FAO SPECIES IDENTIFICATION GUIDE FOR FISHERY PURPOSES

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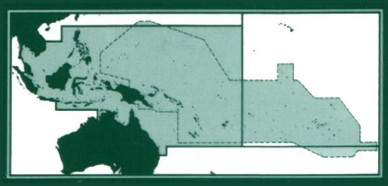
THE LIVING MARINE RESOURCES OF THE

WESTERN CENTRAL PACIFIC



Volume 2. Cephalopods, crustaceans, holothurians and sharks

FFA South Pacific Forum Fisheries Agency

Food and Agriculture Organization of the United Nations

NORAD Norwegian Agency for International Development

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THE LIVING MARINE RESOURCES OF THE WESTERN CENTRAL PACIFIC

VOLUME 2

Cephalopods, crustaceans, holothurians and sharks

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SUMMARY

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

Table of Contents

CEPHALOPODS

INTRODUCTION AND GENERAL REMARKS

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

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

REMARKS ON MAJOR GROUPS OF COMMERCIAL IMPORTANCE

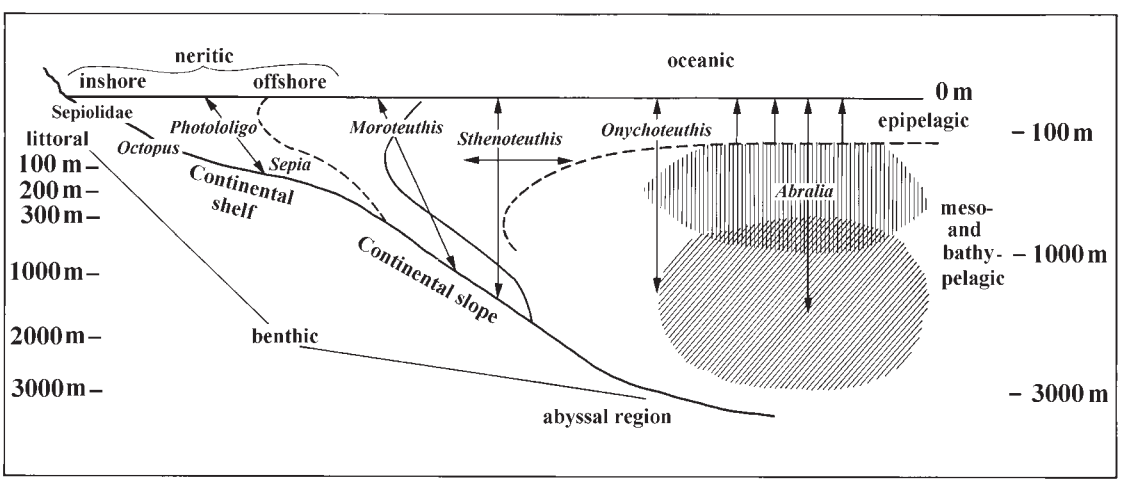
Nautiluses (Family Nautilidae)

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

Squids (Order Teuthida)

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

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



major ocean habitats showing indicative distributions of abundant cephalopods

(after Packard et al., 1972)

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

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

Cuttlefishes (Family Sepiidae)

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

Octopuses (Order Octopoda)

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

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

PRINCIPAL MEASUREMENTS AND METHODS USEFUL FOR IDENTIFICATION

External characteristics and measurements used

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

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

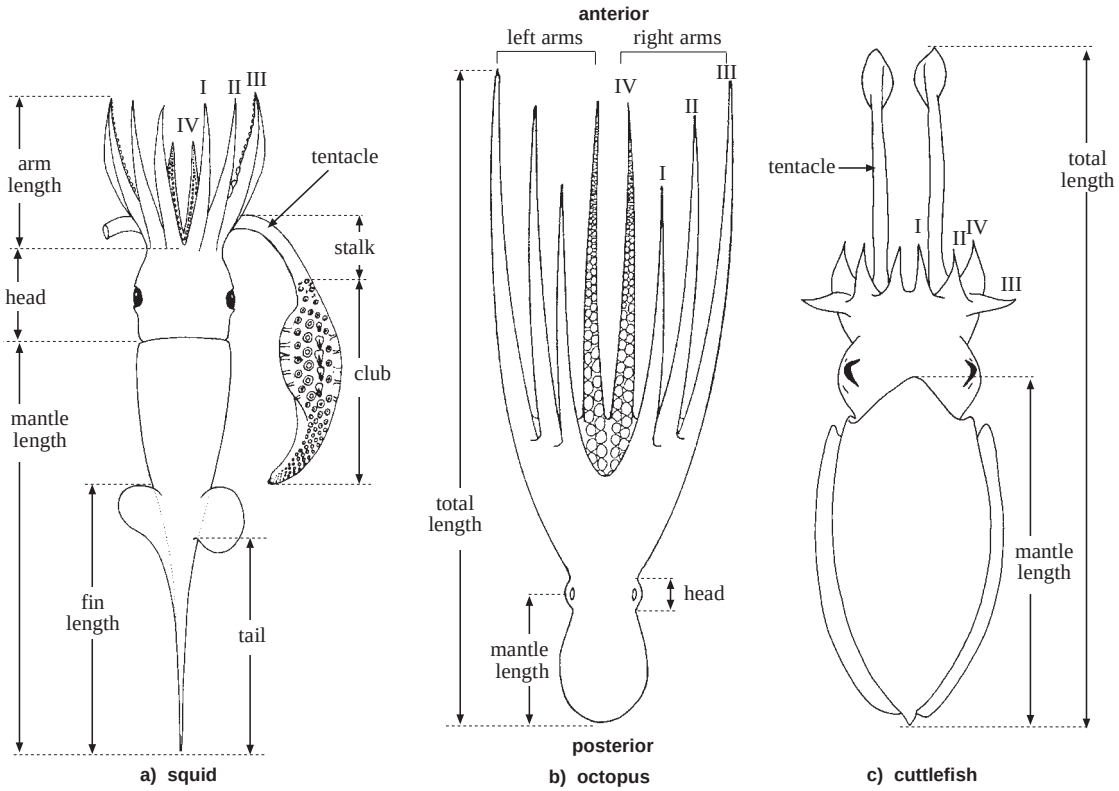


Fig. 1 measurements, arm numbering, and major external features of cephalopods in dorsal view

Determining sex

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

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

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

Internal structures in the mantle cavity

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

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

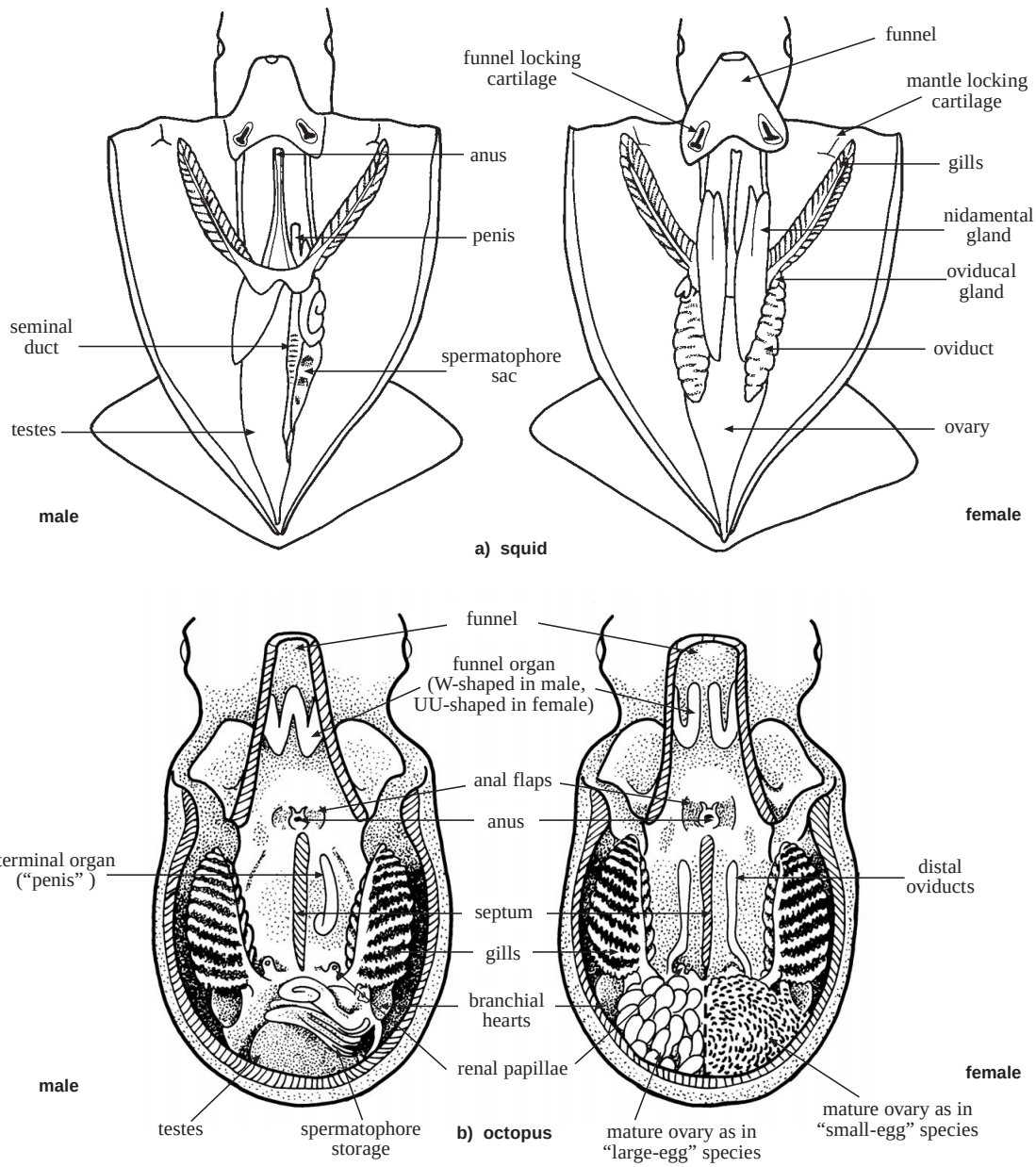


Fig. 2 major features of the mantle cavity of a typical squid and octopus

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

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

Removing internal shells (gladii and cuttlebones)

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

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

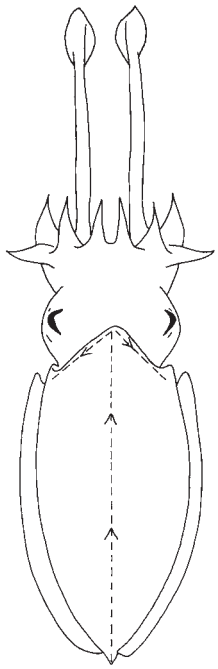


Fig. 3 cuttlefish in dorsal view (broken line indicates suggested incision for dissection)

GLOSSARY OF TECHNICAL TERMS

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

Afferent blood vessels - vessels leading towards the gills.

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

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

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

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

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

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

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

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

Branchial - pertaining to the gills.

Branchial canal - canal between afferent and efferent blood vessels.

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

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

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

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

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

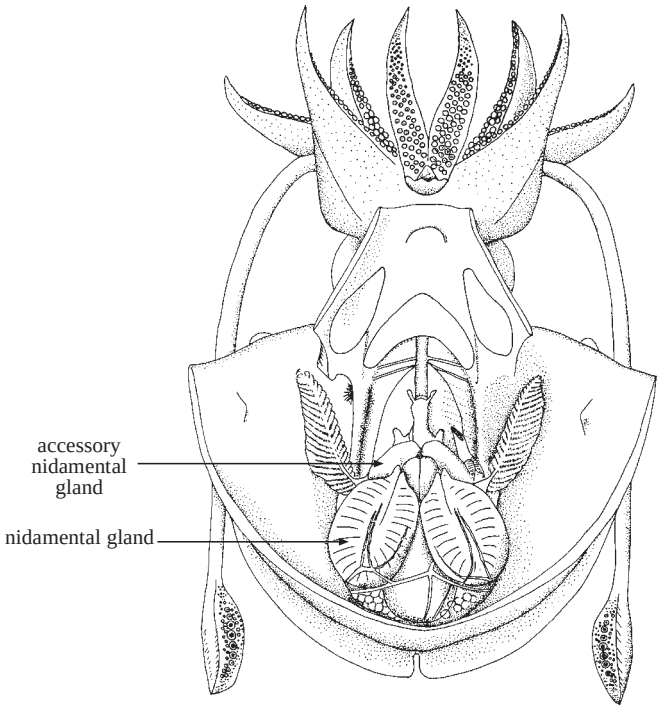


Fig. 4 mantle cavity of female cuttlefish (opened ventrally)

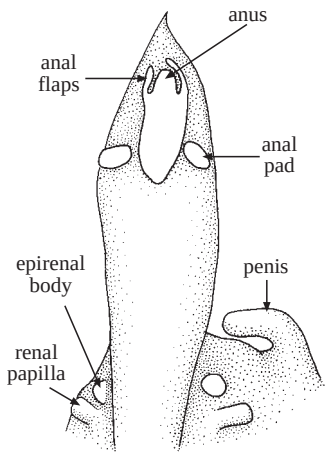


Fig. 5 anterior end of mantle cavity of a sepiolid

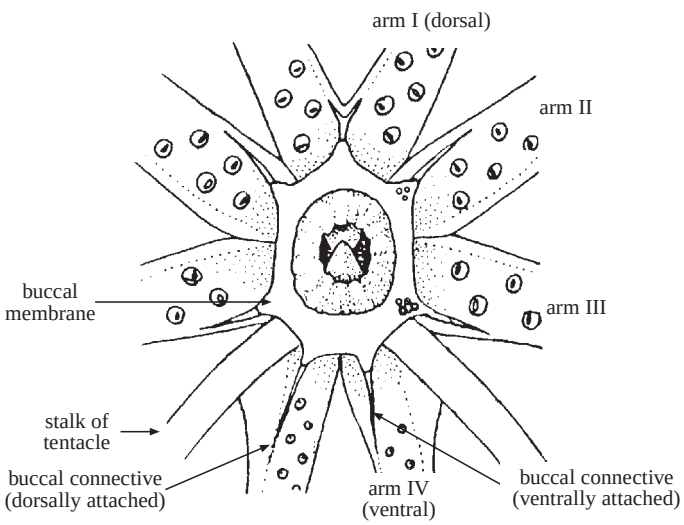


Fig. 6 diagram of oral surface of brachial crown and buccal membrane of a squid

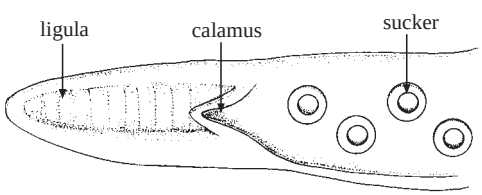


Fig. 7 tip of hectocotylized arm in a male octopus

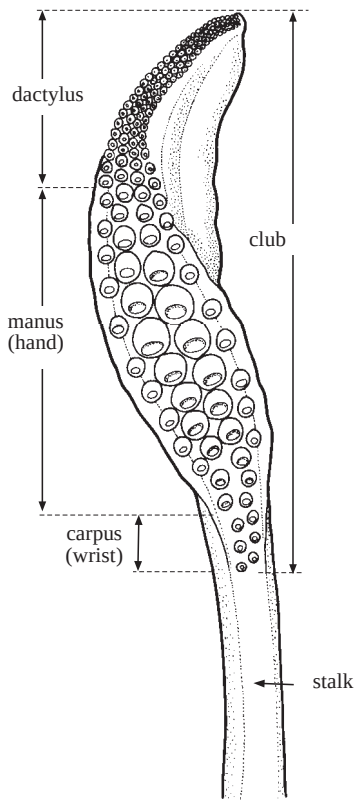


Fig. 8 distal end of tentacle of a squid

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

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

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

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

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

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

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

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

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

Dorsal shield - hard calcareous dorsal surface of the cuttlebone.

Efferent blood vessels - vessels leading away from the gills.

Epipelagic - living in the surface waters of the ocean.

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

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

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

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

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

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

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

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

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

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

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

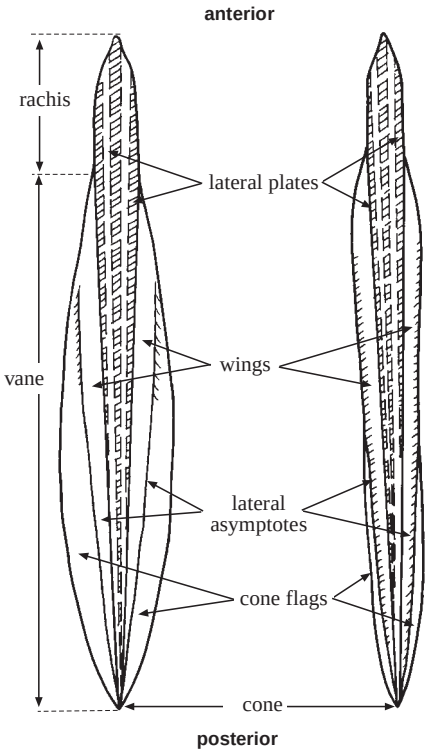


Fig. 9 examples of gladii

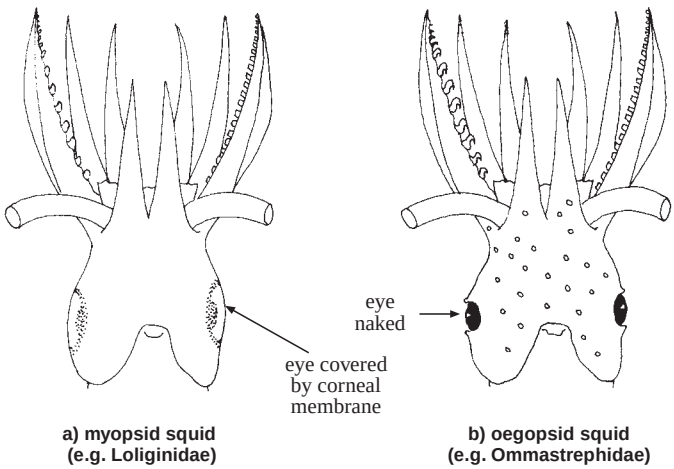


Fig. 11 head, eyes, and arms in ventral view

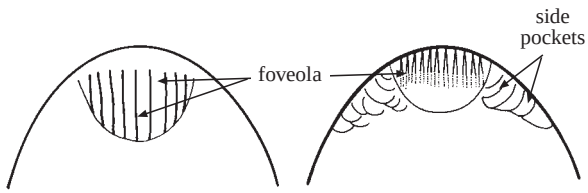


Fig. 12 funnel groove of squids

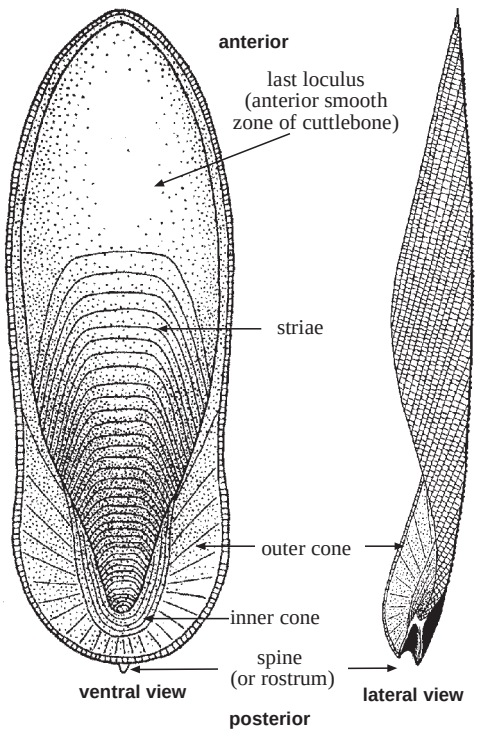
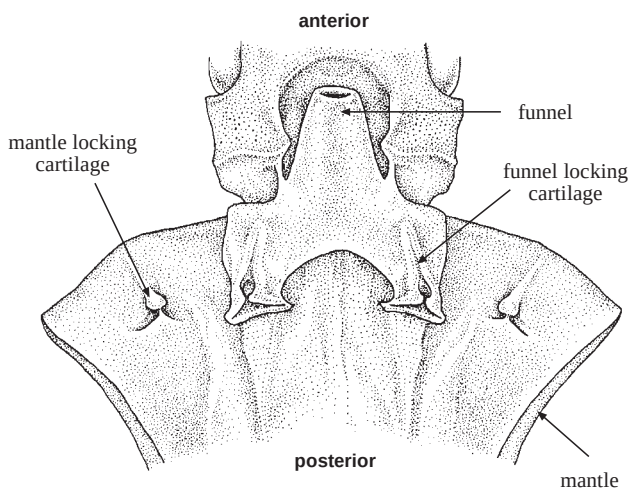


Fig. 10 cuttlebone



(illustration: K.Hollis/ABRS)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Orbit - cavity, or depression housing the eyeball.

Outer cone - rim surrounding the phragmocone in cuttlebones.

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

Phragmocone - system of plates comprising the cuttlebone.

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

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

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

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

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

Renal papilla - kidney opening.

Renal sac - kidney.

Secondary fold - on the eyelid, conspicuous in cuttlefishes.

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

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

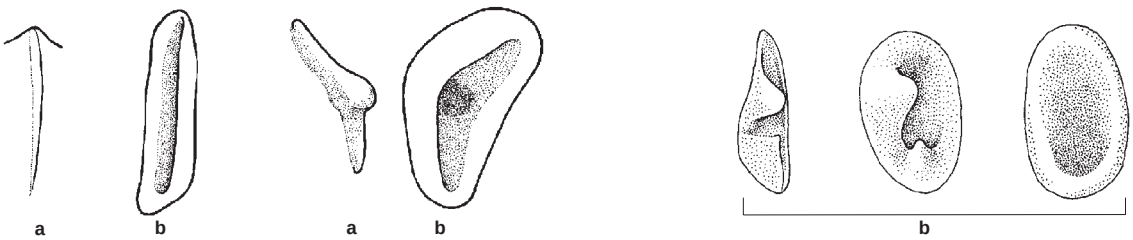


Fig. 14 basic types of mantle locking cartilage (a) and funnel locking cartilage (b)

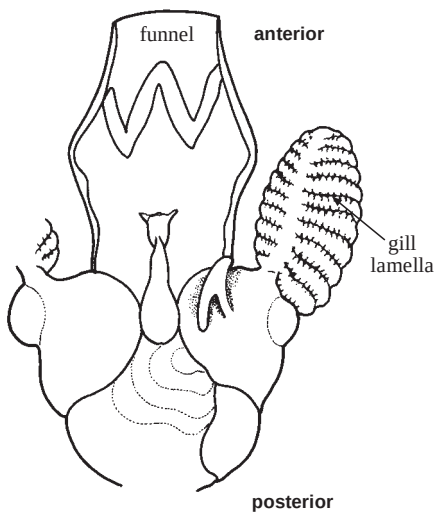


Fig. 15 gills

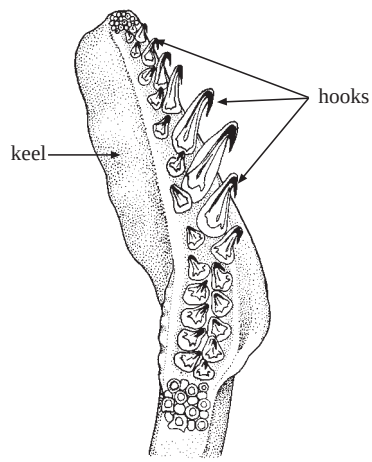


Fig. 16 tentacular club of an onychoteuthid squid

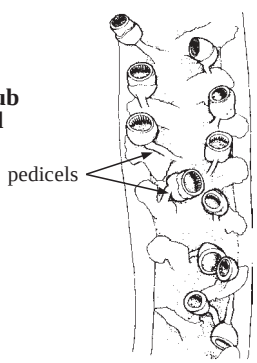


Fig. 18 detail of arm

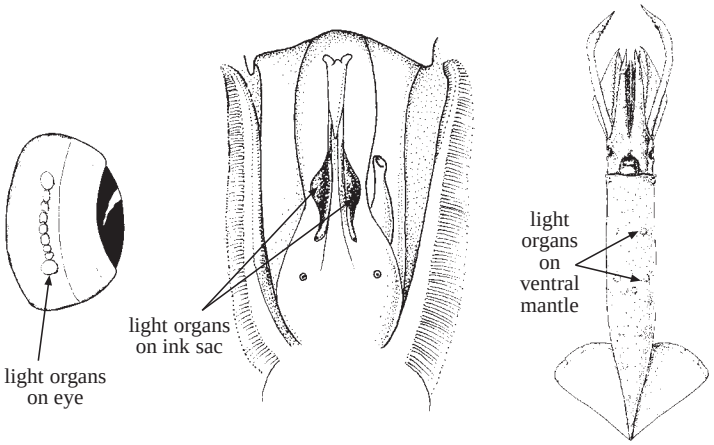


Fig. 17 examples of light organs

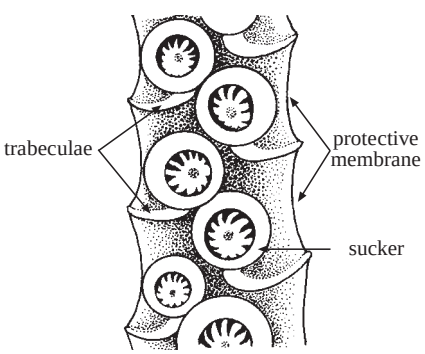


Fig. 19 detail of arm

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

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

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

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

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

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

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

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

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

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

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

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

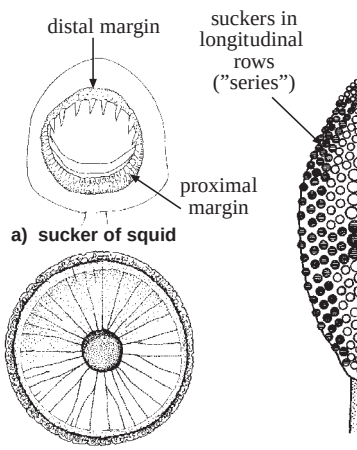
Umbilicus - the central core of the chambered *Nautilus* shell, representing the juvenile shell with its initial coils.

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

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

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

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



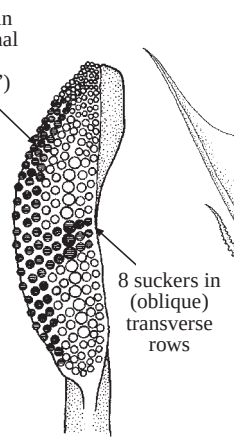


Fig. 20 suckers and how they are counted

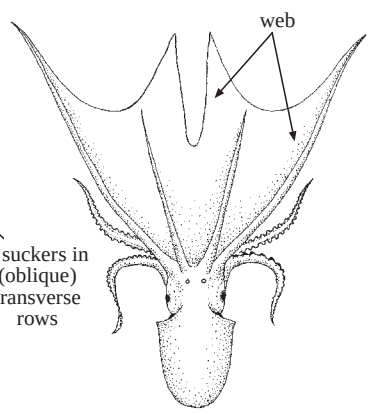


Fig. 21 octopus of the genus *Tremoctopus*, with expanded web

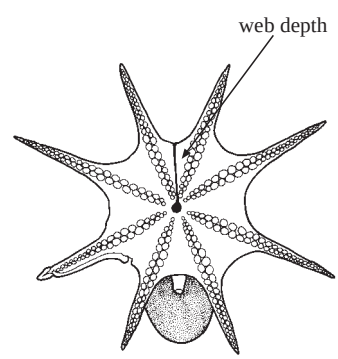


Fig. 22 octopus in oral view

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

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

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

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

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

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

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

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

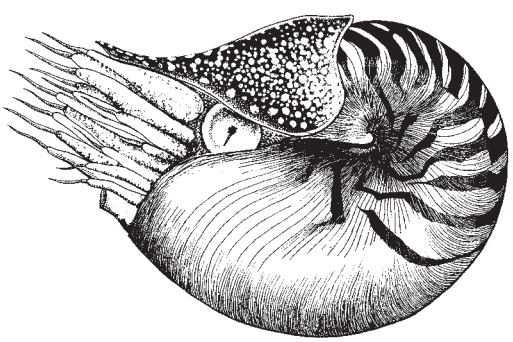
3b. Internal shell straight, feather- or rod-shaped; no pockets present between arms III and IV . . . . . **(Order Teuthida (= Teuthoidea))** → **8**

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

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

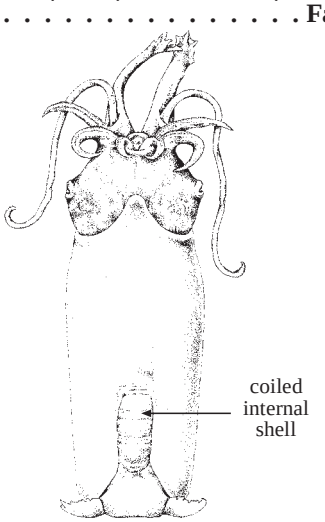
5a. Internal shell coiled, chambered, embedded in posterior mantle (Fig. 24). . . . . **Family Spirulidae** (p. 722)

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



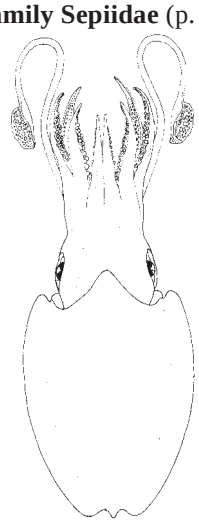
lateral view

Fig. 23 Nautilidae (*Nautilus*)



dorsal view

Fig. 24 Spirulidae (*Spirula*)



dorsal view

Fig. 25 Sepiidae (*Sepia*)

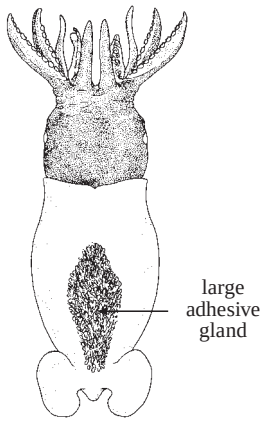
(illustration: K.Hollis/ABRS)

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

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

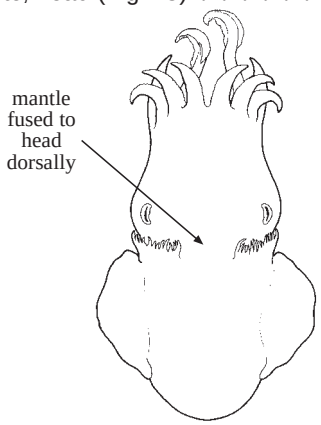
7a. Shell absent; both or only left ventral arm hectocotylized; dorsal border of mantle always fused to head (Fig. 27) . . . . . **Family Sepiadariidae** (p. 719)

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



dorsal view

Fig. 26 Idiosepiidae (*Idiosepius*)



dorsal view

Fig. 27 Sepiadariidae (*Sepiadarium*)

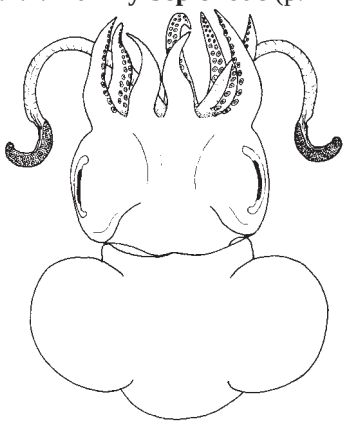

dorsal view

Fig. 28 Sepiolidae (*Rossia*)

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

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

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

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

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

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

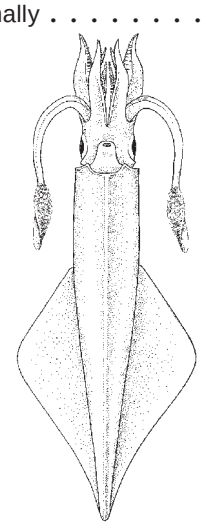

ventral view

Fig. 29 Loliginidae (*Loligo*)

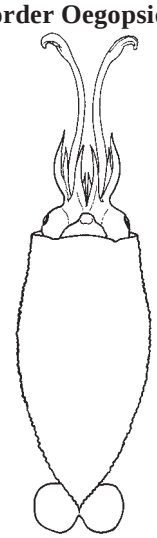

ventral view

Fig. 30 Cranchiidae (*Cranchia*)

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

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

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

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

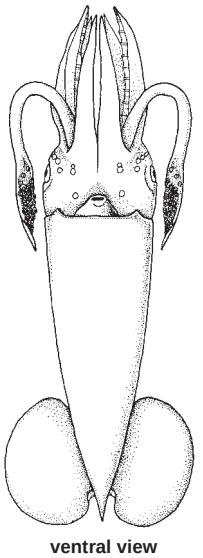


Fig. 31 Enoploteuthidae (*Pterygioteuthis*)

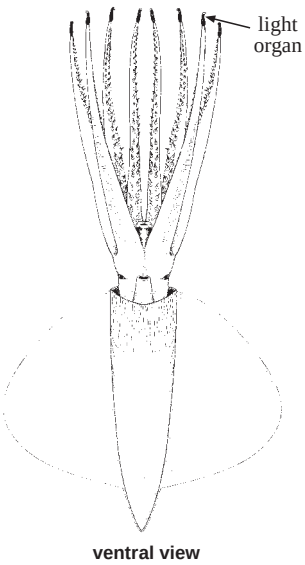


Fig. 32 Octopoteuthidae (*Octopoteuthis*)

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

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

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

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

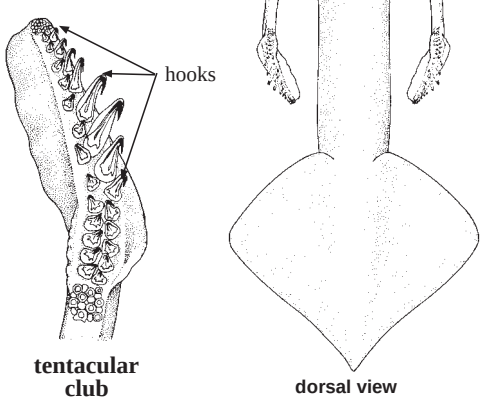


Fig. 33 Oncychoteuthidae (*Onychoteuthis*)

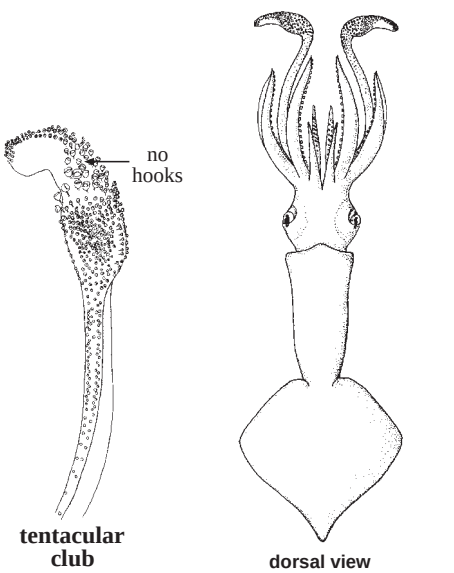


Fig. 34 Brachioteuthidae (*Brachioteuthis*)

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

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

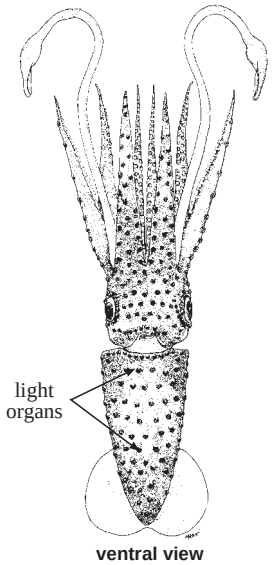


Fig. 35 Histioteuthidae (*Histioteuthis*)

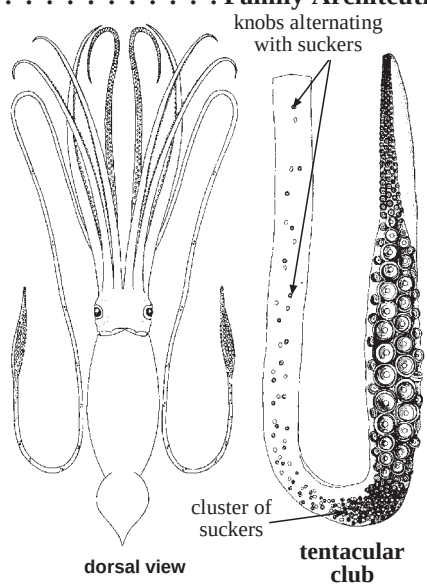


Fig. 36 Architeuthidae (*Architeuthis*)

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

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

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

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

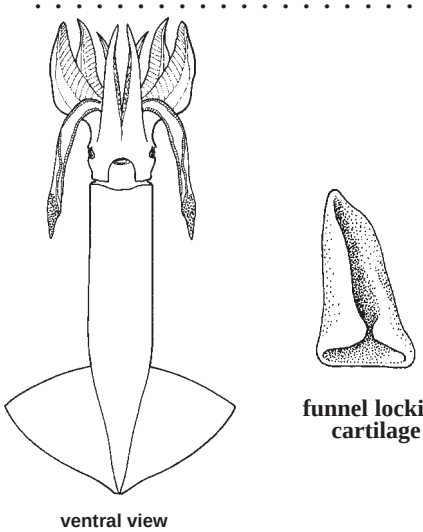


Fig. 37 Ommastrephidae (*Ommastrephes*)

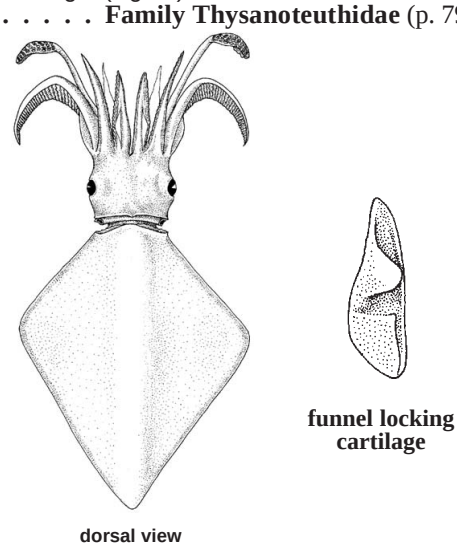


Fig. 38 Thysanoteuthidae (*Thysanoteuthis*)

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

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

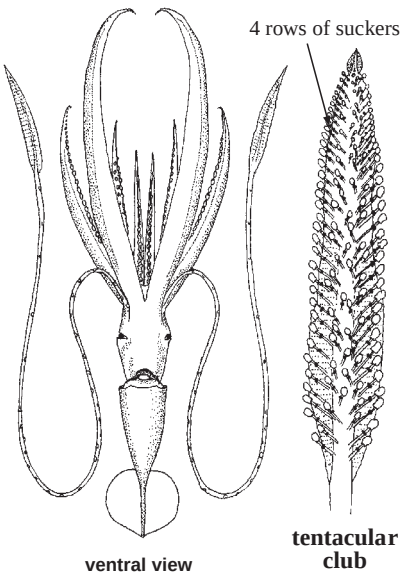


Fig. 39 Chiroteuthidae (*Chiroteuthis*)

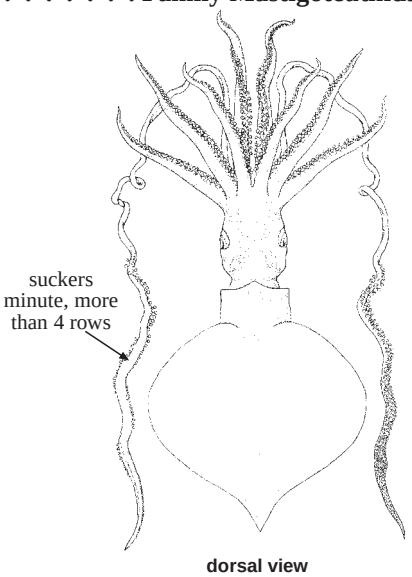


Fig. 40 Mastigoteuthidae (*Mastigoteuthis*)

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

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

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

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

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

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

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

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

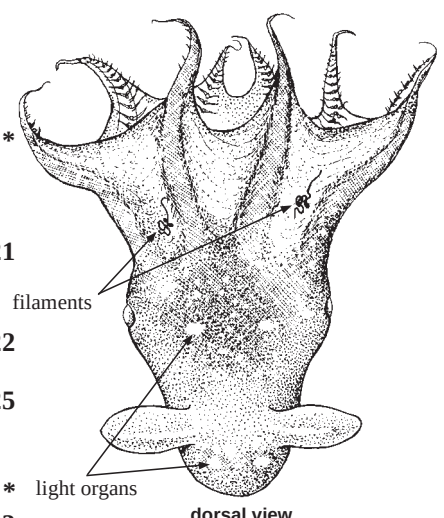


Fig. 41 Vampyroteuthidae (*Vampyroteuthis*)

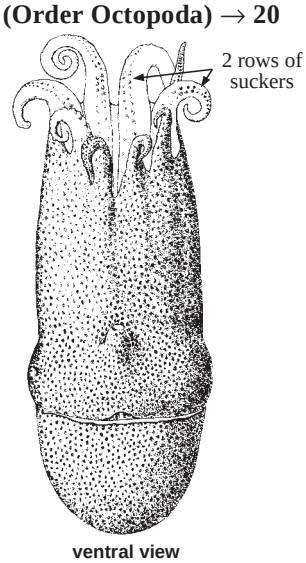


Fig. 42 Alloposidae (*Haliphron*)

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

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

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

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

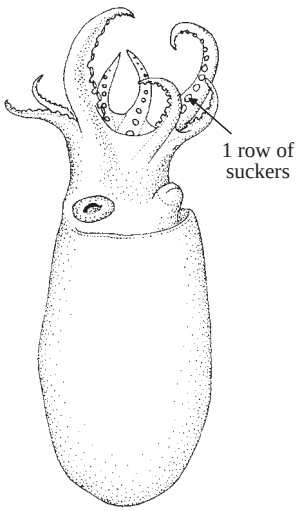


Fig. 43 Bolitaenidae (*Japetella*)

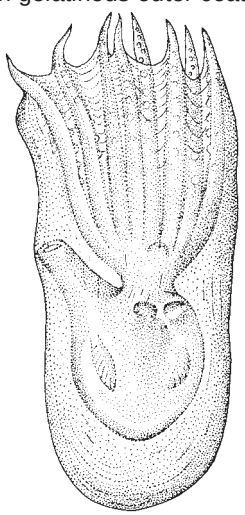


Fig. 44 Amphitretidae (*Amphitretus*)

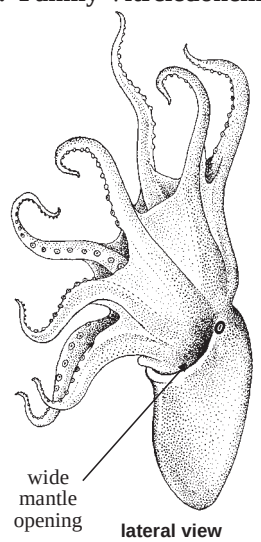


Fig. 45 Vitreledonellidae (*Vitreledonella*)

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

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

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

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

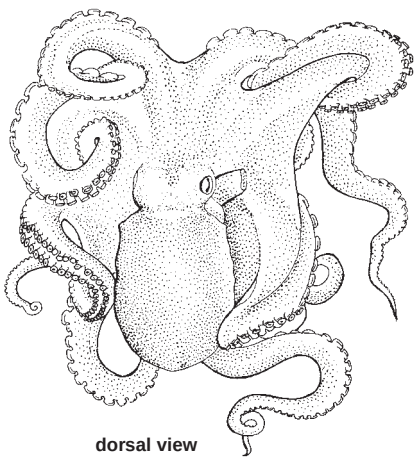


Fig. 46 Octopodidae (*Octopus*)

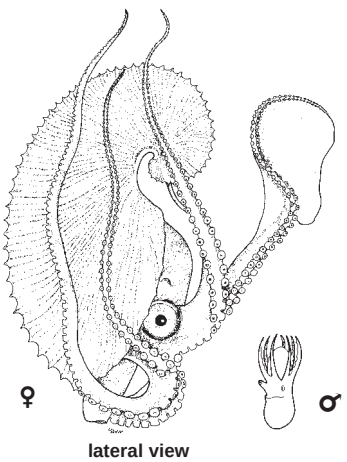
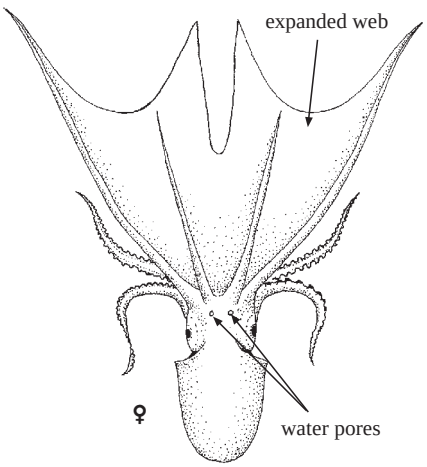


Fig. 47 Argonautidae (*Argonauta*)

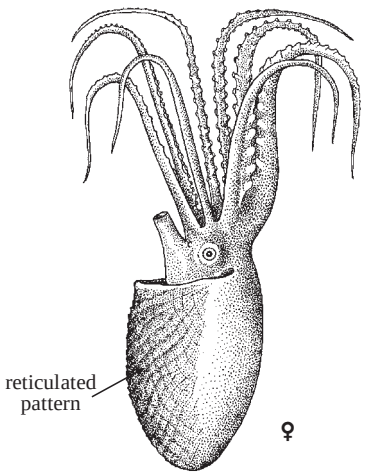
27a. Arms I and II of female joined by very deep thin web; arms I and II longer than other arms; ventral mantle smooth; 2 pairs of open holes on head (cephalic water pores), adjacent to bases of arms I and IV (Fig. 48) . . . . . **Family Tremoctopodidae ***

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



dorsal view

Fig. 48 Tremoctopodidae (*Tremoctopus*)



lateral view

Fig. 49 Ocythoidae (*Ocythoe*)

ANNOTATED LIST OF FAMILIES ENCOUNTERED IN FISHING ACTIVITIES IN THE AREA

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

Class CEPHALOPODA Cuvier, 1798

Subclass NAUTILOIDEA Agassiz, 1847

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

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

Subclass COLEOIDEA Bather, 1888

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Suborder INCIRRATA Grimpe, 1916

Superfamily BOLITAENOIDEA

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

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

Superfamily OCTOPODOIDEA

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

Superfamily ARGONAUTOIDEA

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

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

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

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

LIST OF FAMILIES TREATED IN THIS CONTRIBUTION

Order NAUTILIDA
- NAUTILIDAE - Chambered nautiluses

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

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

Order TEUTHIDA

Suborder MYOPSIDA
- LOLIGINIDAE - Inshore squids, pencil squids

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

Order OCTOPODA
- OCTOPODIDAE - Benthic octopuses

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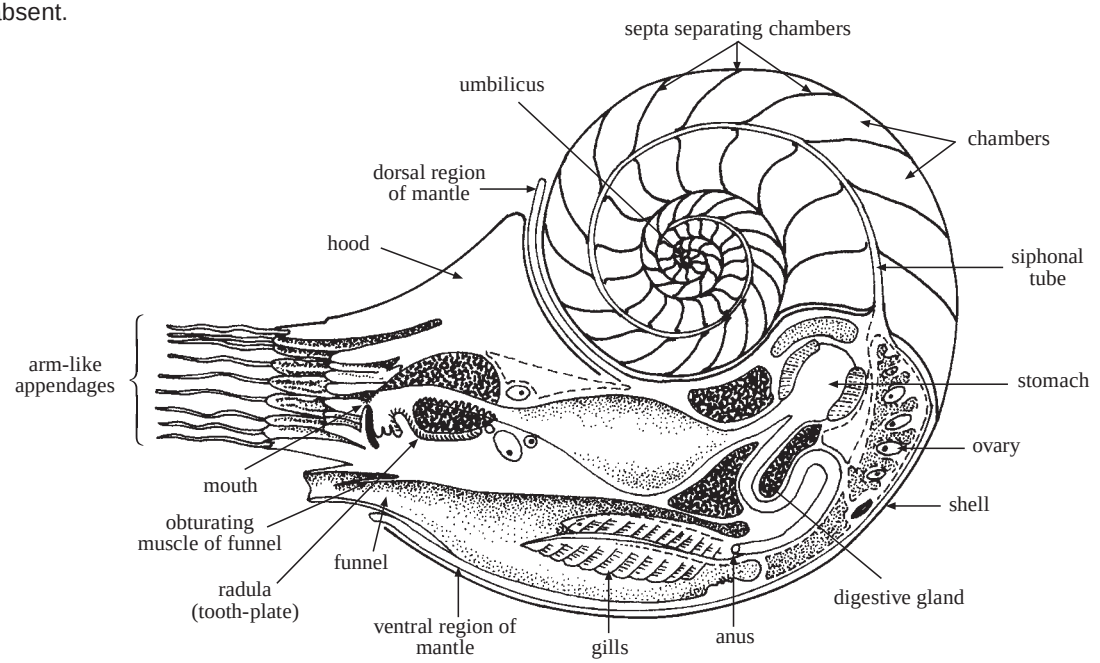
click for next page

NAUTILIDAE

Chambered nautiluses

by M.C. Dunning

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

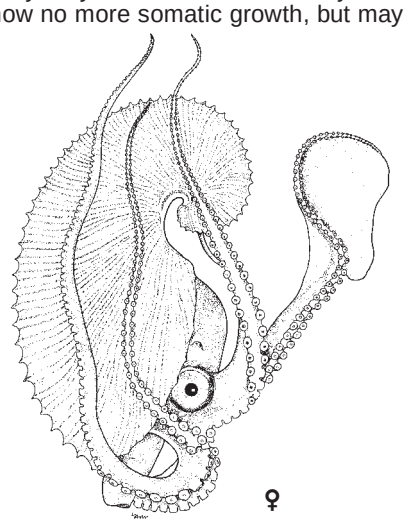


schematic cross-section of a *Nautilus*

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

Similar families occurring in the area

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



Argonautidae

Key to the species of Nautilidae occurring in the area

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

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

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

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

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

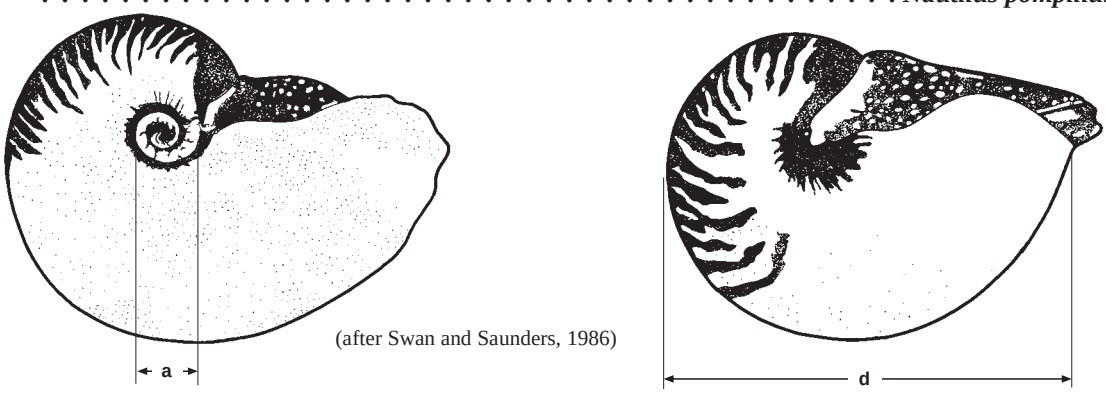
3b. Umbilicus large (approximately 20% shell diameter) with subangular shoulders and vertical walls (Solomon Islands, Papua New Guinea) . . . . . ***Nautilus scrobiculatus***

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

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

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

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



(after Swan and Saunders, 1986)

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

List of species occurring in the area

The symbol is given when species accounts are included.

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

Reference

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

Nautilus macromphalus Sowerby, 1849

Frequent synonyms / misidentifications: None / None.

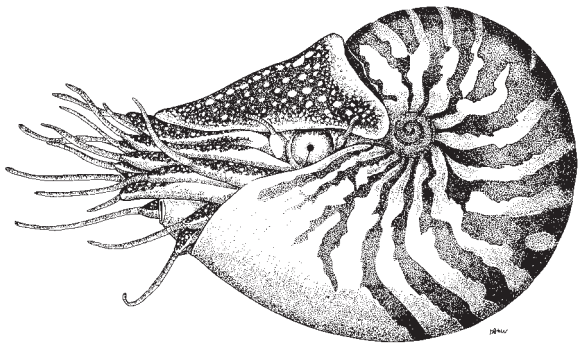
FAO names: En - Bellybutton nautilus; **Fr** - Nautile bouton; **Sp** - Nautilo ombligo.

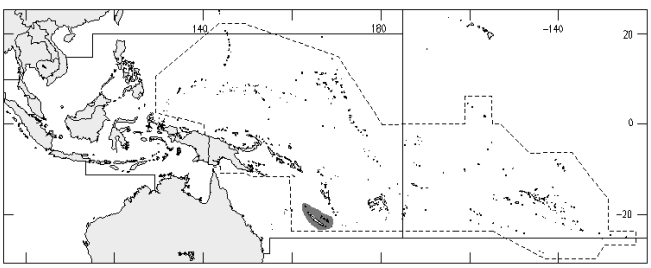
Diagnostic characters: Umbilicus a deep, round shouldered concavity, approximately 16% of shell diameter.

Size: Maximum shell diameter about 160 mm.

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

Distribution: Restricted to New Caledonia and Loyalty Islands.





Nautilus pompilius Linnaeus, 1758

Frequent synonyms / misidentifications: None / None.

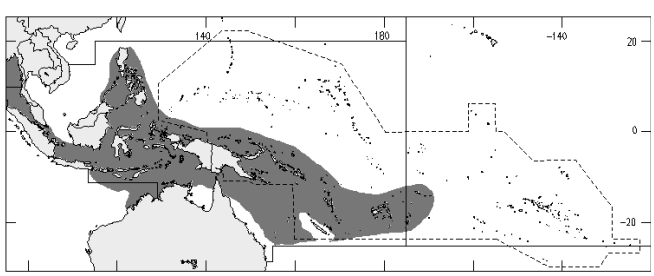
FAO names: En - Emperor nautilus; **Fr** - Nautile flammé; **Sp** - Nautilo común.

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

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

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

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



SEPIOLIDAE

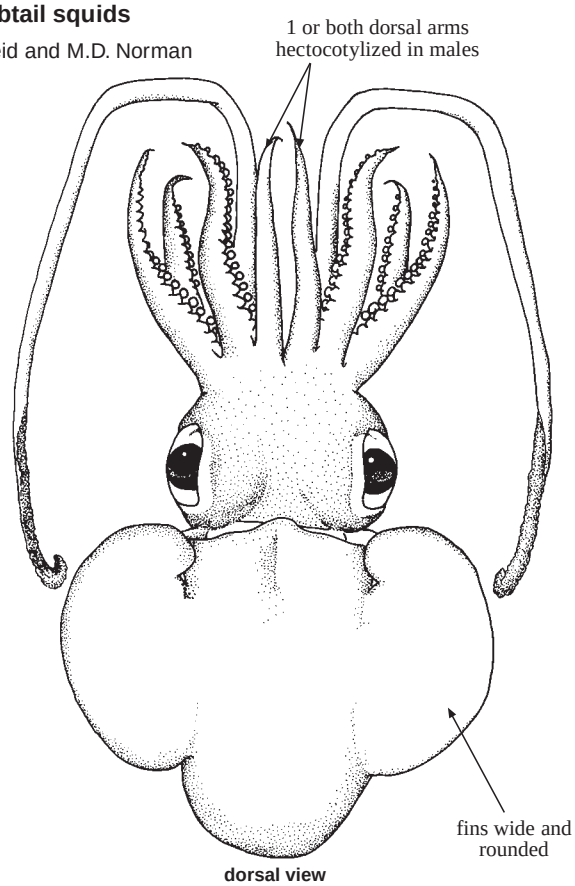
Bobtail squids

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

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

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

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



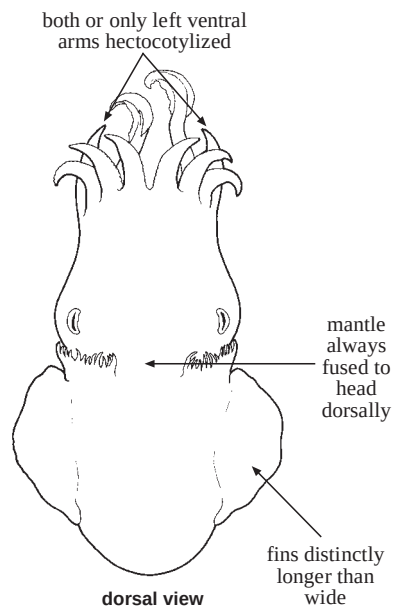
Similar families occurring in the area

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

Key to the genera of Sepiolidae occurring in the area

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

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



Sepiadariidae

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

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

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

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

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

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

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

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

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

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

List of species occurring in the area

The symbol ♜ is given when species accounts are included.

