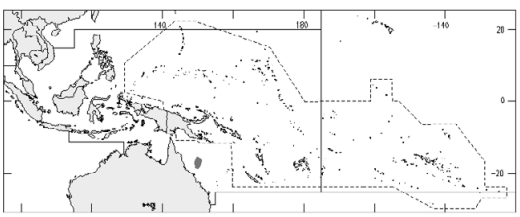
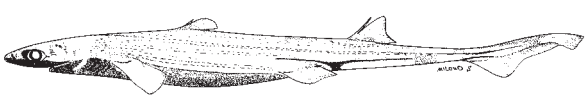


***Etmopterus* sp. F** [Last and Stevens, 1994]

En - Lined lanternshark.

Maximum total length at least 45 cm. On or near the bottom of the upper continental slope at depths of 590 to 700 m. Its biology is poorly known. The few known specimens were collected off northern Queensland between Cairns and Rockhampton. Interest to fisheries unknown.



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