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

♜ *Heteroteuthis weberi* Joubin, 1902

Inioteuthis maculosa Berry, 1918

? *Neorossia* sp.[1/]

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

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

♜ *Sepiolina nipponensis* (Berry, 1911)

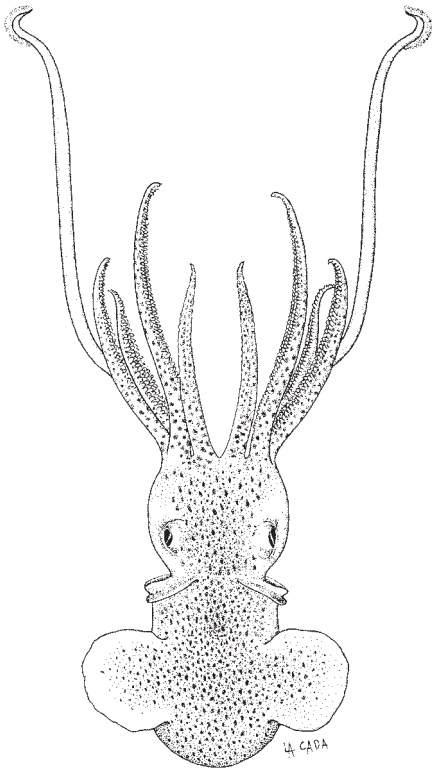
References

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

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

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

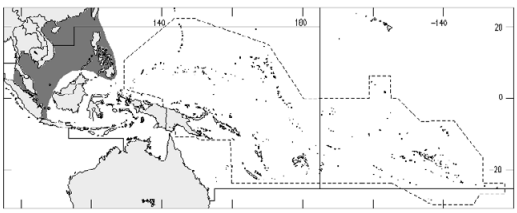
Euprymna morsei (Verrill, 1881)



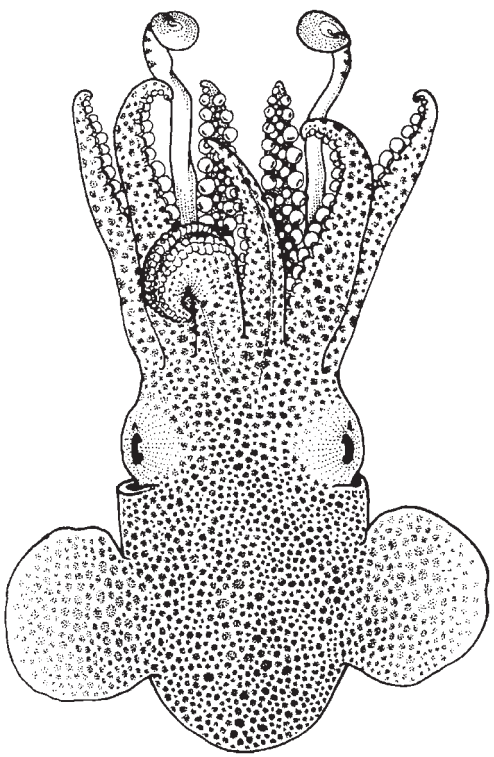
dorsal view

En - Double-ear bobtail squid.

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

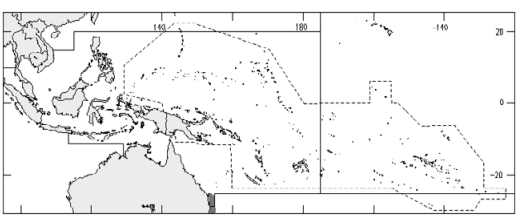


Euprymna tasmanica (Pfeffer, 1884)


dorsal view

En - Southern bobtail squid.

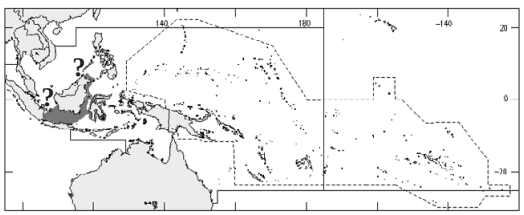
Maximum mantle length 40 mm. Dorsal mantle fused to head. Fins large and round. Arms with 4 longitudinal rows of suckers. **Enlarged suckers of males restricted to ventral rows of arms II and III**, **1 to 3 on each arm.** Left arm I hectocotylized in distal half as rows of columnar suckers with tiny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

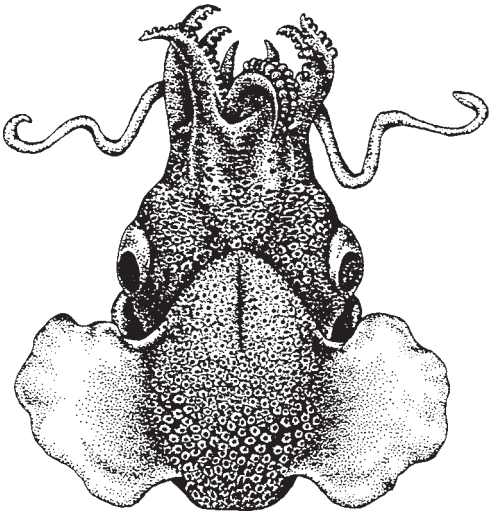


Heteroteuthis weberi Joubin, 1902

En - Stumpy bobtail squid.

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



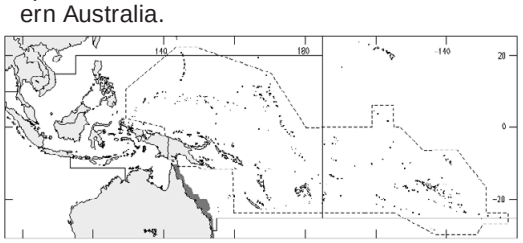


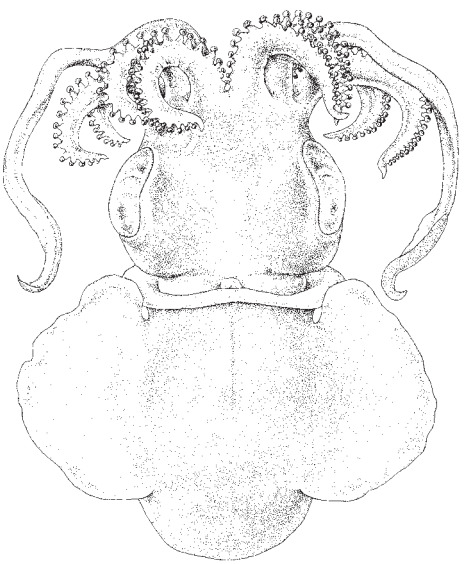
dorsal view

Rossia australis Berry, 1918

En - Big bottom bobtail squid.

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

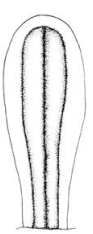




dorsal view of female

(illustration: K.Hollis/ABRS)

tentacular club

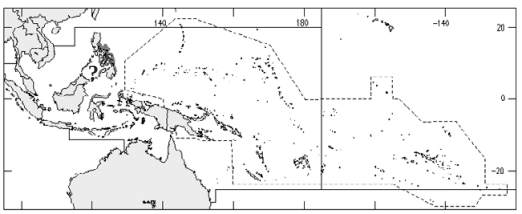


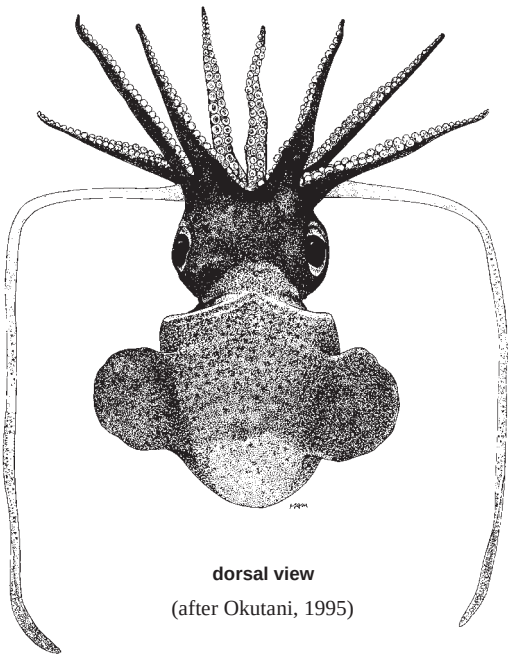
nuchal locking cartilage

Rossia bipapillata Sasaki, 1920

En - Big-eyed bobtail.

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





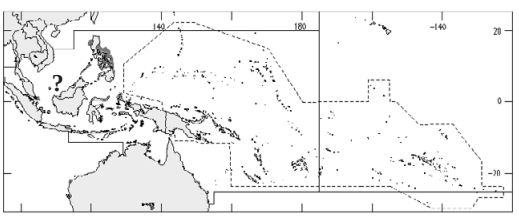
dorsal view

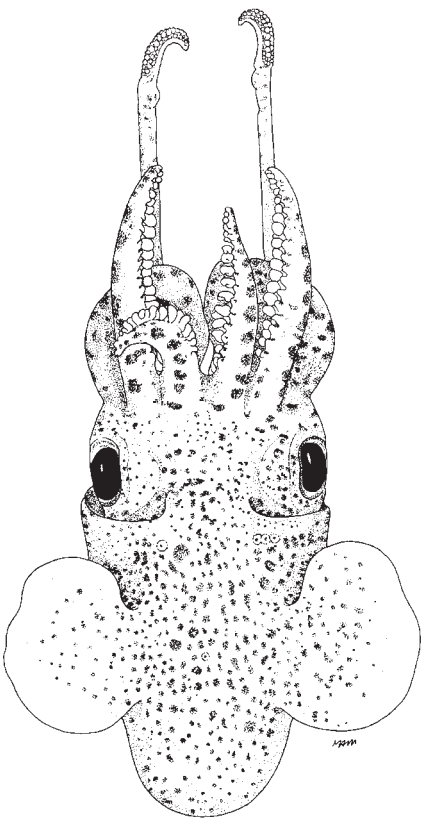
(after Okutani, 1995)

Sepiola birostrata Sasaki, 1918

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

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





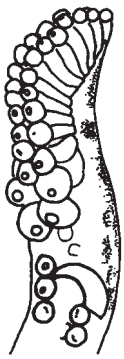
dorsal view

(after Okutani, 1995)

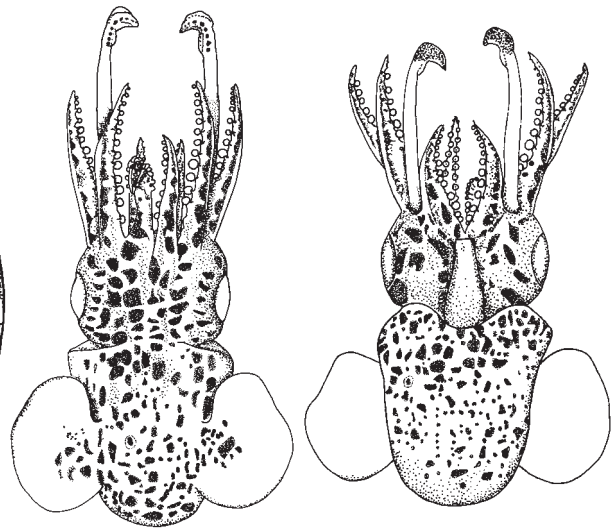
Sepiola parva Sasaki, 1913

En - Spotty bobtail squid.

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



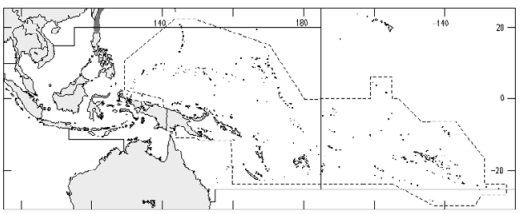
hectocotylus



male **female**

dorsal views

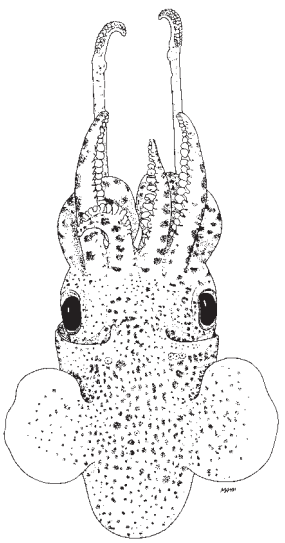
(after Okutani, 1995)



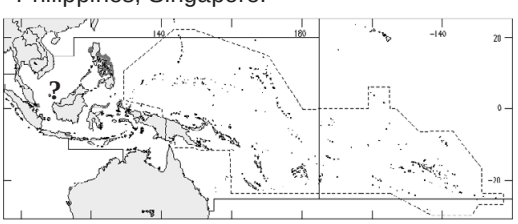
Sepiola trirostrata Voss, 1962

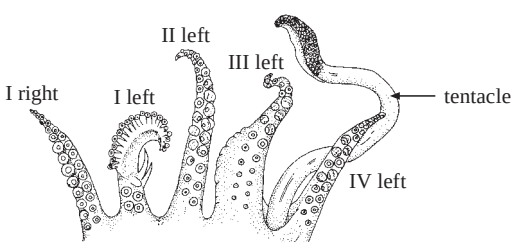
En - Knobby bobtail squid.

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



dorsal view





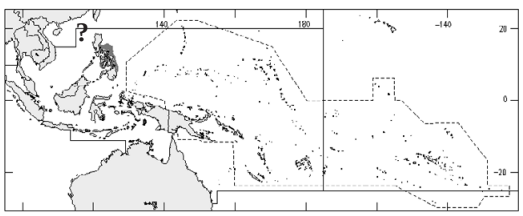
arm arrangement (male)

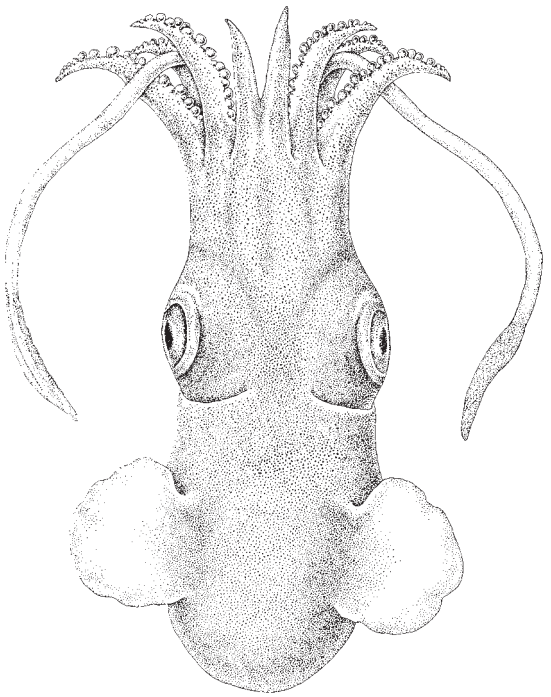
(after Voss, 1963)

Sepiolina nipponensis (Berry, 1911)

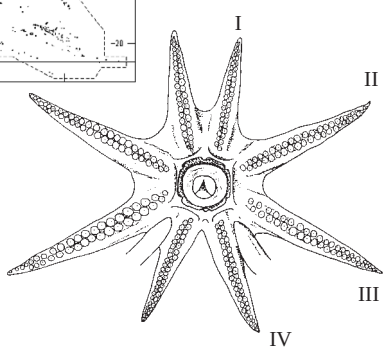
En - Japanese bobtail; **Fr** - Sépiole gros yeux; **Sp** - Sepiolina.

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

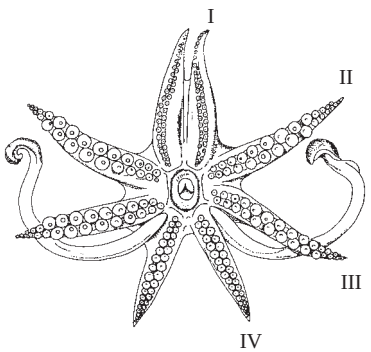




dorsal view
(illustration: K.Hollis/ABRS)



arms of female (oral view)



arms of male (oral view)

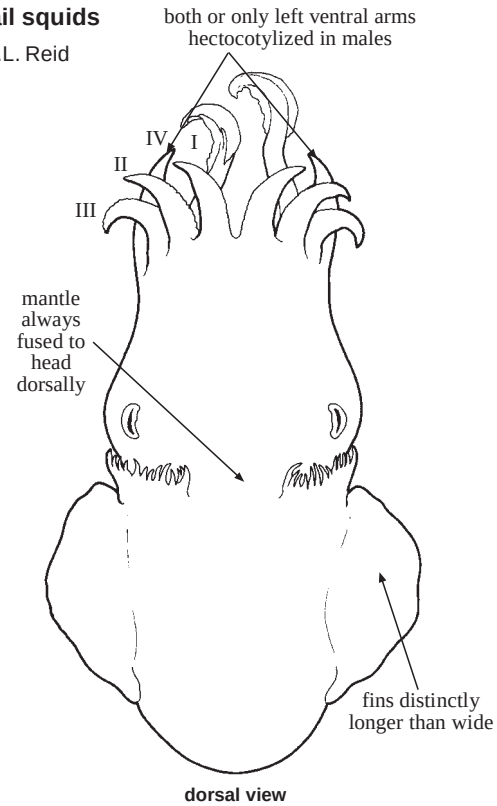
SEPIADARIIDAE

Bottle squids, bottletail squids

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

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

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



dorsal view

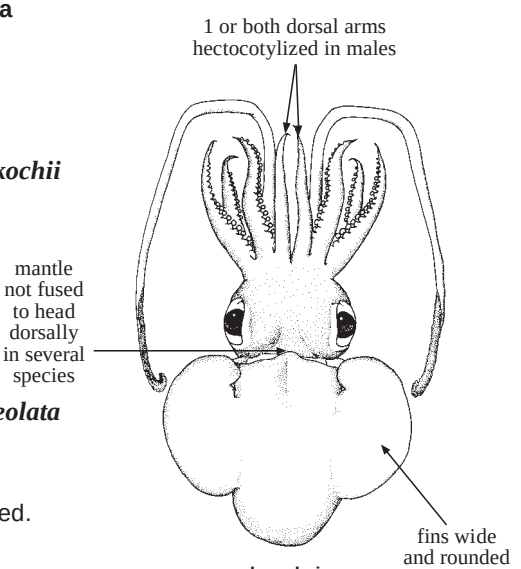
Similar families occurring in the area

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

Key to the species of Sepiariidae occurring in the area

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

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



dorsal view

Sepiolidae

List of species occurring in the area

The symbol ♂ is given when species accounts are included.

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

References

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

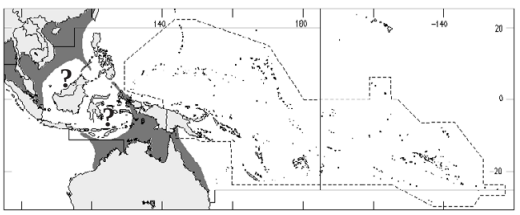
Voss, G.L. 1964. Cephalopods of the Philippines. *Bull. U.S. Natl. Mus.*, (234):180 p.

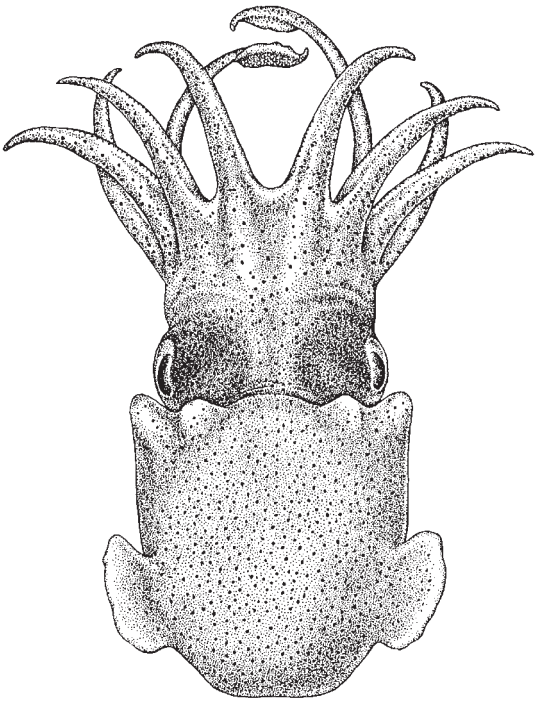
Sepiadarium kochii Steenstrup, 1881

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

En - Koch's bottle squid.

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



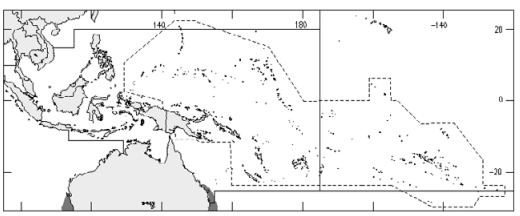


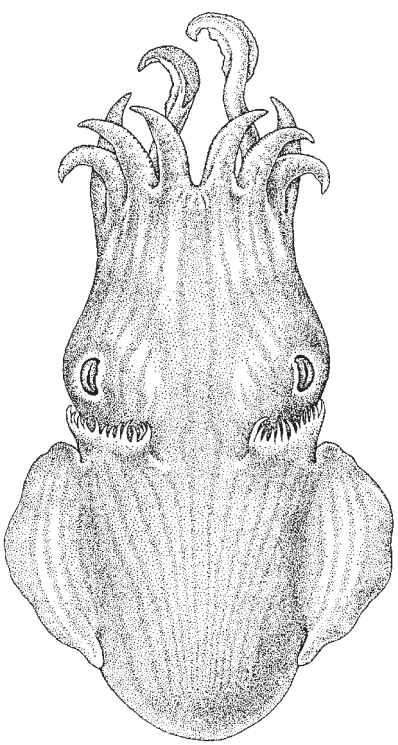
Sepioloidea lineolata (Quoy and Gaimard, 1832)

Frequent synonyms / misidentifications: None / None.

En - Striped (or Tiger) dumpling squid.

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





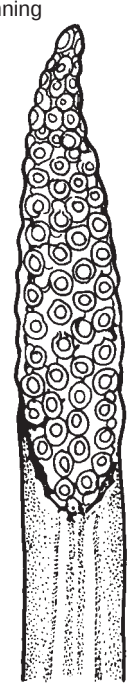
IDIOSEPIIDAE

Pygmy cuttlefish

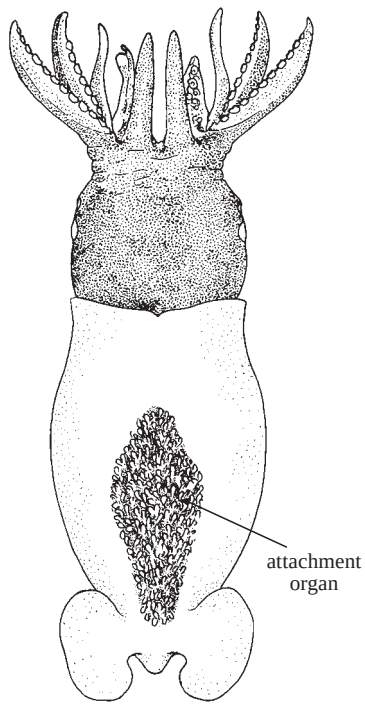
by M.C. Dunning

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

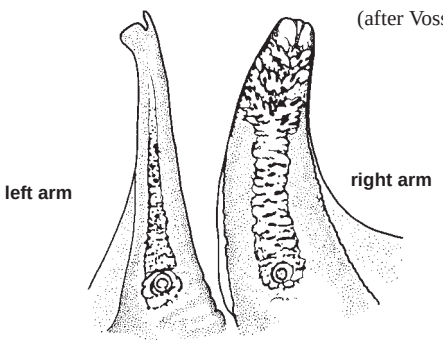
Habitat, biology, and fisheries: Very abundant in shallow tropical coastal environments, particularly inshore seagrass beds and mangrove areas. Species are variously nektonic and planktonic and *Idiosepius pygmaeus* has a life span of less than 3 months. Animals appear to be solitary. Over a few days,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



tentacular club



dorsal view (after Voss, 1963)



ventral arms hectocotylized (oral view)

Similar families occurring in the area

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

List of species occurring in the area

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

References

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

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

SPIRULIDAE

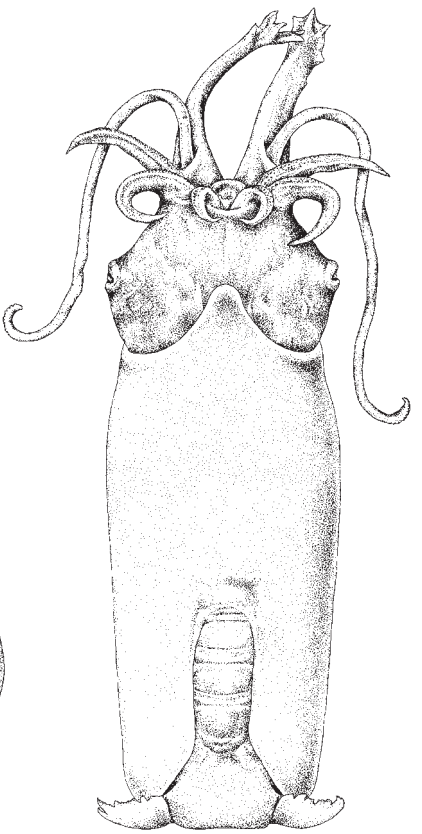
Ram's horn squid

by M.C. Dunning

A single species in the family.

Spirula spirula (Linnaeus, 1758)

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

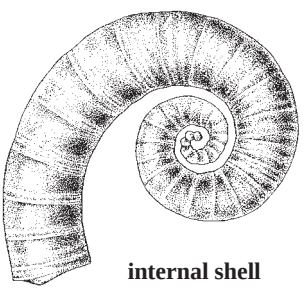


dorsal view of male

(illustration: K.Hollis/ABRS)

Similar families occurring in the area

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



internal shell

Size: Maximum mantle length 45 mm, rarely larger.

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

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

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SEPIIDAE

Cuttlefishes

by A.L. Reid

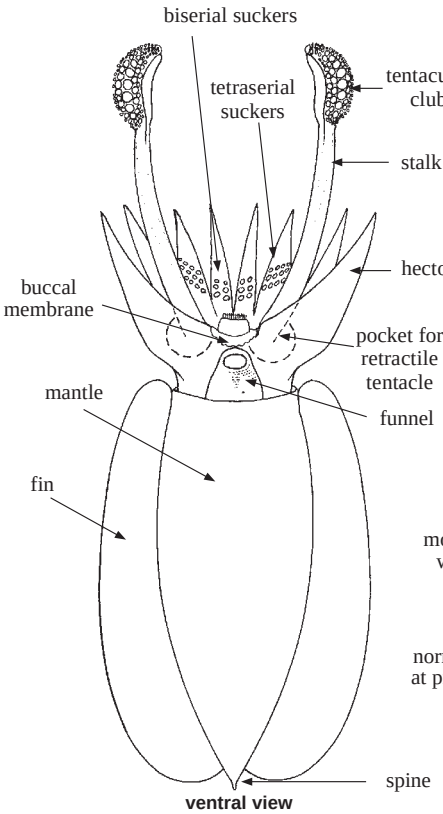
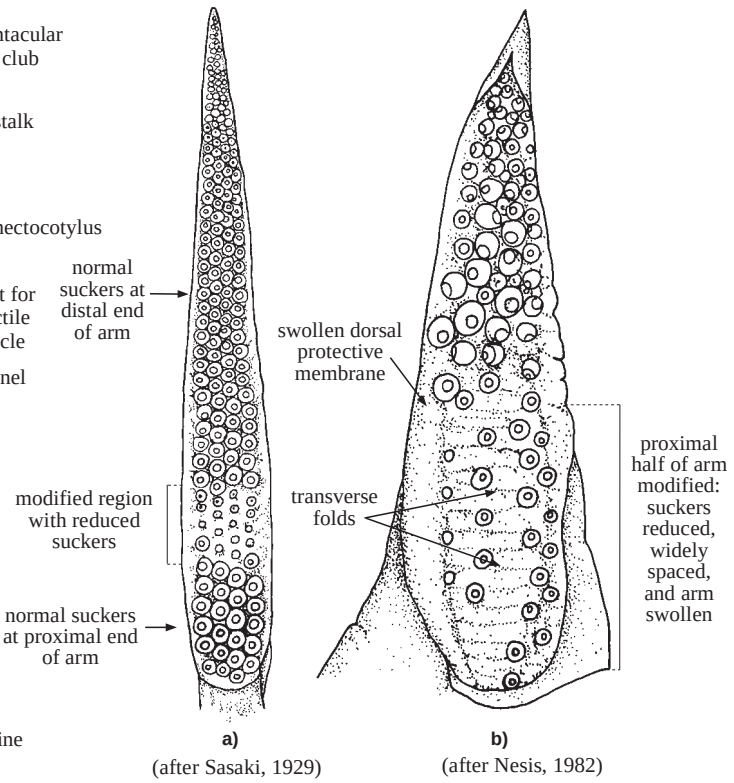
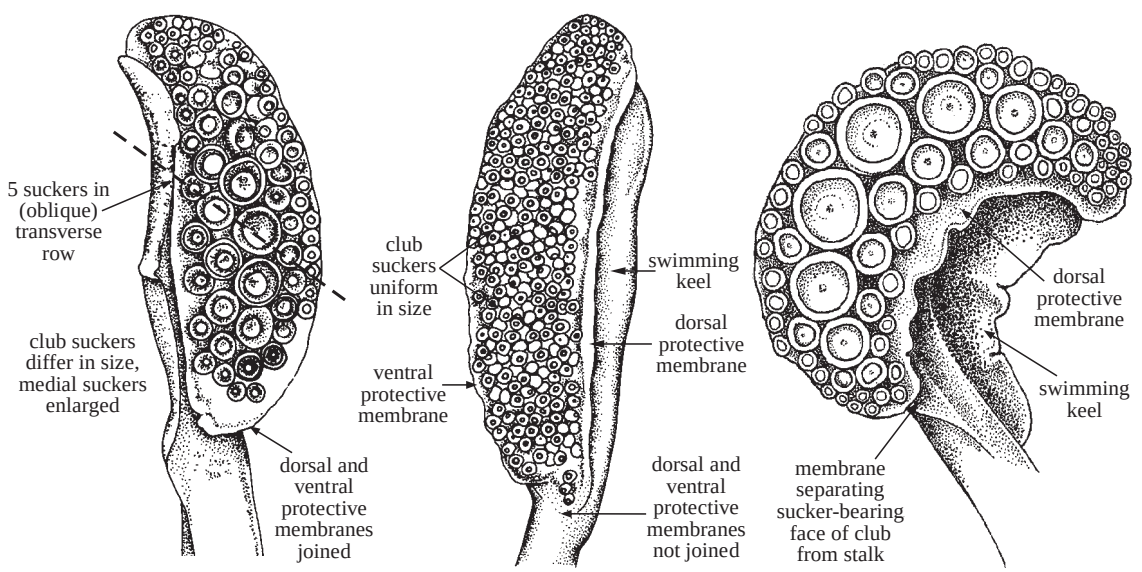


Fig. 1 diagram of basic cuttlefish features



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

Fig. 2 examples of male hectocotylized arms



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

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

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

Fig. 3 tentacular clubs

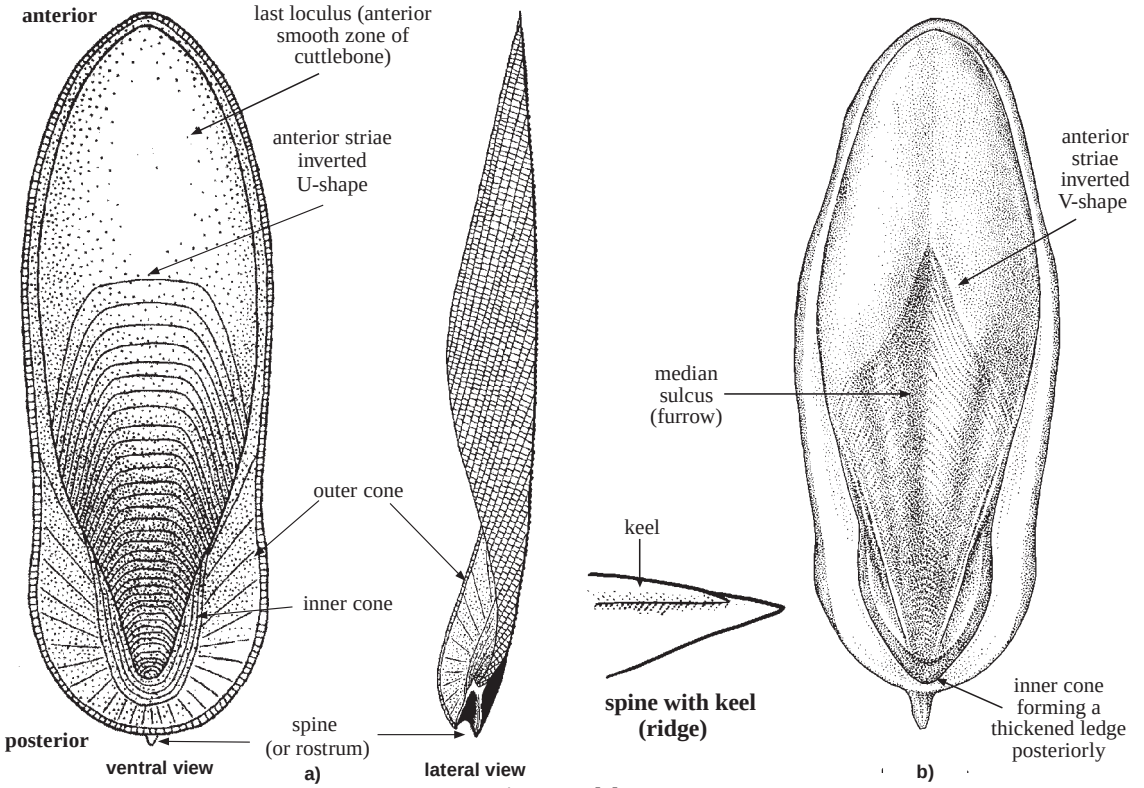


Fig. 4 cuttlebone

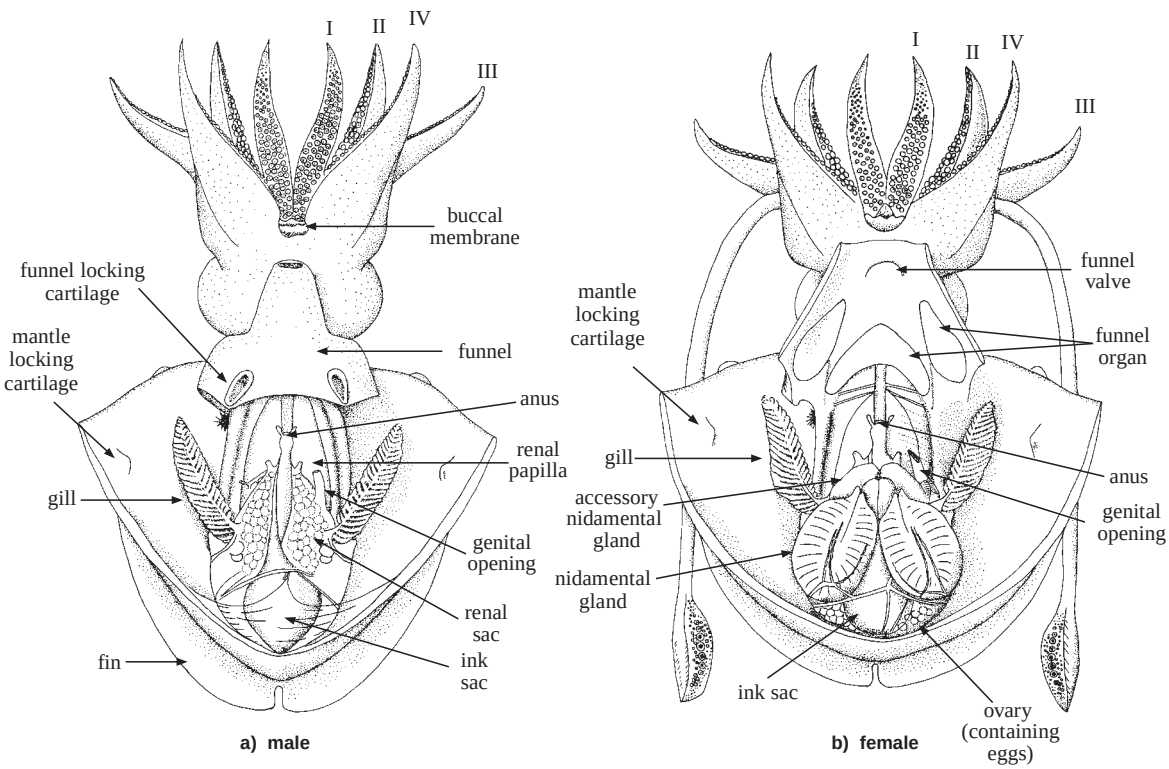
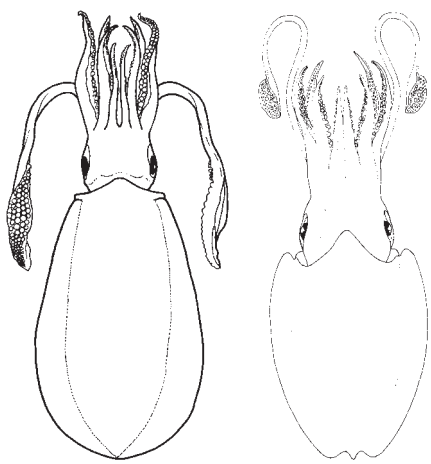


Fig. 5 mantle cavity (*Sepia officinalis*)

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

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

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



Loliginidae (*Sepioteuthis*) **Sepiidae**

Similar families occurring in the area

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

Identification note

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

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

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

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

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

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

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

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

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

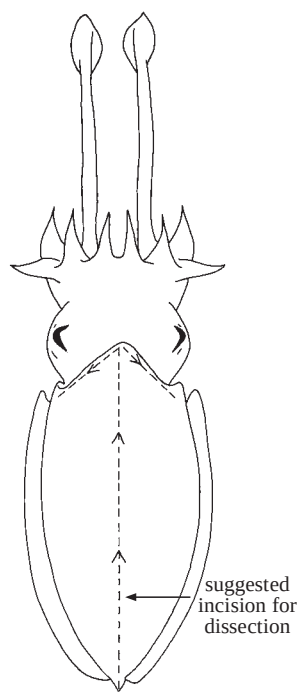


Fig. 6 cuttlefish in dorsal view

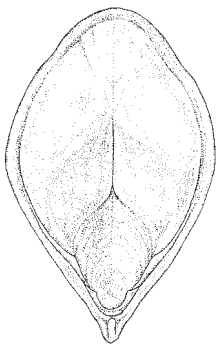
No other internal features, requiring dissection of animals, are included in the following key. Reference should be made to Figures 1 to 4 and the "Glossary of Technical Terms" (pages 692 to 698).

Key to the species of Sepiidae occurring in the area

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

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

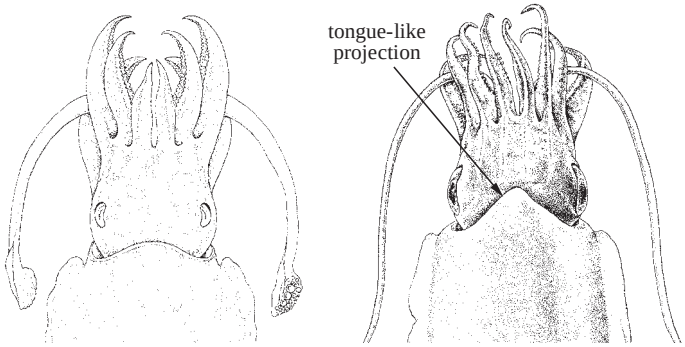
1b. Cuttlebone outline elliptical to lanceolate; cuttlebone length approximately equal to mantle length; dorsal anterior edge of mantle usually with tongue-like projection (Fig. 8b). . . . . → ***2***



cuttlebone (ventral view)

Fig. 7 ***Metasepia pfefferi***

(illustration: K. Hollis/ABRS)



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

Fig. 8 head and anterior mantle (dorsal view)

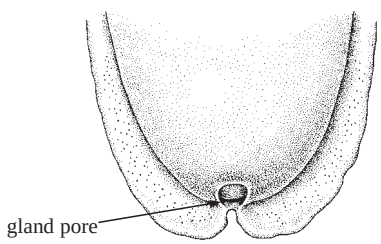
(illustration: K. Hollis/ABRS)

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

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

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

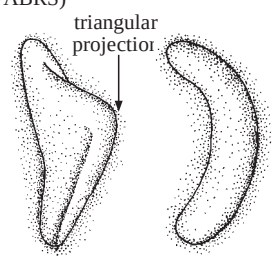
3b. Tentacular club with 12 to 24 suckers in transverse rows . . . . . → ***5***



posterior end of mantle (ventral view)

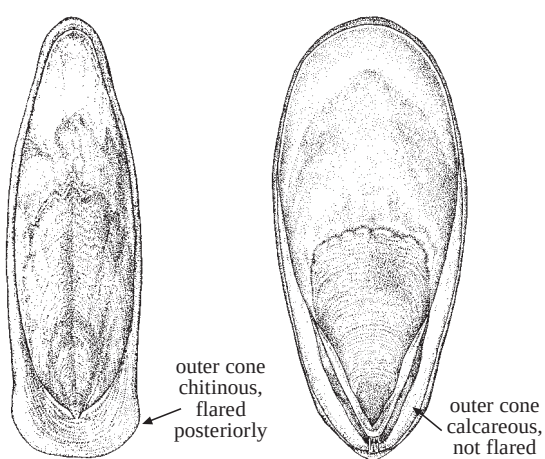
Fig. 9 ***Sepiella***

(illustration: K. Hollis/ABRS)



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

Fig. 10 mantle locking apparatus



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

Fig. 11 cuttlebone (ventral view)

(illustration: K. Hollis/ABRS)

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

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

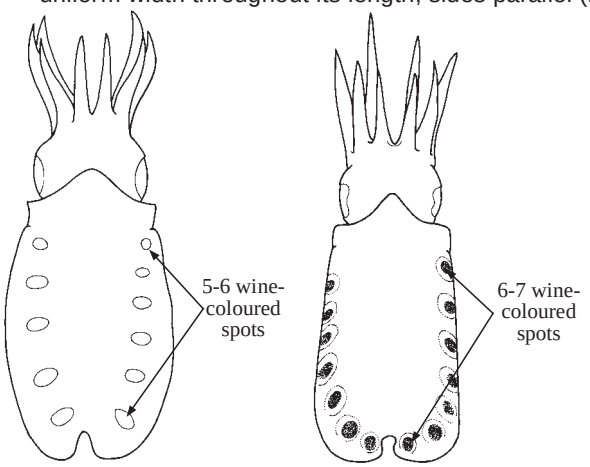


Fig. 12 dorsal view

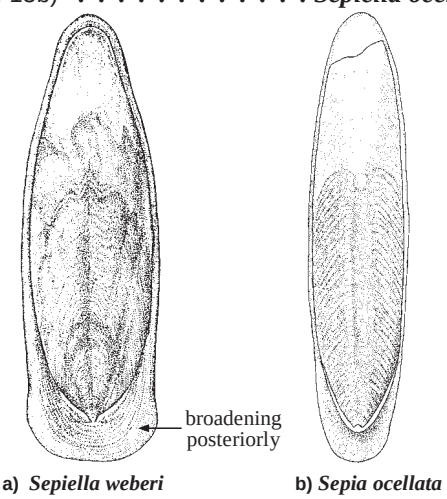
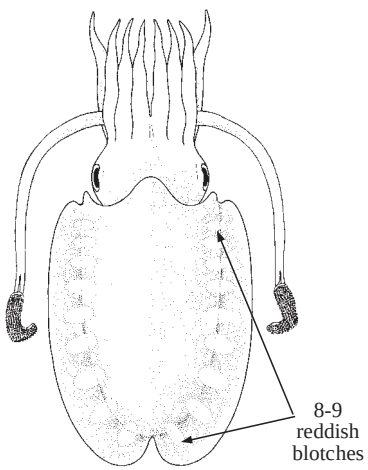


Fig. 13 cuttlebone (ventral view)

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

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



Sepiella inermis

Fig. 14 dorsal view

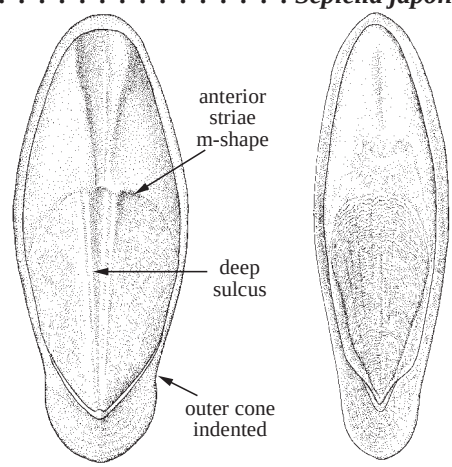


Fig. 15 cuttlebone (ventral view)

(after Sasaki, 1929)

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

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

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

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

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

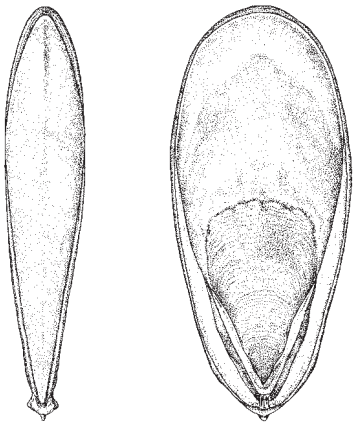
8b. Arms I to III of females with tetraserial suckers proximally and biserial suckers distally, female arms IV with tetraserial suckers; male arms I to III with tetraserial suckers proximally and biserial suckers distally, male arms IV with tetraserial suckers; male arms III protective membranes not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

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

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

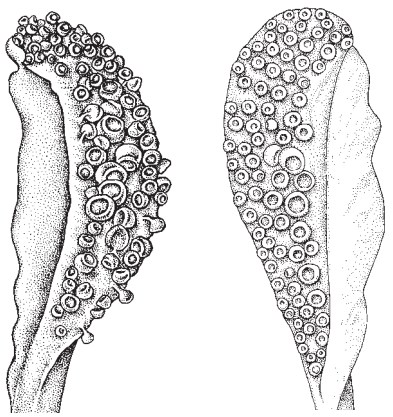
10a. Arms II of males greatly elongate, 3 times longer than other arms (Fig. 18); male arms II with tetraserial suckers proximally, biserial suckers at distal tips; left ventral hectocotylized arm (IV) with approximately 10 rows of normal suckers proximally, then remaining suckers reduced to tip of arm;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

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



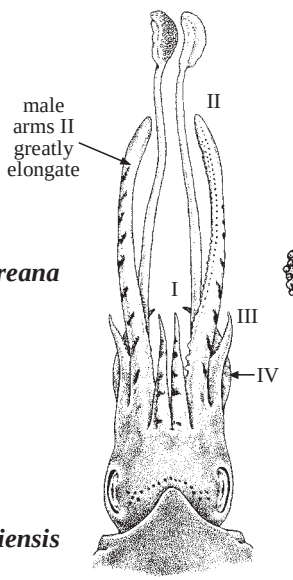
a) lanceolate (*Sepia braggi*) b) oval (*Sepia apama*)

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



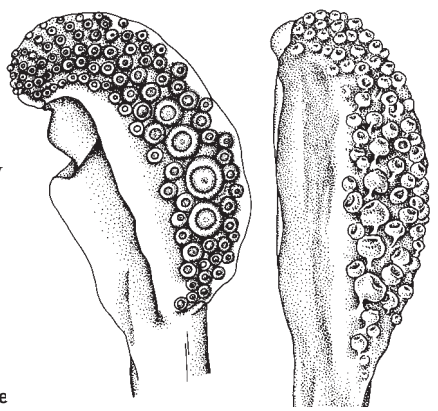
a) *Sepia braggi* b) *Sepia vietnamica*

Fig. 17 tentacular club



head and anterior mantle of male (dorsal view)

Fig. 18 *Sepia andreana*



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

Fig. 19 tentacular club

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

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

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

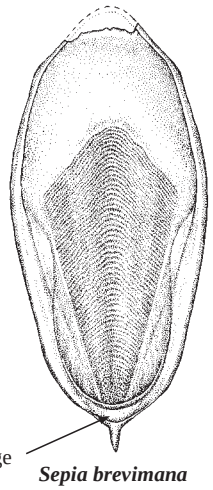
13a. Arms I to IV of both sexes with biserial suckers proximally, tetraserial distally . . . . . ***Sepia sulcata***
13b. Arms I to IV of both sexes with tetraserial suckers throughtout . . . . → ***14***

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

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

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

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



Sepia brevimana

Fig. 24 cuttlebone

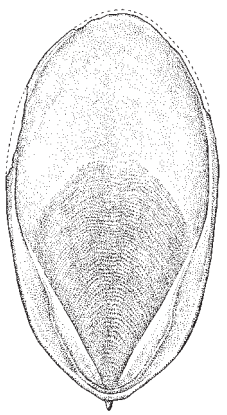
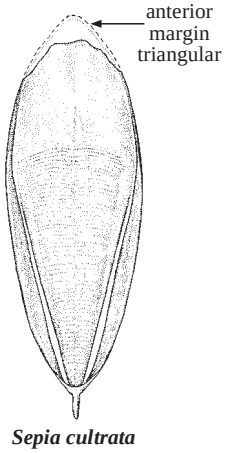
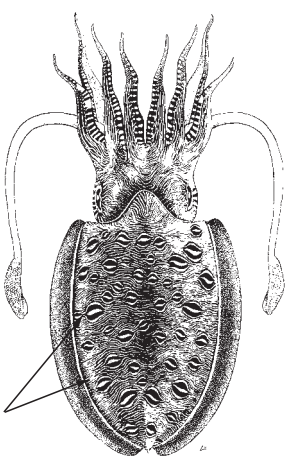

Sepia mestus

Fig. 20 cuttlebone (ventral view)



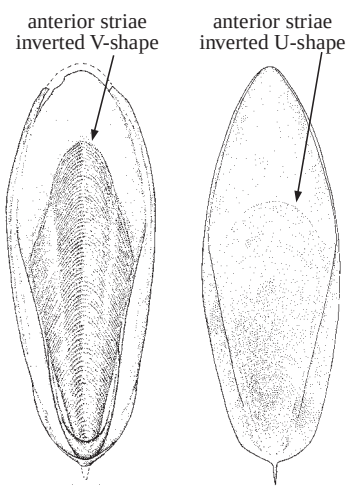
Sepia cultrata

Fig. 21 cuttlebone (ventral view)



dorsal view

Fig. 22 *Sepia lycidas*



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

Fig. 23 cuttlebone (ventral view)

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

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

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

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

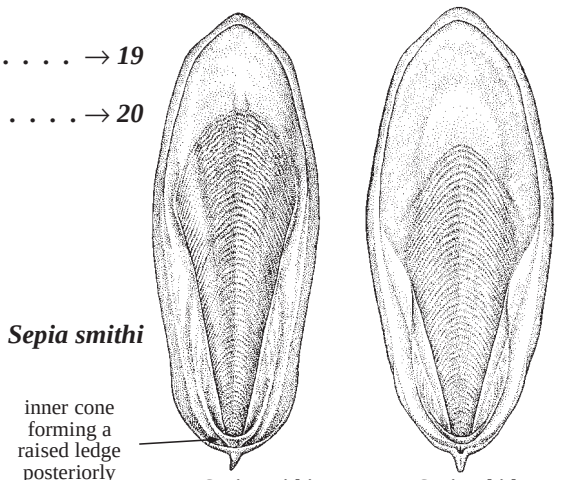


Fig. 25 cuttlebone (ventral view)

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

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

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

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

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

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

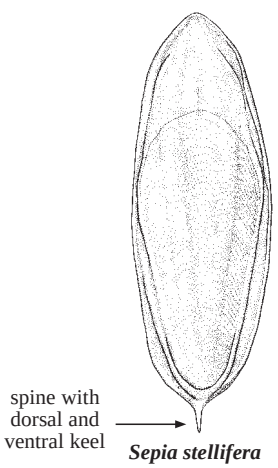


Fig. 26 cuttlebone (ventral view)

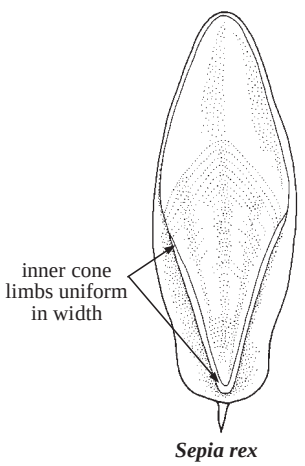


Fig. 27 cuttlebone (ventral view)

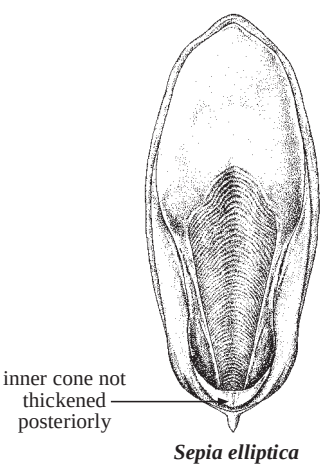


Fig. 28 cuttlebone (ventral view)

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

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

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

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

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

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

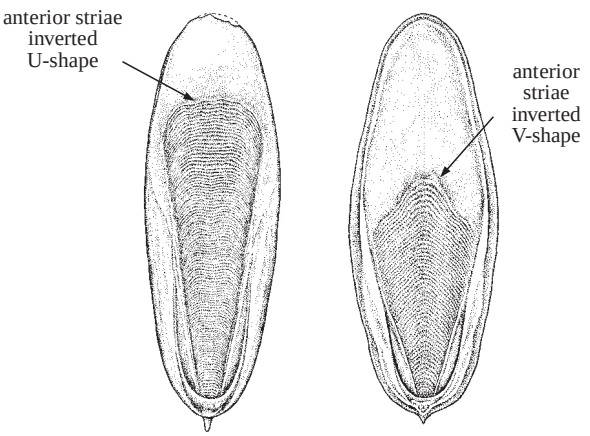
25b. Tentacular club with 5 or 6 suckers in transverse rows . . . . . .→ ***26***

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

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

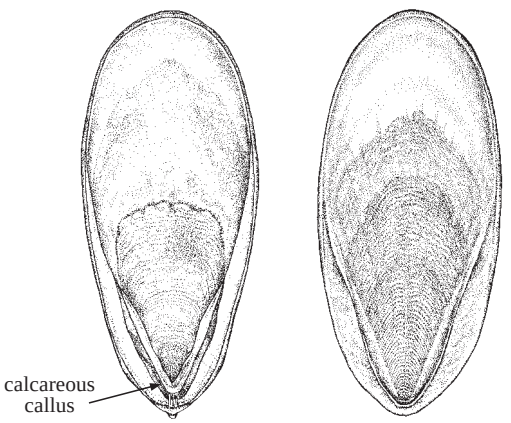
27a. Maximum size 500 mm mantle length; anterior edge of inner cone with a V-shaped calcareous callus, or rough thickening posteriorly (Fig. 30a) . . . . . ***Sepia apama***

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



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

Fig. 29 cuttlebone (ventral view)

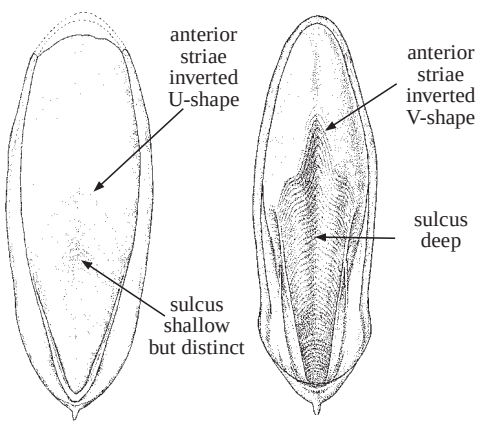


a) ***Sepia apama*** **b)** ***Sepia bandensis***

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

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

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



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

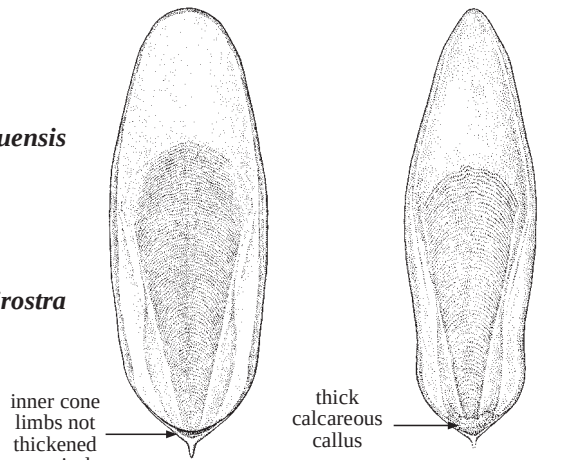
Fig. 31 cuttlebone (ventral view)

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

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

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

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



a) ***Sepia papuensis*** b) ***Sepia recurvirostra***

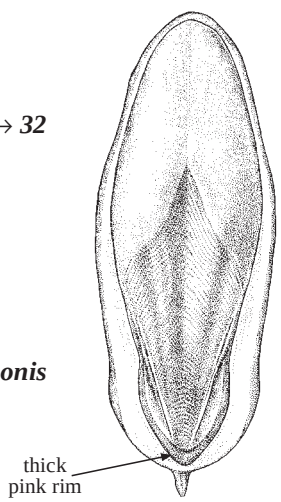
Fig. 32 cuttlebone (ventral view)

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

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

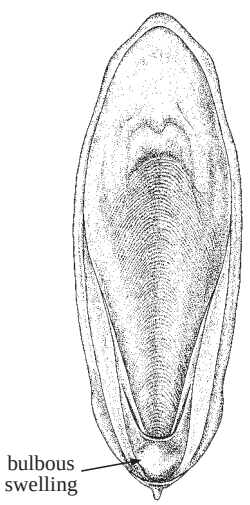
32a. Cuttlebone inner cone limbs broaden, thicken posteriorly to form a distinct bulbous, shiny swelling (Fig. 34); cuttlebone sulcus deep, wide, flanked by rounded ribs; hectocotylus (left ventral arm IV) with 10 rows of normal suckers at base followed by reduced suckers . . . . ***Sepia pharaonis***

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



Sepia rozella

Fig. 33 cuttlebone (ventral view)



Sepia pharaonis

Fig. 34 cuttlebone (ventral view)

List of species occurring in the area

The symbol is given when species accounts are included.

Metasepia pfefferi (Hoyle, 1885)

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

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

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

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Voss, G.L. 1963. Cephalopods of the Philippine Islands. *Bull. U.S. Natl. Mus.*, (234):180 p.

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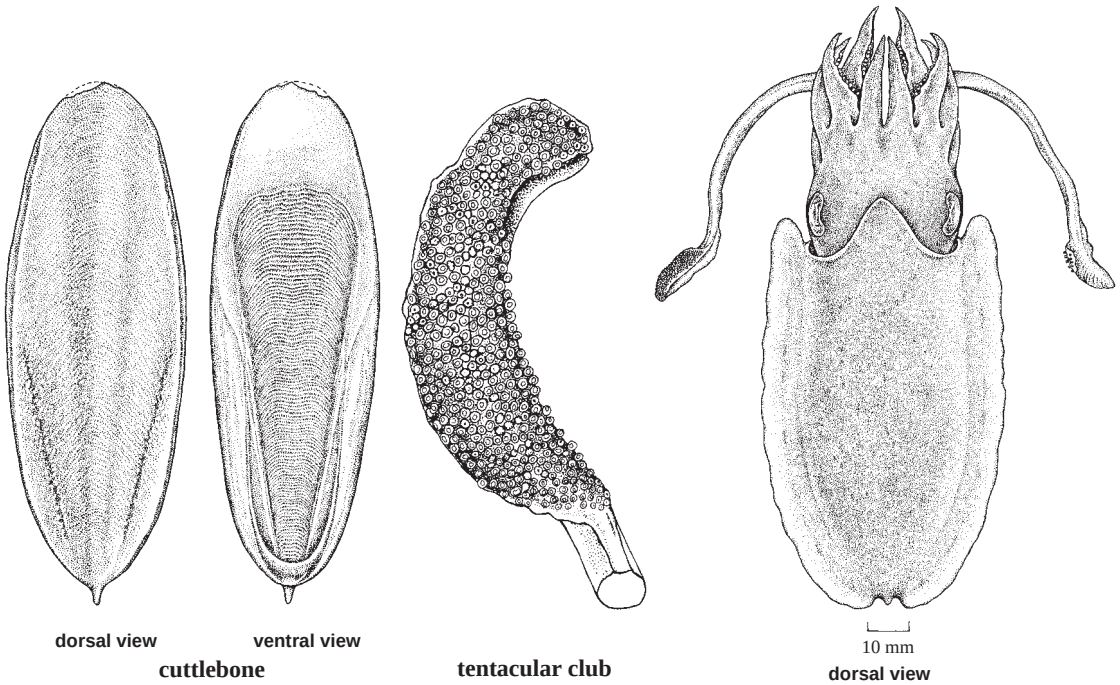
Sepia aculeata Férussac and d'Orbigny, 1848

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

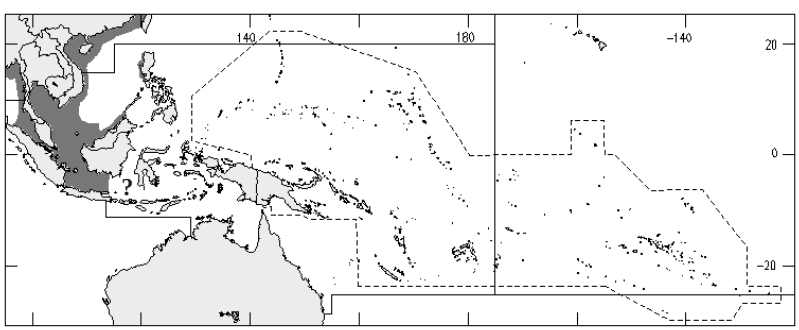
FAO names: En - Needle cuttlefish; **Fr** - Seiche aiguille; **Sp** - Sepia con punta.



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

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

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



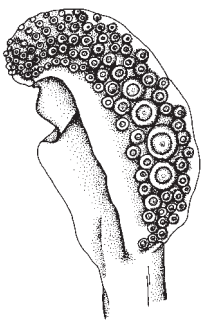
Distribution: Southern India to Andaman Sea, Indonesia, Thailand, Malaysia, the Philippines, China, and north to central Japan.

Sepia andreana Steenstrup, 1875

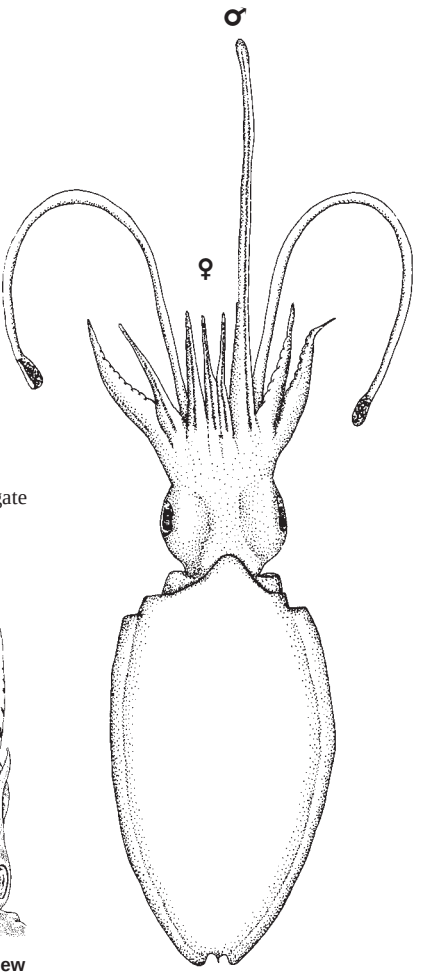
Frequent synonyms / misidentifications: None / *Sepia kobiensis* Hoyle, 1885.

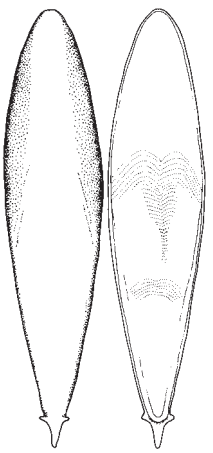
FAO names: En - Andrea cuttlefish; **Fr** - Seiche andreana; **Sp** - Sepia andreana.

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

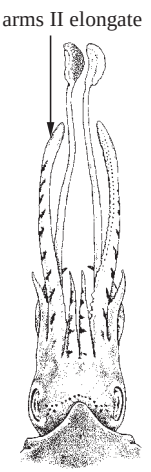


tentacular club
(after Voss, 1963)





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



dorsal view
head of male

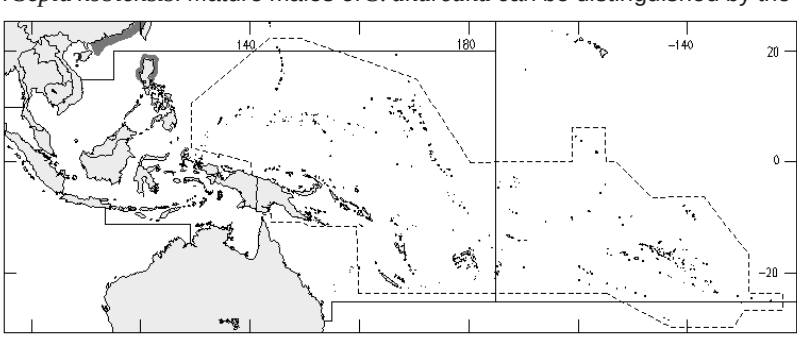
dorsal view
(after Okutani, 1995)

Size: Maximum mantle length 120 mm.

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

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

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



click for next page

Sepia apama Gray, 1849

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

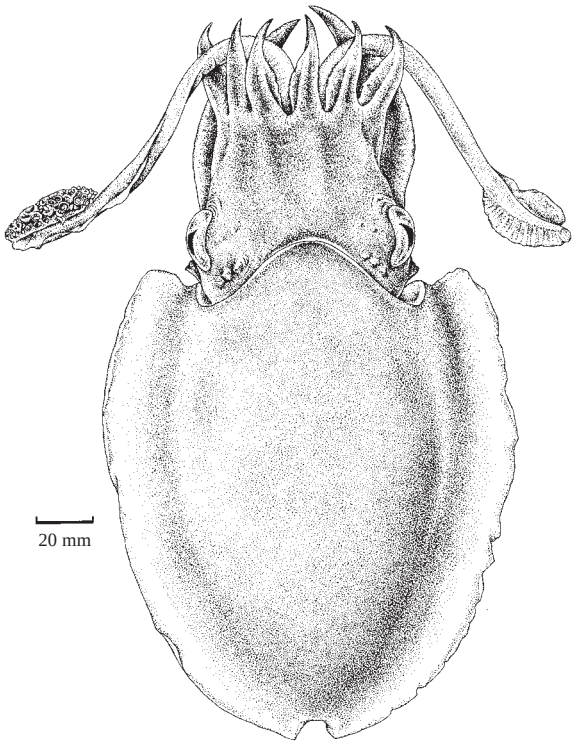
FAO names: En - Giant Australian cuttlefish; **Fr** - Seiche géante; **Sp** - Sepia gigante.

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

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

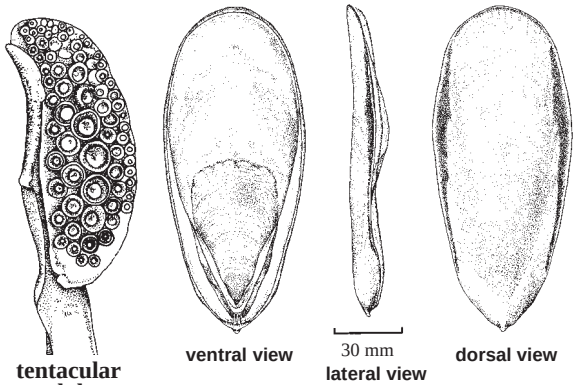
Habitat, biology, and fisheries: A neritic demersal species occurring in rocky areas, seagrass beds and on open trawl grounds to a depth of 100 m. Spawning extends from May to September. Taken as bycatch of prawn and mixed species trawl fisheries and also caught by hook-and-line, or speared by divers.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

Distribution: Southern Australia.



dorsal view

(illustration: K. Hollis/ABRS)

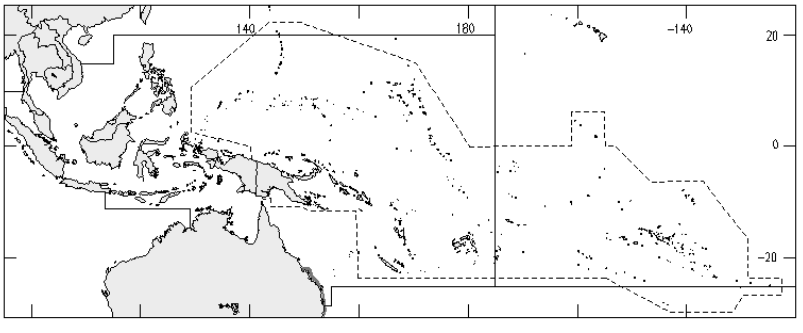


tentacular club

(after Lu, in press)

cuttlebone (subadult)

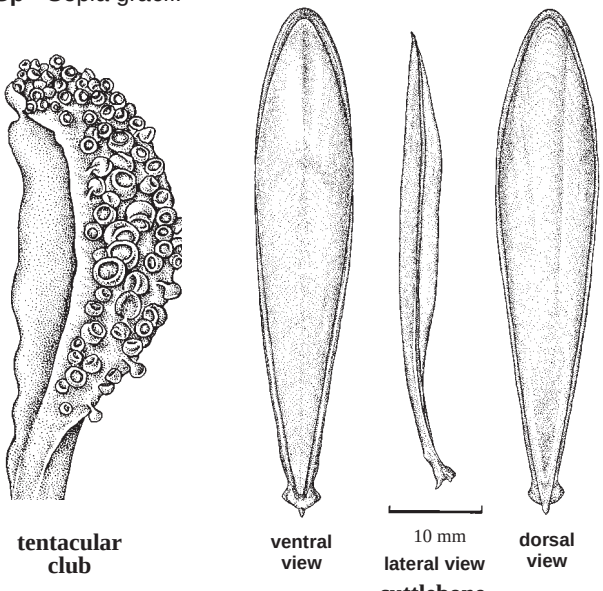
(illustration: K. Hollis/ABRS)

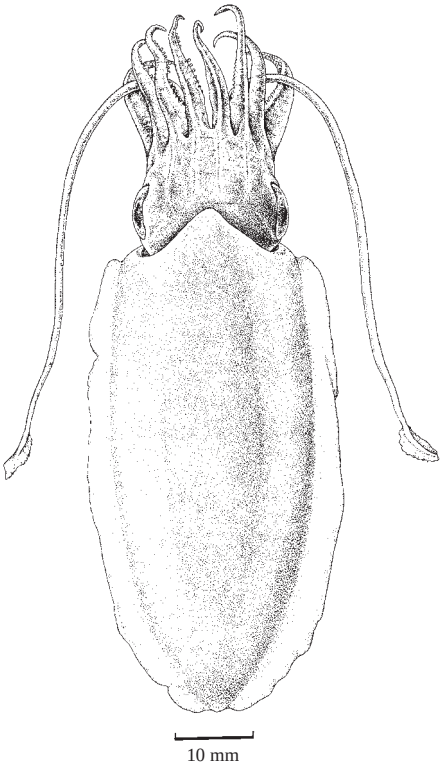


Sepia braggi Verco, 1907

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

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





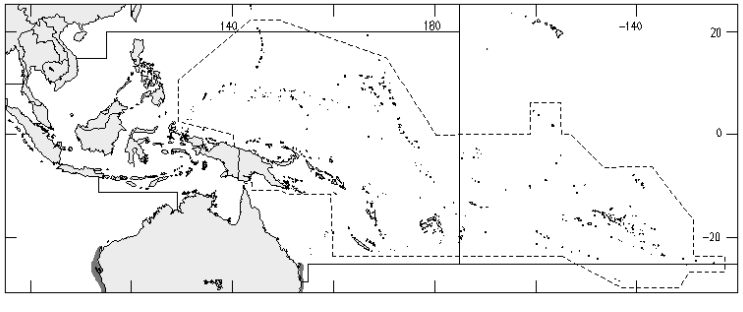
(illustration: K. Hollis/ABRS)

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

Size: Maximum mantle length 65 mm.

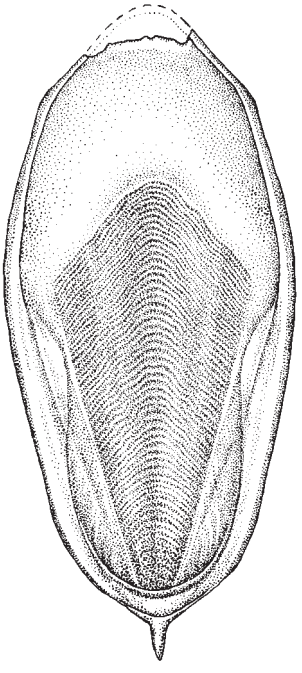
Habitat, biology, and fisheries: A demersal species, at depths between 30 and 146 m. Taken as bycatch with other cuttlefish species in southern and southeastern Australia.

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



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

Sepia brevimana Steenstrup, 1875



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

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

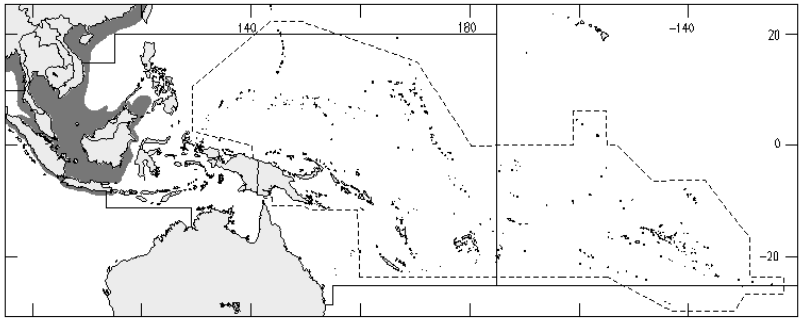
Diagnostic characters: Mantle blunt-pointed posteriorly. **Tentacular club small; with 5 to 8 minute suckers in transverse rows**; swimming keel extending well beyond sucker-bearing face; **dorsal and ventral protective membranes not fused at base of club, dorsal membrane much wider than ventral membrane.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

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

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

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

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

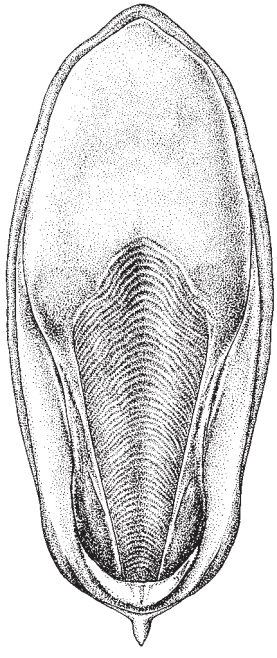


Sepia elliptica Hoyle, 1885

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

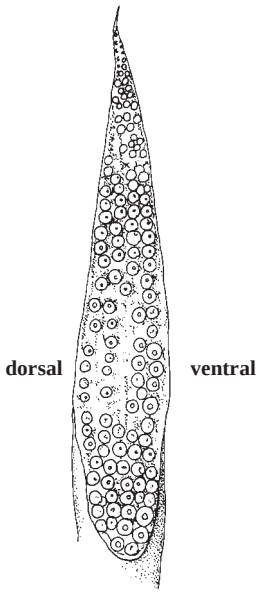
FAO names: En - Ovalbone cuttlefish.

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



ventral view

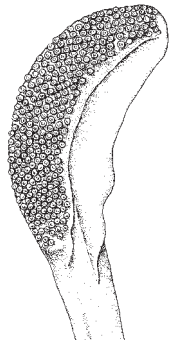
cuttlebone



hectocotylus
(after Hoyle, 1886)

Size: Maximum mantle length 173 mm.

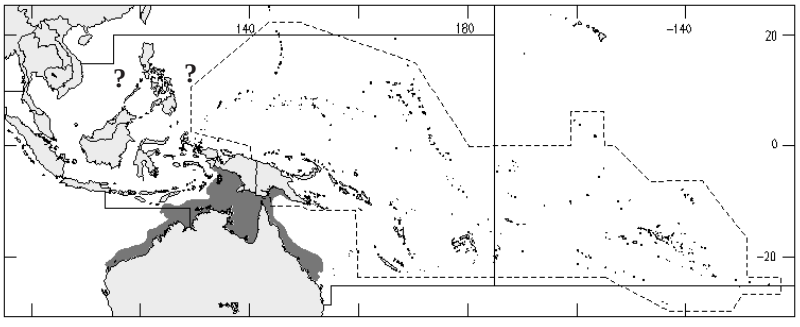
Habitat, biology, and fisheries: Coastal waters at depths from 10 to 142 m. In the Gulf of Carpentaria, both sexes of *Sepia elliptica* reach maturity at 36 mm mantle length, with broad size ranges of both sexes over most of the year indicative of extended spawning season.



tentacular club (subadult)

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

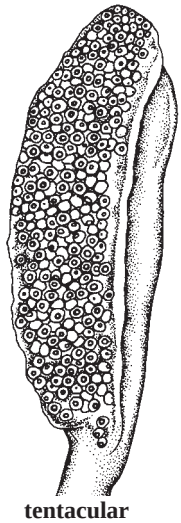
Remarks: May be confused with *Sepia esculenta* which can be distinguished by the following characters: hectocotylus with 5 or 6 rows of normal suckers proximally, followed by 6 rows of reduced suckers; dorsal and ventral protective membranes not fused at base of club; cuttlebone anterior striae inverted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



Sepia esculenta Hoyle, 1885

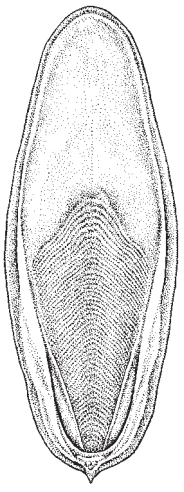
Frequent synonyms / misidentifications: None / *Sepia elliptica* Hoyle, 1885.

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



tentacular club

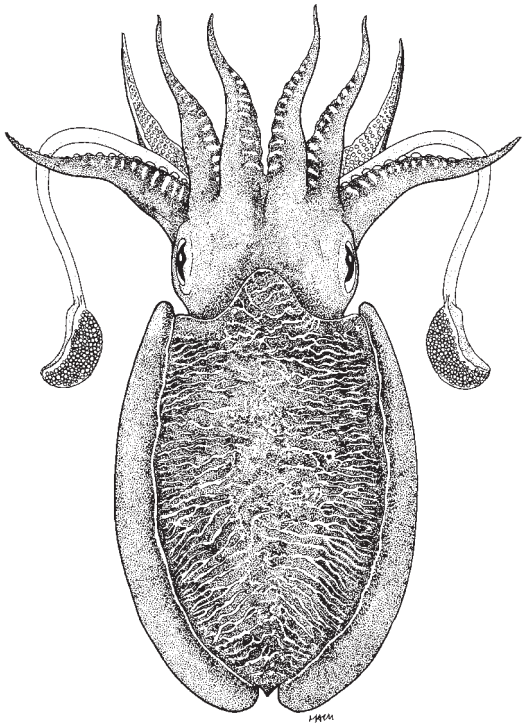
(after Okutani et al., 1987)



10 mm

ventral view

cuttlebone



dorsal view

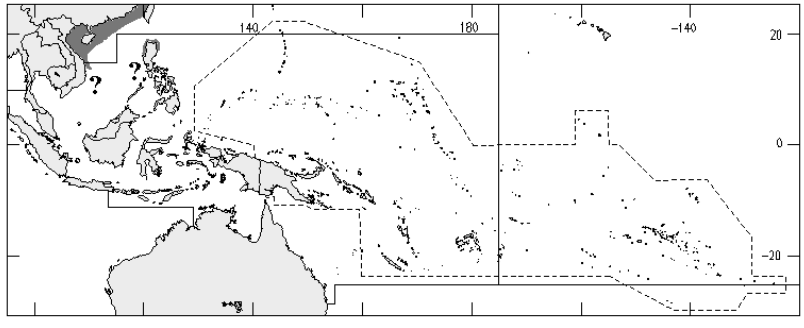
(after Okutani et al., 1987)

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

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

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

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

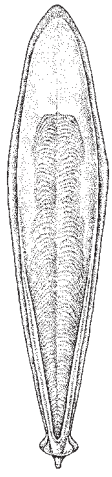


Remarks: This species has been confused with *Sepia elliptica*. In *S. elliptica*, the inner cone ledge of the cuttlebone is thinner, flatter and directed anteriorly, and the anterior striae are inverted U-shaped. The hectocotylus sucker arrangement also differs.

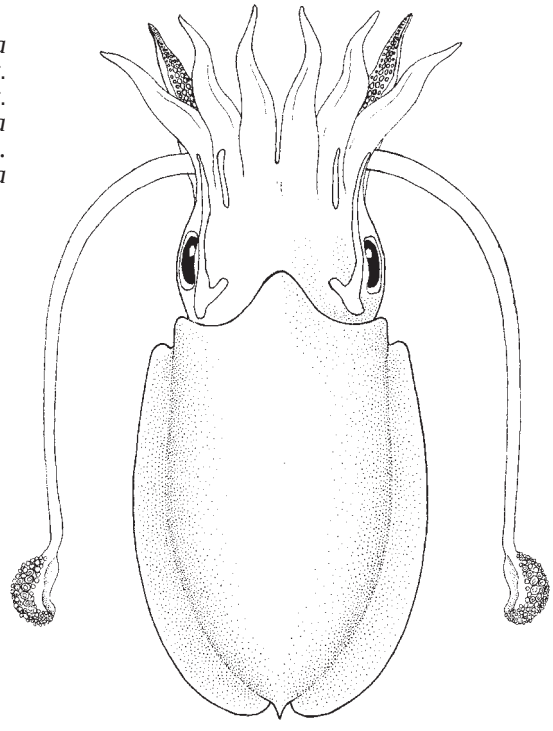
Sepia kobiensis Hoyle, 1885

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

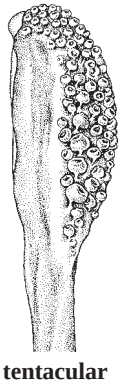
FAO names: En - Kobi cuttlefish; **Fr** - Seiche kobi; **Sp** - Sepia kobí.



ventral view
cuttlebone


dorsal view

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

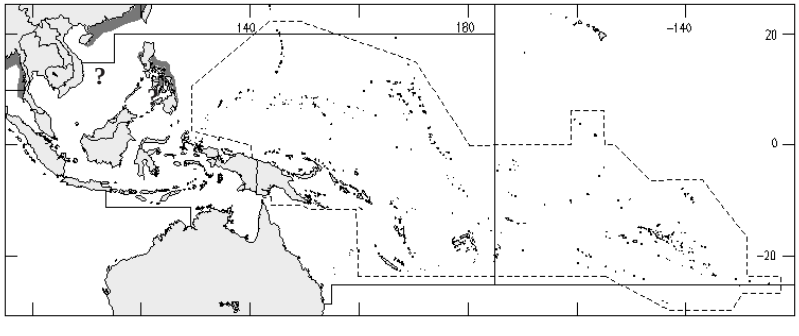

tentacular club

Size: Maximum mantle length 70 mm.

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

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

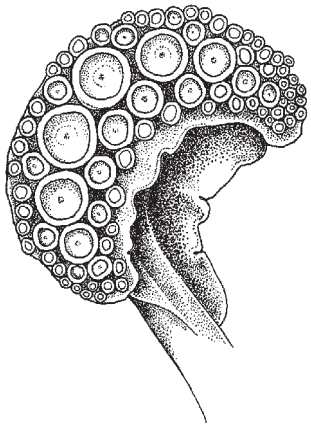
Remarks: Probably a complex of related species. *Sepia kobiensis* has been confused with *S. andreana*. In adult male *S. andreana*, the second pair of arms is greatly elongate and bears biserial suckers, rather than tetraserial suckers; the hectocotylus has about 10 rows of normal suckers at the base,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



Sepia latimanus Quoy and Gaimard, 1832

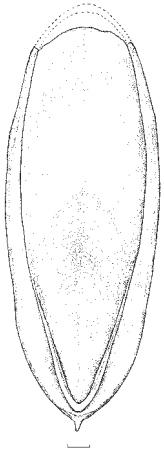
Frequent synonyms / misidentifications: *Ponderisepia eclogaria* Iredale, 1926; *Sepia rappiana* Férussac, 1835; *S. mozambica* Rochebrune, 1884; *S. hercules* Pilsbry, 1894 / None.

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



tentacular club

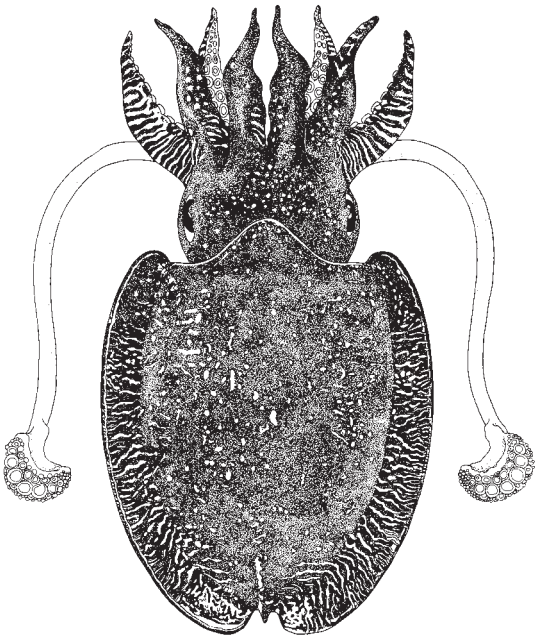
(from Roper et al., 1984)



10 mm

ventral view

cuttlebone



dorsal view

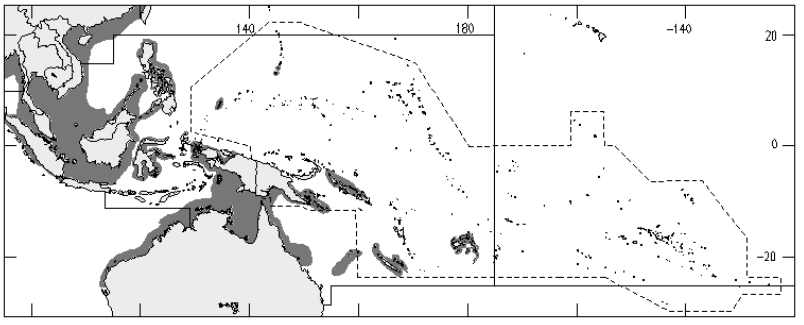
(after Okutani et al., 1987)

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

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

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

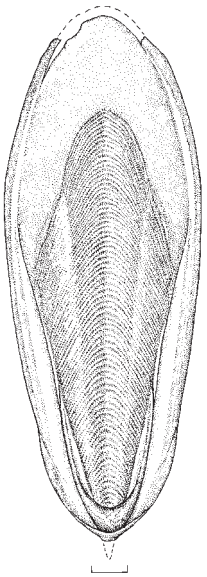
Distribution: Widespread in the tropical Indo-West Pacific from the Andaman Sea, South and East China Seas, Japan, the Philippines, Malaysia, Indonesia to New Guinea, northern Australia and east to Palau, Guam, New Caledonia, and Fiji. Westernmost record Madagascar (doubtful).



Sepia lycidas Gray, 1849

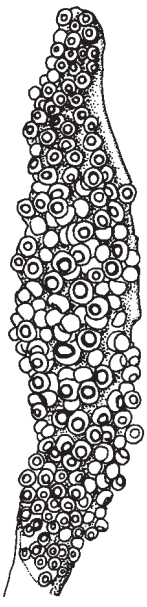
Frequent synonyms / misidentifications: *Sepia subaculeata* Sasaki, 1914 / None.

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



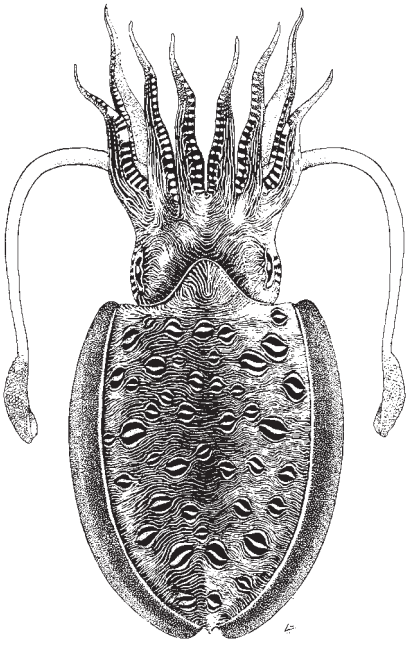
ventral view

cuttlebone



tentacular club

(after Okutani et al., 1987)

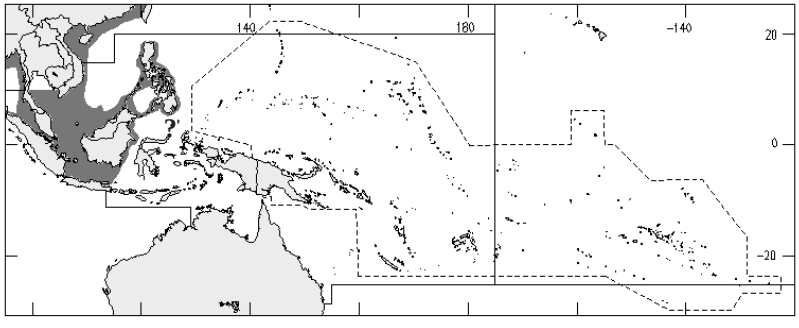


dorsal view

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

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

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



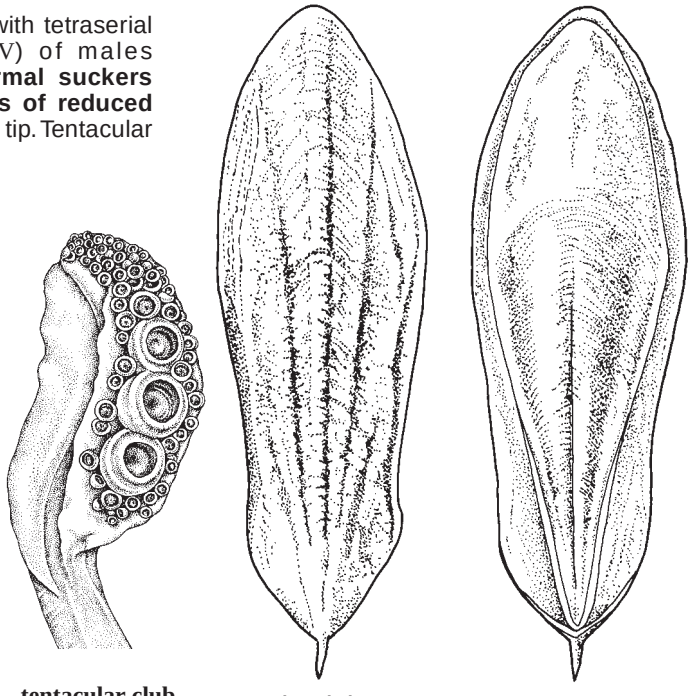
Distribution: East and South China Seas, the Philippines, Viet Nam, and Borneo. Commonly distributed in the Andaman Sea. In the Gulf of Thailand it occurs south of 10°N, and never appears in the inner and eastern coast of the Gulf.

Sepia opipara (Iredale, 1926)

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

FAO names: En -Staregaze cuttlefish.

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

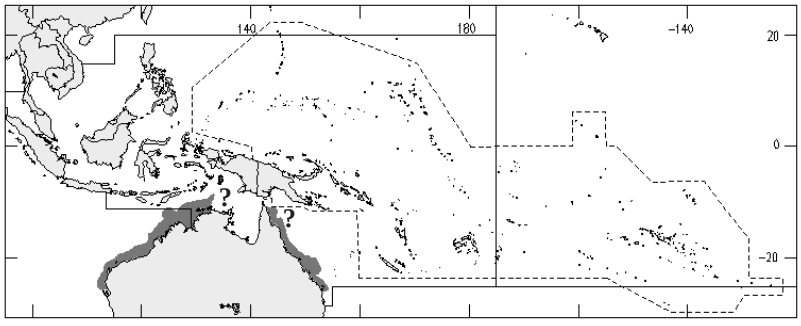


(after Iredale, 1926)

Size: Maximum mantle length about 150 mm.

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

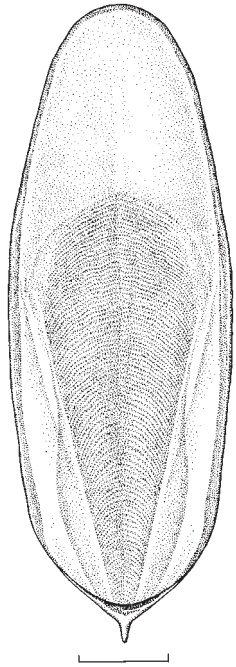
Distribution: Northern Australia.



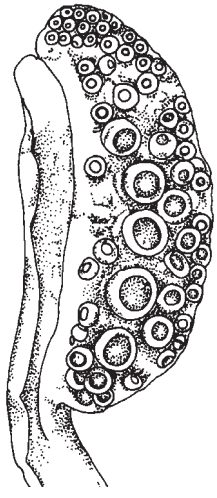
Sepia papuensis Hoyle, 1885

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

FAO names: En - Papuan cuttlefish.



10 mm
ventral view
cuttlebone



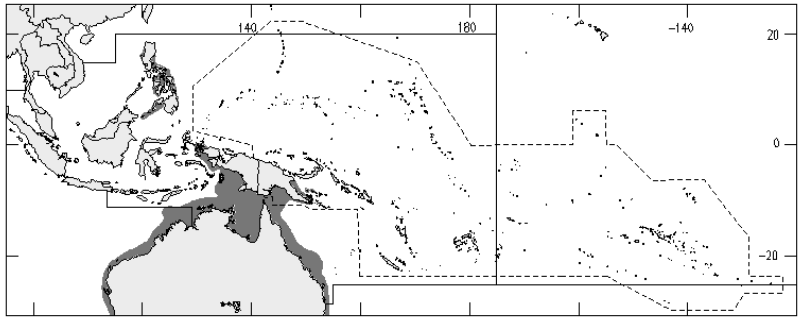
tentacular club (subadult)
(after Lu, in press)

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

Size: Maximum mantle length 110 mm.

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

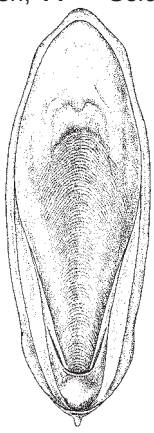
Distribution: Philippines, Indonesia, Arafura and Coral seas, northern Australia.



Sepia pharaonis Ehrenberg, 1831

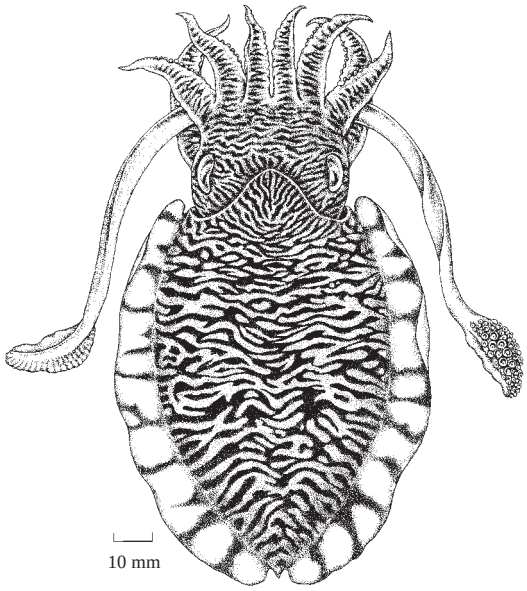
Frequent synonyms / misidentifications: *Crumenasepia hulliana* Iredale, 1926; *C. ursulae* Adam, 1939; *Sepia rouxii* Férussac and d'Orbigny, 1841; *S. formosana* Berry, 1912; *S. tigris* Sasaki, 1929 / None.

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



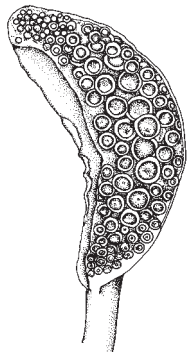
ventral view

cuttlebone



dorsal view

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

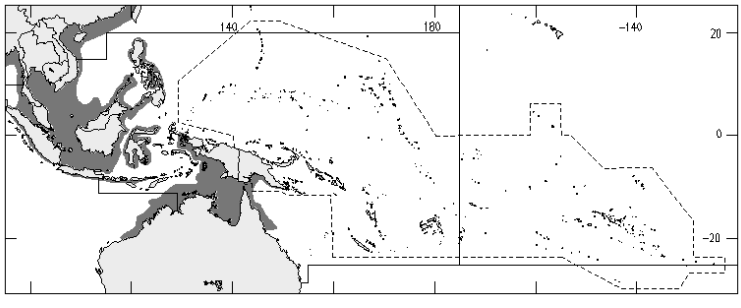


tentacular club

(after Lu, in press)

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

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



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

Sepia plangon Gray, 1849

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

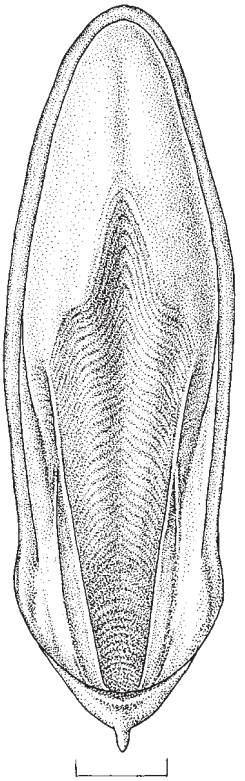
FAO names: En - Striking cuttlefish.

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

Size: Maximum mantle length 135 mm.

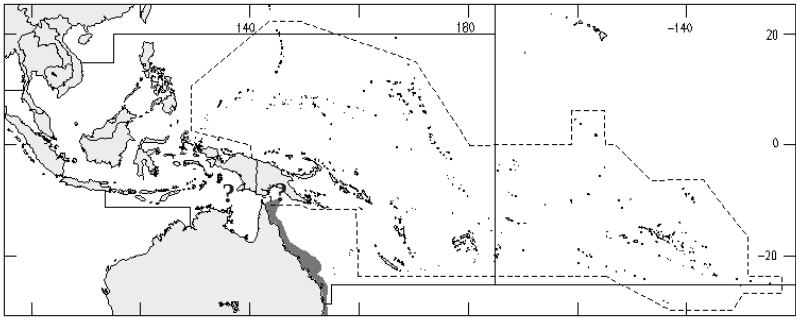
Habitat, biology, and fisheries: Intertidal to a depth of 83 m. Taken as bycatch of prawn and mixed species trawl fisheries.

Distribution: Eastern Australia.



ventral view

cuttlebone



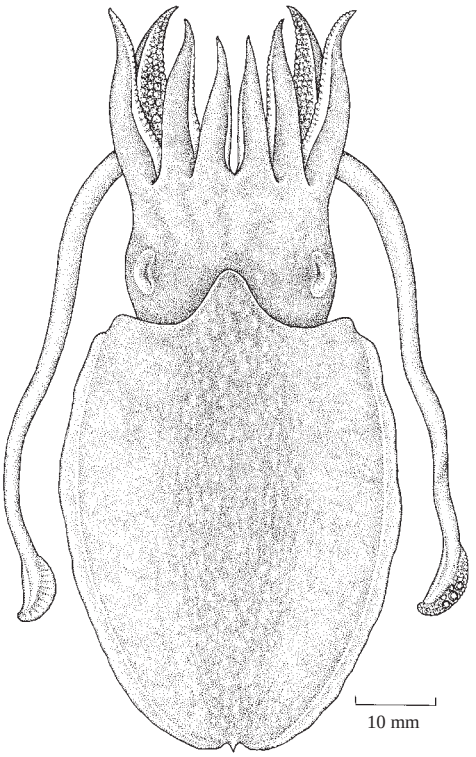
Sepia recurvirostra Steenstrup, 1875

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

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

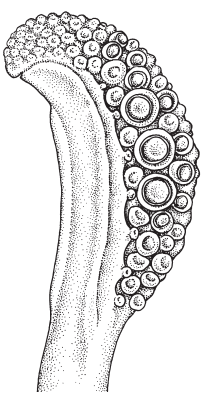
ventral view

cuttlebone



dorsal view

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

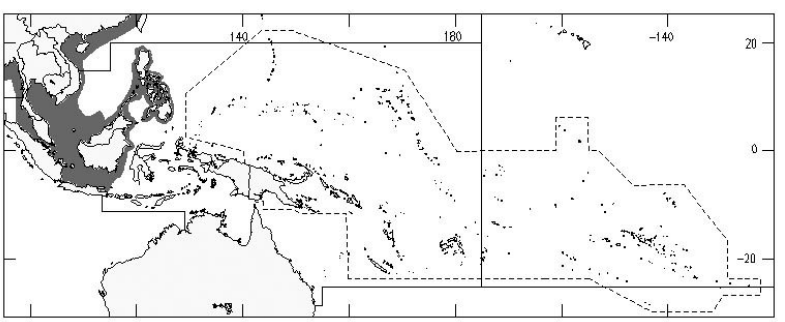


tentacular club

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

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

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

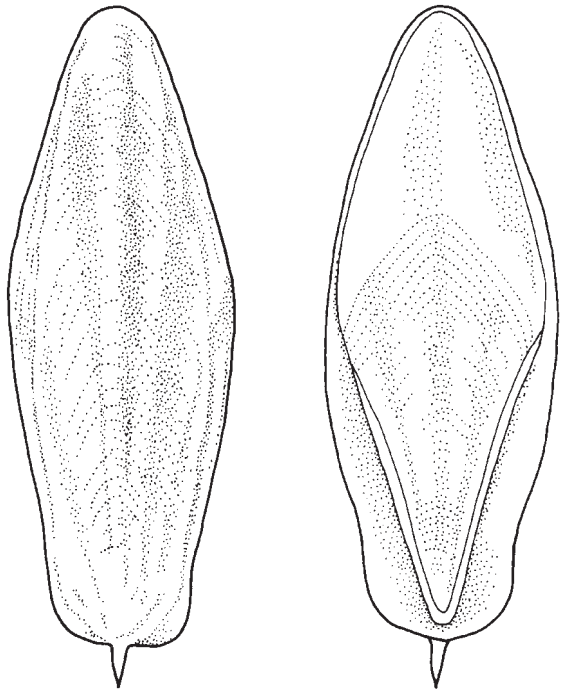


Sepia rex (Iredale, 1926)

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

FAO names: En - King cuttlefish.

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

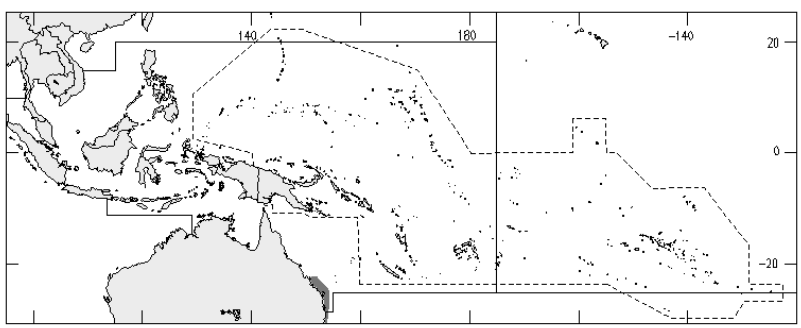


cuttlebone
(after Iredale, 1926)

Size: Maximum mantle length 120 mm.

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

Distribution: Southern Australia.



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

Sepia rozella (Iredale, 1926)

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

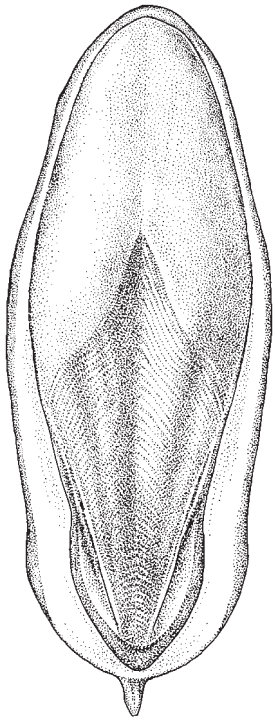
FAO names: En - Rosecone cuttlefish.

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

Size: Maximum mantle length 140 mm.

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

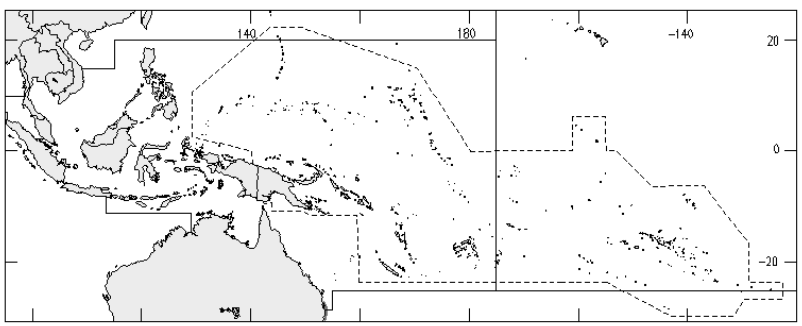
Distribution: Eastern Australia.



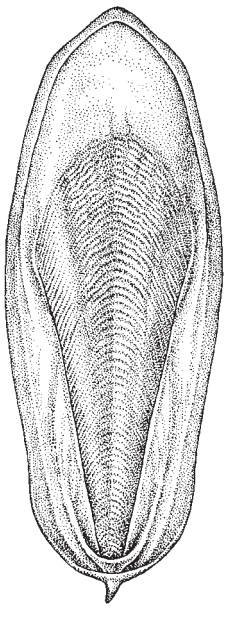
10 mm

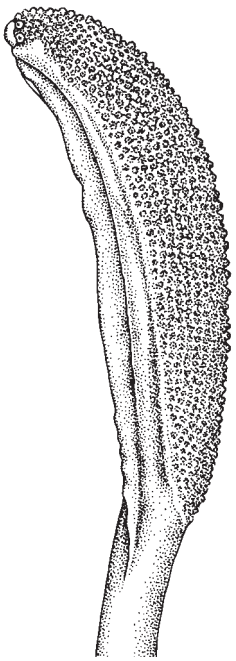
ventral view

cuttlebone



Sepia smithi Hoyle, 1885





cuttlebone **tentacular club**

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

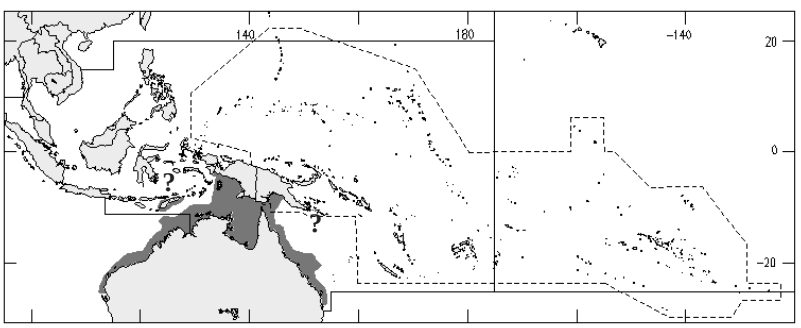
FAO names: En - Smiths cuttlefish.

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

Size: Maximum mantle length 170 mm.

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

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

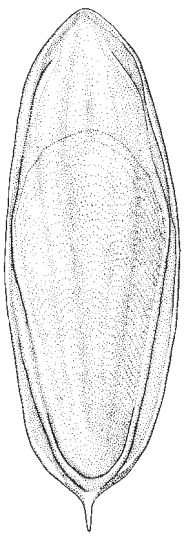


Remarks: Often confused with *Sepia whitleyana*. In *S. whitleyana*, both ventral arms are modified in males, with all reduced suckers equal in size, rather than differing in size as in *S. smithi*. The swimming keel does not extend beyond the sucker-bearing face of the club in *S. whitleyana*. The inner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

Sepia stellifera Homenko and Khromov, 1984

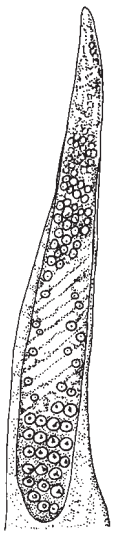
Frequent synonyms / misidentifications: None / *Sepia brevimana* Steenstrup, 1875.

FAO names: En - Starry cuttlefish.

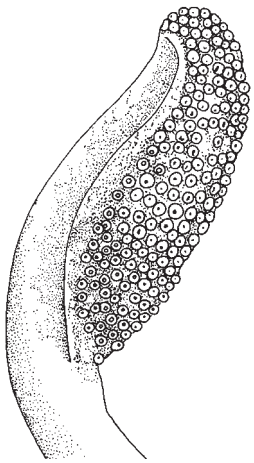


ventral view

cuttlebone

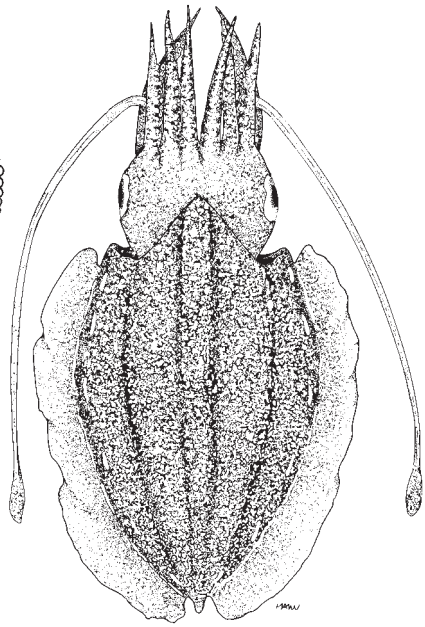


hectocotylus



tentacular club

(after Homenko and Khromov, 1984)



dorsal view

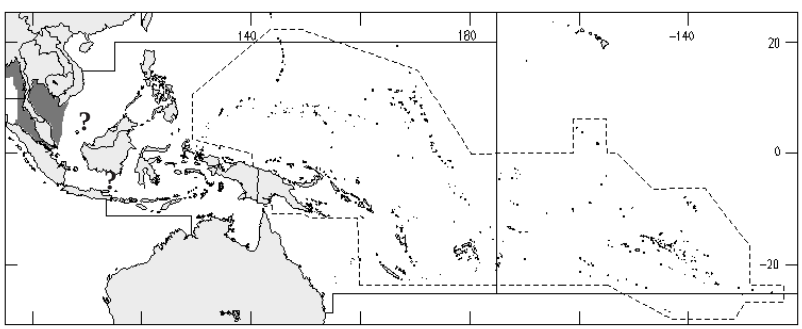
(after Homenko and Khromov, 1984)

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

Size: Maximum mantle length 120 mm.

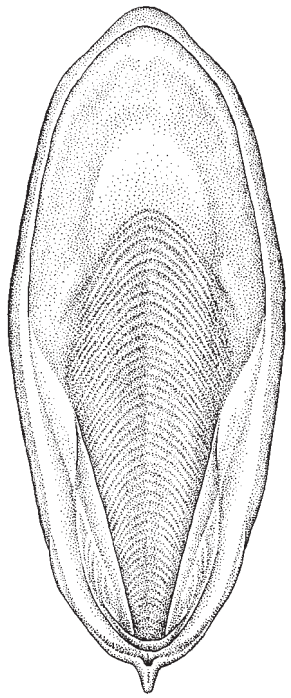
Habitat, biology, and fisheries: At depths to 200 m. Fished commercially in India and the Gulf of Thailand and may figure in statistical data with *S. brevimana*.

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



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

Sepia whitleyana (Iredale, 1926)



ventral view

cuttlebone

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

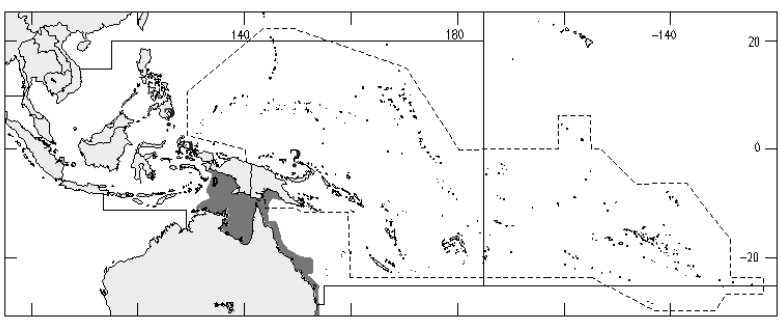
FAO names: En - Whitleys cuttlefish.

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

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

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

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

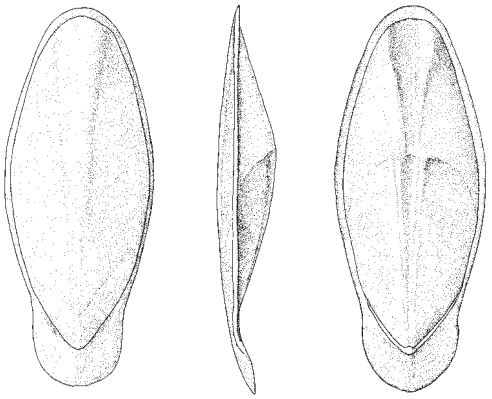


Remarks: Often confused with *Sepia smithi*, but differs in having both ventral arms modified in males (only the left ventral arm hectocotylized in *S. smithi*). The swimming keel extends beyond the sucker-bearing face of the club in *S. smithi*, but is equal to the club length in *S. whitleyana*. The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

Sepiella inermis Férussac and dOrbigny, 1835

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

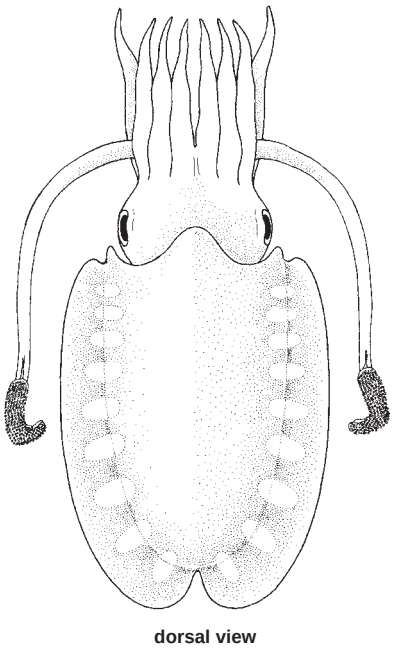
FAO names: En - Spineless cuttlefish; **Fr** - Sepia inerme; **Sp** - Sepia inerme.



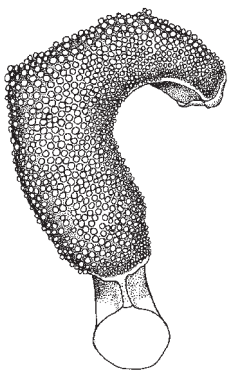
dorsal view lateral view ventral view

cuttlebone

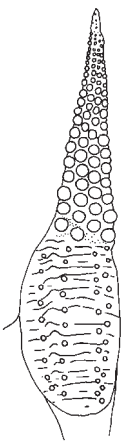
(after Adam, 1939)



dorsal view



tentacular club



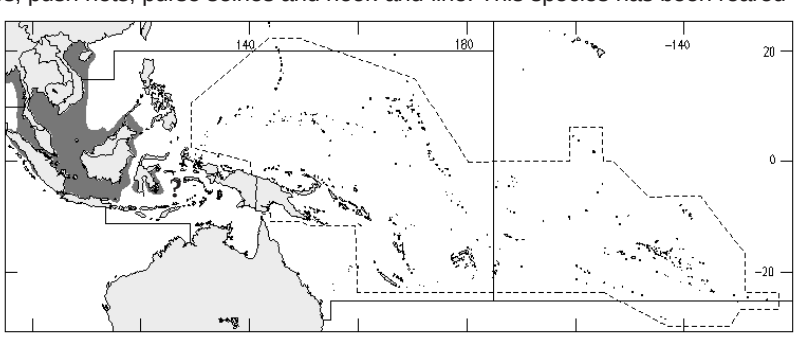
hectocotylus

(after Adam, 1939)

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

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

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

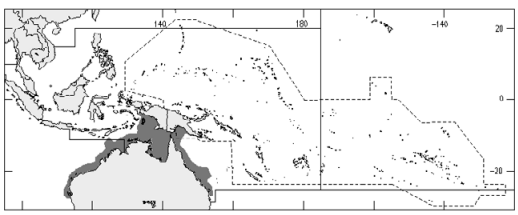


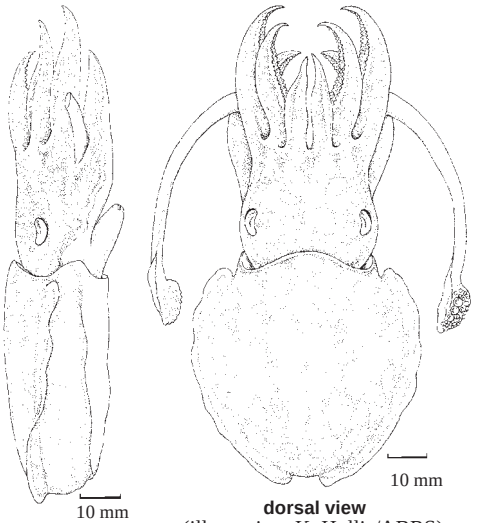
Distribution: Mouth of Zambezi River (Mozambique), Indian Ocean, southern Red Sea, Gulf of Aden to Andaman Sea, eastern Indonesia, the Gulf of Tonkin and the southern South China Sea.

Metasepia pfefferi (Hoyle, 1885)

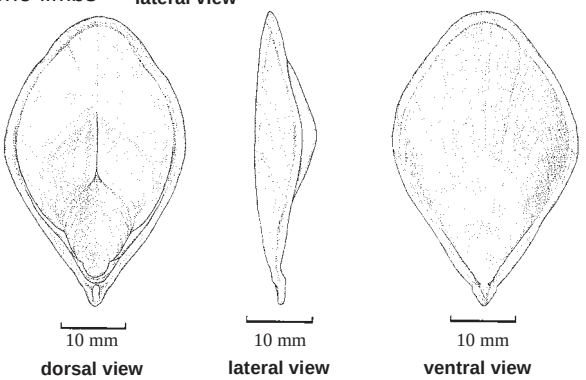
En - Pfeffers flamboyant cuttlefish.

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





(illustration: K. Hollis/ABRS)

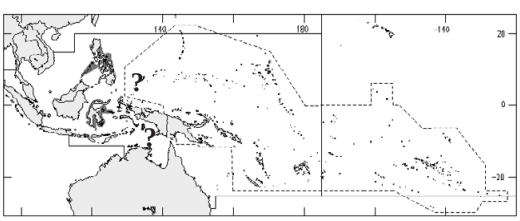


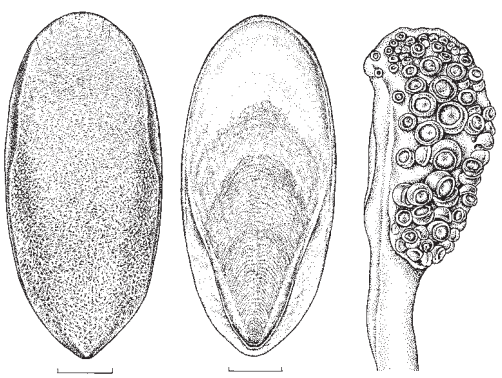
(illustration: K. Hollis/ABRS)

Sepia bandensis Adam, 1939

En - Stumpy spined cuttlefish.

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

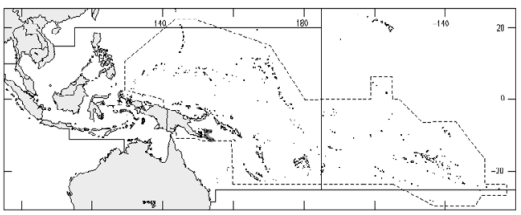


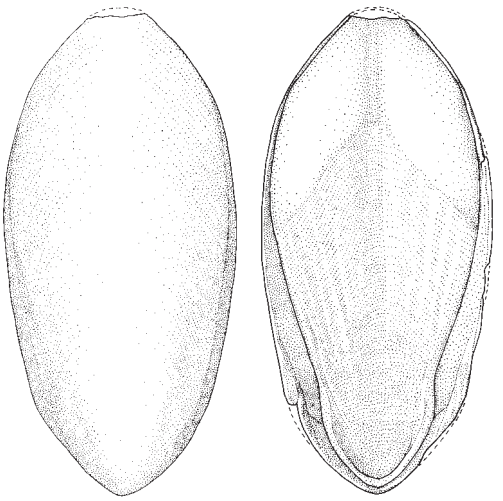


Sepia bartletti (Iredale, 1954)

En - Bartletts cuttlefish.

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





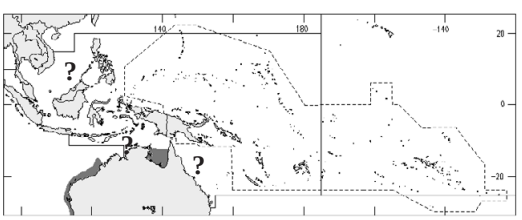
dorsal view ventral view

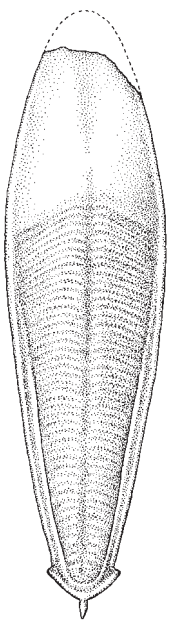
cuttlebone

Sepia cottoni Adam, 1979

En - Cottons cuttlefish.

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





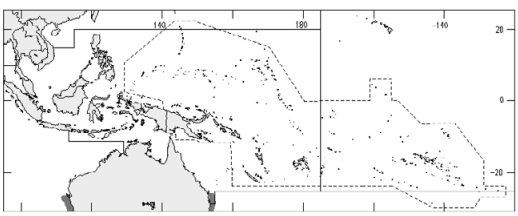
ventral view

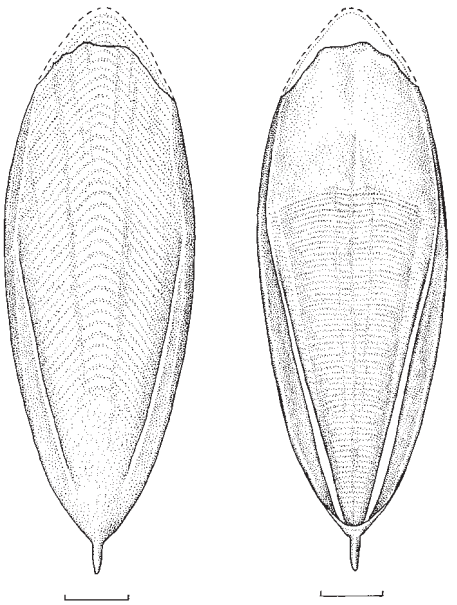
cuttlebone

Sepia cultrata Hoyle, 1885

En - Knifebone cuttlefish.

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



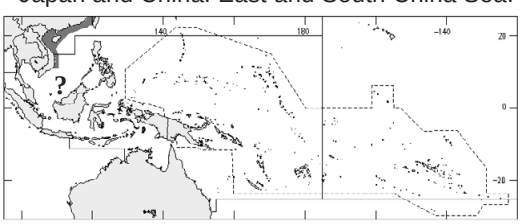


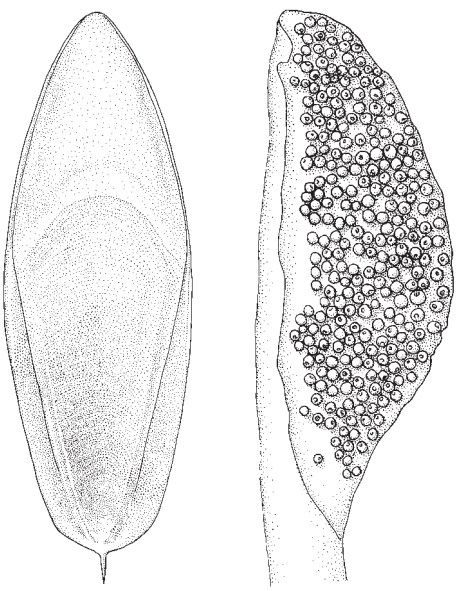
cuttlebone

Sepia madokai Adam, 1939

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

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





ventral view

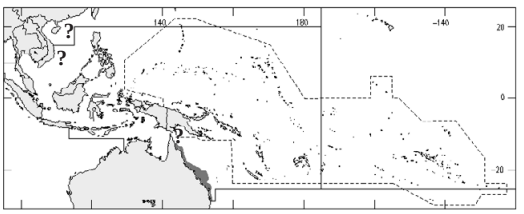
cuttlebone

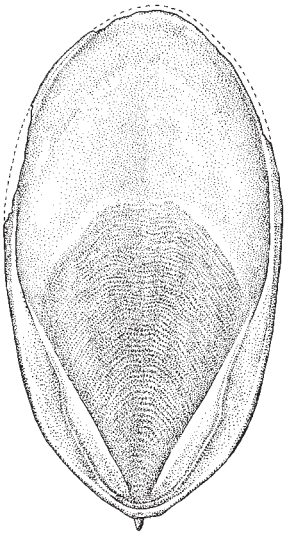
tentacular club
(after Okutani et al., 1987)

Sepia mestus Gray, 1849

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

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





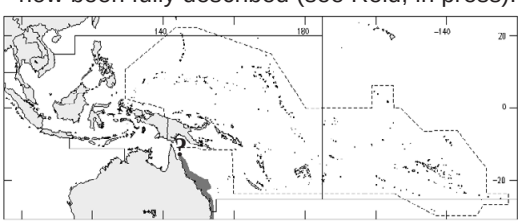
ventral view

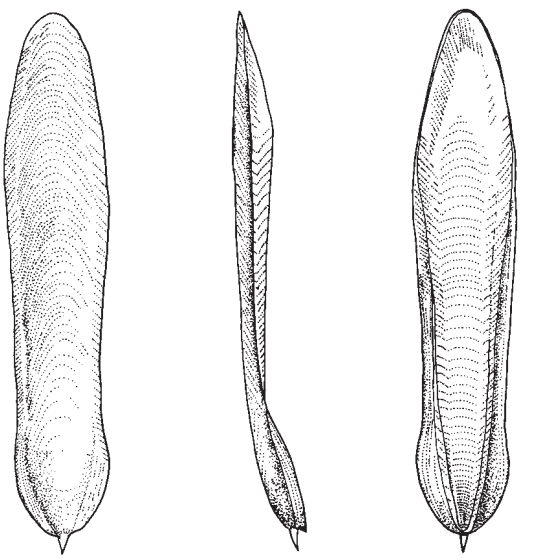
cuttlebone

Sepia mira (Cotton, 1932)

En - Little cuttlefish.

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





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

cuttlebone

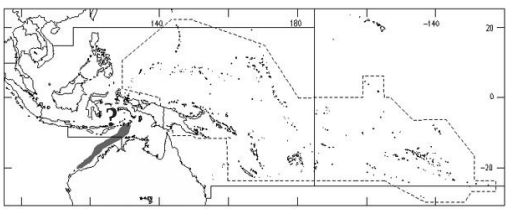
(after Cotton, 1952)

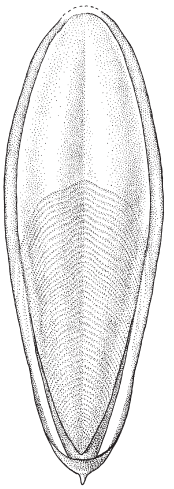
click for next page

Sepia sulcata Hoyle, 1885

En - Grooved cuttlefish.

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

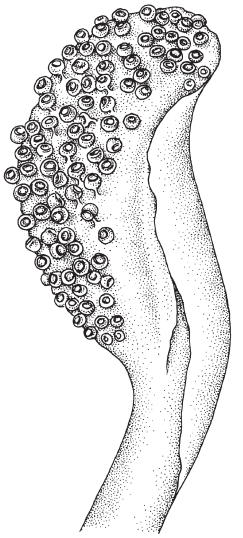




10 mm

ventral view

cuttlebone

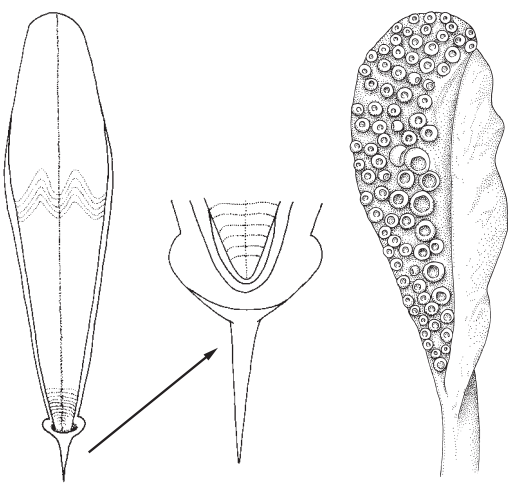


tentacular club

Sepia vietnamica Khromov, 1987

En - Viet Nam cuttlefish.

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

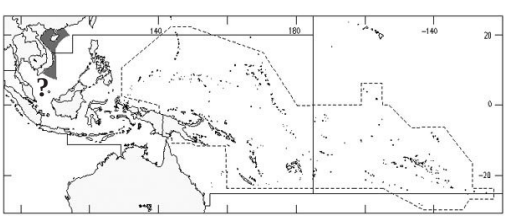


ventral view

cuttlebone

(after Khromov, 1987)

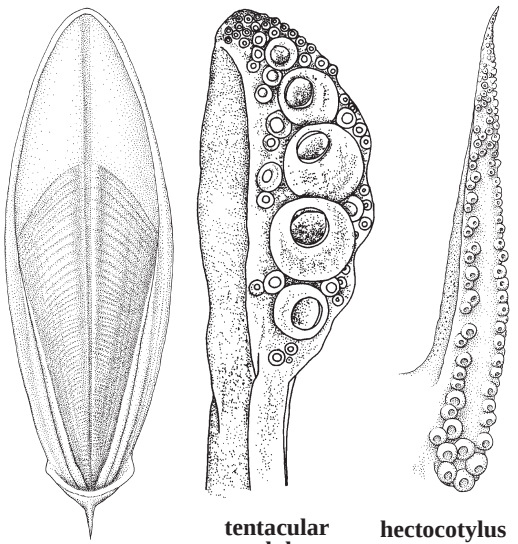
tentacular club



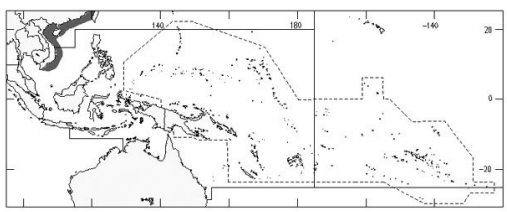
Sepia vossi Khromov, 1996

En - Voss cuttlefish.

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



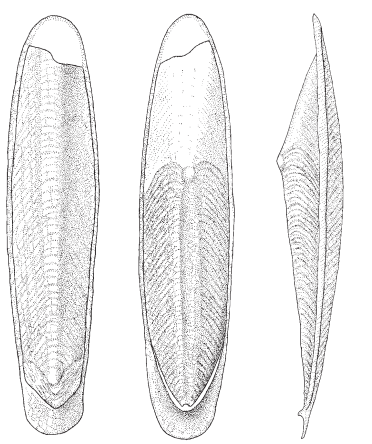
(after Voss and Williamson, 1971)



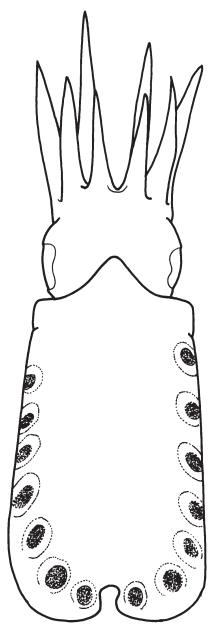
Sepiella ocellata Pfeffer, 1884

En - Spotty cuttlefish.

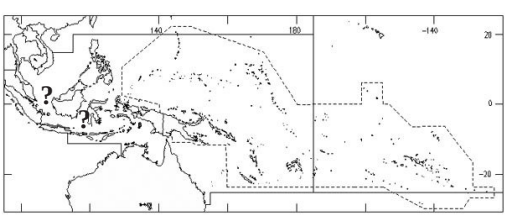
Maximum mantle length 50 mm. Known only from a single male specimen. Tentacular club with **8 to 10 suckers in transverse rows**. Cuttlebone narrow, width 20 to 25% of length, oval, of uniform width along its length, sides approximately parallel. **Colour:** 6 or 7 wine-coloured, similar-sized spots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



(after Adam, 1939)



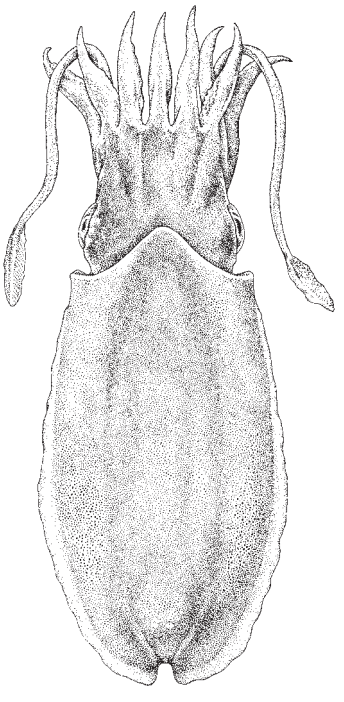
(after Adam, 1939)



Sepiella weberi Adam, 1939

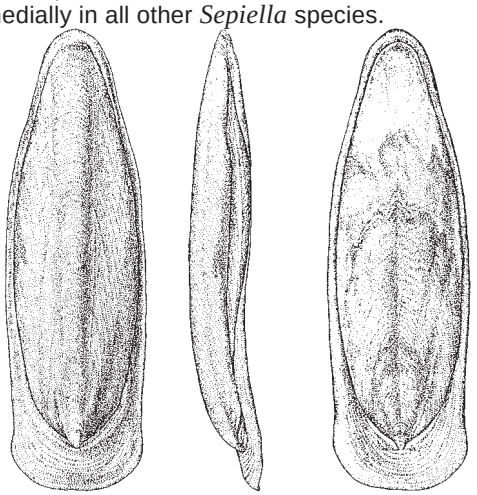
En - Webs cuttlefish.

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



dorsal view

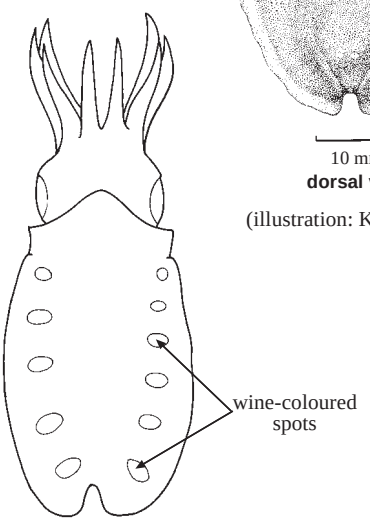
(illustration: K. Hollis/ABRS)



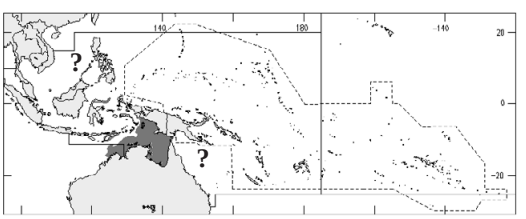
dorsal view **lateral view** **ventral view**

cuttlebone

(illustration: K. Hollis/ABRS)



schematic presentation in dorsal view

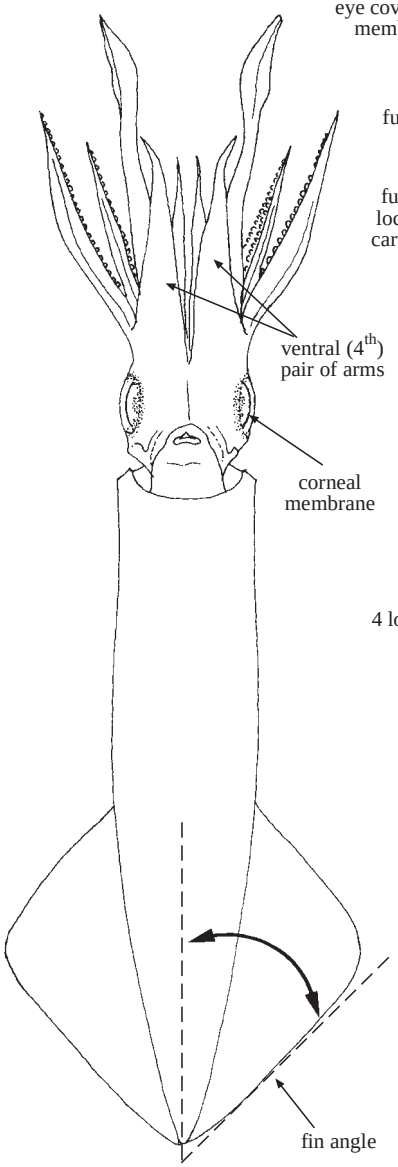


LOLIGINIDAE

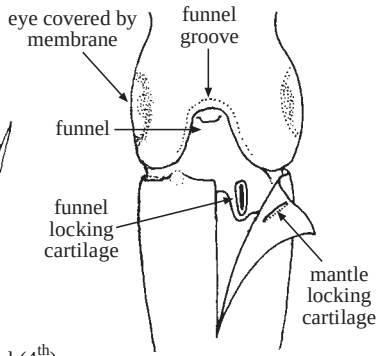
Inshore squids, pencil squids

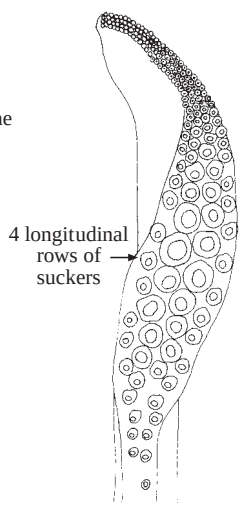
by M.C. Dunning

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

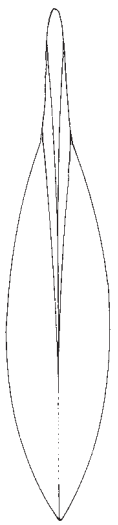


ventral view

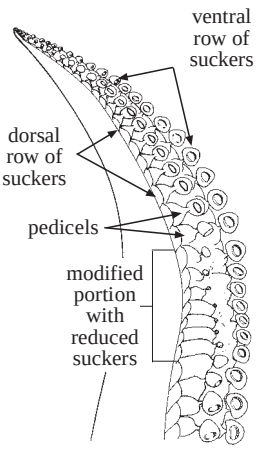




tentacular club



gladius (internal skeletal mantle support) feather-shaped



hectocotylized arm of males

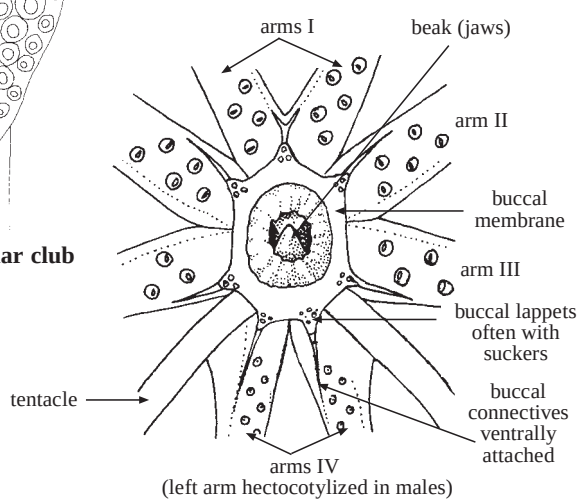
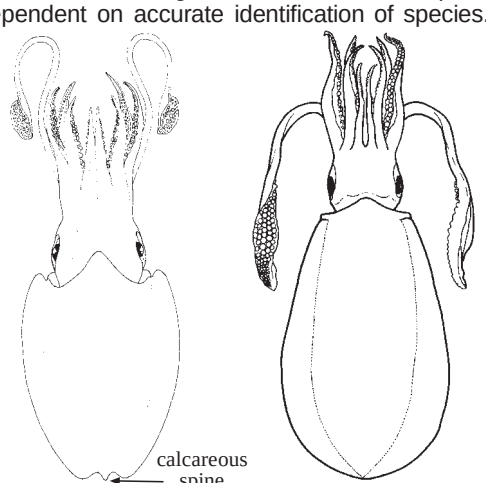


diagram of oral surface of brachial crown and buccal area

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

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



Sepiidae **Loliginidae (*Sepioteuthis*)**

Similar families occurring in the area

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

Identification note

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

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

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

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

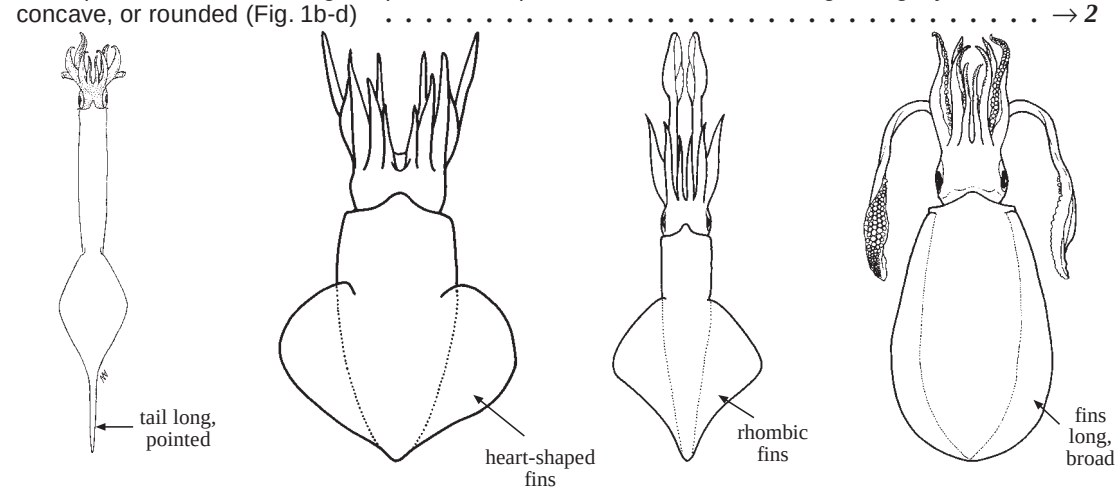
***Photololigo* spp. 1, 2, 3** of Yeatman and Benzie, 1994, are "species" which have been distinguished using allozyme electrophoresis. Morphological characteristics of species 1 and 2 from northern Australia (which mature at less than 120 mm mantle length) fall within the range of the "*Photololigo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

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

Key to the species of Loliginidae occurring in the area

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

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



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

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

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

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

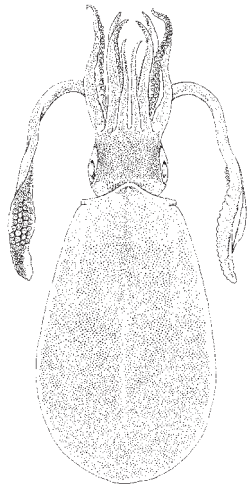
2b. Fins short to moderately long, less than 75% of mantle length; mantle elongate and narrow to short and stout . . . . . → ***3***

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

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

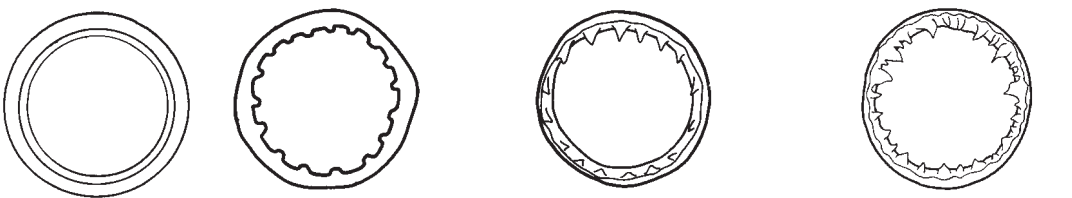
4a. Pair of light organs present on either side of the rectum on ink sac; large tentacular sucker rings smooth (Fig. 3a); sucker stalks on hectocotylus (left ventral arm IV) of males modified as papillae along entire length (Fig. 4) . . . . . ***Loliolus noctiluca***

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



dorsal view

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



a) smooth

b) small blunt truncate teeth

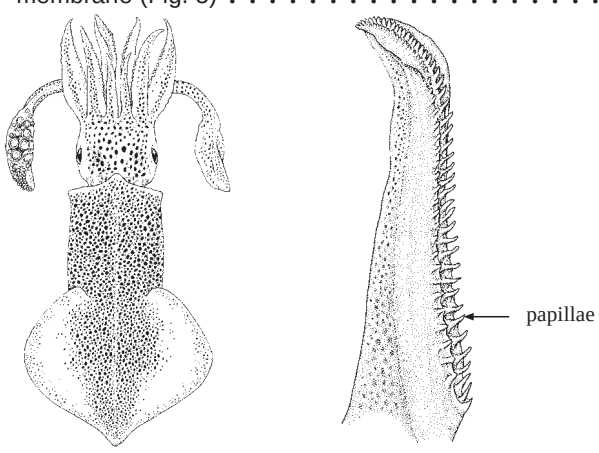
c) subequal-sized regularly spaced sharp conical teeth

d) unequal-sized irregularly spaced sharp conical teeth

Fig. 3 large tentacular sucker

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

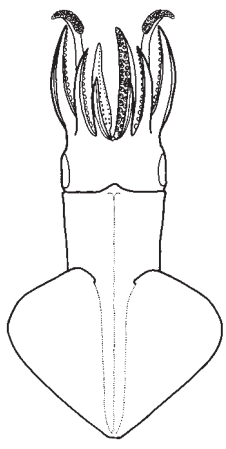
5b. Large tentacular suckers with 15 to 20 small truncate teeth on the entire margin; hectocotylized arm in males without a proximal crest on the modified ventral protective membrane (Fig. 5) . . . . . ***Loliolus affinis***



a) dorsal view

b) hectocotylus

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



dorsal view

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

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

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

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

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

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

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

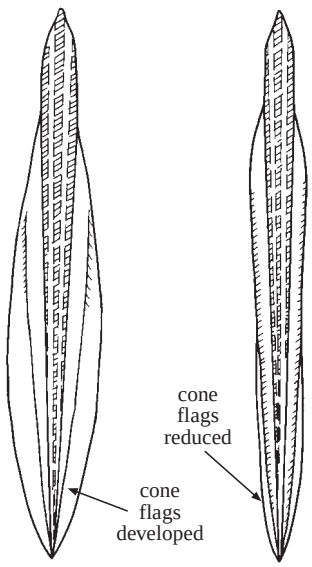


Fig. 6 gladius
(after Alexyev, 1989)

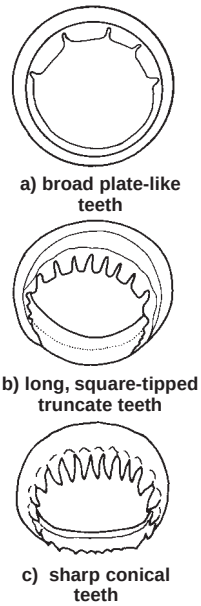


Fig. 7 arm III sucker rings

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

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

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

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

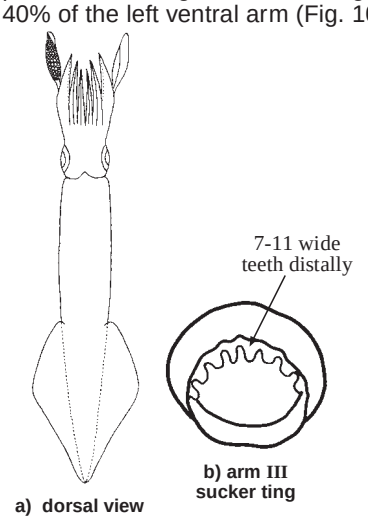


Fig. 8 ***Photololigo singhalensis***

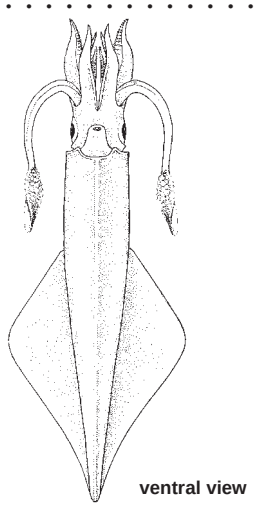


Fig. 9 ***"Photololigo edulis"***

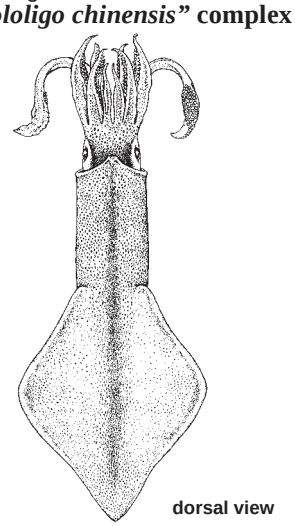


Fig. 10 ***"Photololigo chinensis"***
(illustration: K.Hollis/ABRS)

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

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

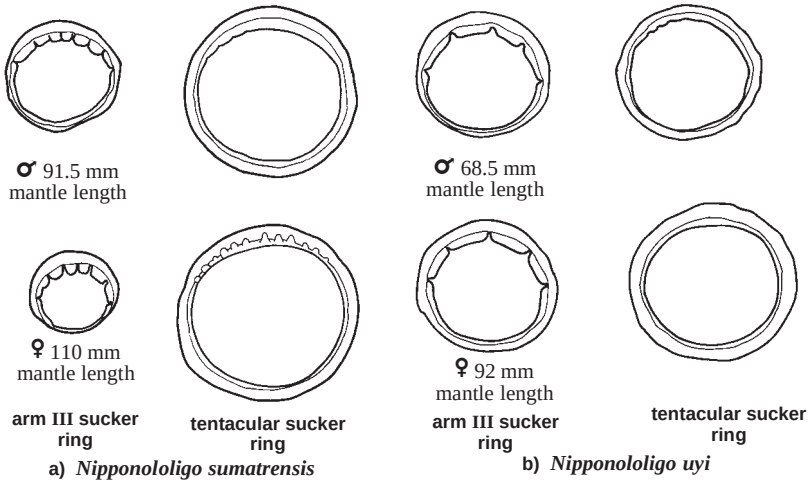


Fig. 11 relative sizes of sucker rings of arms III and tentacles

(after Natsukari, 1984)

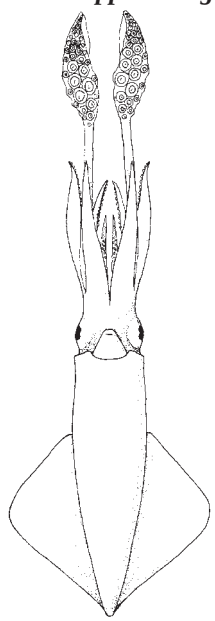


Fig. 12 ***Nipponololigo sumatrensis***

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

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

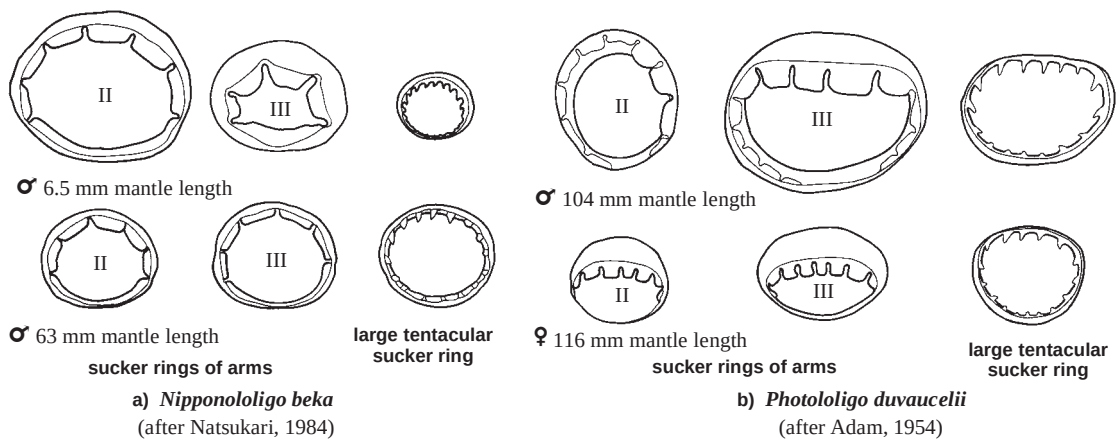
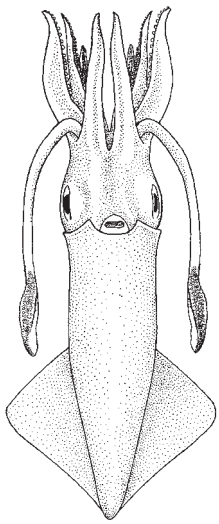
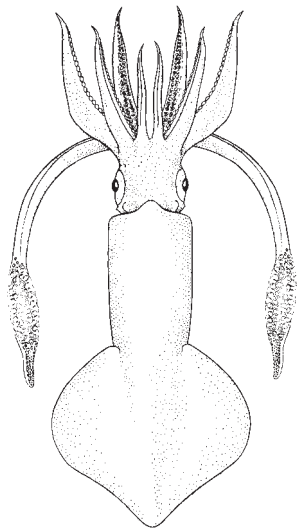


Fig. 13 relative sizes of sucker rings of arms II and III and the large tentacular sucker rings



ventral view

Fig. 14 ***Nippololigo beka***



dorsal view

Fig. 15 ***Photololigo duvaucelii***

List of species occurring in the area

The symbol ♜ is given when species accounts are included.

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

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

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

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

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

♜ *Uroteuthis bartschi* Rehder, 1945

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

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Nipponololigo beka (Sasaki, 1929)

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

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

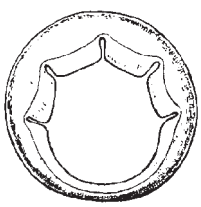
Diagnostic characters: Mantle short, slender; fins rhomboidal with round lateral angles, length more than 50% of mantle length. Tentacular clubs expanded, lanceolate; **medial manus suckers twice the diameter of lateral suckers and with 18 to 30 sharp teeth on the sucker rings**. **Arm sucker rings with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

Size: Maximum dorsal mantle length 70 mm.

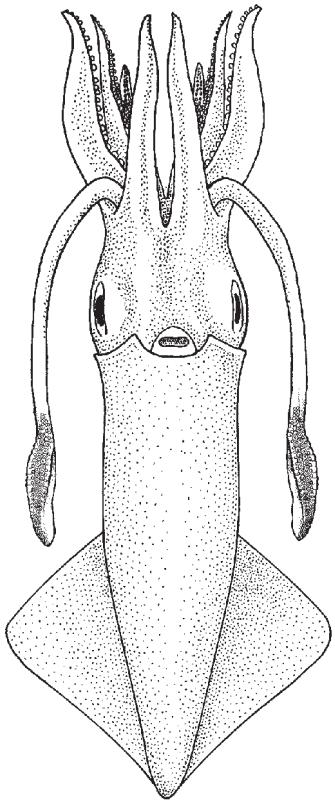
Habitat, biology, and fisheries: Found in coastal waters, particularly bays. Occurs in trawl and light-luring net catches in the Gulf of Thailand.

Distribution: Southeast Asian coastal waters to southern Japan.

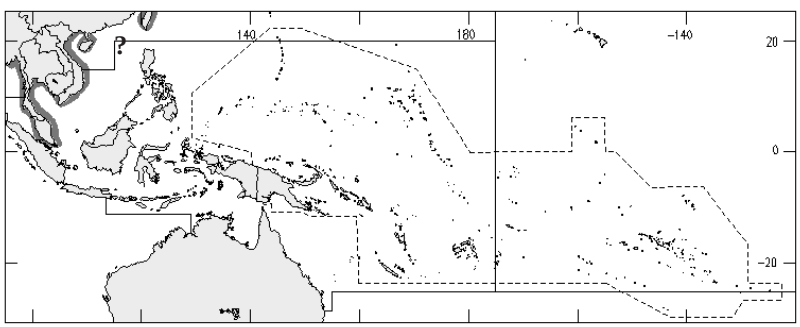
tentacular club sucker ring



arm III sucker ring



ventral view



Nipponololigo sumatrensis (Orbigny, 1835)

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

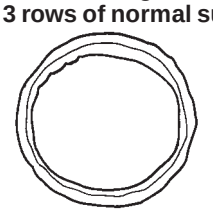
FAO names: En - Kobi squid; **Fr** - Calmar kobi; **Sp** - Calamar kobí.

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

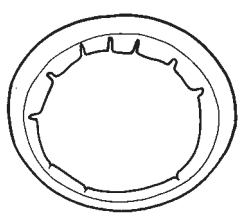
Size: Maximum dorsal mantle length 100 mm, commonly to 50 mm mantle length.

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

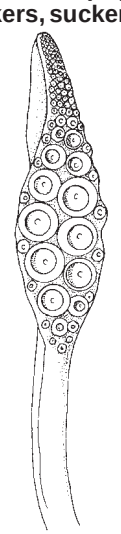
Distribution: Southeast Asian coastal waters to central Japan.



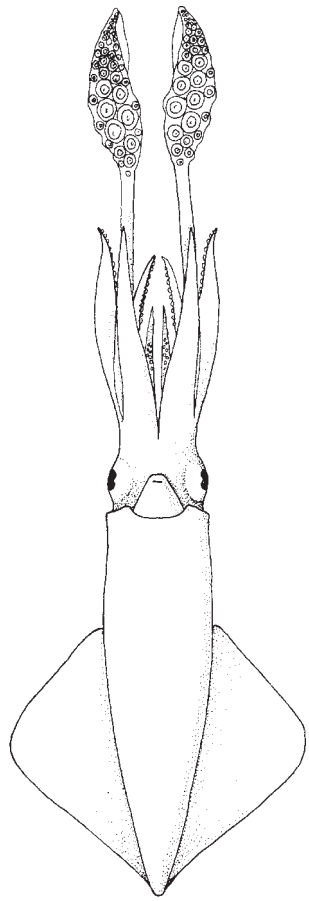
tentacular club sucker ring



arm III sucker ring

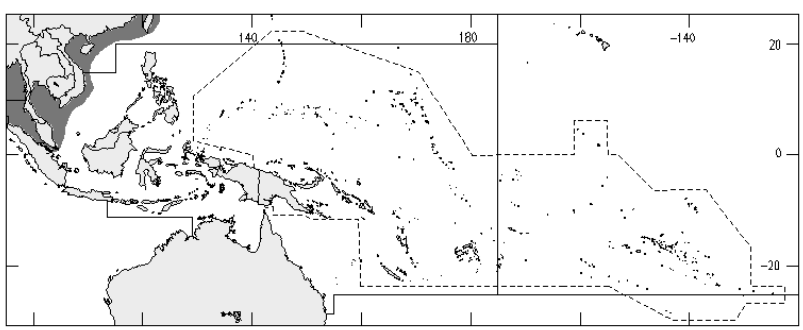


tentacular club



ventral view

(after Natsukari, 1984)

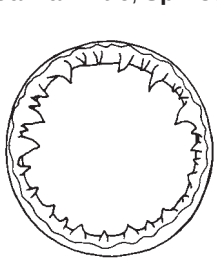


"*Photololigo chinensis*" Gray, 1849 species complex

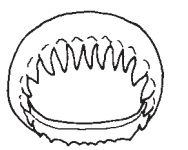
Frequent synonyms (named species of uncertain status included in the complex) / misidentifications: *Loligo chinensis* Gray, 1849; *L. australis* Gray, 1849; *L. formosana* Sasaki, 1929; *L. etheridgei* Berry, 1918; *L. indica* Hoyle, 1886; ?*L. vossi* Nesis, 1982; *Photololigo* sp. 3 of Yeatman and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

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

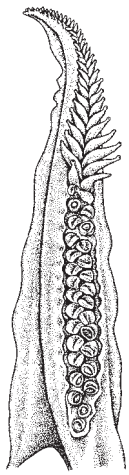
Diagnostic characters: Mantle elongate, slender, bluntly pointed posteriorly; **fins rhombic, long, over 60% of mantle length in adults**. About 12 medial manal suckers of tentacular clubs enlarged to 1.5 times the diameter of lateral suckers and twice the diameter of largest arm sucker; **large rings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



tentacular club sucker ring

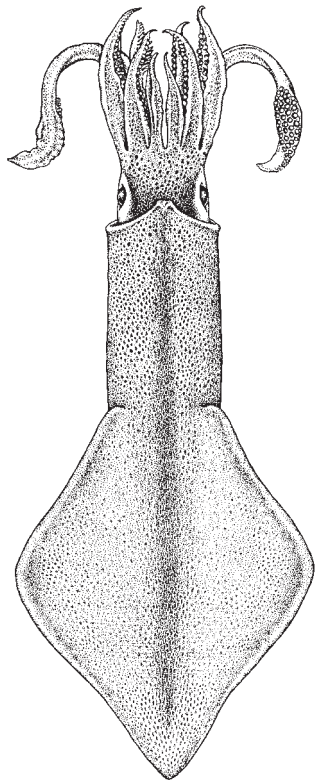


arm III sucker ring



tentacular club

(illustration: K. Hollis/ABRS)



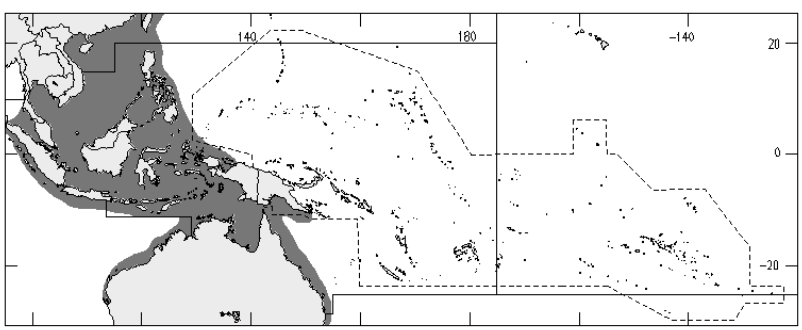
dorsal view

(illustration: K. Hollis/ABRS)

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

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

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

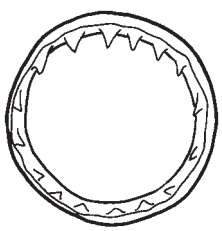


Photololigo duvaucelii (d'Orbigny, 1835)

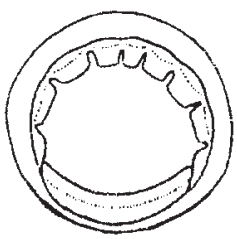
Frequent synonyms / misidentifications: *Loligo duvauceli* Orbigny, 1848, *L. oshimai* Sasaki, 1929; *L. indica* Pfeffer, 1884 / None.

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

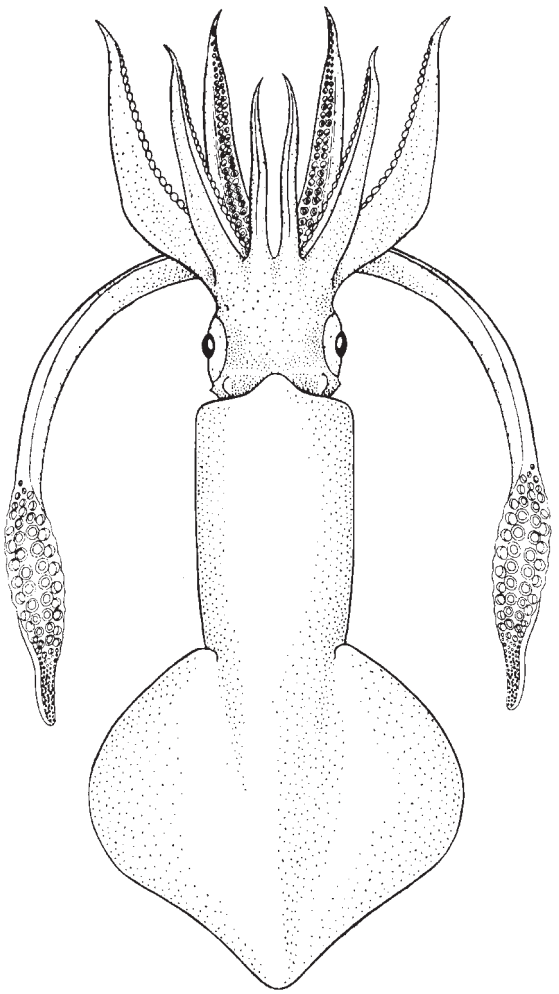
Diagnostic characters: Mantle relatively short, stout. Fins rhombic, broad, short, just over 50% of mantle length. Tentacular clubs expanded; large median manal suckers 1.5 times larger than marginals, with **14 to 17 short, sharp teeth around ring**. **Arm suckers of female of about equal size on arms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



tentacular club sucker ring



arm III sucker ring

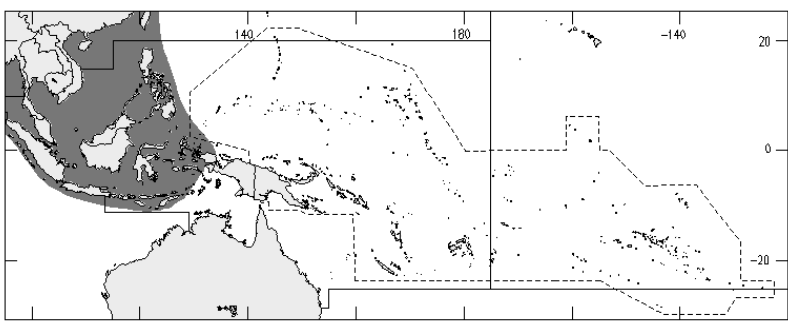


dorsal view

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

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

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

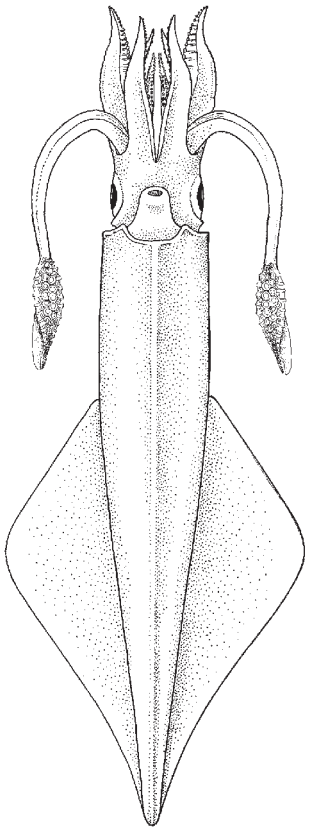


"***Photololigo edulis***" (Hoyle, 1885) species complex

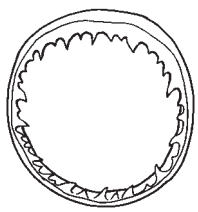
Frequent synonyms / misidentifications: *Doryteuthis kensak* (Wakiya and Ishikawa, 1921); *Loligo budo* Wakiya and Ishikawa, 1921; *Photololigo* sp. 1 and 2 of Yeatman and Benzie, 1994 / ?*Doryteuthis sibogae* Adam, 1954.

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

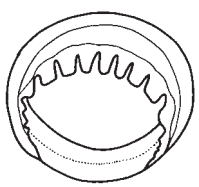
Diagnostic characters: Mantle moderately stout to elongate, slender in mature males. **Fins rhombic, attaining 70% of mantle length in adults**, their posterior margin slightly concave. Tentacular clubs expanded, lanceolate; about 16 medial manal suckers 1.2 times larger than the marginals, approximately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



ventral view



tentacular club sucker ring

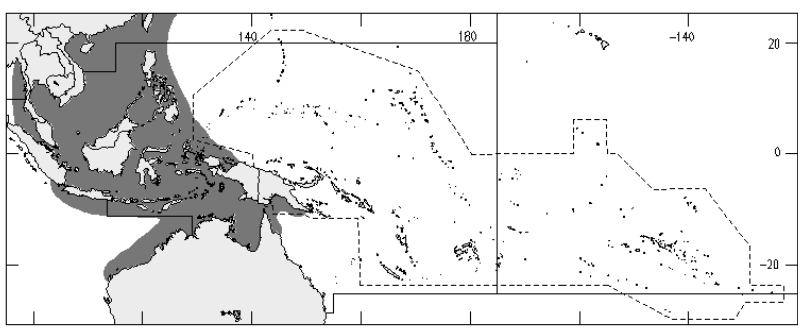


arm III sucker ring

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

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

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



Photololigo singhalensis (Ortmann, 1891)

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

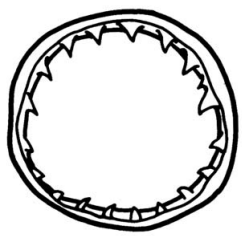
FAO names: En - Long barrel squid; **Fr** - Calmar baril; **Sp** - Calamar buril.

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

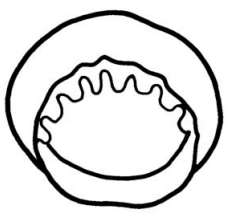
Size: Maximum mantle length 500 mm (males) and 310 mm (females), commonly caught at 150 to 200 mm mantle length.

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

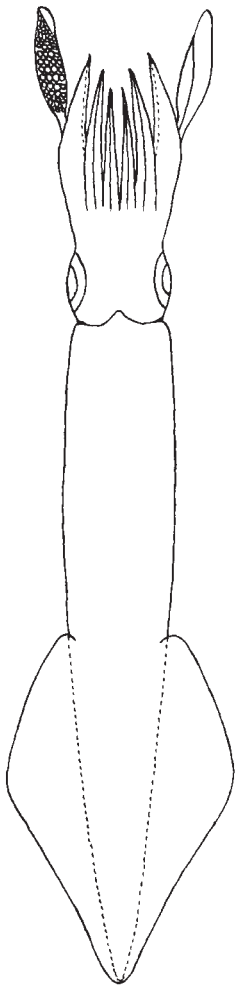
Distribution: Indo-Pacific from Eastern Arabian Sea, Bay of Bengal to South China Sea and Philippines Sea, Indonesian waters, Solomon Sea, and Taiwan Province of China (Penghu).



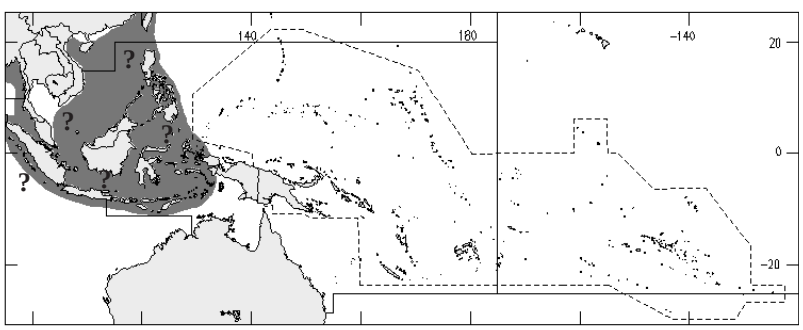
largest tentacular club sucker ring



largest arm III sucker ring



dorsal view

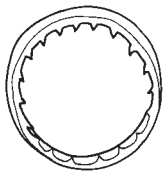


"***Sepioteuthis lessoniana***" Lesson, 1830 ? species complex

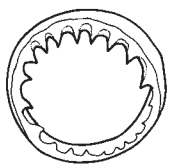
Frequent synonyms / misidentifications: *Sepioteuthis arctipinnis* Gould, 1852 / None.

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

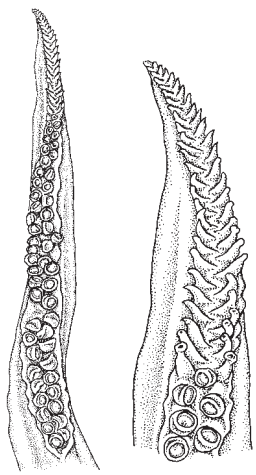
Diagnostic characters: Mantle long, robust, its width about 40% of length. Fins very large, length over 90% mantle length, width up to 75% mantle length; greatest width occurs posterior to the midpoint of the fins. Tentacular clubs long, expanded; median manus suckers enlarged; rings with 14 to 23 sharp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



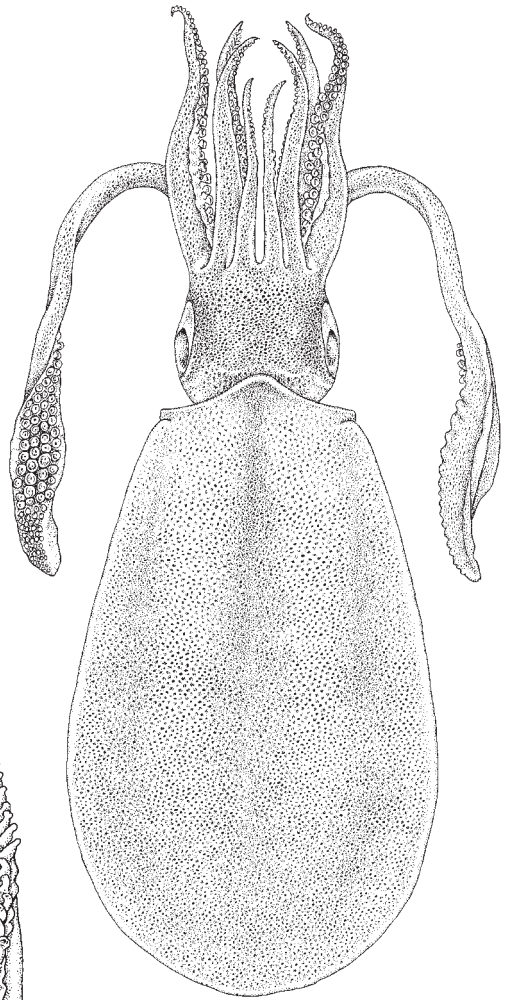
tentacular club sucker ring



arm III sucker ring



hectocotylus **distal end of hectocotylus**



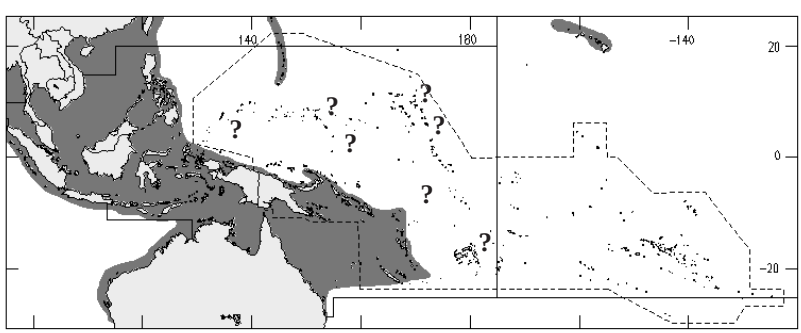
dorsal view

(illustration: K. Hollis/ABRS)

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

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

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



Uroteuthis bartschi Rehder, 1945

Frequent synonyms / misidentifications: None / None.

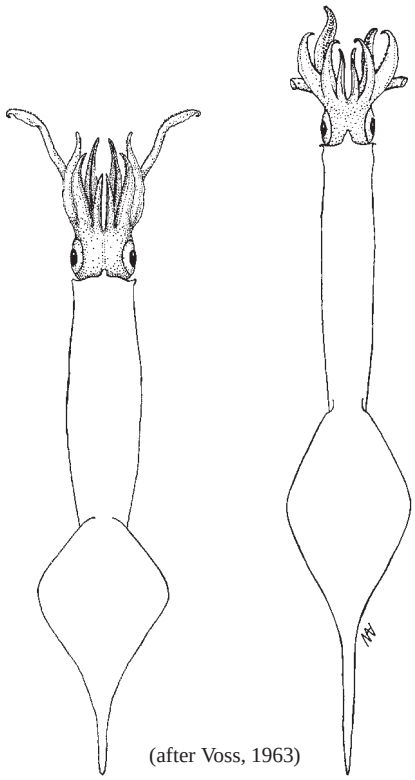
FAO names: En - Bartsch's squid; **Fr** - Calmar tépo; **Sp** - Calamarete.

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

Size: Maximum mantle length 200 mm.

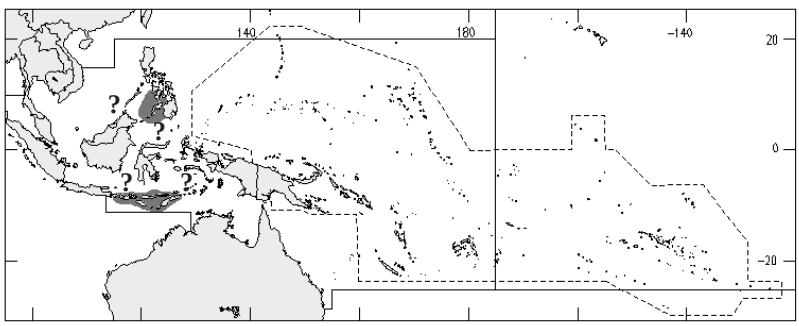
Habitat, biology, and fisheries: A neritic species; upper and lower limit of depth range undetermined. Taken as bycatch in local trawl and net fisheries in Indonesia and the Philippines. Utilized mostly fresh.

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



(after Voss, 1963)

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

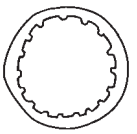


Loliolus affinis Steenstrup, 1856

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

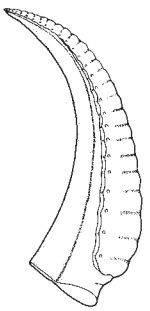
En - Steenstrup's bay squid.

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

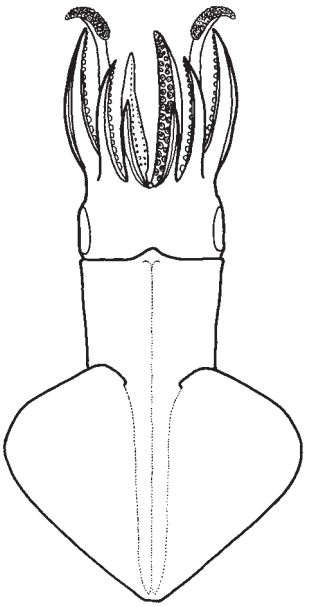


tentacular club sucker ring

arm III sucker ring

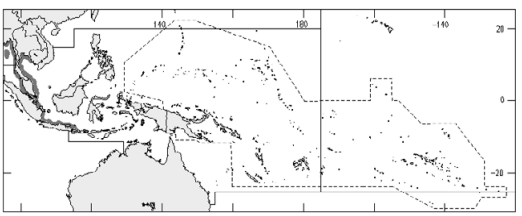


hectocotylus



dorsal view

(after Lu, Roper, and Tait, 1985)



Loliolus noctiluca Lu, Roper, and Tait, 1985

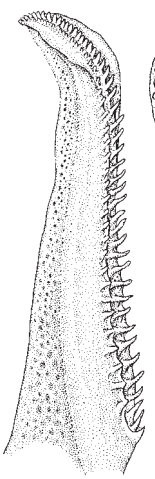
Frequent synonyms / misidentifications: None / *Photololigo* spp.; *Nipponololigo* spp.

En - Luminous bay squid.

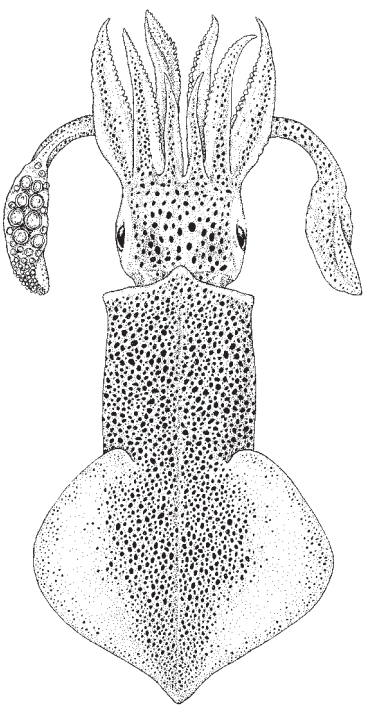
Maximum mantle length to 90 mm (females larger than males). Occur in shallow coastal habitats including seagrass beds to depths of about 50 m. Caught incidentally in inshore prawn trawls along the northeastern Australian coast, may be confused with juveniles of other larger more commercially important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

tentacular club sucker ring

arm III sucker ring

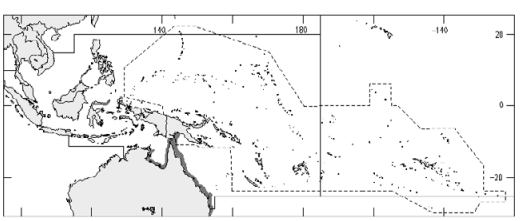


hectocotylus



dorsal view

(illustration: K. Hollis/ABRS)

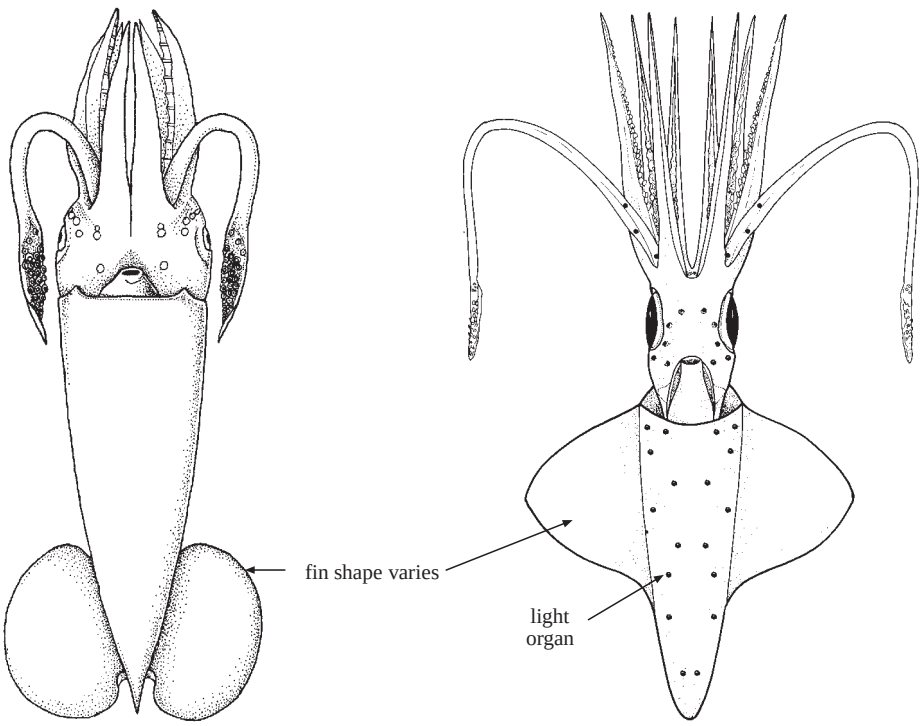


ENOPLOTEUTHIDAE

Firefly squids, enope squids

by M.C. Dunning

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



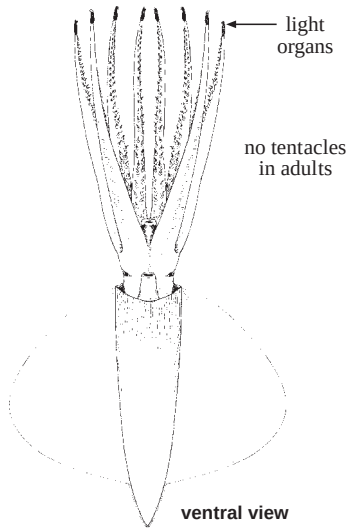
ventral view
Pterygioteuthis

ventral view
Ancistocheirus

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

Similar families occurring in the area

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



Octopoteuthidae

Key to the genera of Enoploteuthidae occurring in the area

(after Nesis, 1987)

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

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

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

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

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

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

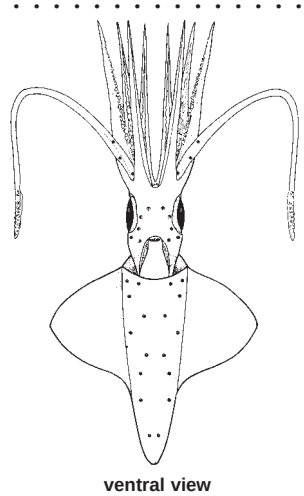


Fig. 1 ***Ancistrocheirus***

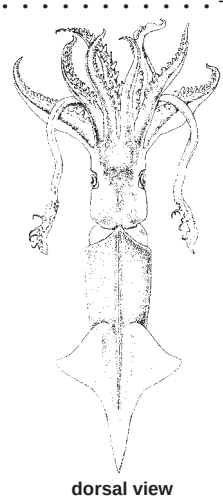


Fig. 2 ***Enoploteuthis***

(illustration: K. Hollis/ABRS)

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

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

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

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

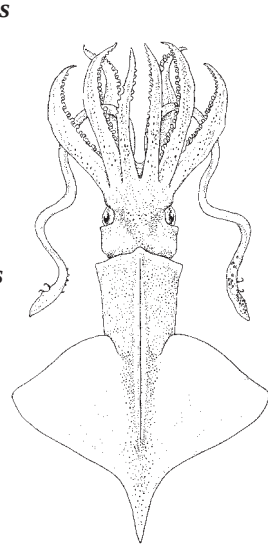


Fig. 3 ***Abralia***

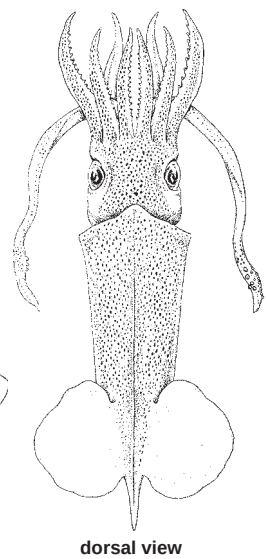


Fig. 4 ***Pterygioteuthis***

(illustration: K. Hollis/ABRS)

List of species occurring in the area

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

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

Ancistrocheirus lesueuri Férussac and d'Orbigny, 1839

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

Pterygioteuthis giardi Fischer, 1896

Pyroteuthis margaritifera (Rüppell, 1844)

References

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

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

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

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

ONYCHOTEUTHIDAE

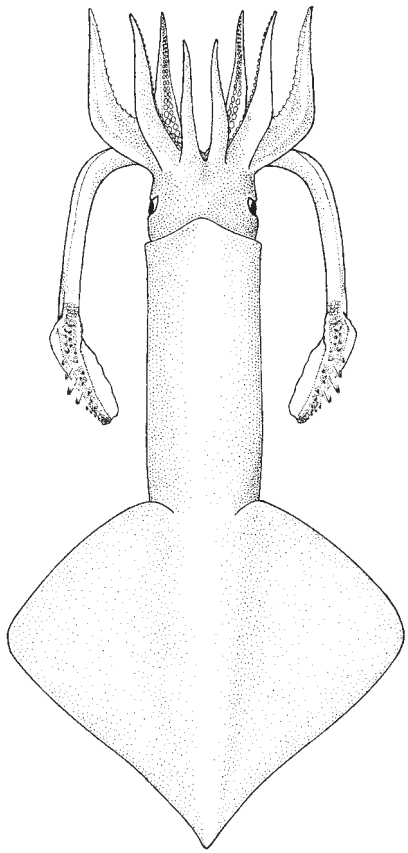
Hooked squids

by M.C. Dunning

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

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

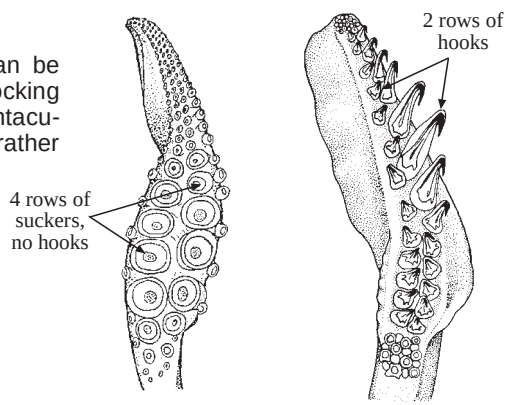
Remarks: Recent taxonomic studies have indicated that at least some tropical oceanic onychoteuthids previously assigned to the genus *Onykia* may be juveniles of various species of *Moroteuthis*.



dorsal view

Similar families occurring in the area

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

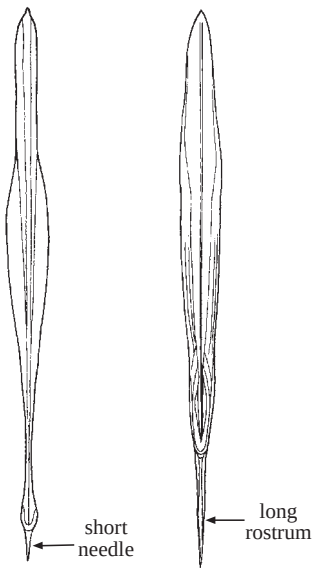


tentacular club Ommastrephidae **tentacular club Onychoteuthidae**

Key to the genera of Onychoteuthidae occurring in the area

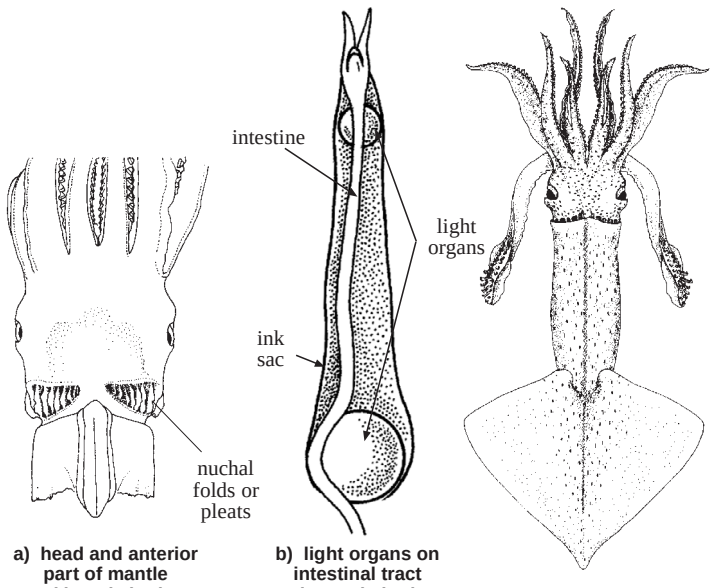
1a. Skin smooth; posterior end of gladius a short chitinous needle (Fig. 1a); light organs present: 1 elongated light organ on ventral side of eyeball, 2 light organs on intestine and ink sac (anterior one small, posterior one large) (Fig. 2a) . . . . . ***Onychoteuthis***

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



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

Fig. 1 gladius

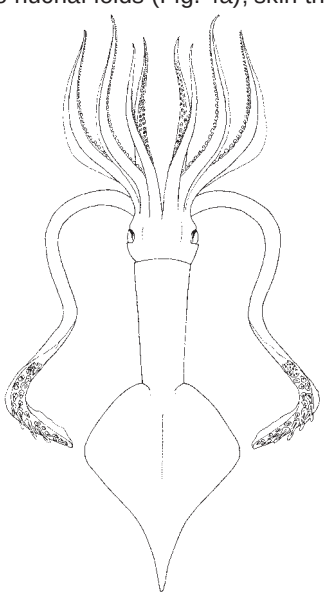


a) head and anterior part of mantle (dorsal view) **b) light organs on intestinal tract (ventral view)** **c) dorsal view**

Fig. 2 *Onychoteuthis*

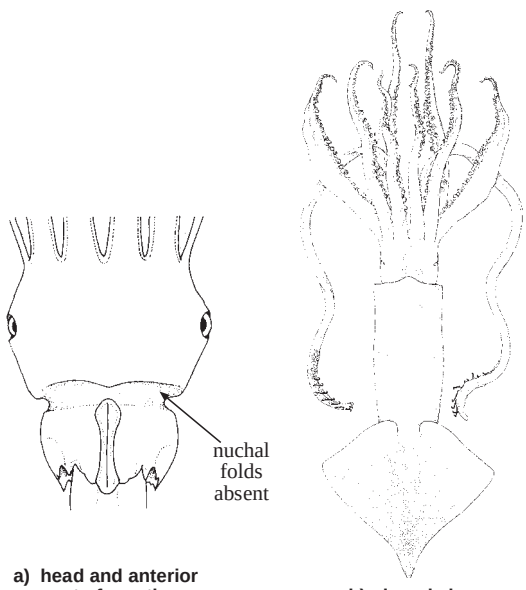
2a. Six to 10 well-developed nuchal folds; skin smooth (Fig. 3) . . . . . ***Ancistroteuthis***

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



dorsal view

Fig. 3 *Ancistroteuthis*



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

(illustration: K. Hollis/ABRS)

Fig. 4 *Moroteuthis*

List of species occurring in the area

Ancistroteuthis lichtensteini (Orbigny, 1839)

Moroteuthis lönnbergi Ishikawa and Wakiya, 1914

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

References

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

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

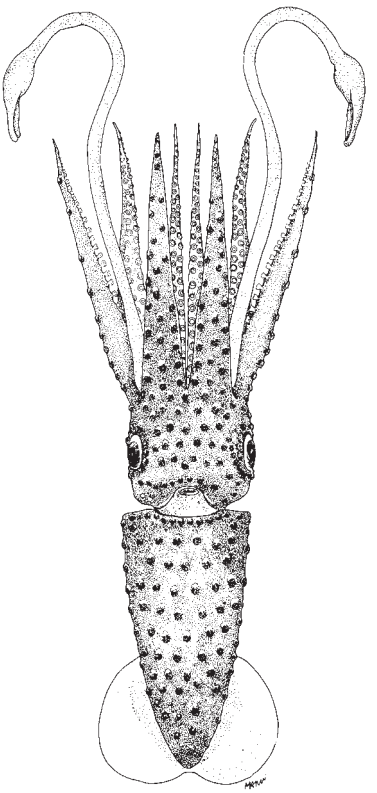
Tsuchiya, K and T. Okutani. 1991. Growth stages of *Moroteuthis robusta* (Verrill, 1881) with a re-evaluation of the genus. *Bull. Mar. Sci.*, 49:137-147.

HISTIOTEUTHIDAE

Jewel squids, umbrella squids

by M.C. Dunning

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



Histioteuthis celetaria pacifica
ventral view

(after Voss, 1969)

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

Similar families occurring in the area

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

List of species occurring in the area

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

Reference

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

click for next page

OMMASTREPHIDAE

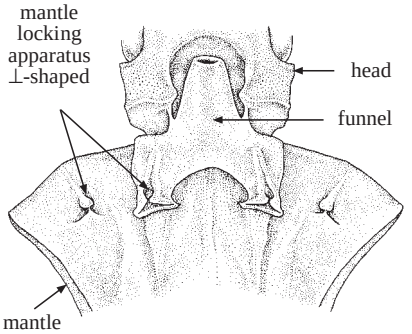
Arrow squids, flying squids

by M.C. Dunning

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

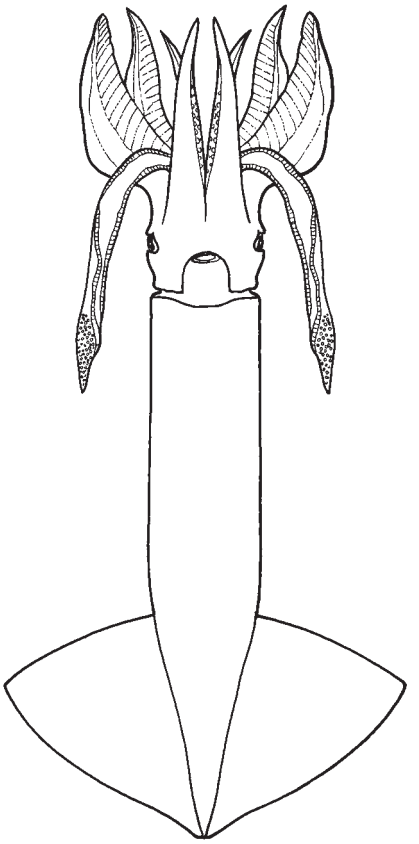
mantle locking cartilage

funnel locking cartilage



internal view of anterior mantle

(illustration: K. Hollis/ABRS)

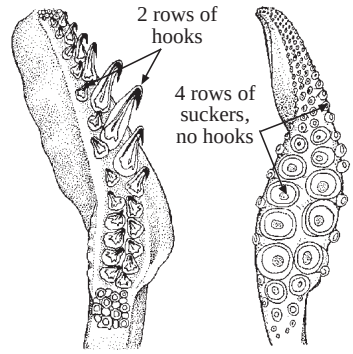


ventral view

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

Similar families occurring in the area

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



Key to the species of Ommastrephidae occurring in the area

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

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

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

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

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

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

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

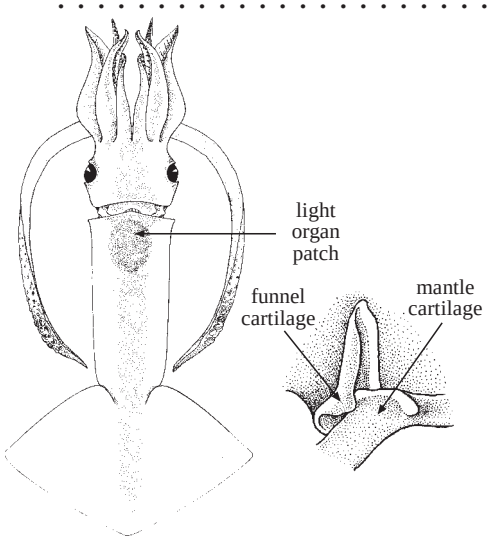


Fig. 1 ***Stenoteuthis oualaniensis***

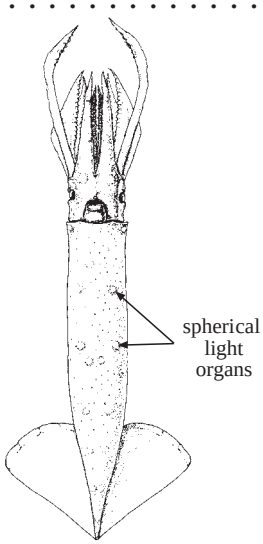


Fig. 2 ***Hyaloteuthis pelagica***

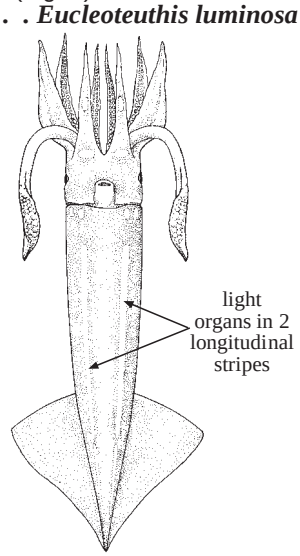


Fig. 3 ***Eucleoteuthis luminosa***

(after Wormuth, 1976)

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

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

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

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

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

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

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

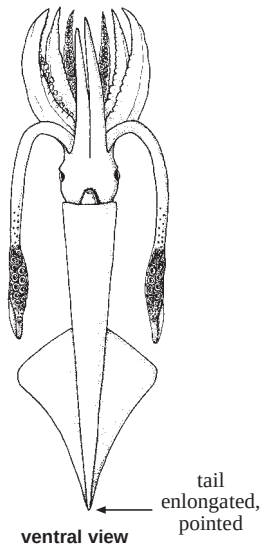


Fig. 4 ***Ornithoteuthis volatilis***

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

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

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

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

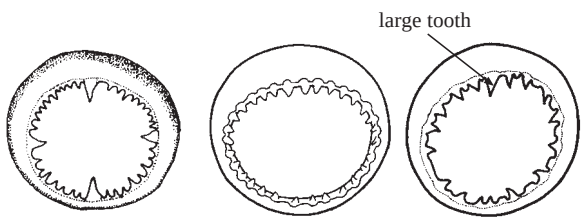


Fig. 5 tentacular sucker rings

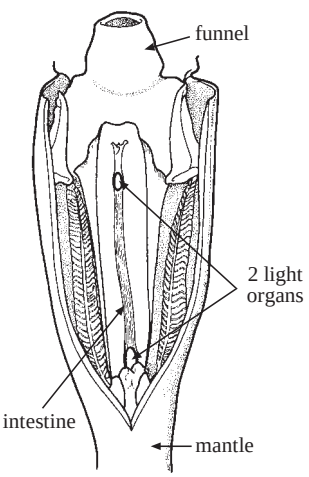


Fig. 6 ***Sthenoteuthis oualaniensis***

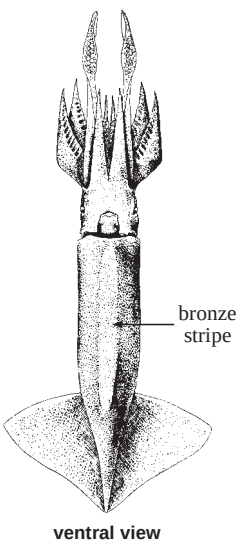


Fig. 7 ***Ommastrephes bartramii***

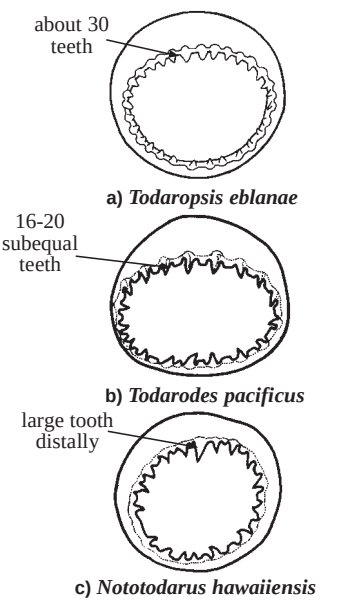
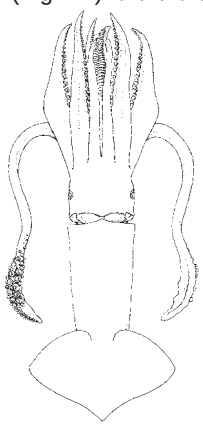


Fig. 8 medial tentacular sucker rings

2/ See footnote on previous page.

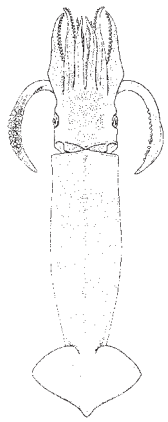
9a. Arms with less than 30 transverse rows of biserial suckers; skin appears rough (Fig. 11) . . . . . ***Nototodarus hawaiiensis***

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



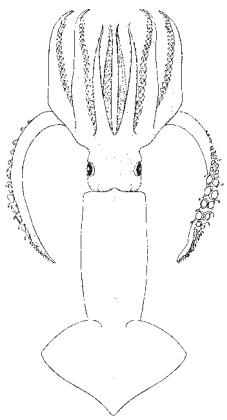
dorsal view

Fig. 9 ***Todaropsis eblanae***



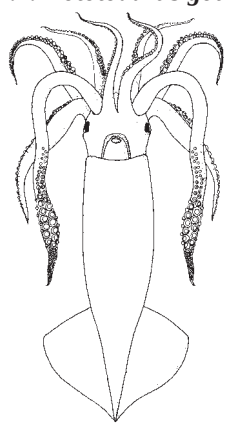
dorsal view

Fig. 10 ***Todarodes pacificus***



dorsal view

Fig. 11 ***Nototodarus hawaiiensis***



ventral view

Fig. 12 ***Nototodarus gouldi***

(illustration: K.Hollis/ABRS)

List of species occurring in the area

The symbol ♜ is given when species accounts are included.

Eucleoteuthis luminosa (Sasaki, 1915)

Hyaloteuthis pelagica (Bosc, 1802)

Nototodarus gouldi (McCoy, 1888)

♜ *Nototodarus hawaiiensis* (Berry, 1912)

♜ *Ommastrephes bartramii* (Lesueur, 1821)

Ornithoteuthis volatilis (Sasaki, 1915)

♜ *Sthenoteuthis oualaniensis* (Lesson, 1830)

♜ *Todarodes pacificus* Steenstrup, 1880

♜ *Todaropsis eblanae* (Ball, 1841)

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

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

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

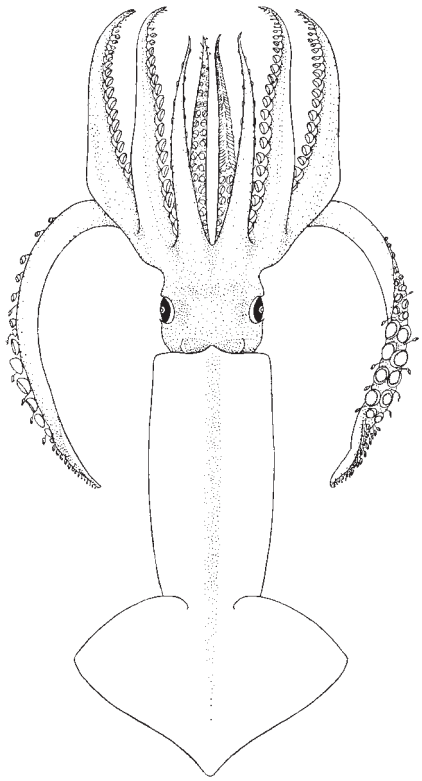
Lu, C.C. 1982. First record of *Todaropsis eblanae* (Ball, 1841) (Cephalopoda: Oegopsida) in the Pacific Ocean. *Venus*, 41:67-70.

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

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

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

Nototodarus hawaiiensis (Berry, 1912)

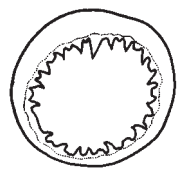


(after Voss, 1963)

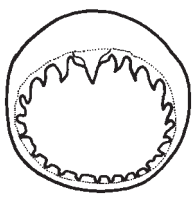
Frequent synonyms / misidentifications: *Nototodarus philippinensis* Voss, 1962; *N. nipponicus* Okutani and Uemura, 1973 / *N. gouldi* (McCoy, 1888).

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

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



tentacular club sucker ring



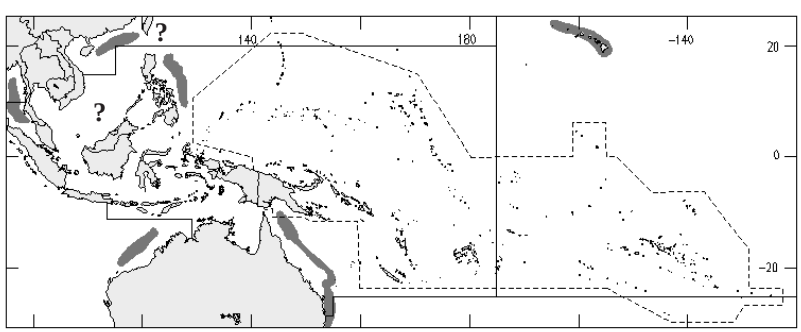
arm III sucker ring

(from Voss and Williamson, 1971)

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

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

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

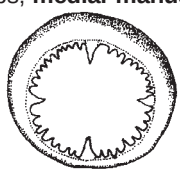


Ommastrephes bartramii (Lesueur, 1821)

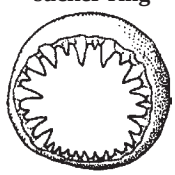
Frequent synonyms / misidentifications: *Ommastrephes caroli stenodactyla* Rancurel, 1976 / *Dosidicus gigas* of Brazier, 1892.

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

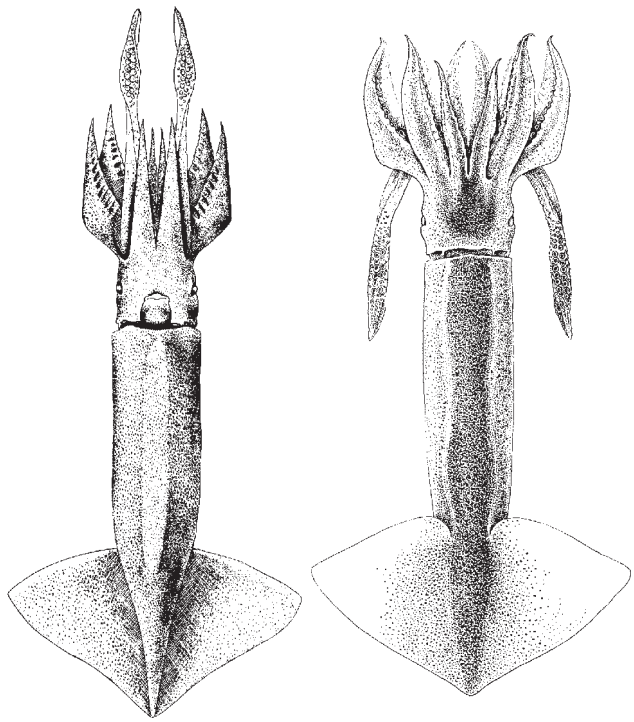
Diagnostic characters: Funnel groove with foveola and side pockets. Tetraserial suckers on dactylus of tentacular clubs; **medial manus sucker rings with 1 tooth in each quadrant greatly enlarged**; carpal fixing apparatus consisting of smooth-ringed suckers and knobs on the tentacular stalk. **Small,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



tentacular club sucker ring



arm III sucker ring

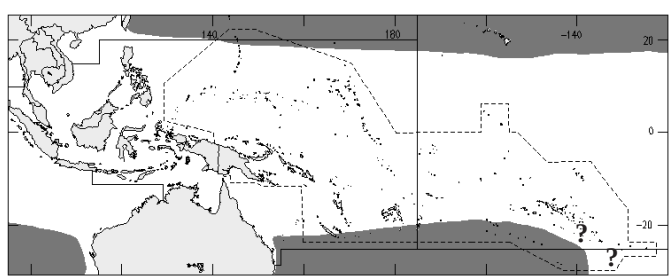


ventral view **dorsal view**

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

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

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

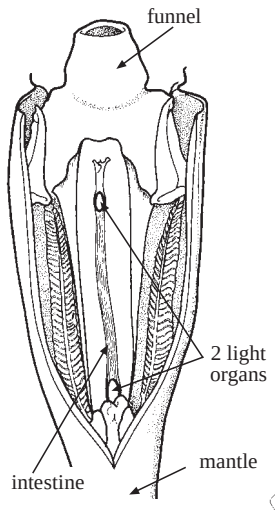


Sthenoteuthis oualaniensis (Lesson, 1830)

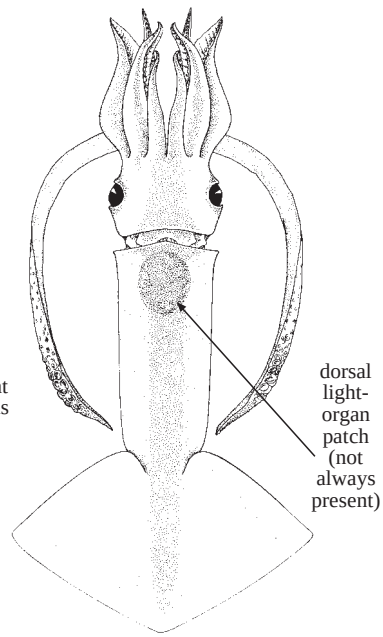
Frequent synonyms / misidentifications: *Symplectoteuthis oualaniensis* (Lesson, 1830) / None.

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

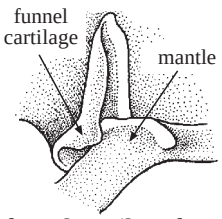
Diagnostic characters: Mantle cylindrical, very muscular, with abrupt caudal taper; fins large rhombic, with fin angle 60 to 70°. Head large, only slightly narrower than mantle. **Mantle element of T-shaped locking apparatus curved with an anterior bifurcation, fused to funnel element** along the posterior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



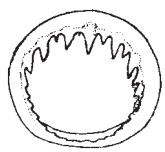
internal view of anterior ventral mantle
(after Wormuth, 1976)



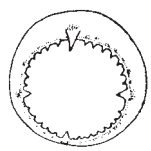
dorsal view



funnel cartilage fused with mantle cartilage



arm III sucker ring

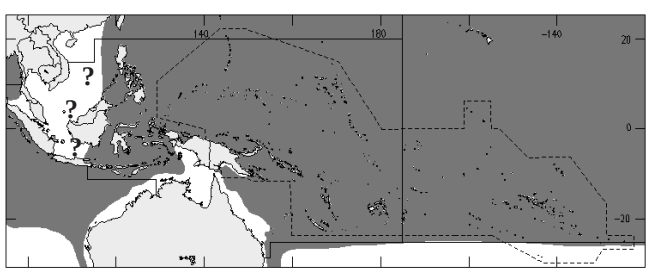


tentacular club sucker ring

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

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

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



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

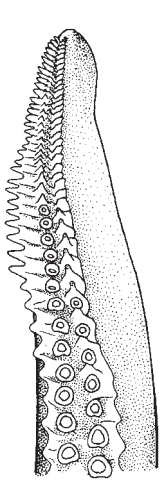
Todarodes pacificus Steenstrup, 1880

SQJ

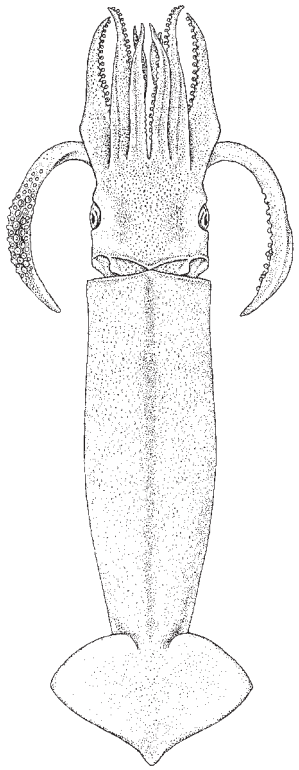
Frequent synonyms / misidentifications: *Ommastrephes sloani pacificus* Sasaki, 1929 / *Nototodarus philippinensis* Voss, 1962 (= *N. hawaiiensis* (Berry, 1912)).

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

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

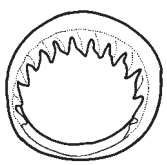


right arm IV of male hectocotylized

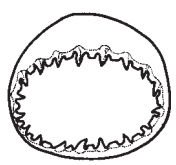


dorsal view

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



arm III sucker ring

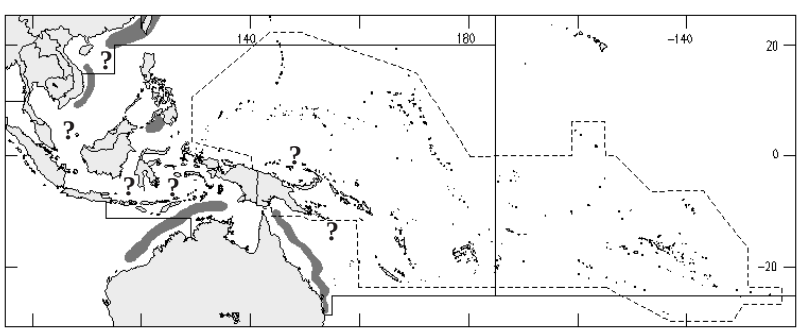


tentacular club sucker ring

(after Voss and Williamson, 1971)

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

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



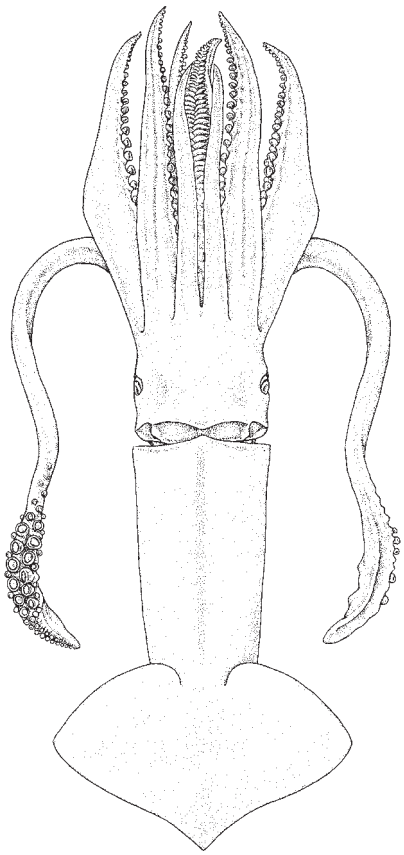
Distribution: Widespread in continental shelf and upper slope waters of the northwestern Pacific, from north of Japan to northern Australia.

Todaropsis eblanae (Ball, 1841)

Frequent synonyms / misidentifications: None / None.

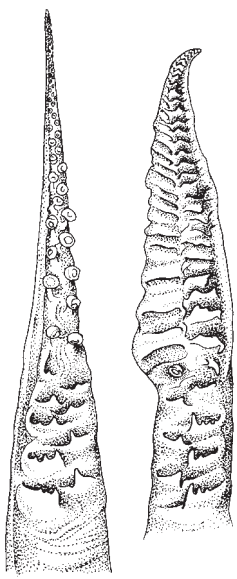
FAO names: En - Lesser flying squid; **Fr** - Toutenon souffleur; **Sp** - Pota costera.

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



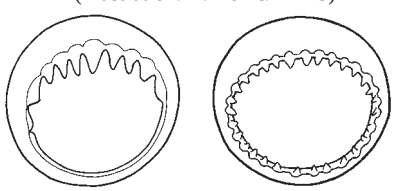
dorsal view

(illustration: K. Hollis/ABRS)



left arm **right arm**

arms IV of male hectocotylized

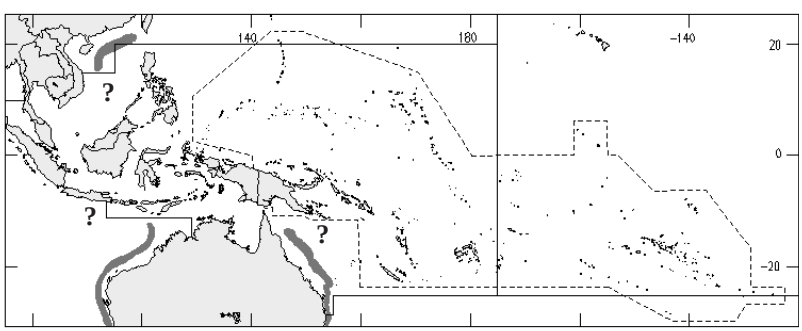


arm III sucker ring **tentacular club sucker ring**

Size: Maximum mantle length to about 160 mm.

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

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



THYSANOTEUTHIDAE

Rhomboid squids, diamondback squids

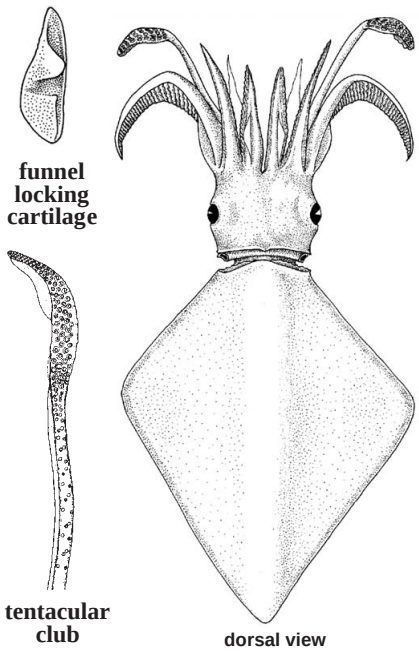
by M.C. Dunning

A single species occurring in the area.

Thysanoteuthis rhombus Troschel, 1857

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

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

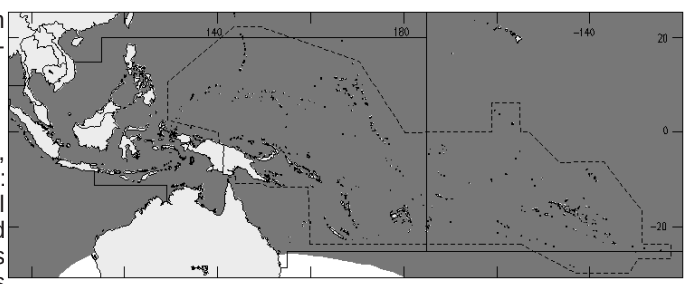


Diagnostic characters: A large squid. Mantle thick, muscular, tapering to a blunt tip posteriorly. **Fins rhombic, extending the entire length of mantle in adults**. **Funnel locking cartilage ⊣-shaped**, with a long narrow longitudinal groove and a short broad transverse groove. Sharp toothed suckers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

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

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

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



Similar families occurring in the area

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

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

Reference

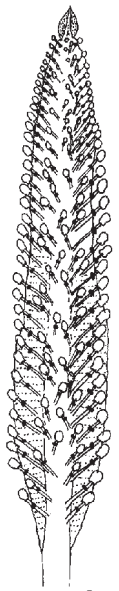
Nigmatullin, Ch.M., A.I. Arkhipkin, and R.M. Sabirov. 1995. Age, growth and reproductive biology of diamond-shaped squid *Thysanoteuthis rhombus* (Oegopsida: Thysanoteuthidae). *Mar. Ecol. Prog. Ser.*, 124:73-87.

CHIROTEUTHIDAE

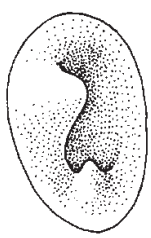
Chiroteuthid squids

by M.C. Dunning

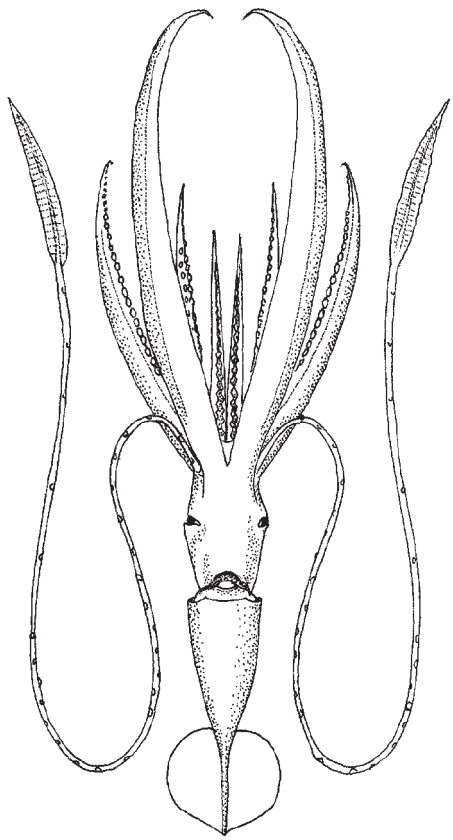
Diagnostic characters: Small to medium-sized squids (less than 400 mm mantle length) with somewhat **gelatinous bodies**. Characterized by an **oval mantle-funnel locking apparatus, the funnel cartilage with 1 or 2 knobs projecting towards the centre of the cavity. Arms with biserial, toothed suckers;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



tentacular club



funnel locking cartilage



ventral view

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

Similar families occurring in the area

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

List of species occurring in the area

Asperoteuthis acanthoderma (Lu, 1977)

Chiroteuthis imperator Chun, 1913

Reference

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

MASTIGOTEUTHIDAE

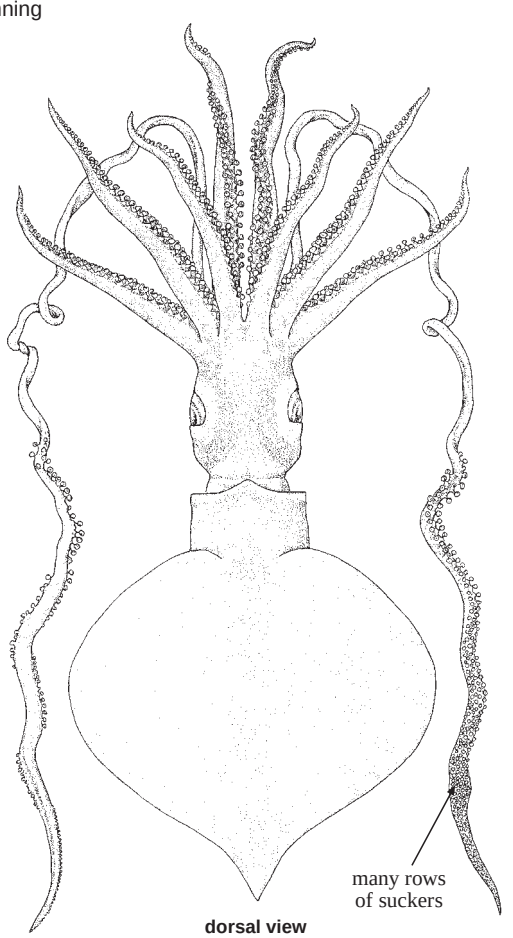
Mastigoteuthid squids

by M.C. Dunning

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

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

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



dorsal view

(***Mastigoteuthis cordiformis***)

(illustration: K.Hollis/ABRS)

Similar families occurring in the area

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

List of species occurring in the area

Mastigoteuthis cordiformis Chun, 1908

References

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

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

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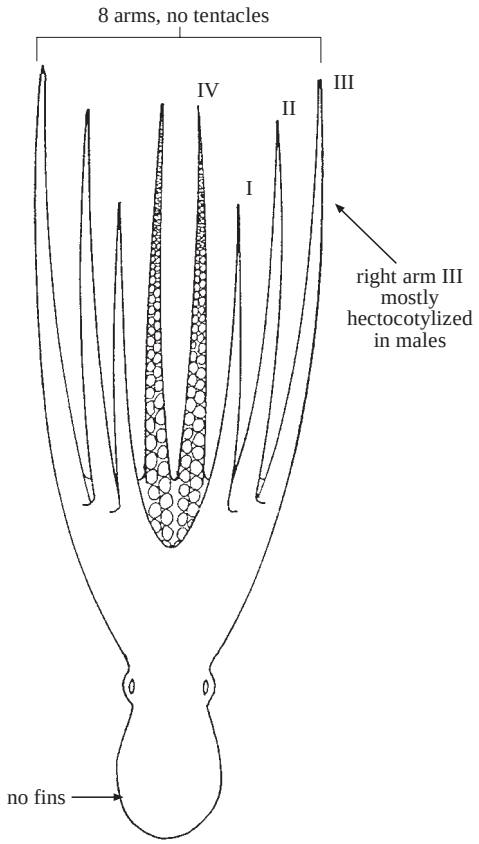
OCTOPODIDAE

Benthic octopuses

by M.D. Norman



dorsal view

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

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

Notes on the taxonomy of Octopodidae

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

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

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

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

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

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

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

Octopuses of deeper waters

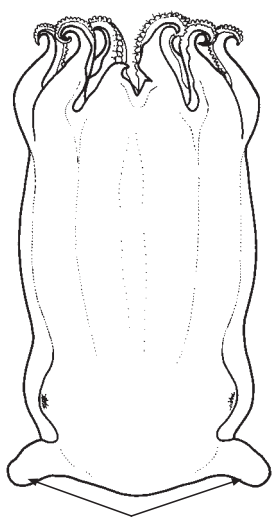
When trawling in deeper waters (more than 200 m), some genera of octopuses may be collected which are not normally encountered in shallower waters. These include species of the poorly-known genera *Scaeurgus* (characterized by a left hand hectocotylized arm in males and a lateral skin ridge around the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

Similar families occurring in the area

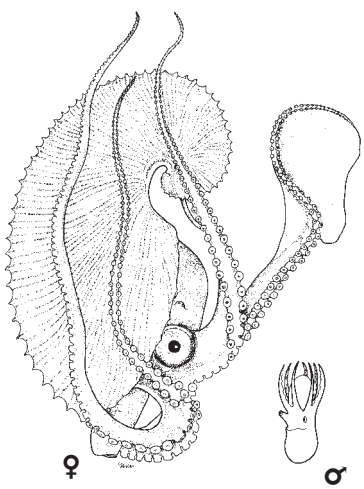
Note: the order Octopoda, as it currently stands, contains 2 distinct groups of octopuses: finned "cirrate" octopuses (suborder Cirrata) and the more familiar "incirrate" octopuses (suborder Incirrata). The latter includes the family Octopodidae.

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

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



Ophisthoteuthidae

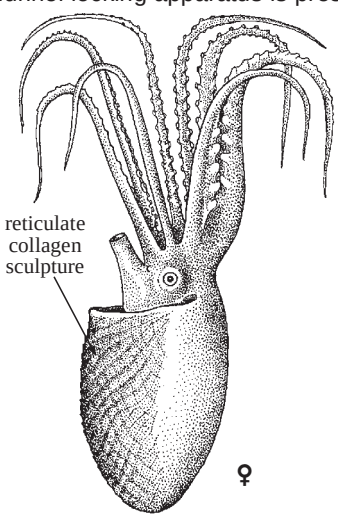


Argonautidae

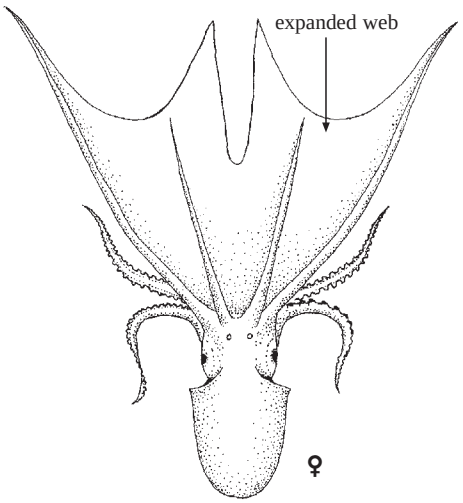
Ocythoidae (suborder Incirrata): contains a single species, the muscular pelagic octopus, *Ocythoe tuberculata*, in which the large female possesses a network of collagen-like ridges in the ventral mantle. The tiny male lacks the collagen sculpture and has a detachable third right arm in a pouch. A funnel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

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

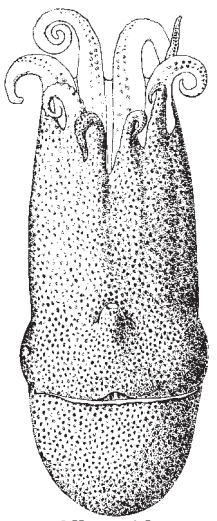
Alloposidae (suborder Incirrata): contains a single species, the deep-water semi-gelatinous octopus, *Haliphron atlanticus* (frequently treated in the literature under the junior synonym, *Alloposus pacificus*). Little is known of this octopus other than the male possesses a detachable third right arm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



Ocythoidae

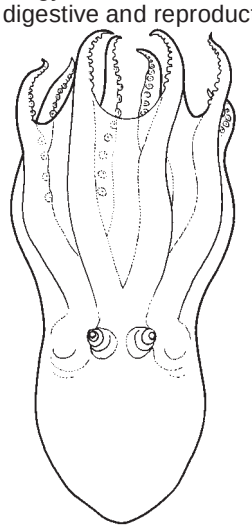


Tremoctopodidae

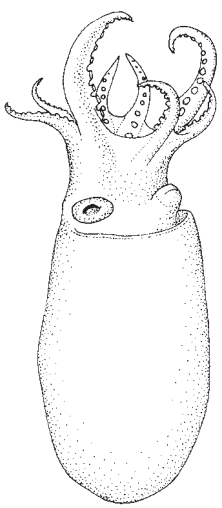


Alloposidae

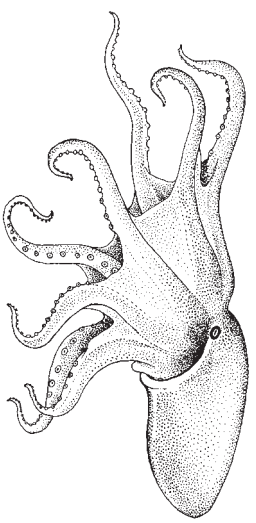
Families Amphitretidae, Bolitaenidae and Vitreledonellidae (suborder Incirrata): These 3 related families of rarely encountered open-water pelagic octopuses are distinguished from members of the family Octopodidae by their gelatinous consistency and a range of internal characters including distinctive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



Amphitretidae



Bolitaenidae



Vitreledonellidae

Key to the species of Octopodidae occurring in the area

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

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

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

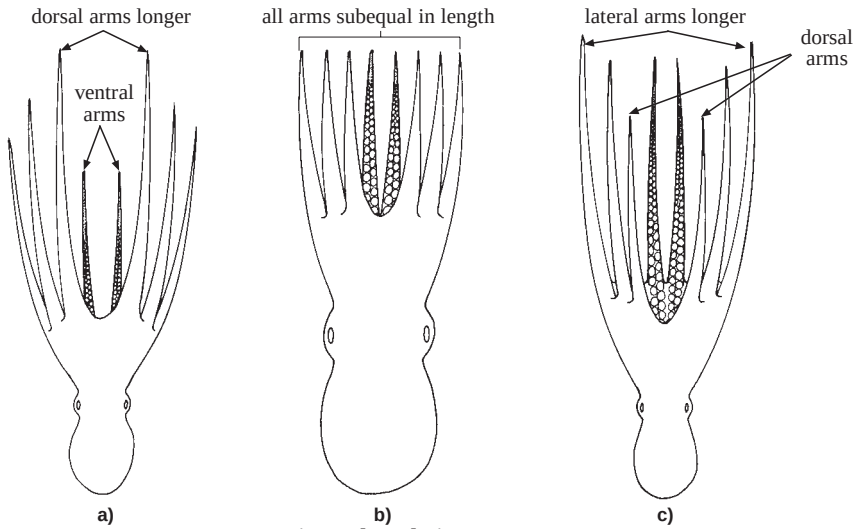


Fig. 1 dorsal view

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

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

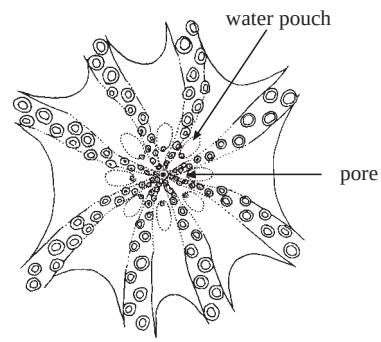


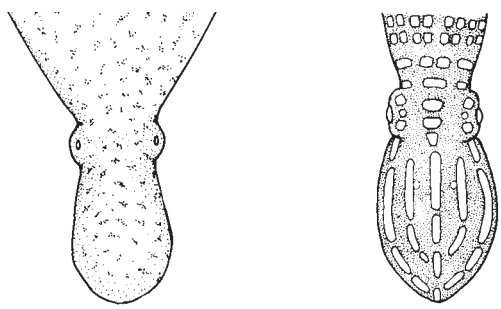
Fig. 2 *Cistopus indicus* (oral view)

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

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

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

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



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

Fig. 3 dorsal mantle and arm crown

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

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

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

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

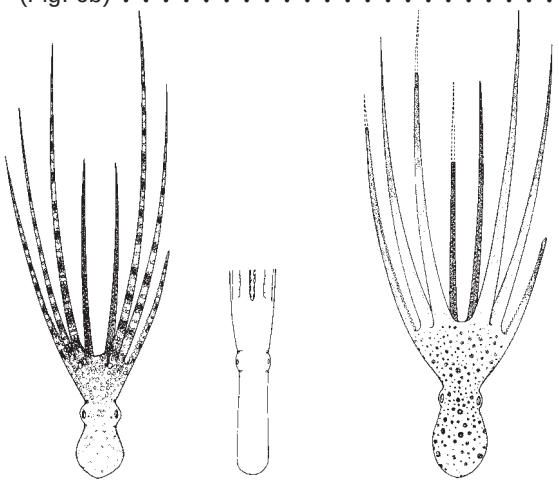


Fig. 4 ***Octopus aspilosomatis*** **Fig. 5** ***Octopus dierythraeus***

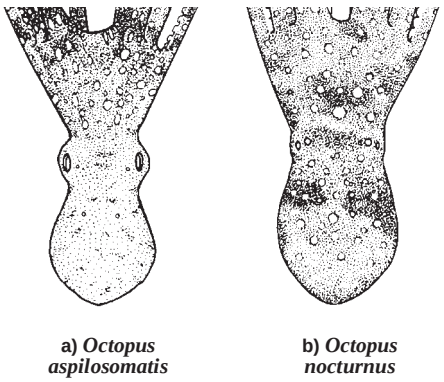


Fig. 6 dorsal mantle and arm crown

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

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

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

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

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

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

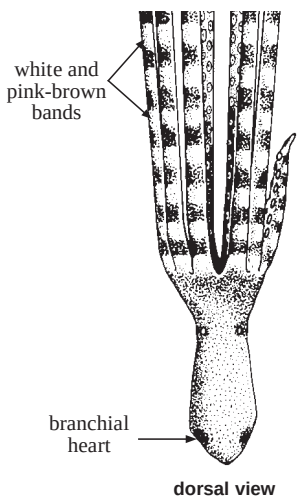


Fig. 7 ***Ameloctopus litoralis***

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

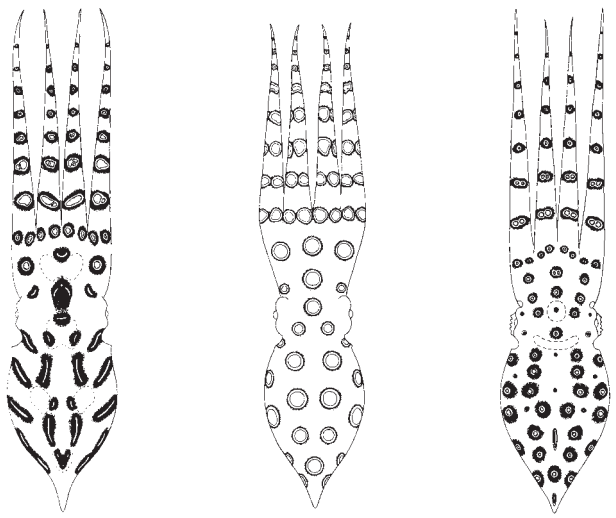
10b. Iridescent tissue absent or, if present, restricted to a pair of false eye-spots ("ocelli") on the arm crown over bases of arms II and III, one below each eye (as in Fig. 13a); arms short to long (more than 2 times mantle length) . . . . . → ***13***

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

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

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

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



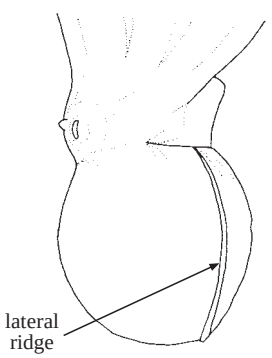
a) *Hapalochlaena fasciata* **b) *Hapalochlaena lunulata*** **c) *Hapalochlaena* cf. *maculosa***

Fig. 8 dorsal view

(after Roper and Hochberg, 1988)

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

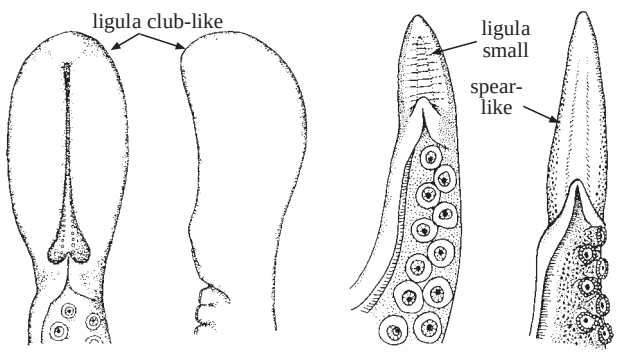
13b. Lateral ridge absent; ligula small to spear-like (Fig. 10b), never as a swollen club . . . . . → ***14***



lateral mantle

Fig. 9 *Octopus australis*

(from Stranks and Norman, 1993)



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

Fig. 10 tip of hectocotylized arm of male

(from Stranks and Norman, 1993)

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

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

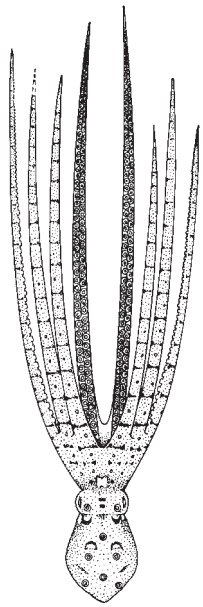


Fig. 11 typical representative of the *Octopus horridus* group

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

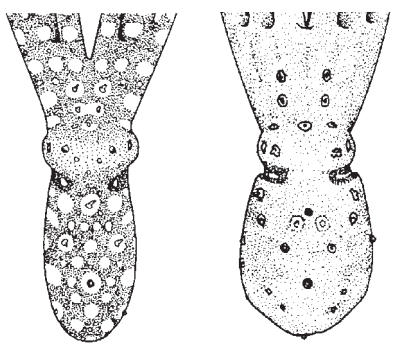
15b. Colour mottled grey-brown to dark grey on dorsal and lateral surfaces (Fig. 12b); sucker counts approximately 140 to 175 on hectocotylized arm; ligula small (less than 2% of arm length) . . . . . ***Octopus aculeatus***

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

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

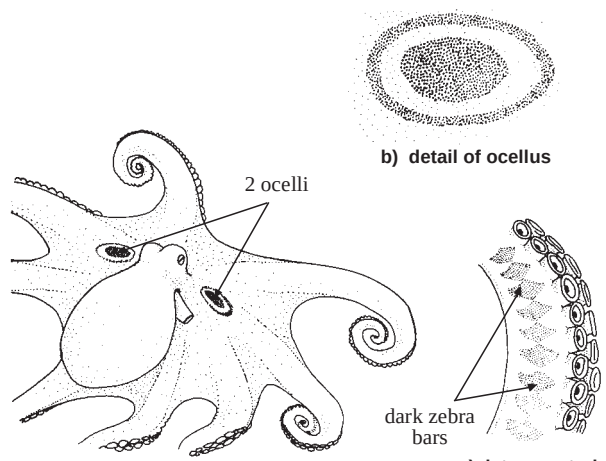
17a. False eye-spot (ocellus) present (Fig. 13a), as a dark oval spot surrounded by pale band of skin (not iridescent) and narrow dark outer band (Fig. 13b); dark zebra bars on lateroventral surfaces of all arms in submature and mature animals (Fig. 13c); sucker counts around 400 to 500 on normal arms,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

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



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

Fig. 12 dorsal mantle and arm crown



b) detail of ocellus

a) whole animal

c) lateroventral surface of arm

Fig. 13 *Octopus cyanea*

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

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

19a. Ocellus plain, without iridescent ring, as plain black spot (Fig. 14a) . . . . . ***Octopus exannulatus***

19b. Ocellus with iridescent ring within black spot (Fig. 14b) . . . . . → ***20***

20a. Widely-spaced dark transverse bars on all arms separated by approximately 3 to 5 suckers (Fig. 15a); mature males with 1 to 3 enlarged suckers (12th to 14th) on all arms at level of edge of web . . . . . ***Octopus polyzenia***

20b. Dark longitudinal lines down leading edge of arms I to III (Fig. 15b), never transverse bars; enlarged suckers of mature males (if present) on arms II and III (never I) . . . . . → ***21***

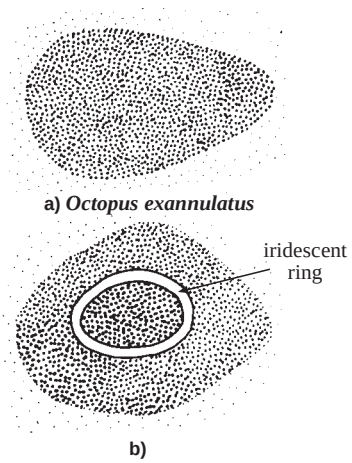


Fig. 14 detail of ocellus

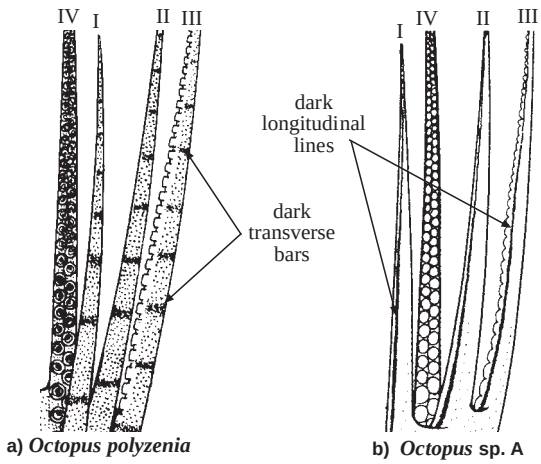


Fig. 15 right arms I to IV

21a. Circular cluster of dark spots above each eye forming petals of "flower" pattern (Fig. 16a); 4 longitudinal rows of dark spots (as solid stripes in some colour patterns) on dorsal body; large digit of skin in white spot on dorsal arm crown anterior to eyes; approximately 100 suckers on hectocotylized arm of males . . . . . ***Octopus mototi***

21b. Base colour of whole animal cream-brown with short black longitudinal bar through each eye (Fig. 16b); pedal of black spots on head and longitudinal stripes on dorsal mantle absent; large digit of skin anterior to eyes absent; 65 to 80 suckers on hectocotylized arm of males . . . . . ***Octopus* sp. A**

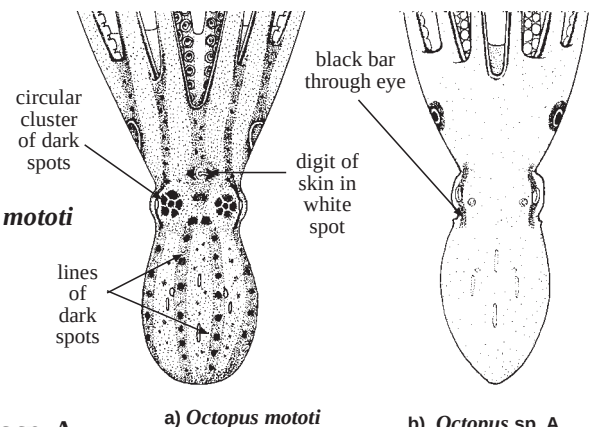


Fig. 16 dorsal view

22a. Pale longitudinal stripe present along midline of dorsal mantle (Fig. 17); pattern of circular cream to green spots bound by dark boundaries over all dorsal and lateral mantle and arm crown (Fig. 17), distinct on lateral faces of arms I to III . . . ***Octopus aegina***

22b. Longitudinal stripe along dorsal midline of mantle absent; dark purple/black longitudinal stripe along lateral faces of arms I to III, in marked contrast with white or pink suckers (Fig. 18a); body colour variable from pale purple-brown to deep purple-black; purple black grooves between patches on lateral arm crown form distinctive branching reticulations (Fig. 18a); distinct white triangle under eye (Fig. 18b) . . . . ***Octopus marginatus***

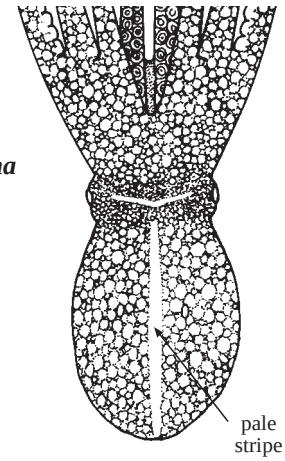


Fig. 17 ***Octopus aegina***

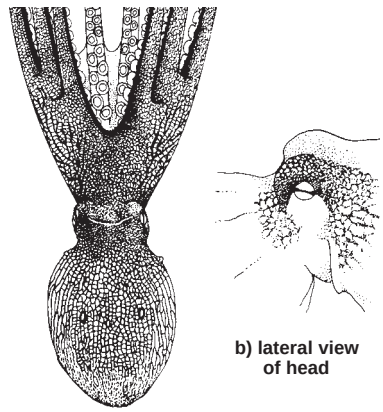


Fig. 18 ***Octopus marginatus***

List of species occurring in the area

The symbol ♜ is given when species accounts are included.

	Distribution	Harvest
♜ *Ameloctopus litoralis* Norman, 1992b	Northern Australia	none
♜ *Cistopus indicus* (Rapp, 1835)	SE Asia to India	high
♜ *Hapalochlaena fasciata* (Hoyle, 1886)	Australia, southern Qld and NSW	none
♜ *Hapalochlaena lunulata* (Quoy and Gaimard, 1832)	Indo-Malayan Arch. to Vanuatu	none
♜ *Hapalochlaena* cf. *maculosa* (from Roper and Hochberg, 1988)	Great Barrier Reef	none
♜ *Octopus abaculus* Norman and Sweeney, 1997	Philippines	none known
♜ *Octopus aculeatus* d'Orbigny, 1835	Philippines	low
♜ *Octopus aegina* Gray, 1849[1/]	Indian Ocean and SE Asia	high
♜ *Octopus alpheus* Norman, 1993a	Southern Great Barrier Reef	none
♜ *Octopus aspilosomatis* Norman, 1993a	Northern Great Barrier Reef	none
♜ *Octopus australis* Hoyle, 1885	Australia, southern Qld and NSW	low
Octopus bocki Adam, 1945	Tropical Pacific	none
♜ *Octopus cyanea* Gray, 1849	Tropical Indo-West Pacific	moderate
♜ *Octopus dierythraeus* Norman, 1993a	Northern Australia	none
♜ *Octopus exannulatus* Norman, 1993b	Indo-Malayan Archipelago	low
♜ *Octopus graptus* Norman, 1993a	Northern Australia	low
♜ *Octopus* cf. *luteus* (from Norman and Sweeney, 1997)	Philippines	moderate
♜ *Octopus marginatus* Taki, 1964 [2/]	Indian Ocean and SE Asia	low
♜ *Octopus mototi* Norman, 1993b	Tropical Pacific	none
♜ *Octopus nocturnus* Norman and Sweeney, 1997	Philippines	low
♜ *Octopus ornatus* Gould, 1852	Tropical Indo-West Pacific	low
♜ *Octopus polyzenia* Gray, 1849	Northern Australia	none
Octopus pumilus Norman and Sweeney, 1997	Philippines	none known
♜ *Octopus tetricus* Gould, 1852 [3/]	Australia, southern Qld and NSW	low
Octopus tonganus Hoyle, 1885	Tonga	none known
Octopus vitiensis Hoyle, 1885	Tropical Pacific	none known
Octopus wolfi Wülker, 1913	Tropical Indo-West Pacific	none known
♜ *Octopus* sp. A	Indo-Malayan Archipelago	very high

1/ The genuine *O. aegina* is treated in Roper et al. (1984) under the name of a junior synonym, *O. dollfusi*.
2/ *O. marginatus* is treated in Roper et al. (1984) incorrectly under the name of the related *O. aegina*.
3/ The species treated under the name *O. tetricus* in Roper et al. (1984) is not identical with *O. tetricus* described originally from eastern Australia.

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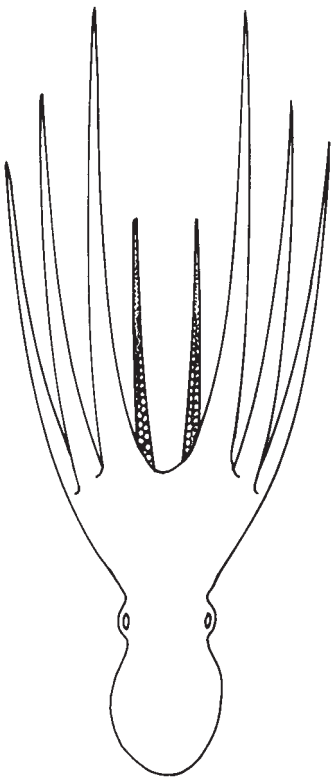
Cistopus indicus (Rapp, 1835 in Férussac and d'Orbigny, 1834-48)



dorsal view

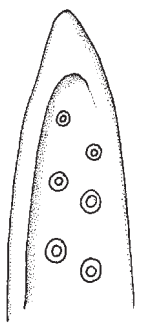
Frequent synonyms / misidentifications: None / *Octopus macropus* Risso, 1826.

FAO names: En - Old woman octopus (from Chinese "Laai Por"); **Fr** - Poulpe vieille femme; **Sp** - Pulpo perforado.

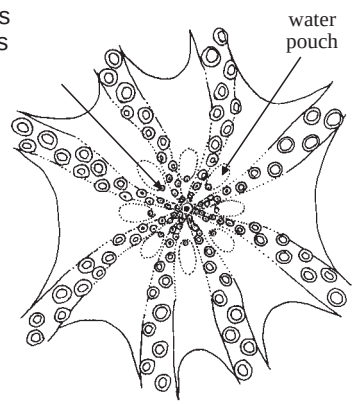
Diagnostic characters: Large species. **Water pouches present, embedded in the web around the mouth, one in each sector between arms**. Pouch opens through a "water pore" situated at the level of third or fourth sucker from the mouth. Arms long, 6 to 7 times mantle length. Dorsal arms longer than ventral arms (arm formula I.II.III.IV). **Right third arm of males hectocotylized with tiny blunt ligula** (less than 1% of arm length) **and no apparent calamus**. Gills with 9 to 11 lamellae per demibranch. In larger animals, around 120 to 190 suckers on each normal arm, 60 to 130 on hectocotylized arm of male (see comments below). One or 2 enlarged suckers (11th to 13th) sometimes visible in mature males on arms I, II, and IV, but never on arm III. **Colour:** pink or cream, to slate grey with iridescent purple sheen on lateral mantle in fresh specimens; skin sculpture consisting of a few scattered low papillae on the dorsal mantle; no large primary papillae.

Size: Maximum mantle length 180 mm, total length to over 1 m; weight to 2 kg.

Habitat, biology, and fisheries: Known from muddy coastal waters, living subtidally on soft substrates to depths of at least 80 m. Nothing known of diet or foraging behaviour. No mature females found. The function of the unique water pores is not known. There may be more than 1 species treated under this species name. Specimens from Thailand and Singapore, and west to India appear to show lower sucker counts (around 110 to 140 on normal arms, less than 80 on hectocotylized arm of males) and distinctly enlarged suckers in males, compared with animals from further north and east (180 to 200 suckers on normal arms, 110 to 130 suckers on hectocotylized arm of males, and enlargement of suckers in males slight or absent). These octopuses form major fisheries, important in subsistence, local small-scale and larger commercial fisheries in many coastal Asian countries, harvested primarily by trawlers.

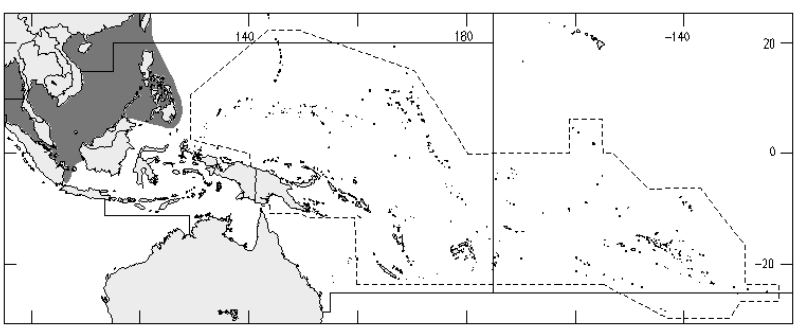


tip of hectocotylized arm of male

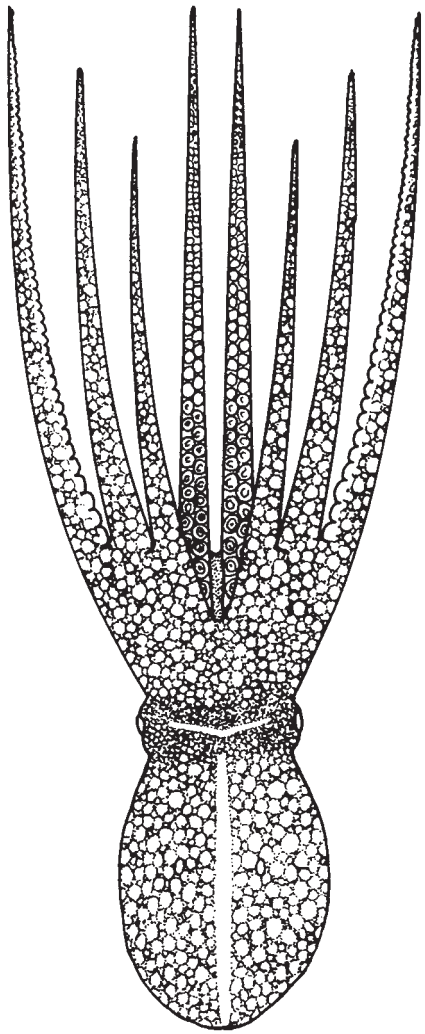


oral view

Distribution: *Cistopus indicus*, as it currently stands, occurs in tropical and subtropical coastal waters of the Asian mainland from China, the Philippines, and northern Indonesia, south to Malaysia and west to Pakistan.



Octopus aegina Gray, 1849



dorsal view

Frequent synonyms / misidentifications: *Octopus dollfusi* Robson, 1828; *O. hardwickei* Gray, 1849 / None.

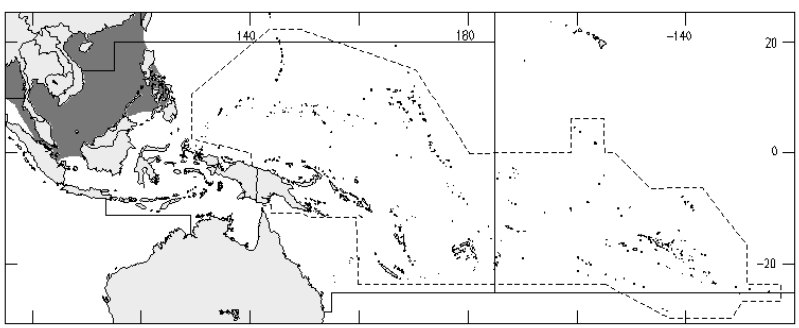
FAO names: En - Marbled octopus; **Fr** - Poulpe nain; **Sp** - Pulpo marmóreo.

Diagnostic characters: Moderate-sized robust species. Arms relatively short, 2 to 3 times mantle length. Lateral and ventral arms longest (arm formula IV=III.II.I). Web deep on lateral arms, very shallow between dorsal arms. Right third arm of males hectocotylized with moderate length sharp ligula (4 to 6% of arm length) with distinct calamus. Gills with 8 or 9 lamellae per demibranch. In larger animals, around 110 to 130 suckers on each normal arm, around 60 to 70 on hectocotylized arm of male. Mature males with 2 or 3 enlarged suckers (6^{th} to 8^{th}) on arms II and III (slightly enlarged on arms IV). **Colour: pattern of reticulations formed by dark grooves defining large, and smaller intermediate, circular patches; reticulated pattern most distinctive on dorsal arm faces; cream coloured longitudinal stripe along dorsal midline of mantle; cream transverse head bar visible in many specimens**; skin sculpture of regular round patches and grooves matching colour pattern; diamond of longitudinal skin ridges on dorsal mantle.

Size: Maximum mantle length 90 mm, total length to around 300 mm; weight to around 100 g.

Habitat, biology, and fisheries: Known from muddy coastal waters found subtidally on soft substrates to depths of at least 40 m. Nothing known of diet or foraging behaviour. This octopus is a major fisheries species throughout coastal mainland Asia, important in commercial trawl fisheries, particularly from the Gulf of Thailand and South China Sea. Exported throughout the world on a large scale along with *Octopus* sp. A (tens of thousands of tonnes annually). Both species are sold and prepared under the name “baby octopus” (at least in Australia and the United States). *Octopus aegina* has frequently been treated under the name of a junior synonym, *Octopus dollfusi*. Large catches of this species reported from Gulf of Thailand under the name *Octopus* “*dollfusi*”.

Distribution: Found in coastal waters of continental Asia, from China south to Malaysia and west to at least Madras, India. Also reported from the Philippines.

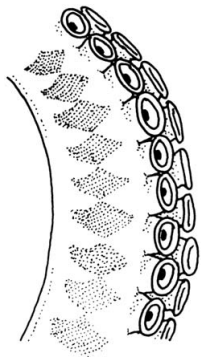


Octopus cyanea Gray, 1849

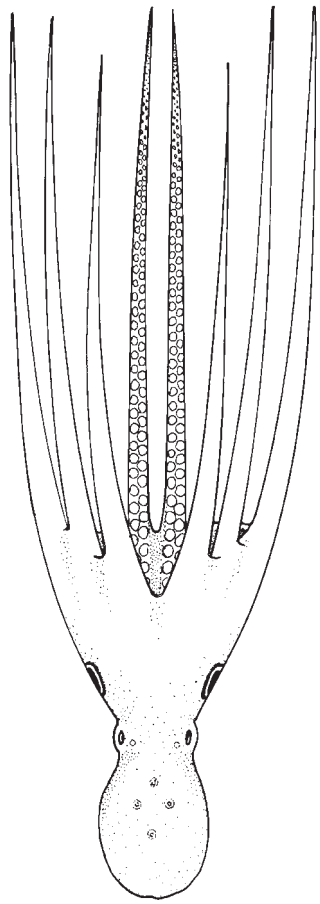
Frequent synonyms / misidentifications: *Octopus magnocellatus* (Taki, 1964); *O. marmoratus* Hoyle, 1885 / *O. bimaculatus* Verrill, 1883.

FAO names: En - Day octopus (formerly reported as big blue octopus).

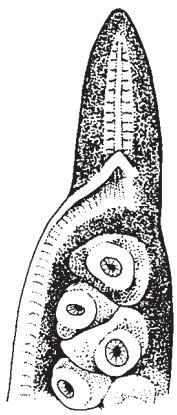
Diagnostic characters: Large and robust ocellate octopus. Arms robust and long, 4 to 6 times mantle length. Dorsal arms slightly shorter than other arms (arm formula IV=III=II.I). Right third arm of males hectocotylized with **tiny ligula (1 to 2% of arm length).** Gills with 9 to 11 lamellae per demibranch. In larger animals, 400 to 500 suckers on each normal arm, 180 to 230 on hectocotylized arm of male. Mature males with 2 to 4 enlarged suckers (12th to 14th) on arms II and III (slightly enlarged on arm IV). **Colour:** variable from dark chocolate brown through mottled patterns to pale grey; **ocellus present as plain black spot surrounded by pale and dark rings; dark zebra bars on ventrolateral faces of all arms in submature and mature animals**; skin sculpture of irregular patches separated by distinct grooves interspersed by large primary papillae, including diamond of 4 papillae on dorsal mantle and large papilla over each eye.



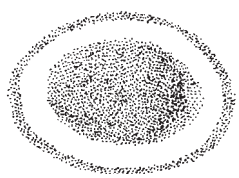
lateroventral surface of arm



dorsal view



tip of hectocotylized arm

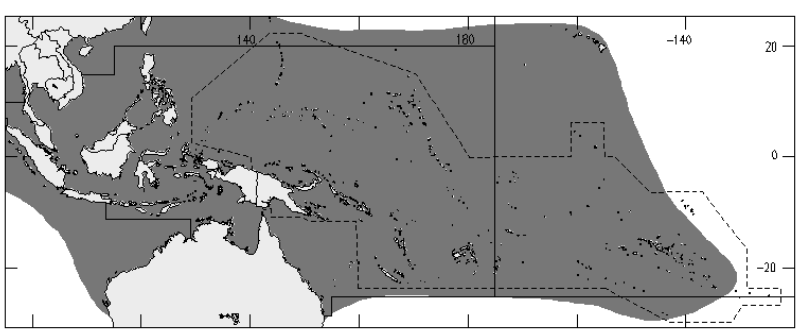


ocellus

Size: Maximum mantle length 160 mm, total length to over 1 m; weight to 6 kg.

Habitat, biology, and fisheries: Known from clear tropical waters, from intertidal reefs to depths of at least 25 m, on coral reefs amongst both live corals and dead coral rubble. Preys primarily on crabs and other crustaceans, foraging throughout the day with peak activity at dusk and dawn. Occupies lairs in coral or rock, often visible by midden of large crab carapaces. Females lay up to 600 000 eggs in festoons, each egg around 1 mm long. Important fisheries species collected in large numbers throughout its range in local subsistence and small-scale fisheries. Frequently sold in fish markets, particularly through the central and southern tropical Pacific, in countries such as Fiji, Tonga, Solomons, New Caledonia, Papua New Guinea, and Philippines. Harvested using spear, lures, traps, and chemical irritants to flush animals from lairs.

Distribution: Found widely throughout shallow waters of the tropical Indo-West Pacific region, from Hawaii in the east to the east African coast in the west. Reported as far north as southern Japan and as far south as New South Wales, Australia.

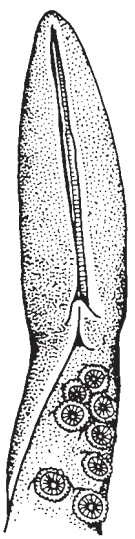


Octopus graptus Norman, 1993a

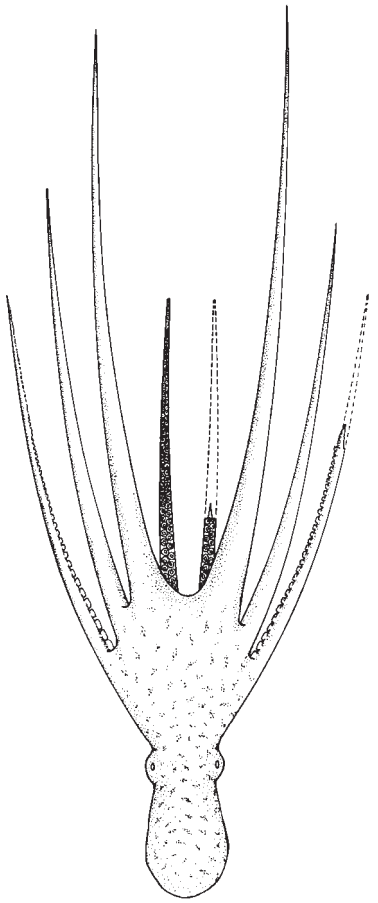
Frequent synonyms / misidentifications: None / None.

FAO names: En - Scribbled night octopus.

Diagnostic characters: Large robust and muscular species. Arms long, 4.5 to 7 times mantle length. Dorsal arms longer than ventral arms (arm formula I.II.III.IV). Webs moderately deep, deepest 16 to 22% of longest arm. Right third arm of males hectocotylized with large cylindrical ligula (around 6% of arm length), with deep groove. Gills with 13 or 14 lamellae per demibranch. In larger animals, around 200 to 280 suckers on each normal arm, around 80 to 90 on hectocotylized arm of male. Suckers on longer dorsal arms proportionally larger than other arms, but none markedly enlarged. **Eggs large (to 40 mm) and produced in low numbers (to 700). Colour:** white to pink base colour with **dark irregular spots and short lines ("scribbles") over dorsal surfaces**; distal tips of all arms grading to crimson purple; skin sculpture simple, consisting of scattered low papillae evenly distributed over dorsal surfaces.



tip of hectocotylized arm

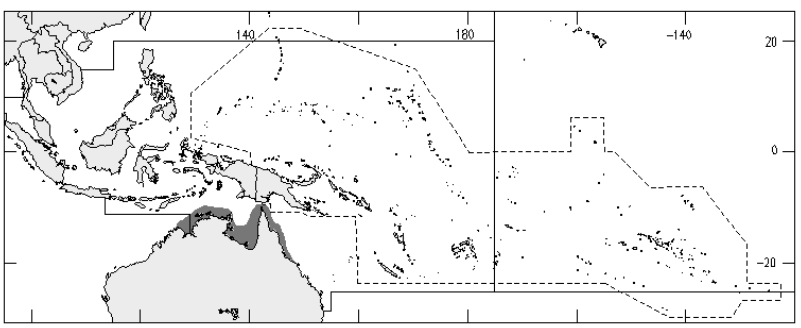


dorsal view

Size: Maximum mantle length 200 mm, total length to over 1.3 m; weight to 5 kg.

Habitat, biology, and fisheries: Known from muddy coastal waters, living subtidally on soft substrates to depths of at least 40 m. Trawl capture data shows this species is caught at night, presumably when it is emerged from lairs and foraging. Captive animals emerge at night to forage, taking a range of prey including crustaceans, bivalves and fish. Females lay large eggs, attached singly to the roof of a lair, not in festoons. This large octopus is commercially harvested as bycatch in prawn trawl fisheries, sold for both human consumption and as bait.

Distribution: Restricted to tropical muddy coastal waters of northern Australia from the Great Barrier Reef to northern Western Australia.



Octopus* cf. *luteus (from Norman and Sweeney, 1997)

Frequent synonyms / misidentifications: None / *Octopus macropus* Risso, 1826.

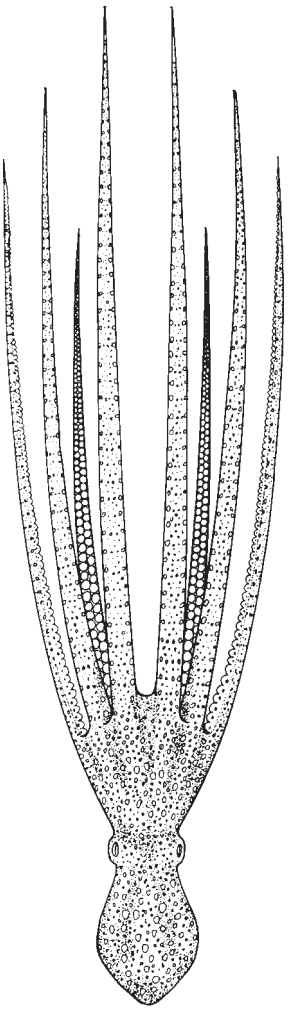
FAO names: En - Small-spot night octopus.

Diagnostic characters: Large elongate species. Arms long, 4.5 to 5.5 times mantle length. Dorsal arms longer than ventral arms (arm formula I.II.III.IV). Webs moderately deep, deepest around 15 to 20% of longest arm. Right third arm of males hectocotylized with large cylindrical ligula with deep groove. Gills with 12 or 13 lamellae per demibranch. In larger animals, greater than 200 suckers on each normal arm, approximately 80 to 90 on hectocotylized arm of male. Suckers on longer dorsal arms proportionally larger than other arms, but none markedly enlarged. **Eggs small type in submature females examined. Colour:** pink to bright red base colour with **many small white spots over dorsal mantle**, arm crown, webs, and arms; **skin sculpture of raised papillae in centres of white spots, interspersed by smaller low papillae over all dorsal and lateral surfaces.**

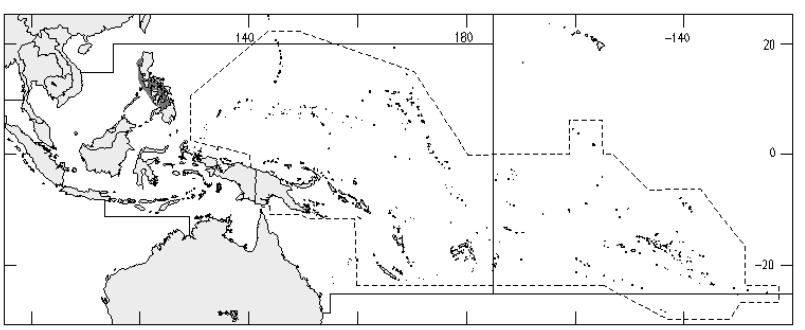
Size: Maximum mantle length at least 90 mm, total length to over 0.5 m; weight to at least 500 g.

Habitat, biology, and fisheries: Little known of the biology and distribution of this species. Material examined was collected from coral rubble and rocky reefs at depths between 1 and 82 m. Females lay small type eggs, no mature females examined. This octopus is taken in local subsistence harvests and in line and trawl fisheries as bycatch. This species shows similarities with *Octopus luteus* Sasaki, 1929, from Taiwan Province of China and coastal waters of mainland China. Resolution of the identity of this species is not possible until more mature material is available.

Distribution: At this stage, the species treated here is only known from the Philippines.



dorsal view



Octopus marginatus Taki, 1964

Frequent synonyms / misidentifications: *Octopus striolatus* Dong, 1976 / *Octopus aegina* Gray, 1849.

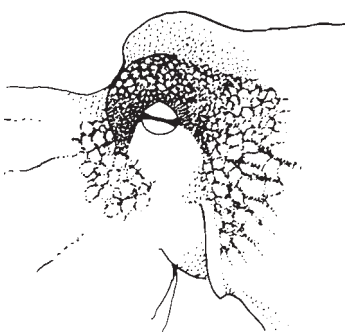
FAO names: En - Sand bird octopus (from Chinese "Saa liu"); **Fr** - Poulpe des sables; **Sp** - Pulpo reticulado.

Diagnostic characters: Moderate-sized octopus. Arms short, 2 to 3 times mantle length. Dorsal arms slightly shorter than other arms (arm formula IV=III=II.I or III.IV=II.I). Right third arm of males hectocotylized with small ligula (1.5 to 3.5% of arm length). Gills with 9 to 11 lamellae per demibranch. Up to 150 suckers on each normal arm, 60 to 85 on hectocotylized arm of male. Mature males possess 4 to 5 slightly enlarged suckers (7th to 11th) on arms II and III. **Colour:** pattern typically orange-brown to purple with dark reticulations defining distinct patches in irregular longitudinal rows; **suckers white to pink contrasting against dark brown to black along leading edge of arms I to III**; narrow transverse "head bar" visible in live animals; **white triangle below each eye; dark reticulations distinctive on lateral arm crown** in same position as false eye-spots in ocellate species; skin sculpture of regular patches separated by distinct grooves; diamond of 4 longitudinal skin ridges on dorsal mantle and large papilla over each eye.

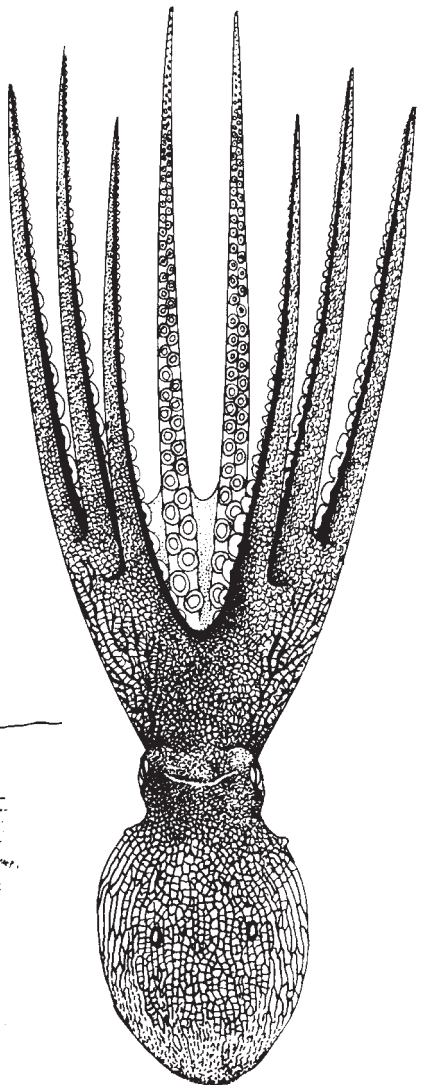
Size: Maximum mantle length around 100 mm, total length to around 300 mm; weight to 400 g.

Habitat, biology, and fisheries: Known from coastal muddy waters on mud and sand substrates, subtidal to depths of at least 190 m. Little known of biology or behaviour. Females lay up to 100 000 small eggs, up to 3 mm long. Important fisheries species collected by trawlers, pots and lines. Taxonomy confused with *Octopus aegina* (treated above) and *O. kagoshimensis* from Japan.

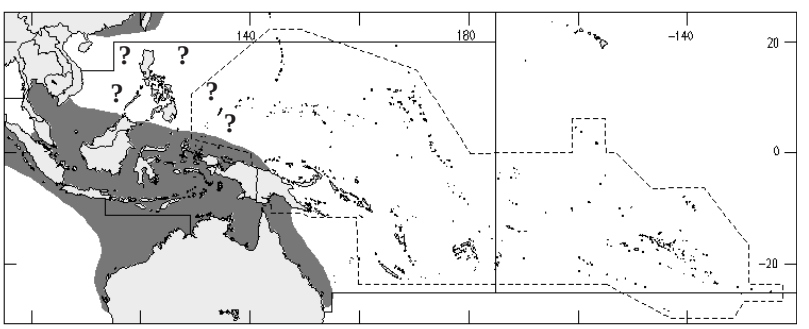
Distribution: Found in tropical continental waters of the Indian Ocean, from the Red Sea and East Africa to Southeast Asia and eastern Australia.



lateral view of head



dorsal view



Octopus nocturnus Norman and Sweeney, 1997

Frequent synonyms / misidentifications: None / *Octopus macropus* Risso, 1826.

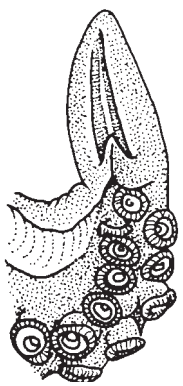
FAO names: En - Philippine night octopus.

Diagnostic characters: Moderate-sized octopus. Arms long, 5 to 6.5 times mantle length. Dorsal arms distinctly longer than other arms (arm formula I.II.III.IV). **Webs shallow, deepest 10 to 15% of longest arm.** Right third arm of males hectocotylized with moderate length ligula (3 to 5% of arm length). Gills with 10 or 11 lamellae per demibranch. In larger specimens, 180 to 220 suckers on each normal arm, 80 to 90 on hectocotylized arm of male. No enlarged suckers in either sex. **Eggs small type and numerous (more than 1 000) in submature females examined. Colour:** pattern of red-brown base with irregular darker blotches and **white spots over dorsal surfaces including mantle**; white spots paired along length of arms; skin sculpture of small low round papillae; no primary papillae visible.

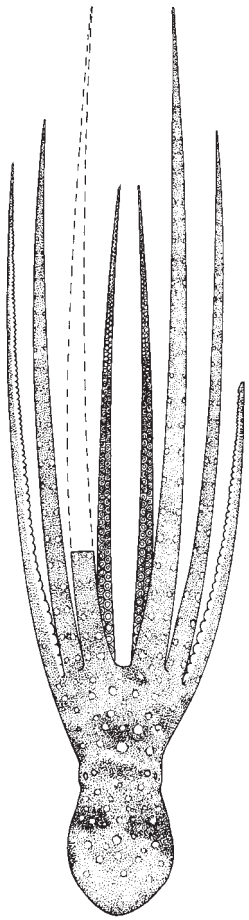
Size: Maximum mantle length around 60 mm, total length to around 350 mm; weight to at least 100 g.

Habitat, biology, and fisheries: Known primarily from intertidal coral and rocky reefs. Deepest record a poison station affecting between a depth of 1.5 and 4.5 m. Members of this species emerge at night to forage during low tides on intertidal reefs. Females produce small eggs in large numbers. Collected in local subsistence harvest, speared on night low tides, historically using burning bamboo torches to find active octopuses.

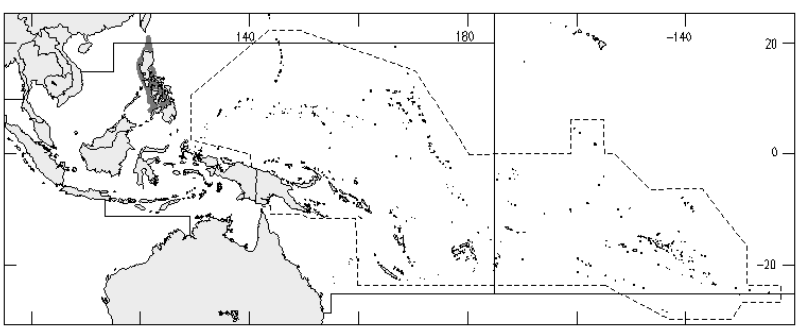
Distribution: At this stage, known only from throughout the Philippines.



tip of hectocotylized arm of male



dorsal view



Octopus ornatus Gould, 1852

Frequent synonyms / misidentifications: *Octopus* (or *Callistoctopus*) *arakawai* (Taki, 1964) / None.

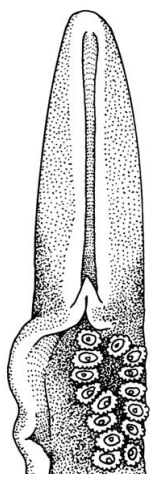
FAO names: En - White-striped octopus.

Diagnostic characters: Large and elongate octopus. **Arms long, 6 to 8 times mantle length.** Dorsal arms much longer than ventral arms (arm formula I.II.III.IV). **Webs shallow, deepest 5 to 11% of longest arm.** Right third arm of males hectocotylized with large cylindrical ligula (4 to 6% of arm length), with deep groove. Gills with 13 or 14 lamellae per demibranch. In larger animals, 300 to 400 suckers on each normal arm, 150 to 170 on hectocotylized arm of male. Suckers on longer dorsal arms proportionally larger than other arms, but none markedly enlarged. **Colour:** pattern of brown to deep red base colour with white markings; **distinctive pattern of longitudinal white bars on dorsal mantle**, visible in live, fresh dead and preserved material; large paired white spots along arms; skin sculpture of low irregular patches separated by distinct grooves; **elongate skin flaps can be raised within longitudinal white bars on mantle.**

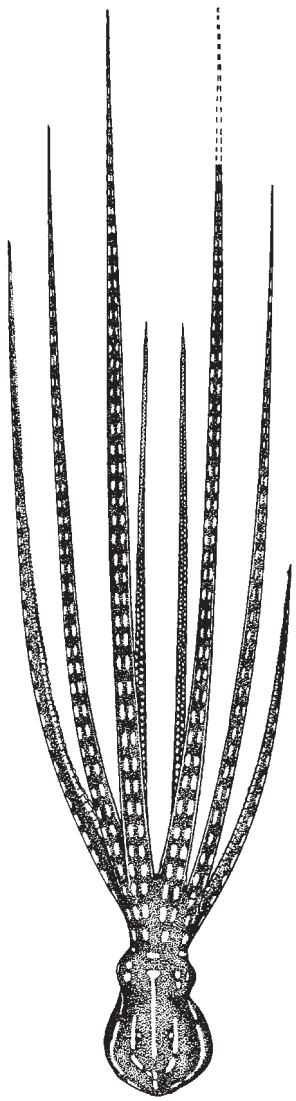
Size: Maximum mantle length 130 mm, total length to over 1 m; weight to at least 1 kg.

Habitat, biology, and fisheries: Known from clear tropical waters, from intertidal shallows to a depth of at least 10 m, on coral reefs amongst both live corals and dead coral rubble. Forages exclusively at night, preying primarily on crustaceans and other octopus species. Typically encountered foraging along the edges of intertidal reefs adjacent to deeper water. Sometimes encountered swimming at the surface in or near lagoons. Occupies deep lairs during the day, the entrance of which is blocked at several levels. Females lay up to 35 000 eggs in festoons, each egg around 3 to 4 mm long. Harvested on a small scale throughout its range, primarily in local subsistence fisheries. It is sold in fish markets in the central and southern tropical Pacific, but less frequently than *Octopus cyanea*. Harvested at night using torches and spears in at least Hawaii.

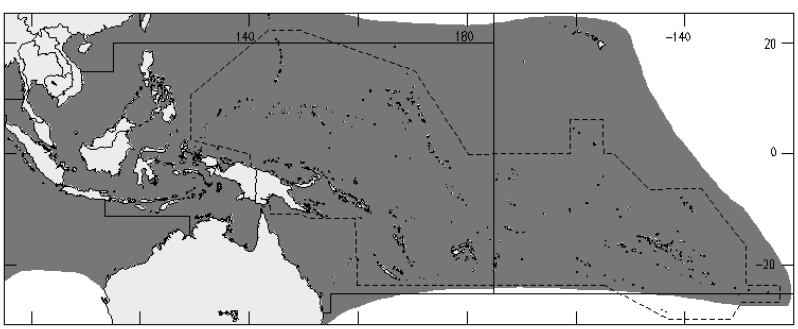
Distribution: Found widely throughout shallow waters of the tropical Indo-West Pacific region, from Hawaii in the east to the east African coast in the west. Reported as far north as southern Japan (as *Callistoctopus arakawai*) and as far south as New South Wales, Australia.



tip of hectocotylized arm III



dorsal view



Octopus tetricus Gould, 1852

Frequent synonyms / misidentifications: None / *Octopus cyanea* Gray, 1849; *O. cyaneus* Gray, 1849.

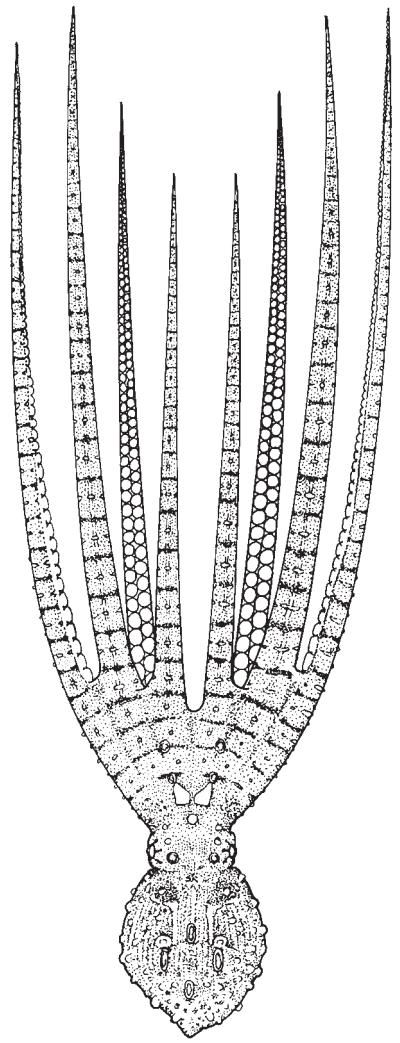
FAO names: En - Common Sydney octopus.

Diagnostic characters: Large and robust species. Arms moderate to long, 3 to 4.5 times mantle length. Dorsal arms slightly shorter and less robust than other arms (arm formula IV=III=II.I). Right third arm of males hectocotylized with **tiny ligula (1 to 2% of arm length).** Gills with 8 or 9 lamellae per demibranch. In larger animals, around 220 to 260 suckers on each normal arm, around 140 to 160 on hectocotylized arm of male. Mature males with around 3 to 5 enlarged suckers (13^{th} to 17^{th}) on arms II and III. **Colour:** active animals cream to mottled orange and dark brown; transverse narrow dark bands along arms in some colour patterns; resting **animals within lairs show grey dorsal surfaces, orange arm faces and eyes with a white iris; skin sculptured in rounded patches separated by distinct grooves**; capable of raising large papillae over dorsal surfaces, including 4 in diamond pattern on dorsal mantle and 1 above each eye.

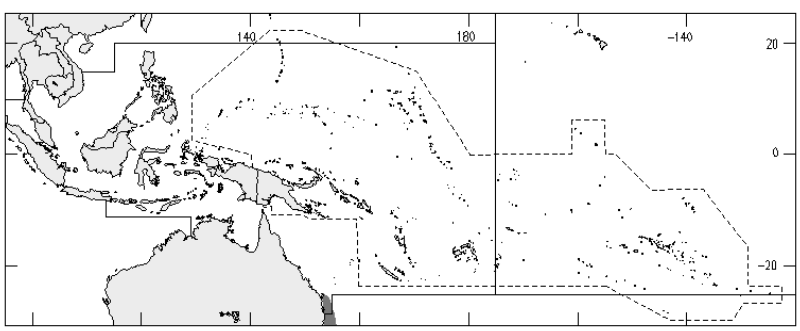
Size: Maximum mantle length at least 140 mm, total length to over 0.6 m; weight to 1 kg.

Habitat, biology, and fisheries: Known from shallow coastal waters, living subtidally on and adjacent to rocky reefs, to a depth of at least 60 m. Active primarily at night, although alert in the mouth of lairs throughout the day. Preys primarily on crabs, but will also take shellfish and finfish (at least in captivity). Occupies lairs in rock crevices or excavated under rocks on sand or mud. Females lay over 150 000 eggs in festoons, each egg around 2 to 3 mm long. Moderate scale harvest as bycatch in prawn and finfish trawl fisheries. Frequently sold in fish markets in New South Wales and southern Queensland. A distinct undescribed species from Western Australia has been incorrectly treated under this name.

Distribution: Found in warm temperate waters of coastal New South Wales and southern Queensland, Australia.



dorsal view



***Octopus* sp. A**

Frequent synonyms / misidentifications: None / *Octopus membranaceus* Quoy and Gaimard, 1832.

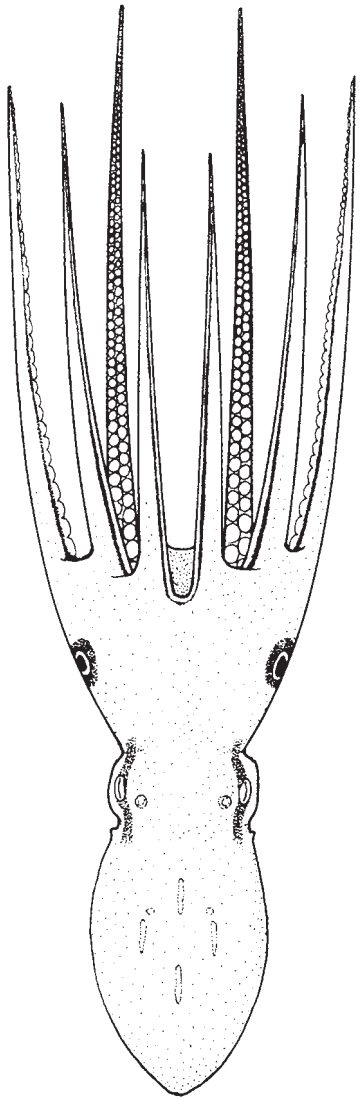
FAO names: En - Eye-bar ocellate octopus.

Diagnostic characters: Small to moderate-sized ocellate octopus. Arms short to moderately long, 2.5 to 3 times mantle length. Dorsal arms slightly shorter than other arms (arm formula IV=III.II.I). Right third arm of males hectocotylized with moderate length, elongate ligula (4 to 10% of arm length) with a shallow groove. Gills with 8 to 10 lamellae per demibranch. Up to 150 suckers on each normal arm, 65 to 80 on hectocotylized arm of male. Mature males possess 2 to 4 moderately enlarged suckers (4^{th} to 8^{th}) on arms II and III. **Colour:** pattern typically cream to light green colour on all surfaces; **short longitudinal bar through each eye; dark brown or black lines along edges of arms; ocellus present as black spot containing a fine iridescent blue to purple ring (4 to 6 mm in diameter in adults)**; head bar and longitudinal stripes on mantle absent; skin sculpture of small low rounded papillae, interspersed by slightly larger pink papillae; diamond of four longitudinal skin ridges on dorsal mantle and large papilla over each eye.

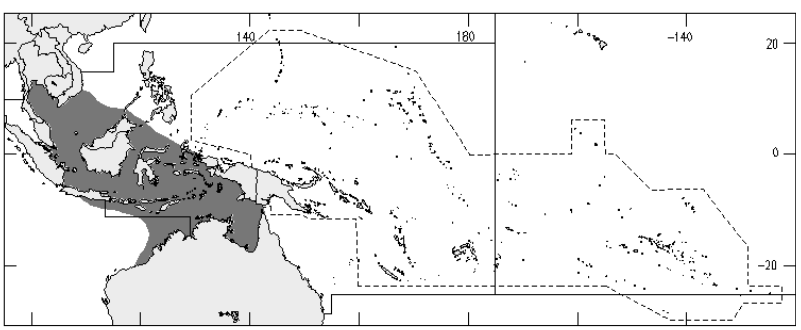
Size: Maximum mantle length around 60 mm, total length to around 250 mm.

Habitat, biology, and fisheries: Known from coastal waters on mud and sand substrates, from intertidal shallows to a depth of at least 60 m. Females lay small eggs, up to 3 mm long, often in shells or bottles. Very important fisheries species collected primarily from the Gulf of Thailand by trawlers. Exported throughout the world on a large scale along with *Octopus aegina* (tens of thousands of tonnes annually). Both species are sold and prepared under the name “baby octopus” (at least in Australia and the United States). The ocellate octopuses of Southeast Asia require extensive revision. A number of undescribed taxa occur throughout the area, several of which are treated under the name *O. membranaceus*. Fisheries statistics for *Octopus* sp. A were reported from Gulf of Thailand, under the name *Octopus* “*membranaceus*”.

Distribution: Found in tropical continental waters of Southeast Asia, from at least Gulf of Thailand, through Indonesia to northern Australia.



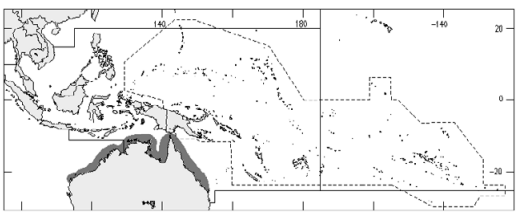
dorsal view

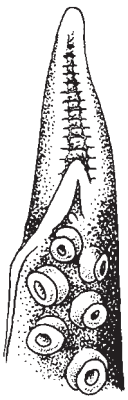


Ameloctopus litoralis Norman, 1992b

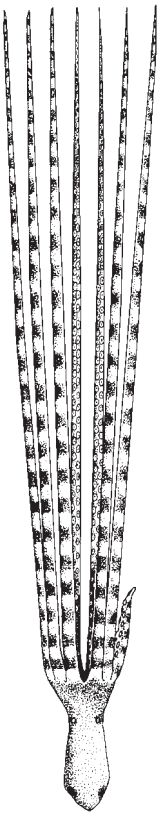
En - Banded long-arm octopus.

Small octopus (maximum mantle length 30 mm) with **greatly elongated arms** (5 to 10 times mantle length). **Arms frequently sever at base as decoy to predators, around 10th sucker.** more than 180 suckers on intact normal arms of larger animals, 20 to 40 on hectocotylized arm of male. **No ink sac.** Right third arm long in submature males, lacking ligula. Mature males sever arm around 40th sucker and develop ligula from stump. Eggs large, to 10 mm. Skin smooth, no papillae. **Colour:** pink to brown, **hearts visible through thin-walled mantle**, **arms with regular purple-brown bands**. Intertidal mud, sand, and rubble reefs. No fisheries value but may be poisonous. Restricted to tropical coastal waters of northern Australia.





tip of hectocotylized arm

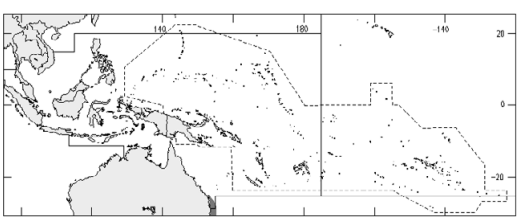


dorsal view

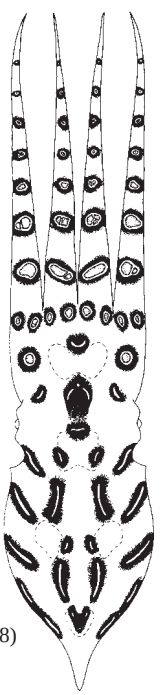
Hapalochlaena fasciata (Hoyle, 1886)

En - Blue-lined octopus.

Small octopus (maximum mantle length 40 mm) with short arms (2 to 3 times mantle length). **Colour:** cream to orange base colour with **iridescent blue lines (not rings) on dorsal mantle** and single or linked blue rings on arm crown and arms. Intertidal and shallow rocky reefs to depths of at least 20 m. No fisheries value but extremely venomous, tetrodotoxin venom produced in the salivary glands and responsible for a number of human deaths. Subtropical waters of eastern Australia from southern Queensland to southern New South Wales.



(after Roper and Hochberg, 1988)

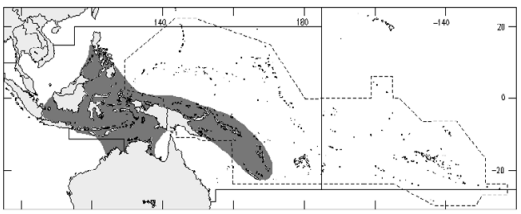


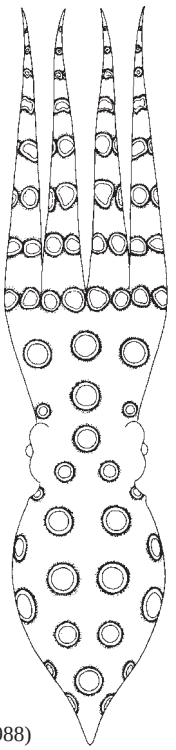
dorsal view

Hapalochlaena lunulata (Quoy and Gaimard, 1832)

En - Greater blue-ringed octopus.

Small octopus (maximum mantle length 50 mm) with short arms (1.5 to 2 times mantle length). **Colour:** cream to orange base colour with **large iridescent blue rings (to 12 mm in diameter) on dorsal mantle**, arm crown and arms. Intertidal and shallow coral reefs. No fisheries value but extremely venomous, tetrodotoxin venom produced in the salivary glands and responsible for a number of human deaths. Tropical waters of Indo-Malayan Archipelago from at least the Philippines to northern Australia and east to Vanuatu.





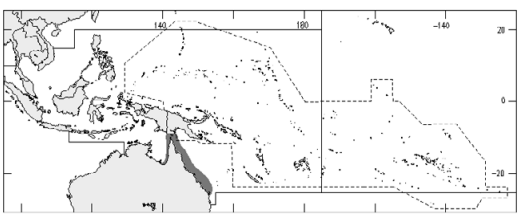
(after Roper and Hochberg, 1988)

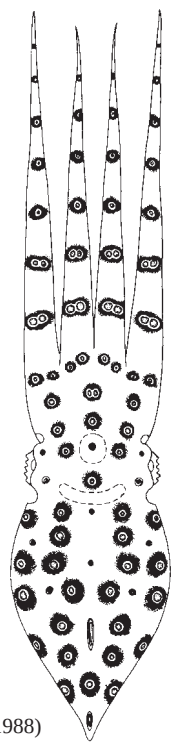
dorsal view

Hapalochlaena* cf. *maculosa (from Roper and Hochberg, 1988)

En - Lesser blue-ringed octopus.

Small octopus (maximum mantle length 40 mm) with short arms (1.5 to 2.5 times mantle length). **Colour:** cream to orange base colour with **small iridescent blue rings (approximately 2 mm in diameter) on dorsal mantle** and single or linked blue rings on arm crown and arms. Intertidal and shallow coral reefs to depths of at least 55 m. No fisheries value but potentially venomous, as in other members of the genus. Tropical waters of northeastern Australia from southern Great Barrier Reef to southern Gulf of Carpentaria.





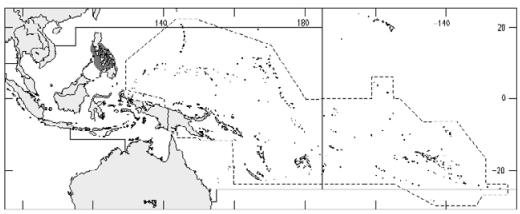
(after Roper and Hochberg, 1988)

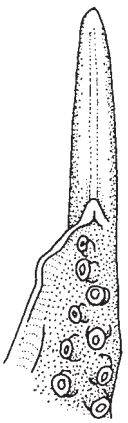
dorsal view

Octopus abaculus Norman and Sweeney, 1997

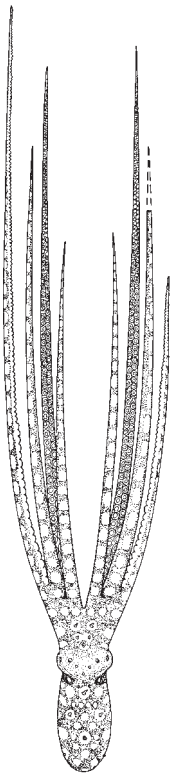
En - Mosaic drop-arm octopus.

Small octopus (maximum mantle length 33 mm) with long arms (5 to 6 times mantle length). **Arms frequently sever at base as decoy to predators, between 5th and 8th sucker.** In adults, 170 to 210 suckers on normal arms, **90 to 120 on hectocotylized arm of male**. Mature males with 8 to 12 enlarged suckers on arms III to IV. Gills with 6 lamellae per demibranch. **Colour: dark grey to purple-black reticulations define large circular cream spots on dorsal surfaces, producing a mosaic pattern**. Intertidal and shallow coral, rubble, or rocky reefs to depths of at least 6 m. No known fisheries value, but may be taken in local subsistence harvest. Only known from the Philippines.





tip of hectocotylized arm

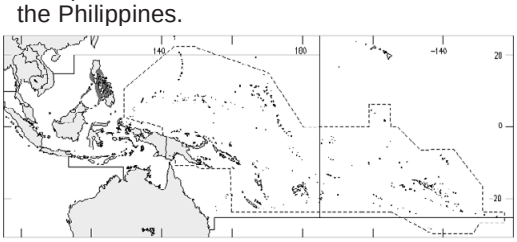


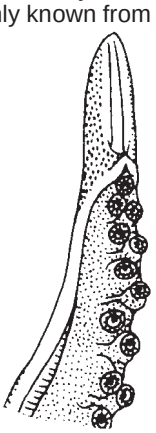
dorsal view

Octopus aculeatus d'Orbigny, 1835

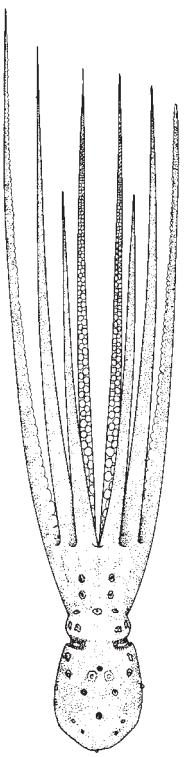
En - Greater drop-arm octopus.

Small to moderate octopus (maximum mantle length 65 mm) with long arms (5 to 6 times mantle length). **Arms frequently sever at base as decoy to predators, between 5th and 8th sucker**. In adults, 190 to 250 suckers on normal arms, **140 to 175 on hectocotylized arm of male**. Mature males with 5 to 12 enlarged suckers on arms II to IV. Gills with 6 or 7 lamellae per demibranch. **Colour: mottled grey-brown to dark grey with small cream spots forming fine mosaic pattern towards arm tips**. Intertidal and shallow mangroves, coral rubble, and rocky reefs to depths of at least 10 m. Small-scale local subsistence harvest. Only known from the Philippines.





tip of hectocotylized arm

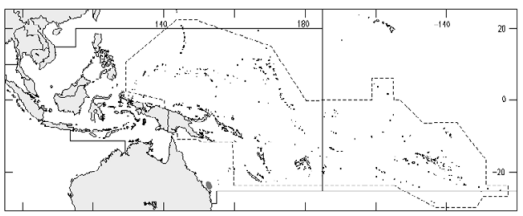


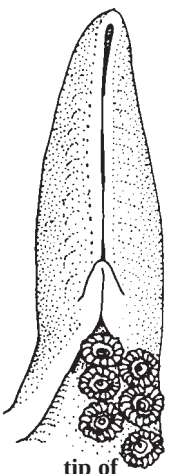
dorsal view

Octopus alpheus Norman, 1993a

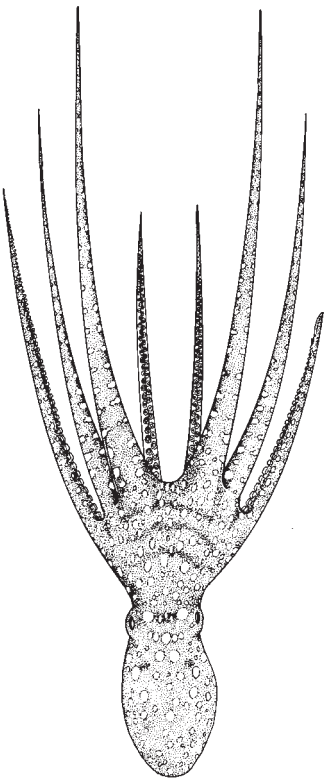
En - Capricorn night octopus.

Moderate to large robust octopus (maximum mantle length 90 mm) with moderately long arms (3 to 5 times mantle length). Dorsal arms longer than lateral and ventral arms. **Webs moderately deep, deepest 16 to 25% of longest arm.** In adults, 190 to 230 suckers on normal arms, 80 to 100 on hectocotylized arm of male. No enlarged suckers. **Large eggs (more than 8 mm) produced in low numbers (less than 500)**. **Colour: orange-brown to red base colour with large white spots over dorsal mantle, arm crown, webs and arms**. Intertidal coral reef flats, emerging to forage during night low tides. No commercial harvest. Tropical species restricted to the Capricorn Bunker Islands, southern Great Barrier Reef, Australia.





tip of hectocotylized arm

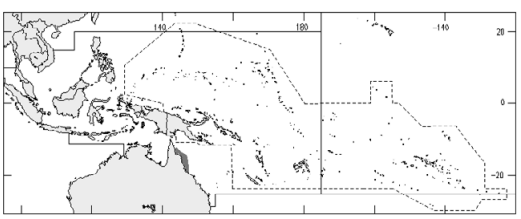


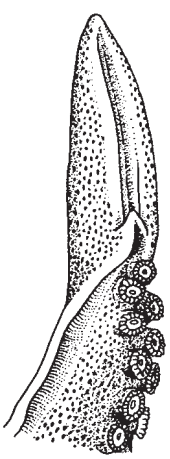
dorsal view

Octopus aspilosomatis Norman, 1993a

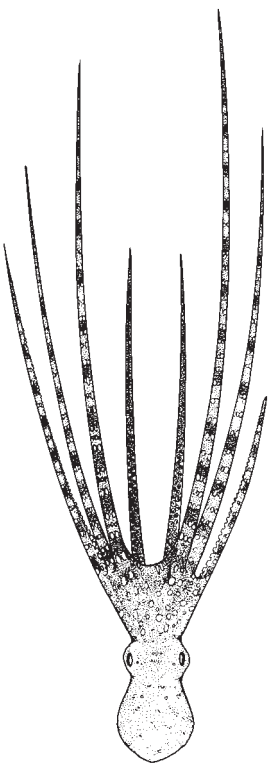
En - Plain-body night octopus.

Moderate-sized, elongate octopus (maximum mantle length 80 mm) with long arms (4.5 to 6 times mantle length). Dorsal arms longer than lateral and ventral arms. **Webs shallow, deepest 9 to 15% of longest arm.** In adults, 200 to 270 suckers on normal arms, 75 to 100 on hectocotylized arm of male. No enlarged suckers. **Small eggs (less than 3 mm) produced in large numbers (more than 10 000). Colour:** orange-brown to deep maroon base colour with white spots on arm crown, webs, and paired down arms; **no white spots ever expressed on mantle.** Intertidal coral reef flats, emerging to forage during night low tides. No commercial harvest. Tropical species known only from coastal reefs and offshore islands of northern Great Barrier Reef, Australia.





tip of hectocotylized arm

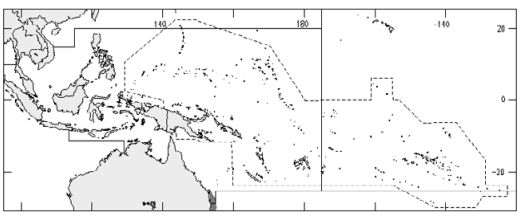


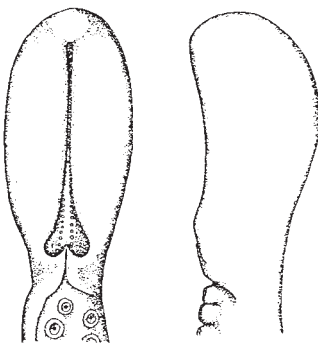
dorsal view

Octopus australis Hoyle, 1885

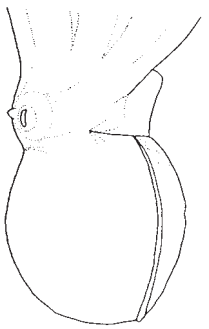
En - Hammer octopus.

Moderate-sized octopus (maximum mantle length 70 mm) with moderately long arms (2.5 to 4 times mantle length). Up to 220 suckers on normal arms, 60 to 80 on hectocotylized arm of male. **Ligula of large swollen club ("hammer").** Eggs large, to 12 mm. **Raised ridge ("keel") of skin around lateral mantle**. Skin covered in regular rounded papillae. **Colour:** cream to purple-brown dorsally, cream on ventral surfaces. Sand and mud substrates to a depth of 134 m. Small-scale trawl harvest for human consumption and as bait. Restricted to subtropical waters of southern Queensland and New South Wales, Australia.

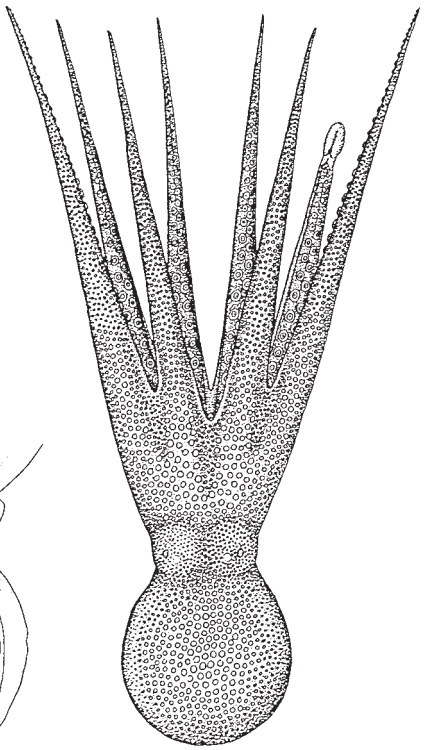




tip of hectocotylized arm



lateral view



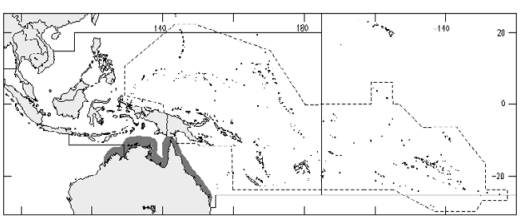
dorsal view

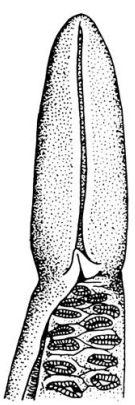
(after Stranks and Norman, 1993)

Octopus dierythraeus Norman, 1993a

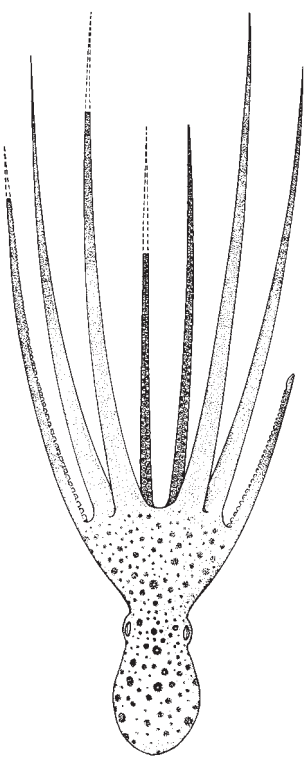
En - Red-spot night octopus.

Large robust octopus (maximum mantle length 140 mm) with moderately long arms (4 to 5 times mantle length). Dorsal arms longer than lateral and ventral arms. **Webs moderately deep, deepest 18 to 28% of longest arm.** In adults, 230 to 280 suckers on normal arms, 100 to 130 on hectocotylized arm of male. No enlarged suckers. **Large eggs (more than 14 mm) produced in low numbers (less than 500). Colour:** foraging animals orange brown to red with white spots over dorsal surfaces, **alarm display of white base colour with red spots over mantle, arm crown, webs and arms.** Shallow coastal waters on rubble, sand or mud from intertidal reefs to depths of at least 80 m. Potential bycatch harvest. Tropical species restricted to coastal waters of northern Australia.





tip of hectocotylized arm

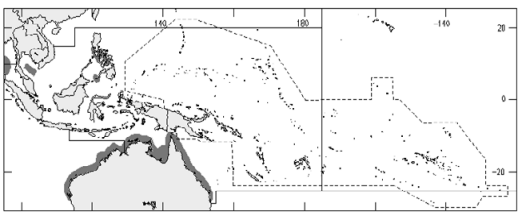


dorsal view

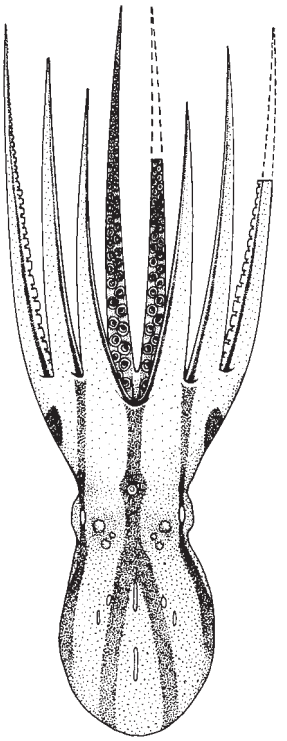
Octopus exannulatus Norman, 1993b

En - Plain-spot ocellate octopus.

Small octopus (maximum mantle length 50 mm) with short arms (2 to 3 times mantle length). 120 to 190 suckers on normal arms of adults, 60 to 80 on hectocotylized arm of male. Gills with 7 or 8 lamellae per demibranch. In mature males, 2 or 3 very large suckers on arms II and III (10th to 12th). Eggs small, to 4 mm. Skin covered in regular oval to round papillae. **Colour:** cream with **4 black stripes along dorsal mantle and arm crown; plain ocellus without iridescent ring; black lines along leading edge of arms**. Shallow sand and mud substrates to depths of at least 84 m. Small harvest in Australia, primarily as bait. Indo-Malayan area from Philippines, to Thailand, and northern Australia.



ocellus

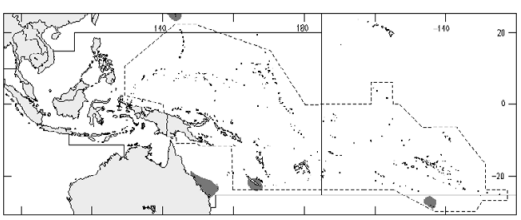


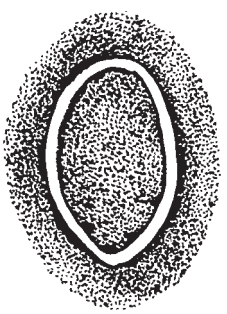
dorsal view

Octopus mototi Norman, 1993b

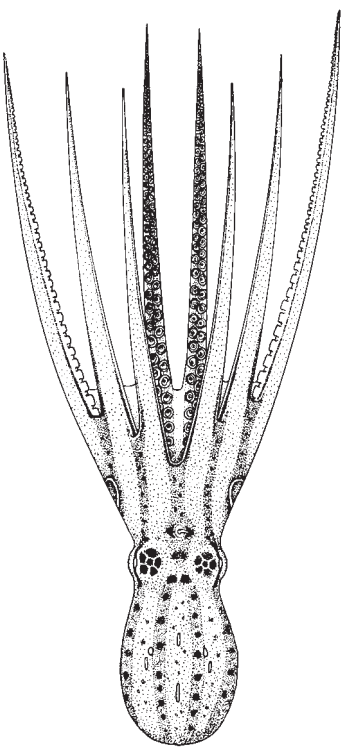
En - Poison ocellate octopus (from Rapa, Rapa Is., “Fe’e motot”).

Moderate-sized octopus (maximum mantle length 70 mm) with short to moderate arms (2.5 to 3 times mantle length). In adults, 140 to 170 suckers on normal arms, 90 to 110 on hectocotylized arm of male. Gills with 9 to 11 lamellae per demibranch. No distinct enlargement of suckers in mature males. Eggs small, to 6 mm. Skin covered in regular polygonal patches. **Colour:** resting colour of orange with **ring of 5 large black spots above each eye**; **6 longitudinal rows of spots on dorsal mantle which become solid maroon stripes in live alarm displays; ocellus with large iridescent blue ring.** Sand and coral rubble substrates to depths of 54 m. No fisheries value, potentially venomous as for blue-ringed octopuses. Reported as poisonous on Rapa Island. Occurs in at least the western and southern tropical Pacific Ocean.





ocellus

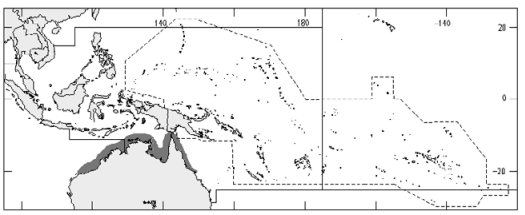


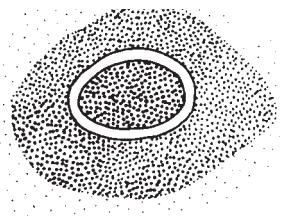
dorsal view

Octopus polyzenia Gray, 1849

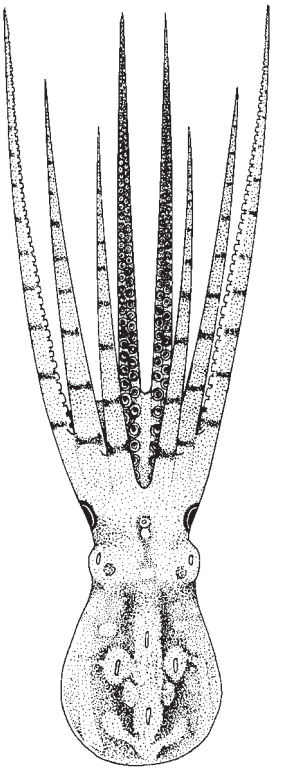
En - Arm-band ocellate octopus.

Small octopus (maximum mantle length 40 mm) with short to moderate arms (2 to 3 times mantle length). 80 to 140 suckers on normal arms of adults, 45 to 55 on hectocotylized arm of male. Gills with 6 or 7 lamellae per demibranch. In mature males, 1 to 3 enlarged suckers (12th to 14th) on all arms. Eggs large relative to mantle length, to 7.5 mm. Skin covered in low small papillae. **Colour:** mottled cream to dark brown; **ocellus with small iridescent blue ring; transverse dark bars widely spaced on arms, one every 3 to 5 sucker pairs**. Shallow coastal waters on rubble, sand or mud to depths of at least 20 m. No fisheries value but may be harvested with other northern Australian ocellate octopuses. Coastal waters of northern Australia.





ocellus



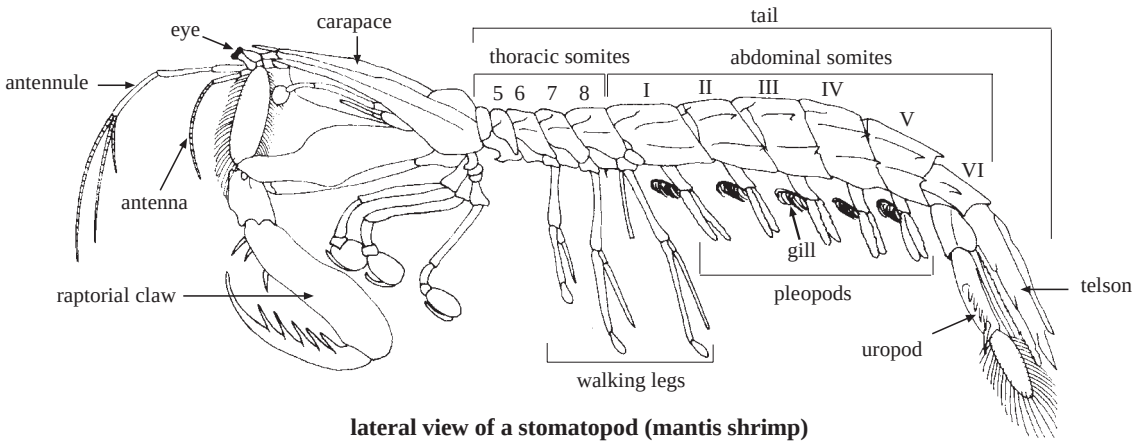
dorsal view

click for next page

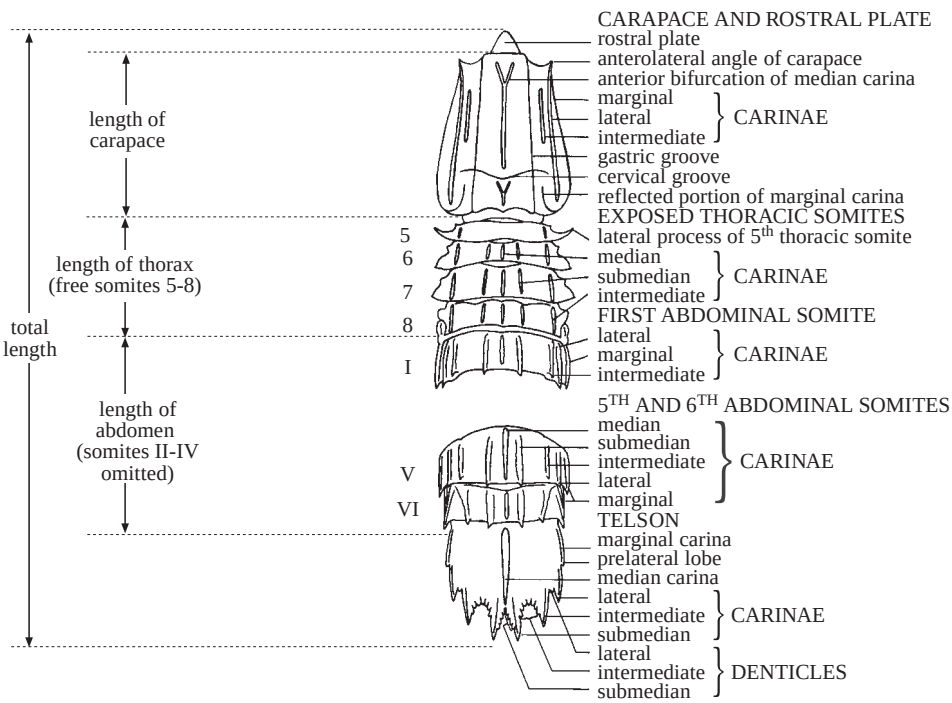
STOMATOPODS

by R.B. Manning

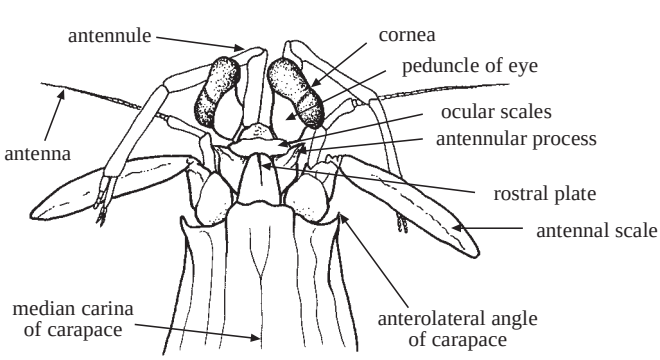
TECHNICAL TERMS AND MEASUREMENTS



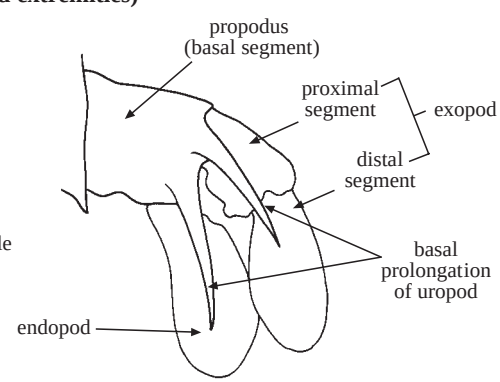
lateral view of a stomatopod (mantis shrimp)



dorsal view (without head and extremities)



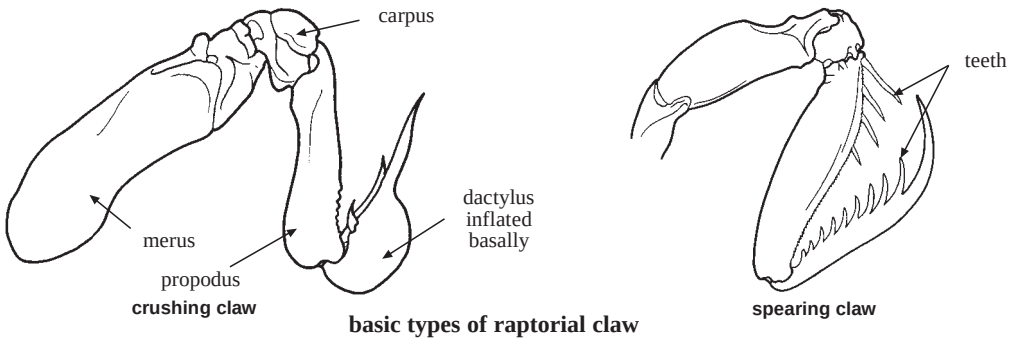
anterior part of body (dorsal view)



left uropod (ventral view)

GENERAL REMARKS

Stomatopods, also called mantis shrimps, are elongate, flattened, shrimp-like or lobster-like crustaceans, which are characterized by the following features: large, often T-shaped, movable eyes, often with a bilobed cornea; **a very short carapace, not more than about 1/3 the total length and not covering the eyes; only 3 pairs of walking legs**; 5 pairs of pleopods under the anterior 5 abdominal somites (I to V); **a long, flattened tail (which includes part of the thorax, the abdomen, and the terminal telson)**; 1 pair of lateral uropods on the abdominal somite VI which includes a strongly spined ventral process; a telson that is often spined posteriorly. The most conspicuous characteristic of mantis shrimps is a pair of **massive, conspicuous, praying mantis-like "raptorial" claws** which are folded under the sides of the carapace. In many of the larger stomatopods, the terminal 2 segments of the claws usually are lined with sharp, serrated teeth. The claws are adapted for crushing or spearing. Those species with crushing claws have the terminal segment of the claw broadened and heavily buttressed basally. Spearing claws are more elongate, more conspicuously toothed, and much more slender, not inflated basally.



basic types of raptorial claw

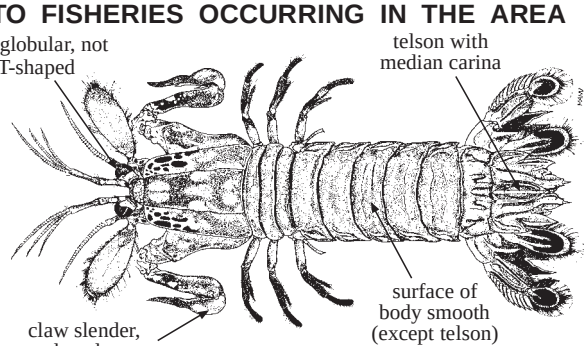
These are burrowing animals that hunt from the burrow or leave it to forage for food. Few, if any, mantis shrimps are fished commercially in the Western Central Pacific. However, very large, up to 38 cm long, representatives of 4 families can be found in markets or may be fished artisanally. They are often caught in trawls and fish traps, at night lights, and by hand.

GUIDE TO FAMILIES OF INTEREST TO FISHERIES OCCURRING IN THE AREA

ODONTODACTYLIDAE **Page 832**

Odontodactylid mantis shrimps

Body smooth, lacking longitudinal ridges or carinae anterior to terminal abdominal somite (= telson); telson with distinct median longitudinal carina; eyes subglobular, cornea not bilobed; raptorial claw short, with dactylus heavily buttressed, swollen basally. Four species of *Odontodactylus* occur in the area, only 1 of which, *O. scyllarus*, is large and common enough to occasionally be found in markets.

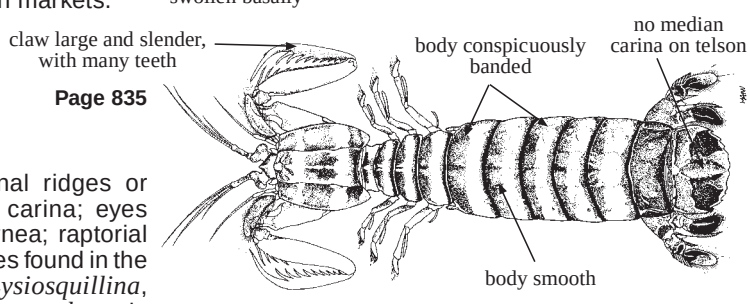


Odontodactylidae

LYSIOSQUILLIDAE **Page 835**

Banded mantis shrimps

Body smooth, lacking longitudinal ridges or carinae; telson without median carina; eyes T-shaped, with large, bilobed cornea; raptorial claw large and slender. Four species found in the area, 2 of *Lysiosquilla* and 2 of *Lysiosquillina*, only 1 of which, *Lysiosquillina maculata*, is known to be fished, at least artisanally.



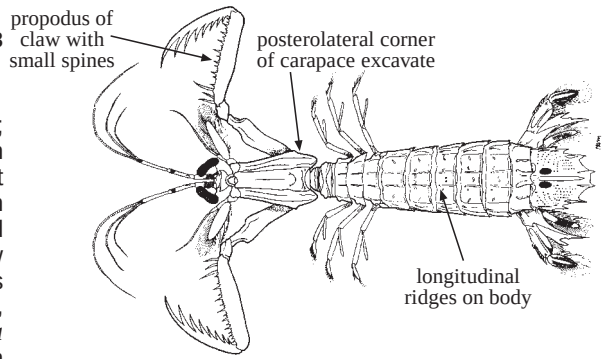
Lysiosquillidae

HARPIOSQUILLIDAE

Page 838

Harpiosquillid mantis shirmps

Body with longitudinal carinae or ridges; posterolateral angles of carapace with conspicuous excavation; telson with distinct median longitudinal carina; eyes T-shaped, with large bilobed cornea; raptorial claw large and slender; opposable margin of propodus of claw with erect spines. The larger, more conspicuous harpiosquillids belong to a single genus, *Harpiosquilla*. Nine species of *Harpiosquilla* found in the area, 2 of which are common enough to be found in markets.



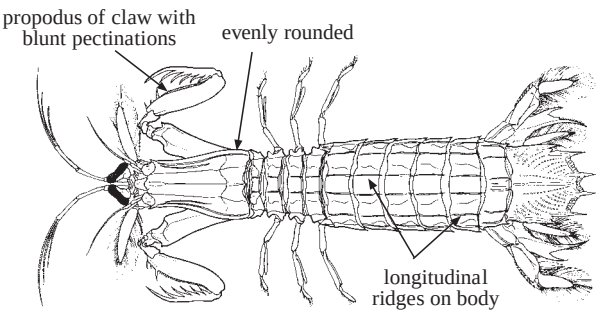
Harpiosquillidae

SQUILLIDAE

Page 842

Squillid mantis shrimps

Body with longitudinal carinae or ridges; telson with distinct median longitudinal carina; eyes T-shaped, with bilobed cornea; raptorial claw large and slender; opposable margin of propodus of claw lined with low, blunt pectinations; posterolateral angles of carapace rounded, convex, rather than excavate. The family Squillidae comprises some 40 genera, 20 of which are represented in the Indo-West Pacific, but members of only 5 genera are large enough or abundant enough to be used for food.



Squillidae

KEY TO MAJOR FAMILIES OF STOMATOPODS OCCURRING IN THE AREA

1a. Telson without median carina (Fig. 1a). . . . . → **2**

1b. Telson with distinct median carina (Fig. 1b). . . . . → **3**

2a. Distal segment of endopod of walking legs circular or nearly so (Fig. 2a); eyes not T-shaped, with cornea rounded or oval, not bilobed (Fig. 3a); total length not exceeding 7 cm. . . . . **Nannosquillidae**

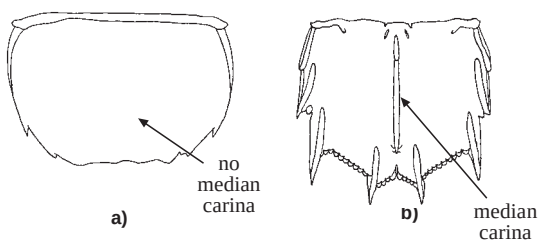
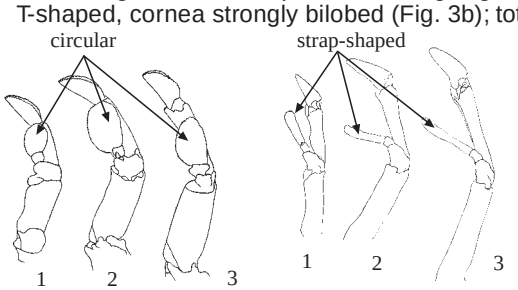


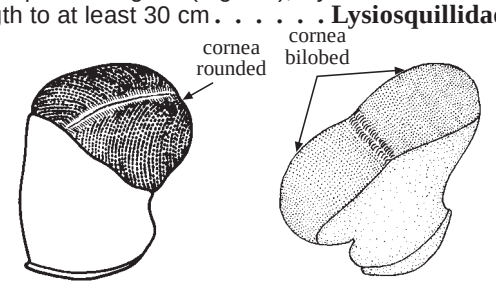
Fig. 1 telson (dorsal view)

2b. Distal segment of endopod of walking legs strap-shaped, elongate (Fig. 2b); eyes T-shaped, cornea strongly bilobed (Fig. 3b); total length to at least 30 cm. . . . . **Lysiosquillidae**



a) Nannosquillidae **b) Lysiosquillidae**

Fig. 2 walking legs 1-3



a) Nannosquillidae **b) Lysiosquillidae**

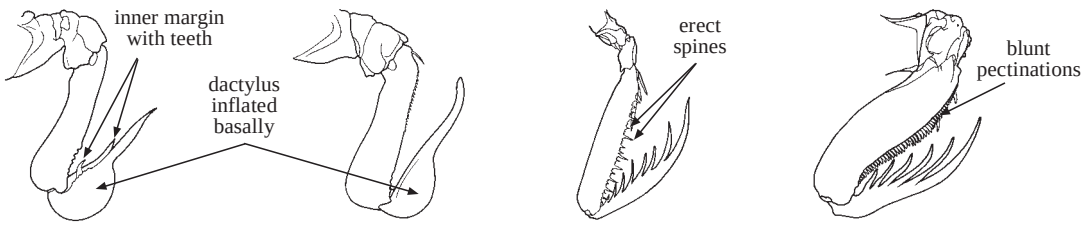
Fig. 3 eye

3a. Dactylus of raptorial claw inflated basally, strongly buttressed (Fig. 4a, b). . . . . → **4**

3b. Dactylus of raptorial claw slender, not inflated or buttressed basally (Fig. 4c, d). . . . . → **5**

4a. Dactylus of raptorial claw with teeth on inner margin (Fig. 4a); total length up to 17 cm . . . . . **Odontodactylidae**

4b. Dactylus of raptorial claw unarmed on inner margin (Fig. 4b); total length less than 10 to 11 cm . . . . . **Gonodactylidae**

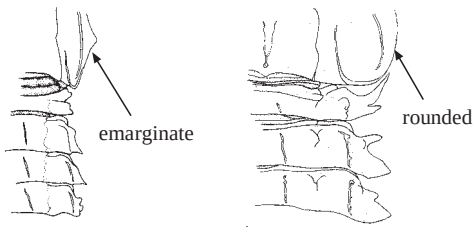


a) Odontodactylidae **b) Gonodactylidae** **c) Harpiosquillidae** **d) Squillidae**

Fig. 4 right claw

5a. Carapace with posterolateral excavation (Fig. 5a); propodus of raptorial claw lined with erect spines (Fig. 4c) . . . . . ***Harpiosquillidae***

5b. Carapace rounded posterolaterally, not excavate (Fig. 5b); propodus of raptorial claw lined with blunt pectinations (Fig. 4d). . . ***Squillidae***



a) Harpiosquillidae **b) Squillidae**

Fig. 5 posterolateral carapace and lateral processes of thoracic somites (dorsal view)

LIST OF FAMILIES OCCURRING IN THE AREA

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

Superfamily BATHYSQUILLOIDEA Manning, 1967
BATHYSQUILLIDAE Manning, 1967
INDOSQUILLIDAE Manning, 1995

Superfamily ERYTHROSQUILLOIDEA Manning and Bruce, 1984
ERYTHROSQUILLIDAE Manning and Bruce, 1984

Superfamily GONODACTYLOIDEA Giesbrecht, 1910
ALAINOSQUILLIDAE Moosa, 1991
EURYSQUILLIDAE Manning, 1977
GONODACTYLIDAE Giesbrecht, 1910
HEMISQUILLIDAE Manning, 1980
ODONTODACTYLIDAE Manning, 1980
PARASQUILLIDAE Manning, 1995
PROTOSQUILLIDAE Manning, 1980
PSEUDOSQUILLIDAE Manning, 1977
TAKUIDAE Manning, 1995

Superfamily LYSIOSQUILLOIDEA Giesbrecht, 1910
CORONIDIDAE Manning, 1980
HETEROSQUILLIDAE Manning, 1995
LYSIOSQUILLIDAE Giesbrecht, 1910
NANNOSQUILLIDAE Manning, 1980
TETRASQUILLIDAE Manning and Camp, 1993

Superfamily SQUILLOIDEA Latreille, 1803
HARPIOSQUILLIDAE Manning, 1980
SQUILLIDAE Latreille, 1803

Reference

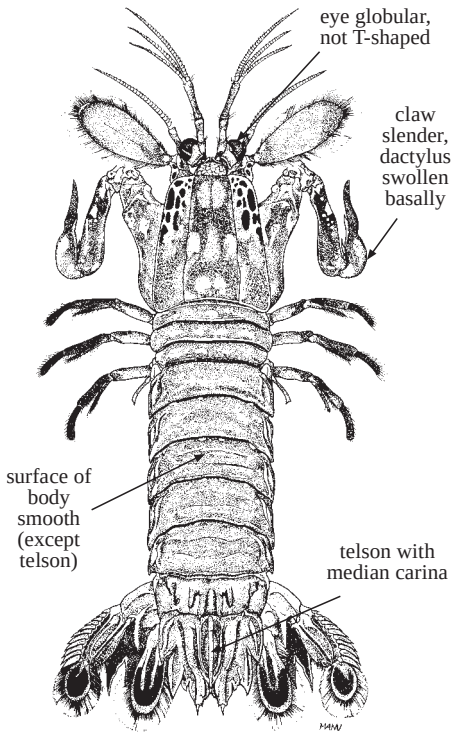
Manning, R.B. 1995. *Stomatopod Crustacea of Vietnam: the legacy of Raoul Serène*. Tokyo, Crustacean Research, The Carcinological Society of Japan, Special Number 4:339 p.

ODONTODACTYLIDAE

Odontodactylid mantis shrimps

Diagnostic characters: Moderate-sized mantis shrimps (maximum total length more than 17 to 18 cm). **Eyes globular**, not T-shaped, cornea not bilobed. **Carapace, thorax, and abdomen smooth**, not ornamented with any longitudinal ridges or carinae anterior to last abdominal somite (= telson). Telson with median longitudinal carina. Raptorial claw short and **heavily buttressed at base of terminal segment**, adapted for smashing prey; inner margin of dactylus toothed with no more than 5 short teeth.

Habitat, biology, and fisheries: In coarse-bottom or level-bottom habitats. Essentially nothing is known about the biology of odontodactylids and no organized fisheries are known to exist for them.

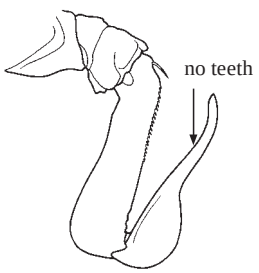


dorsal view

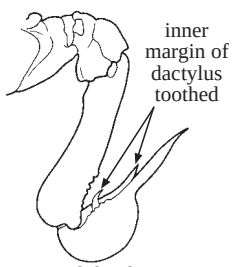
(after Manning, 1995)

Similar families occurring in the area

Gonodactylidae: share the buttressed, inflated claw, but have the inner margin of the claw unarmed and are much smaller.



right claw
Gonodactylidae

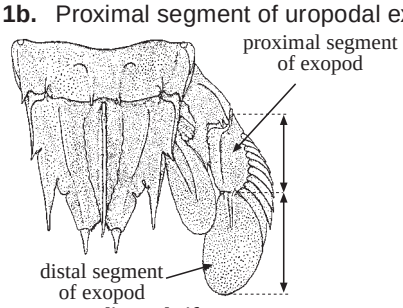


right claw
Odontodactylidae

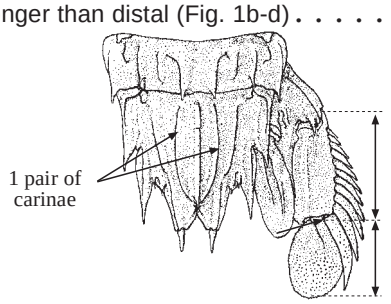
Key to the species of Odontodactylidae occurring in the area

1a. Proximal segment of uropodal exopod shorter than distal (Fig. 1a) . . . . . ***Raoulius cultrifer***

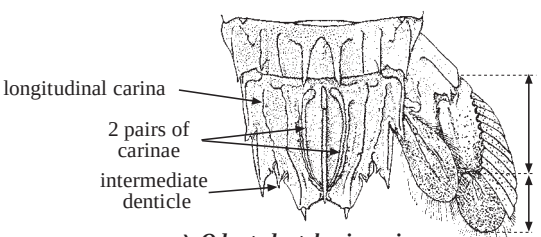
1b. Proximal segment of uropodal exopod longer than distal (Fig. 1b-d) . . . . . → ***2***



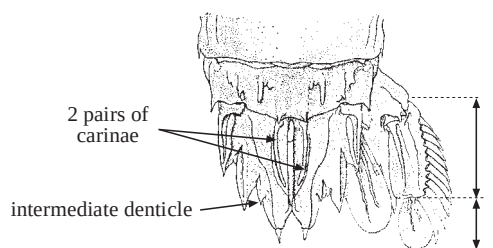
a) ***Raoulius cultrifer***



b) ***Odontodactylus brevirostris***



c) ***Odontodactylus japonicus***

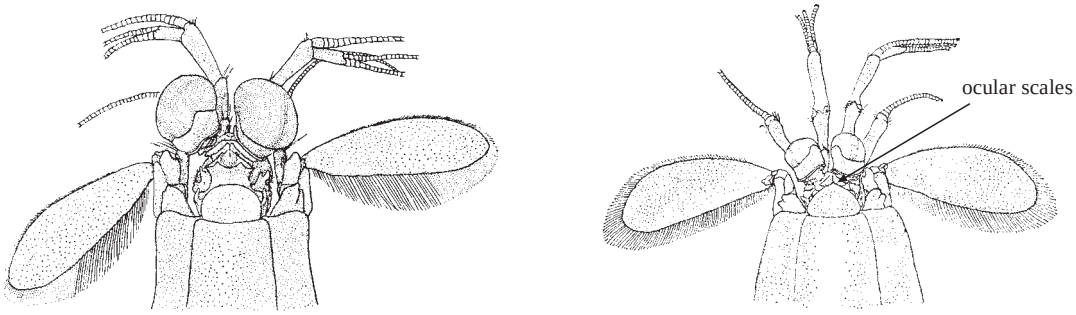


d) ***Odontodactylus scyllarus***

Fig. 1 sixth abdominal somite, telson, and right uropod (dorsal view) (from Manning, 1967)

2a. Ocular scales separate in midline (Fig. 2a); telson with 1 pair of carinae converging under apex of median carina (Fig. 1b) . . . . . ***Odontodactylus brevirostris***

2b. Ocular scales fused in midline (Fig. 2b); telson with 2 pairs of carinae converging under apex of median carina (Fig. 1c, d) . . . . . → ***3***

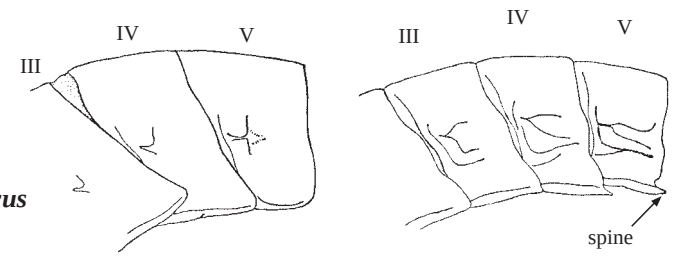


a) ***Odontodactylus brevirostris*** (from Manning, 1967) **b)** ***Odontodactylus scyllarus***

Fig. 2 anterior part of body (dorsal view)

3a. Fifth abdominal somite unarmed posterolaterally (Fig. 3a); telson with longitudinal carina extending anteriorly from inner intermediate denticle (Fig. 1c) . . . . . ***.Odontodactylus japonicus***

3b. Fifth abdominal somite with posterolateral spine (Fig. 3b); telson lacking longitudinal carina extending anteriorly from inner intermediate denticle (Fig. 1d) . . . ***Odontodactylus scyllarus***



a) ***Odontodactylus japonicus*** **b)** ***Odontodactylus scyllarus***

Fig. 3 abdominal somites III-V (lateral view)

List of species occurring in the area

The symbol is given when species accounts are included.

Odontodactylus brevirostris (Miers, 1884)
Odontodactylus japonicus (De Haan, 1844)
Odontodactylus scyllarus (Linnaeus, 1758)
Raoulius cultrifer (White, 1850)

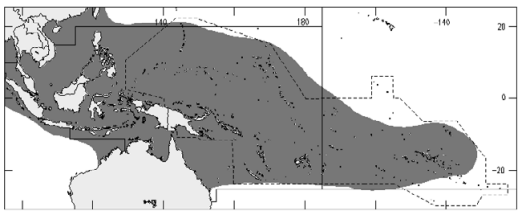
Reference

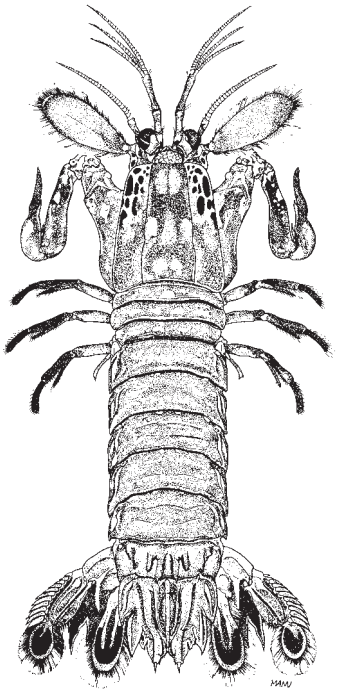
Manning, R.B. 1967. Review of the genus *Odontodactylus* (Crustacea: Stomatopoda). *Proc. U.S. Natl. Mus.*, 123(3606):1-33.

Odontodactylus scyllarus (Linnaeus, 1758)

En - Reef odontodactylid mantis shrimp.

Maximum total length about 17 cm, the largest “smasher”. One of the most brightly coloured stomatopods, with deep blue uropods and those and other appendages lined with bright red setae. Lives in existing burrows in shallow rough bottom habitats, often on or near coral reefs. Active during the day and uses its buttressed raptorial claws to smash hard-bodied prey like other scyllarids. Collected primarily by hand. Used in the aquarium trade because of its bright coloration. Widely distributed from Japan to the western Indian Ocean.





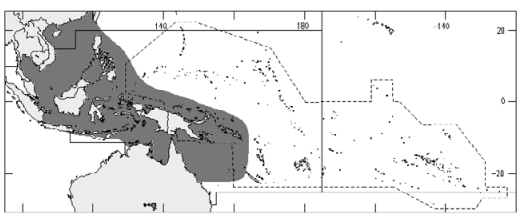
dorsal view

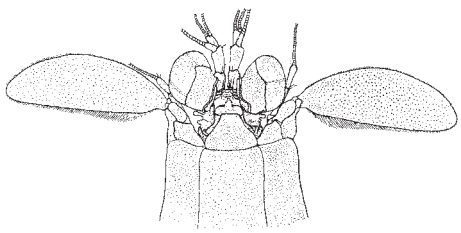
(after Manning, 1995)

Raoulius cultrifer (White, 1850)

En - Pastel odontodactylid mantis shrimp.

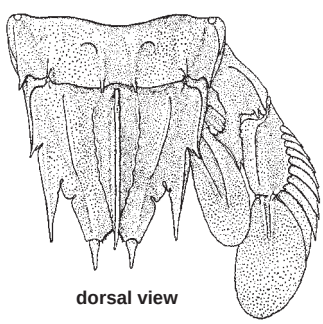
Maximum total length about 12 cm. Colour primarily in pastels, with pink or purple uropods and antennal scales. Burrows in level bottoms near shore, in depths to about 25 m. May be taken together with lysiosquillids and squillids in trawling operations and at night lights. Known from southern China to Australia.





dorsal view

anterior part of body



dorsal view

6th abdominal somite, telson, and right uropod

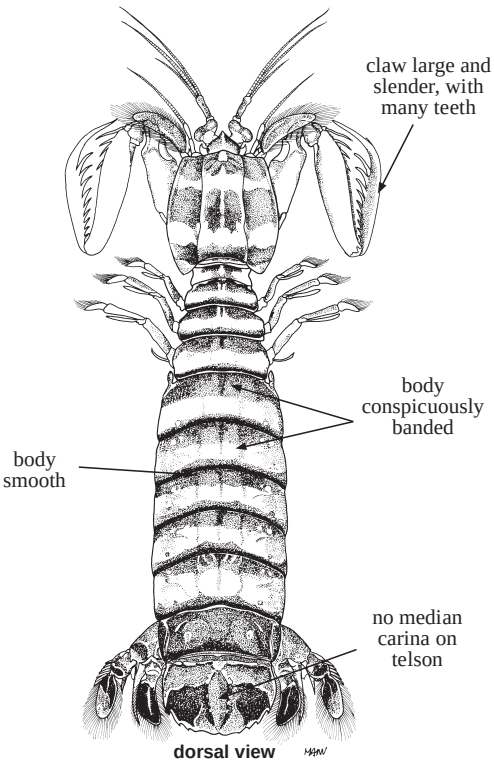
(from Manning, 1967)

LYSIOSQUILLIDAE

Banded mantis shrimps

Diagnostic characters: Eye T-shaped, cornea bilobed. **Carapace, thorax, and abdomen smooth, lacking longitudinal ridges or carinae**. **Telson lacking distinct median carina**; marginal teeth or spines of telson inconspicuous. Raptorial claw slender and elongate, adapted for spearing prey, with toothed edge of dactylus bearing numerous, large, serrated teeth or spines. Lysiosquillids **usually are clearly banded with alternate light and darkly pigmented bands**. Members of the 2 genera likely to be encountered in markets are readily distinguished by 2 features: in *Lysiosquilla*, (1) the antennal scale is slender, elongate, more than 3 times longer than wide and it is outlined by dark pigment, and (2) there is a spine-like projection on the anterior margin of the antennal peduncle; in *Lysiosquillina*, the antennal scale is oval, about 2 times longer than wide, and it bears a central spot or blotch of dark pigment; the antennal peduncle is smooth anteriorly, lacking a distinct spine-like projection.

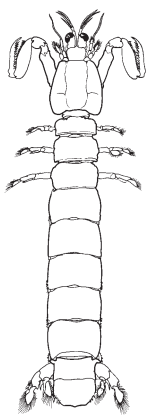
Habitat, biology, and fisheries: Almost nothing is known about the biology of lysiosquillids. They form simple burrows with 2 entrances, one at each end, in level-bottom habitats in shallow water, from shore to a depth of about 25 m. The burrow openings may be as much as 10 m apart. Although they generally hunt from the mouth of their burrow, they occasionally leave their burrows and may be caught at night lights or in trawls. Most fisheries for lysiosquillids are artisanal. Five species of lysiosquillids occur within the area, but information on distribution is limited and contradictory. Only 1 species, *Lysiosquillina maculata* (Fabricius, 1793), is particularly common and known to be fished artisanally.



(after Manning, 1995)

Similar families occurring in the area

Nannosquillidae: also smooth-bodied and also may be conspicuously banded with alternate dark and light bands of pigment, but much smaller, rarely exceeding 7 cm in length, and of no commercial importance.

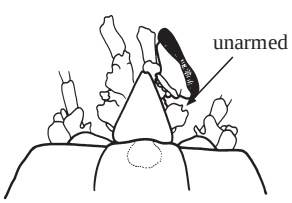


Nannosquillidae

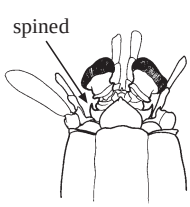
Key to the species of Lysiosquillidae occurring in the area

1a. Dorsal processes of antennular somite unarmed (Fig. 1a); telson with movable submedian teeth (Fig. 2a) . . . . . ***Lysiosquilloides siamensis***

1b. Dorsal processes of antennular somite produced into spines (Fig. 1b); telson lacking movable submedian teeth (Fig. 2b) . . . . . → ***2***

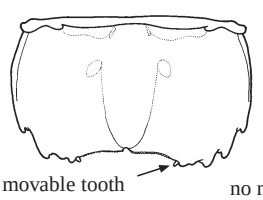


a) ***Lysiosquilloides siamensis***

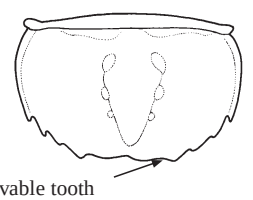


b) ***Lysiosquilla, Lysiosquillina***

Fig. 1 anterior part of body (dorsal view)



a) ***Lysiosquilloides siamensis***

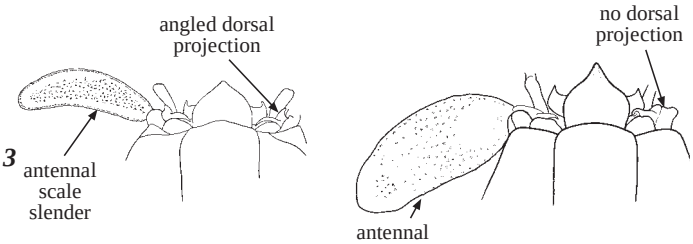


b) ***Lysiosquilla, Lysiosquillina***

Fig. 2 telson (dorsal view)

2a. Antennal protopod with angled dorsal projection (Fig. 3a); antennal scale slender, length more than 3 times width (Fig. 3a) . . . . . **(*Lysiosquilla*)** → ***3***

2b. Antennal protopod lacking angled dorsal projection (Fig. 3b); antennal scale broad, length less than 3 times width (Fig. 3b) . . . . **(*Lysiosquillina*)** → ***4***

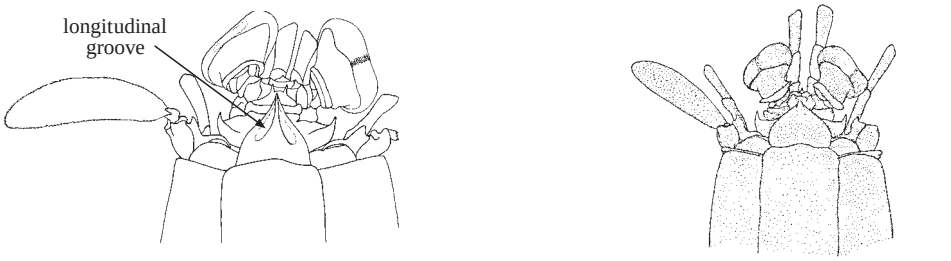


a) ***Lysiosquilla*** **b)** ***Lysiosquillina***

Fig. 3 anterior part of body (dorsal view)

3a. Median carina on rostral plate flanked by longitudinal grooves (Fig. 4a); dactylus of raptorial claw with 7 or 8 teeth (Fig. 5a) . . . . . ***Lysiosquilla sulcirostris***

3b. Median carina on rostral plate not flanked by longitudinal grooves (Fig. 4b); dactylus of raptorial claw with 10 to 13 teeth (Fig. 5b) . . . . . ***Lysiosquilla tredecimdentata***

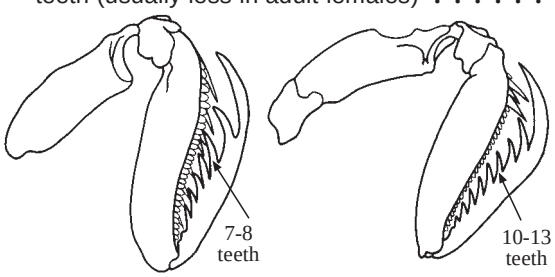


a) ***Lysiosquilla sulcirostris*** **b)** ***Lysiosquilla tredecimdentata***

Fig. 4 anterior part of body (dorsal view)

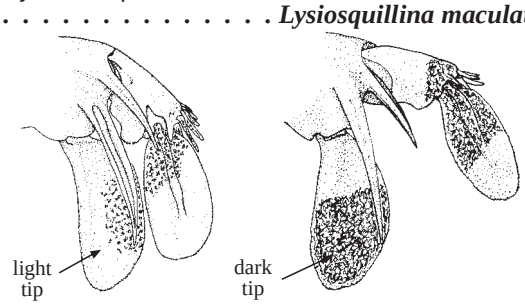
4a. Distal end of uropodal endopod light (Fig. 6a); dactylus of raptorial claw with 7 to 9 teeth . . . . . ***Lysiosquillina sulcata***

4b. Distal end of uropodal endopod dark (Fig. 6b); dactylus of raptorial claw with 10 or 11 teeth (usually less in adult females) . . . . . ***Lysiosquillina maculata***



a) ***Lysiosquilla sulcirostris*** **b)** ***Lysiosquilla tredecimdentata***

Fig. 5 right claw



a) ***Lysiosquillina sulcata*** **b)** ***Lysiosquillina maculata***

Fig. 6 left uropod (ventral view)

List of species occurring in the area

The symbol is given when species accounts are included.

Lysiosquilla sulcirostris Kemp, 1913
Lysiosquilla tredecimdentata Holthuis, 1941

Lysiosquillina maculata (Fabricius, 1793)
Lysiosquillina sulcata (Manning, 1978)

Lysiosquilloides siamensis Naiyanetr, 1980 (a single record from Thailand)

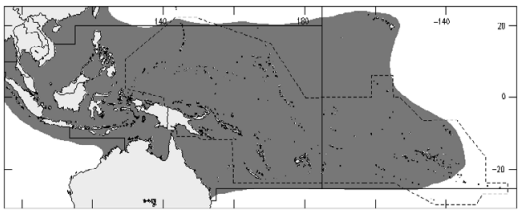
Reference

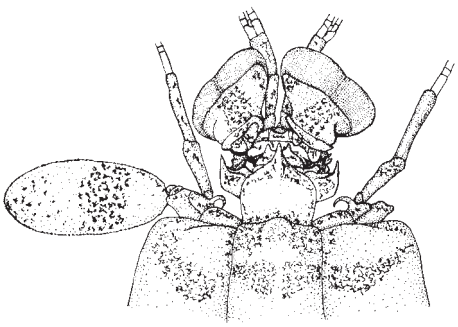
Manning, R.B. 1978. Synopses of the Indo-West-Pacific species of *Lysiosquilla* Dana, 1852 (Crustacea: Stomatopoda: Lysiosquillidae). *Smithson. Contrib. Zool.*, (259):16 p.

Lysiosquillina maculata (Fabricius, 1793)

En - Common banded mantis shrimp.

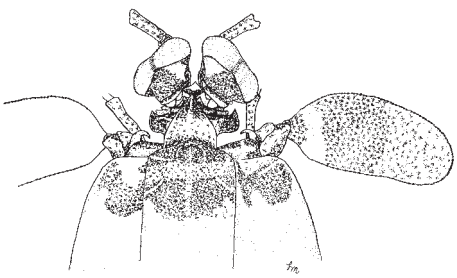
Maximum total length about 38 cm; the characteristic raptorial claw may be 4 cm long. Distinctly banded with alternate light and dark bands. Burrows in level bottoms near shore. Collected with spears, snares and bait, or at night lights. Widely distributed from Japan and Hawaii to the western Indian Ocean.





male

anterior part of body



female

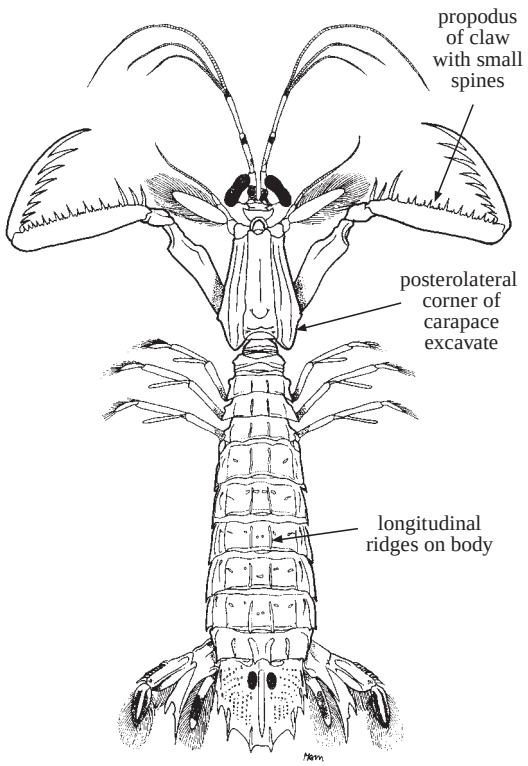
(from Manning, 1978)

HARPIOSQUILLIDAE

Harpiosquillid mantis shrimps

Diagnostic characters: Very large mantis shrimps (maximum total length at least 30 cm). Eye very large, T-shaped, cornea strongly bilobed. **Carapace, thorax, and abdomen with longitudinal ridges**. **Telson with median longitudinal carina** and conspicuous posterior spines. **Posterolateral corners of carapace deeply and conspicuously excavate**. Raptorial claw very large and conspicuous, adapted for spearing. In males outer edge of the claw forming an obtuse angle; in females it is evenly rounded. Propodus of raptorial claw with irregularly spaced, large and **small erect spines on margin opposite terminal segment** (= dactylus). Dactylus of claw usually with 7 or 8 large, serrated teeth.

Habitat, biology, and fisheries: Harpiosquillids are burrowers in level bottoms. They use the burrow as a refuge while waiting for prey and they also leave the burrow to hunt prey. Their large raptorial claws are well adapted for capturing fishes. There is no organized fishery for these species which reach markets as bycatch. At least 9 species occur within the area, but only 2 are abundant enough to be sold in markets.



dorsal view

Similar families occurring in the area

Squillidae: carapace rounded posterolaterally; propodus of raptorial claw lined with blunt pectinations.

Key to the species of Harpiosquillidae occurring in the area

1a. Carapace lacking median carina (Fig. 1a); distal segment of uropodal exopod entirely black (Fig. 2a) . . . . . ***Harpiosquilla melanoura***

1b. Carapace with median carina (Fig. 1b); distal segment of uropodal exopod with white midline, or inner half dark (Fig. 2b) . . . . . → ***2***

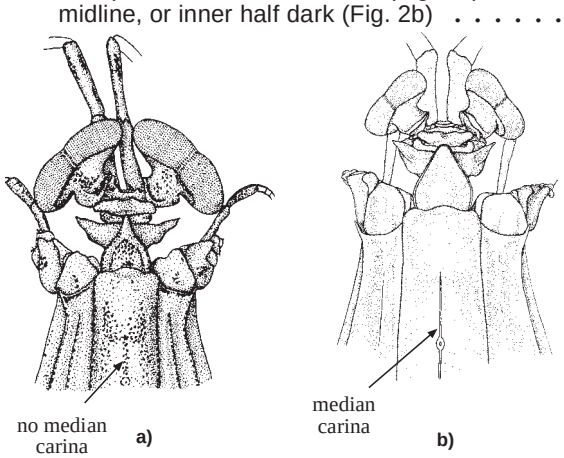


Fig. 1 anterior part of body (dorsal view)

(from Manning, 1969)

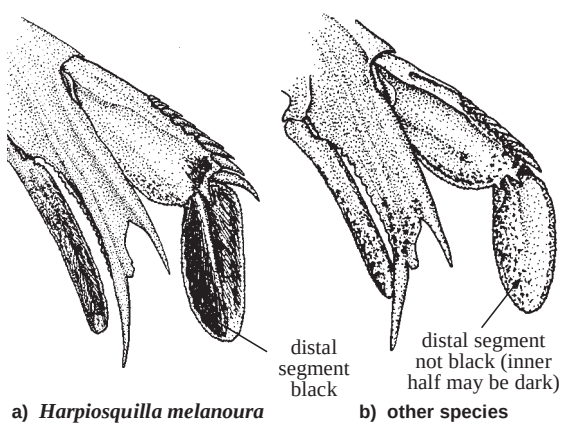
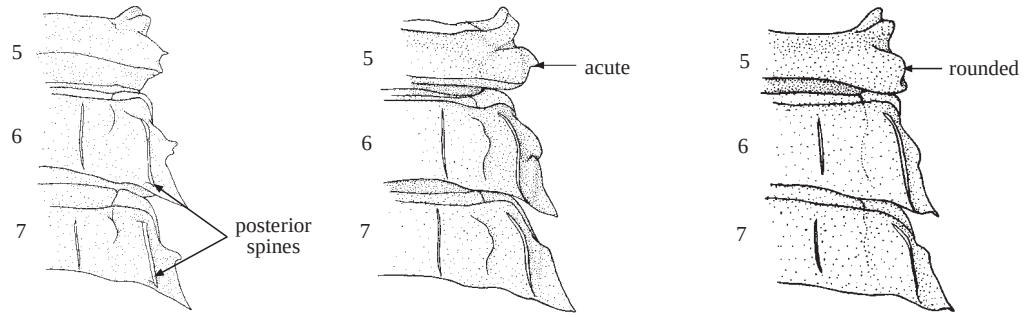


Fig. 2 left uropod (ventral view)

(from Manning, 1969)

2a. Intermediate carinae of thoracic somites with posterior spine (Fig. 3a) . . . . . →***3***

2b. Intermediate carinae of thoracic somites unarmed (Fig. 3b, c) . . . . . →***4***

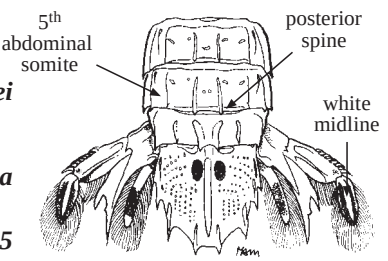


a) ***Harpiosquilla annandalei*** **b)** ***Harpiosquilla stephensoni*** **c)** ***Harpiosquilla japonica***

Fig. 3 lateral processes of thoracic somites 5-7
(from Manning, 1969)

3a. Submedian carinae of fifth abdominal somite with posterior spine (Fig. 4); distal segment of uropodal exopod black with white midline (Fig, 4); total length to 15 cm or less . . . . . ***Harpiosquilla annandalei***

3b. Submedian carina of fifth abdominal somite unarmed; distal segment of uropodal exopod with inner half dark; total length to at least 30 cm . . . . ***Harpiosquilla raphidea***



Harpiosquilla annandalei

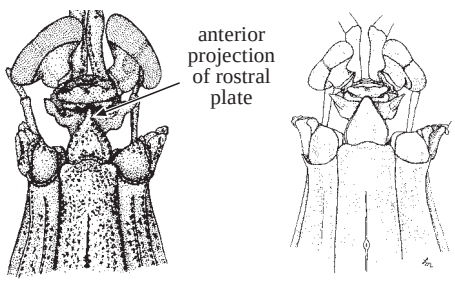
Fig. 4 posterior part of body (dorsal view)

4a. Rostral plate with anterior projection (Fig. 5a) . . . . . →***5***

4b. Rostral plate without anterior projection (Fig. 5b) . . . . . →***7***

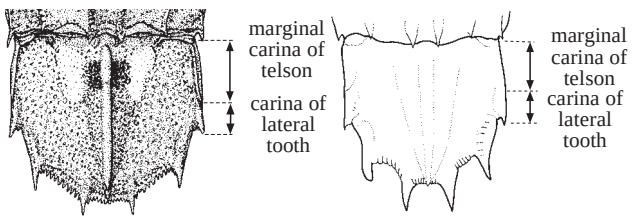
5a. Marginal carina of telson more than twice as long as carina of lateral tooth (Fig. 6a); dactylus of raptorial claw with 8 teeth . . . . . ***Harpiosquilla harpax***

5b. Marginal carina of telson twice or less than twice as long as carina of lateral tooth (Fig. 6b); dactylus of raptorial claw with 9 teeth . . . . . →***6***



a) ***Harpiosquilla harpax*** **b)** ***Harpiosquilla stephensoni***

Fig. 5 anterior part of body (dorsal view)
(from Manning, 1969)



a) ***Harpiosquilla harpax*** **b) other species**

Fig. 6 telson (dorsal view)

6a. Intermediate carinae of second abdominal somite with posterior spine . . . . ***Harpiosquilla indica***

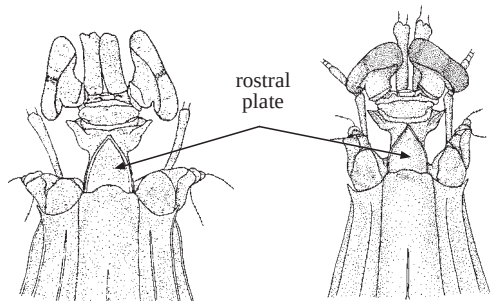
6b. Intermediate carinae of second abdominal somite unarmed . . . . . ***Harpiosquilla philippina***

7a. Dactylus of raptorial claw with 7 teeth; fifth thoracic somite acute laterally (Fig. 3b) . . . . . ***Harpiosquilla stephensoni***

7b. Dactylus of raptorial claw with 8 teeth; fifth thoracic somite rounded laterally (Fig. 3c) . . . . . →***8***

8a. Rostral plate longer than broad (Fig. 7a); marginal carina of telson twice as long as carina of lateral tooth . . . . . ***Harpiosquilla intermedia***

8b. Rostral plate length and width subequal (Fig. 7b); marginal carina of telson less than twice as long as carina of lateral tooth . . . . . ***Harpiosquilla japonica***



a) ***Harpiosquilla intermedia*** **b)** ***Harpiosquilla japonica***

Fig. 7 anterior part of body (dorsal view)

List of species occurring in the area

The symbol is given when species accounts are included.

Harpiosquilla annandalei (Kemp, 1911)

Harpiosquilla harpax (De Haan, 1844)
Harpiosquilla indica Manning, 1969
Harpiosquilla intermedia Manning and Michel, 1973
Harpiosquilla japonica Manning, 1969
Harpiosquilla melanoura Manning, 1968
Harpiosquilla philippina Garcia, 1978

Harpiosquilla raphidea (Fabricius, 1798)
Harpiosquilla stephensoni Manning, 1969

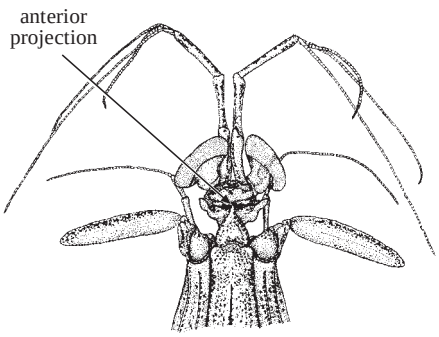
Reference

Manning, R.B. 1969. A review of the genus *Harpiosquilla* (Crustacea: Stomatopoda), with descriptions of three new species. *Smithson. Contrib. Zool.*, (36):41 p.

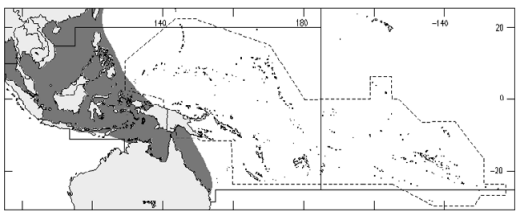
Harpiosquilla harpax (De Haan, 1844)

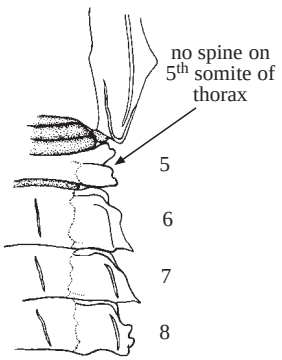
En - Robber harpiosquillid mantis shrimp.

Maximum total length about 25 cm; usually 17 cm or less. Inhabits level bottom habitats, near shore to depths of about 100 m. Collected by trawl, trapping, or hook-and-line. Japan to the Red Sea.



anterior part of body





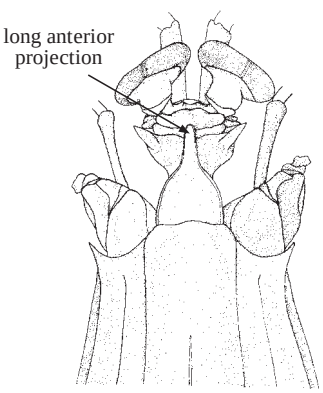
(from Manning, 1969)

lateral processes of thoracic somites 5-7

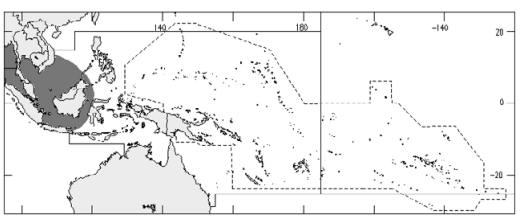
Harpiosquilla raphidea (Fabricius, 1798)

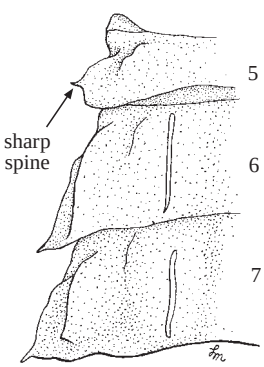
En - Giant harpiosquillid mantis shrimp.

The largest known squilloid; maximum total length more than 33 cm, although most specimens range from 16 to 29 cm. Inhabits level bottoms in shallow water and can be found in estuaries. Collected in traps, by trawls, and by hand. Indo-Malaya and Indonesia to East Africa.



anterior part of body





(from Manning, 1969)

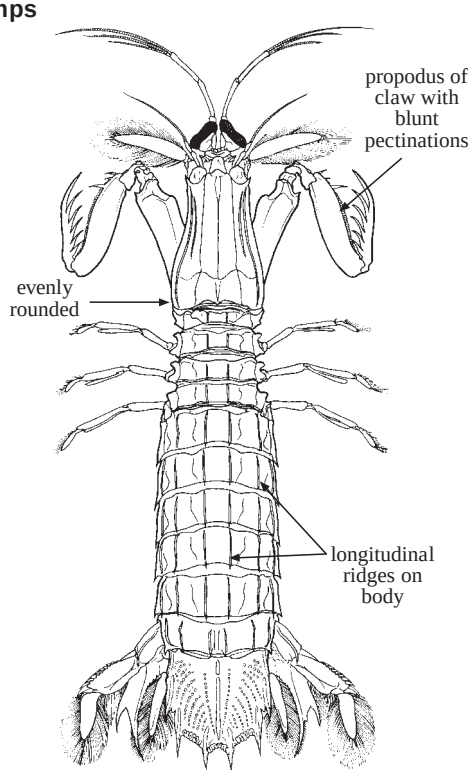
lateral processes of thoracic somites 5-7

SQUILLIDAE

Squillid mantis shrimps

Diagnostic characters: Large mantis shrimps (maximum total length more than 20 cm). Eye T-shaped, cornea bilobed. **Carapace, thorax, and abdomen with longitudinal ridges or carinae. Telson with median longitudinal ridge** and conspicuous posterior spines**. Posterolateral corners of carapace evenly rounded, not excavate**. Raptorial claw large and conspicuous, slender, adapted for spearing. Dactylus of raptorial claw usually with 5 or 6 serrated teeth on inner margin. Propodus of raptorial claw lined with short, **blunt pectinations on margin opposite toothed margin of distal segment** (= dactylus).

Habitat, biology, and fisheries: Squillids are burrowers in level bottoms and they seek prey at night. They are often collected by commercial trawls fishing for penaeid shrimps. Some of the larger and more abundant species have been reported to be edible and may be found in markets, but there is no organized fishery for them in the area. One species of *Oratosquilla* is fished commercially in Japan.



dorsal view
(after Manning, 1995)

Similar families ocurring in the area

Harpiosquillidae: carapace with posterolateral excavation; propodus of raptorial claw lined with erect spines.

Notes on genera of interest to fisheries

Species of at least 5 genera, *Cloridopsis*, *Erugosquilla*, *Miyakea*, *Oratosquilla*, and *Oratosquillina*, can be expected to be found in markets in the Philippines and in the continental parts of the area. These genera can be distinguished as follows:

Species of *Cloridopsis* differ from other squillids that might be found in markets in having but one broad, anteriorly-curved lateral spine on the fifth thoracic somite, the first free somite behind the carapace. In all of the other squillids large enough to be found in markets (except *Anchisquilla fasciata*), the lateral process on the fifth thoracic somite is distinctly bilobed, with an anteriorly-directed acute lobe and a shorter, laterally-directed acute lobe. The terminal segment of the raptorial claw usually is armed with 5 serrated spines. Adults rarely exceed 10 cm in length. Six species of *Cloridopsis* are known from the Indo-West Pacific, but only *C. scorpio* is relatively common.

Members of *Erugosquilla* can be distinguished by their broad, smooth, carapace, with its anterior margin more than half as long as its median length. The carapace is characteristically smooth and shiny, lacking any hint of roughness or pits. The median carina of the carapace completely lacks the anterior bifurcation, characteristic of members of *Miyakea*, *Oratosquilla*, and *Oratosquillina*. The raptorial claw is armed with 6 serrated teeth on the opposable margin of its terminal segment. Bright blue color on the uropods is characteristic of members of this genus, and in at least 1 species the usual rounded lobe between the spines of the basal prolongation of the uropod may be replaced by a sharp spine. *Erugosquilla woodmasoni* (Kemp, 1911) is the most common member of this genus, which contains 4 species.

A single species of *Miyakea* is abundant enough to be found in markets, and it occurs on level-bottom habitats throughout the area. *Miyakea nepa* has relatively small eyes and a distinctive median carina on the carapace that is uninterrupted, splits **posterior to** the dorsal pit on the midline of the carapace, and extends almost to the anterior margin of the carapace. The raptorial claw is armed with 6 teeth on its margin that folds. This is one of the most common species of squillids in the western part of the area. *Miyakea nepa* (Latreille, 1828) is the only abundant and widespread member of this genus which contains 1 other species.

Oratosquilla and *Oratosquillina* have much larger eyes than species of *Miyakea*, and in both genera the median carina of the carapace splits or bifurcates **anterior to** the pit on the midline of the carapace. In *Oratosquilla* the median carina of the carapace is entire, uninterrupted, from its base to its bifurcate anterior part near the anterior margin. In members of *Oratosquillina*, the median carina of the carapace is interrupted at its bifurcation, and the anterior branches of the bifurcation may be indistinct or absent. In both genera the distal segment of the claw usually is armed with 6 teeth, but some species of *Oratosquillina* have but 5 teeth on the claw.

Oratosquilla includes only 4 species, 1 of which, *O. oratoria*, occurs in the western part of the area, in the northern part of Viet Nam. A second species is known from a single record from New Caledonia, and a third from a single record in the Philippines.

Oratosquillina includes 22 species, 3 of which, *O. gravieri*, *O. interrupta*, and *O. perpensa* are common enough in the area to be found in markets. *Oratosquillina interrupta* is one of the most characteristic species of the genus, as it can be recognized at once by the convex lobe between the spines of the ventral prolongation of the uropod.

Key to species of interest to fisheries occurring in the area

1a. Lateral process of fifth thoracic somite a single, anteriorly- or anterolaterally-directed spine (Fig. 1a-c) . . . . . → ***2***

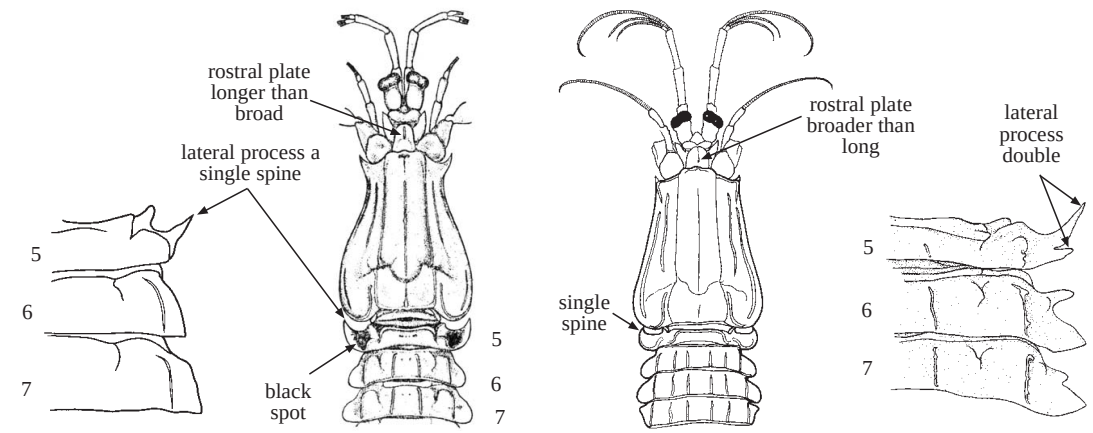
1b. Lateral process of fifth thoracic somite double, with an anteriorly-directed spine and a shorter, laterally-directed lobe (Fig. 1d) . . . . . → ***4***

2a. Lateral process of fifth thoracic somite a slender, straight spine, directed anterolaterally (Fig. 1a); telson with distinct longitudinal carinae on surface . . . . . ***Anchisquilla fasciata***

2b. Lateral process of fifth thoracic somite a broad, anteriorly-curved spine (Fig. 1b, c); telson lacking longitudinal carinae on surface . . . . . → ***3***

3a. Rostral plate longer than broad (Fig. 1b); lateral process of fifth thoracic somite with black spot (Fig. 1b) . . . . . ***Cloridopsis scorpio***

3b. Rostral plate broader than long (Fig. 1c); lateral process of fifth thoracic somite lacking any dark color (Fig. 1c) . . . . . ***Cloridopsis immaculata***



a) ***Anchisquilla fasciata*** **b)** ***Chloridopsis scorpio*** **c)** ***Chloridopsis immaculata*** **d)** ***Oratosquilla oratoria***

Fig. 1 anterior part of body and lateral thoracic somites 5-7 (dorsal view)

4a. Thorax and abdomen completely covered with longitudinal carinae . . . . . → ***5***

4b. Thorax and abdomen with no more than 8 longitudinal carinae . . . . . → ***6***

5a. Submedian carinae of sixth to eighth thoracic somites and fourth to sixth abdominal somites ending in spines . . . . . ***Keijia lirata***

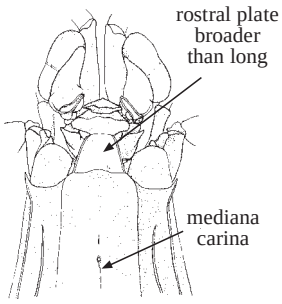
5b. Most carinae on thorax and abdomen terminating posteriorly in spines . . ***Carinosquilla multicarinata***

6a. Dorsal surface of carapace smooth, shiny, lacking any trace of an anterior bifurcation on the median carina (Fig. 2a, b) . . . . . → ***7***

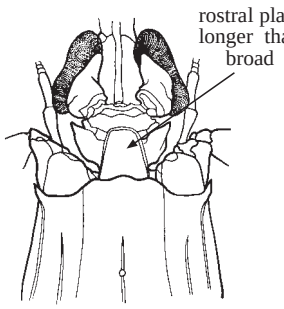
6b. Dorsal surface of carapace pitted or eroded, at least part of an anterior bifurcation of the median carina present (Fig. 4a, b) . . . . . → ***8***

7a. Dorsal surface of telson lacking a line of tubercles on each side of median carina (Fig. 3a); rostral plate broader than long (Fig. 2a) . . . . . ***Erugosquilla woodmasoni***

7b. Dorsal surface of telson with a line of tubercles on each side of median carina, the 2 lines converging posteriorly under apical spine of median carina (Fig. 3b); rostral plate longer than broad.(Fig. 2b) . . . . . ***Erugosquilla hesperia***

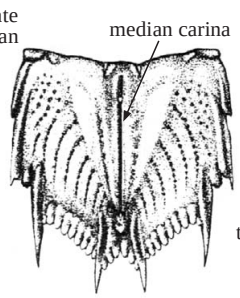


a) ***Erugosquilla woodmasoni***

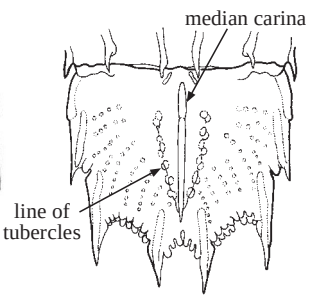


b) ***Erugosqilla hesperia***

Fig. 2 anterior part of body (dorsal view)



a) ***Erugosquilla woodmasoni***



b) ***Erugosquilla hesperia***

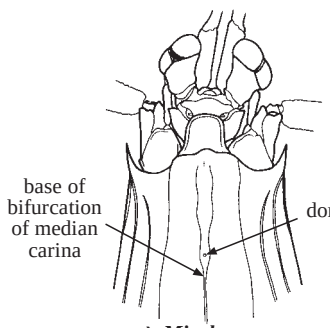
Fig. 3 telson (dorsal view)

8a. Median carina of carapace bifurcates posterior to dorsal pit (Fig. 4a) . . . . . ***Miyakea nepa***

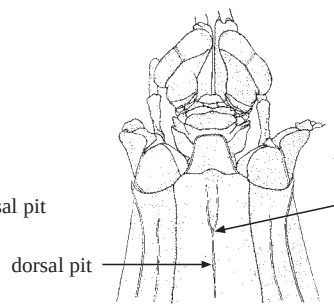
8b. Median carina of carapace bifurcates anterior to dorsal pit (Fig. 4b, c) . . . . . → ***9***

9a. Median carina of carapace entire, not interrupted at base of bifurcation (Fig. 4b) . . . . . ***Oratosquilla oratoria***

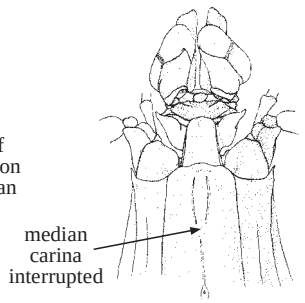
9b. Median carina of carapace interrupted at base of bifurcation (Fig. 4c) . . . . . → ***10***



a) ***Miyakea nepa***



b) ***Oratosquilla oratoria***



c) ***Oratosquillina gravieri***

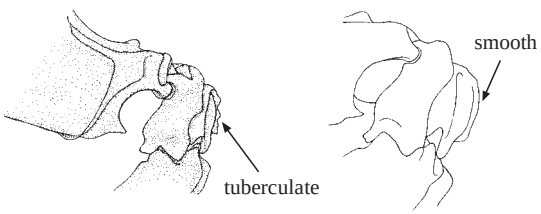
Fig. 4 anterior part of body (dorsal view)

10a. Dactylus of raptorial claw with 5 teeth . . . . . ***Oratosquillina quinquedentata***

10b. Dactylus of raptorial claw with 6 teeth . . . . . → ***11***

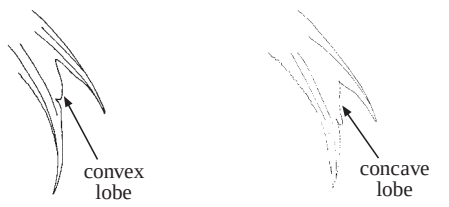
11a. Dorsal ridge on carpus of raptorial claw tuberculate (Fig. 5a); lobe between spines of basal prolongation of uropod convex (Fig. 6a) . . . . . ***Oratosquillina interrupta***

11b. Dorsal ridge on carpus of raptorial claw smooth, undivided (Fig. 5b); lobe between spines of basal prolongation of uropod concave (Fig. 6b) . . . . . → ***12***



a) ***Oratosquillina interrupta*** b) ***Oratosquillina perpensa***

Fig. 5 carpus of right raptorial claw (dorsal view)



a) ***Oratosquillina interrupta*** b) ***Oratosquillina perpensa***

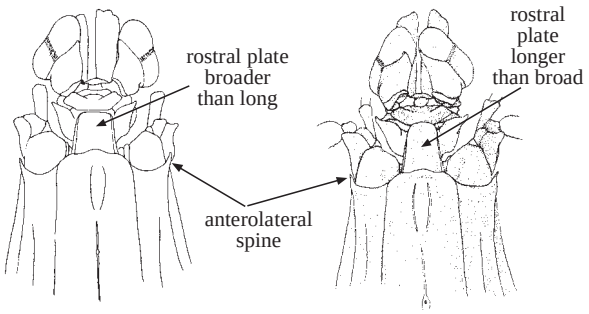
Fig. 6 basal prolongation of left uropod (ventral view)

12a. Rostral plate broader than long (Fig. 7a); anterolateral spines of carapace extending to or overreaching base of rostral plate (Fig. 7a) . . . . . ***.Oratosquillina perpensa***

12b. Rostral plate longer than broad (Fig. 7b); anterolateral spines of carapace not overreaching base of rostral plate (Fig. 7b) . . . . . → ***13***

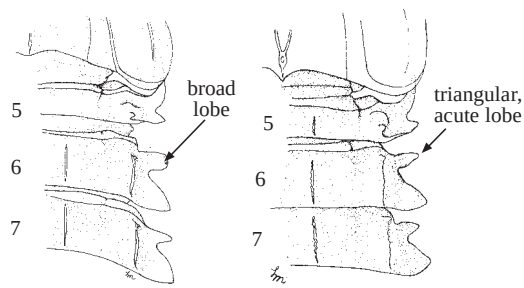
13a. Lateral process of sixth thoracic somite with broad, rectangular anterior lobe (Fig. 8a) . . . . . ***Oratosquillina solicitans***

13b. Lateral process of sixth thoracic somite with slender, triangular anterior lobe, acute apically (Fig. 8b) . . . . . ***Oratosquillina gravieri***



a) ***Oratosquillina perpensa*** **b)** ***Oratosquillina gravieri***

Fig. 7 anterior part of body (dorsal view)



a) ***Oratosquillina solicitans*** **b)** ***Oratosquillina gravieri***

Fig. 8 lateral processes of thoracic somites 5-7

(from Manning, 1978)

List of species occurring in the area

The symbol is given when species accounts are included.

Anchisquilla fasciata (De Haan, 1844)

Carinosquilla multicarinata (White, 1848)

Cloridopsis immaculata (Kemp, 1913)
Cloridopsis scorpio (Latreille, 1828)

Erugosquilla hesperia (Manning, 1968)
Erugosquilla woodmasoni (Kemp, 1911)

Keijia lirata (Kemp and Chopra, 1921)

Miyakea holoschista (Kemp, 1911)
Miyakea nepa (Latreille, 1828)

Oratosquilla calumnia (Townsley, 1953)
Oratosquilla mauritiana (Kemp, 1913)
Oratosquilla oratoria (De Haan, 1844)

Oratosquillina anomala (Tweedie, 1935)
Oratosquillina asiatica (Manning, 1978)
Oratosquillina fossulata (Moosa, 1986)
Oratosquillina gravieri (Manning, 1978)
Oratosquillina inornata (Tate, 1883)
Oratosquillina interrupta (Kemp, 1911)
Oratosquillina pentadactyla (Manning, 1978)
Oratosquillina perpensa (Kemp, 1911)
Oratosquillina quinquedentata (Brooks, 1886)
Oratosquillina solicitans (Manning, 1978)
Oratosquillina stephensoni (Manning, 1978)
Oratosquillina subtilis (Manning, 1978)

References

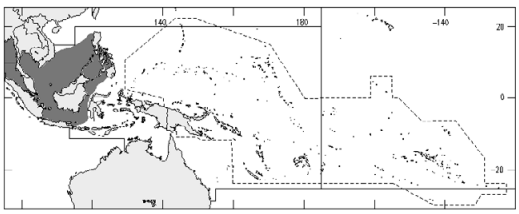
Manning, R.B. 1971. Keys to the species of *Oratosquilla*, (Crustacea: Stomatopoda), with descriptions of two new species. *Smithson. Contrib. Zool.*, (71):16 p.

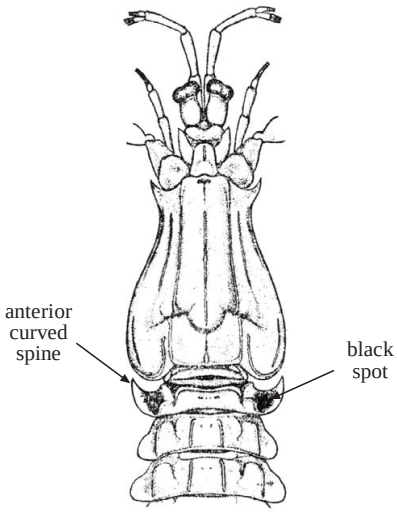
Manning, R.B. 1978. Further observations on *Oratosquilla*, with accounts of two new genera and nine new species (Crustacea: Stomatopoda: Squillidae). *Smithson. Contrib. Zool*., (272):44 p.

Cloridopsis scorpio (Latreille, 1828)

En - Spotted squillid mantis shrimp.

Maximum total length 10 cm or less. A shore species not known to occur in brackish water. Taken by traps. The most common species among the 6 *Cloridopsis* known from the Indo-West Pacific. Known from Viet Nam, Indonesia, and Malaysia to Pakistan.



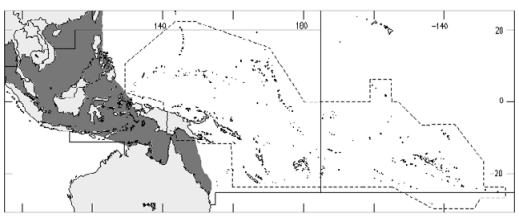


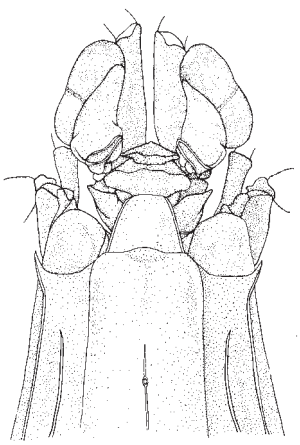
anterior part of body

Erugosquilla woodmasoni (Kemp, 1911)

En - Smooth squillid mantis shrimp.

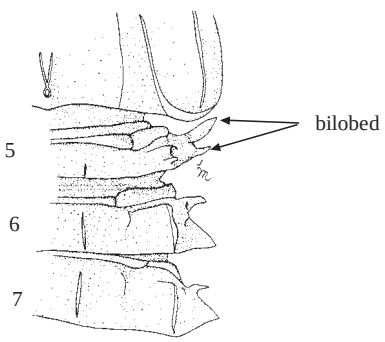
Maximum total length about 15 cm. A common shallow water species inhabiting burrows on level bottoms. Commonly taken by trawlers. Widely distributed from Japan to the western Indian Ocean.





anterior part of body

(from Manning, 1978)

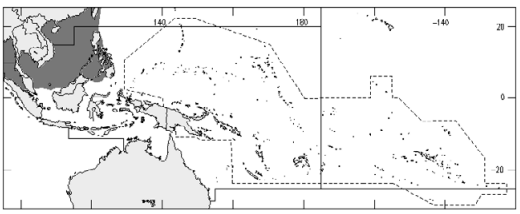


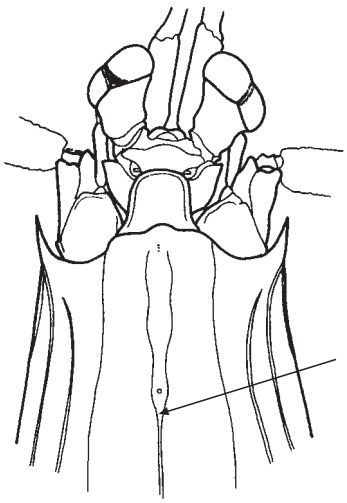
lateral processes of thoracic somites 5-7

Miyakea nepa (Latreille, 1828)

En - Smalleyed squillid mantis shrimp.

Maximum total length about 17 cm. A very common shore species that burrows in level-bottom habitats and one of the most common squillids in the western part of the area. Usually taken by trawls. Known from Taiwan Province of China to the Red Sea.



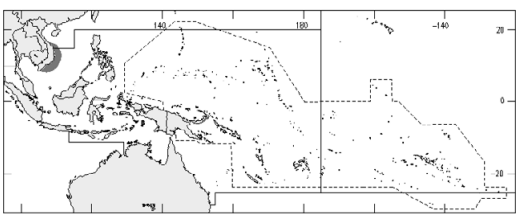


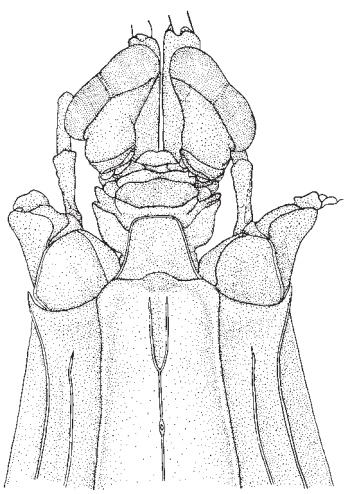
anterior part of body

Oratosquilla oratoria (De Haan, 1844)

En - Japanese squillid mantis shrimp.

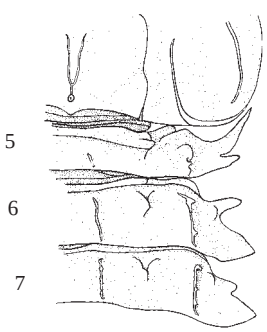
Maximum total length more than 18 cm. The common commercial species in Japan. Burrows in near-shore level-bottom habitats. Taken by trawls and traps. Known from Japan to Hong Kong (China) and Viet Nam, rare in southern part of its range.





anterior part of body

(from Manning, 1971)

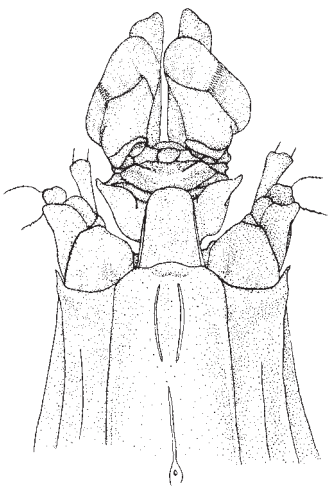


lateral processes of thoracic somites 5-7

Oratosquillina gravieri (Manning, 1978)

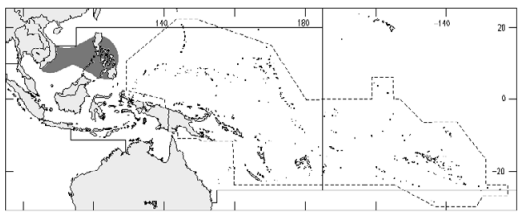
En - Vietnamese squillid mantis shrimp.

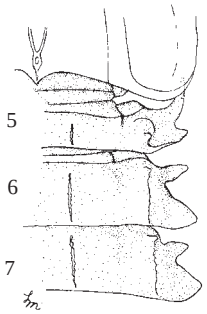
Maximum total length about 11 cm. Burrows in level bottoms in depths of 15 to 25 to more than 100 m. Taken by trawls. Known only from Viet Nam, where it is a common species, and the Philippines.



anterior part of body

(from Manning, 1978)



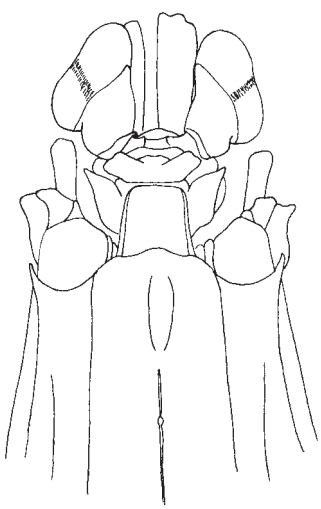


lateral processes of thoracic somites 5-7

Oratosquillina perpensa (Kemp, 1911)

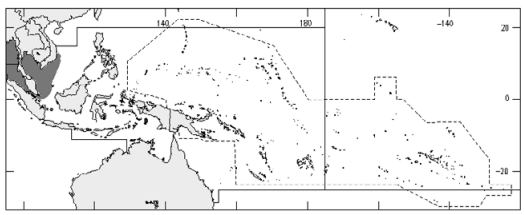
En - Common squillid mantis shrimp.

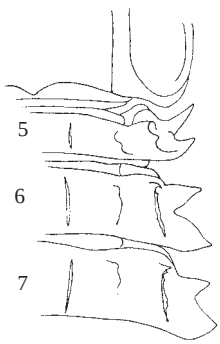
Maximum total length about 10 cm. Occurs in sublittoral, level-bottom habitats, in depths of 100 m or less. Usually taken in trawls. Known from localities between southern Taiwan Province of China and Myanmar.



anterior part of body

(from Manning, 1978)



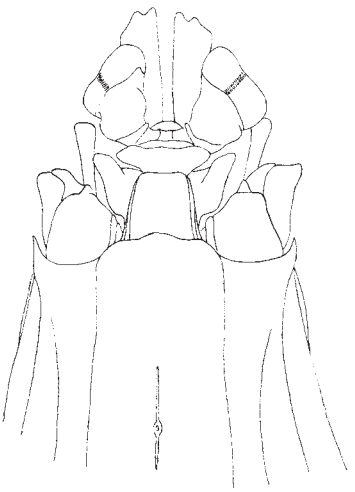


lateral processes of thoracic somites 5-7

Oratosquillina quinquedentata (Brooks, 1886)

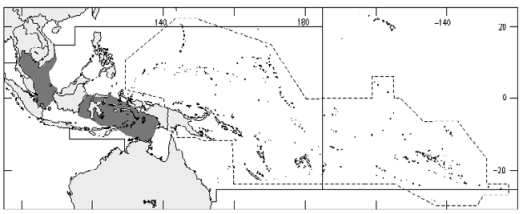
En - Fivespined squillid mantis shrimp.

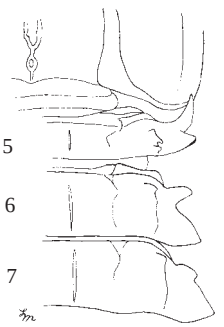
Maximum total length 14 cm. Occurs in sublittoral, level-bottom habitats in depths of at least 50 m. Usually taken in trawls. Known from the Arafura Sea, Gulf of Thailand, and Bombay, India.



anterior part of body

(from Manning, 1978)



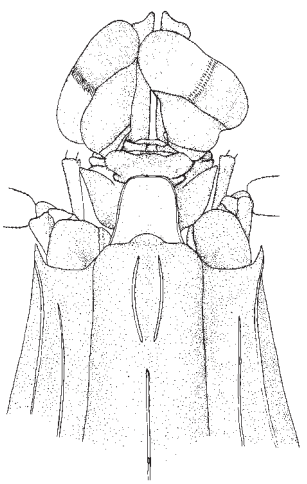


lateral processes of thoracic somites 5-7

Oratosquillina solicitans (Manning, 1978)

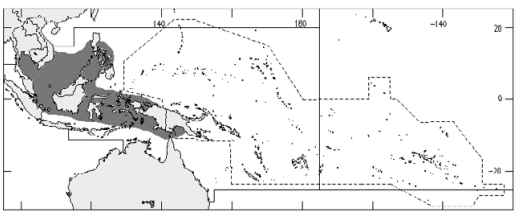
En - Variable squillid mantis shrimp.

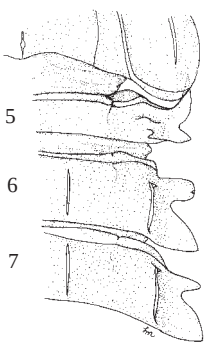
Maximum total length less than 10 cm. Occurs in level-bottom habitats near shore. Usually taken in trawls. Known from the western Pacific, Taiwan Province of China, the Gulf of Thailand, Malaysia, and Indonesia.



anterior part of body

(from Manning, 1978)





lateral processes of thoracic somites 5-7

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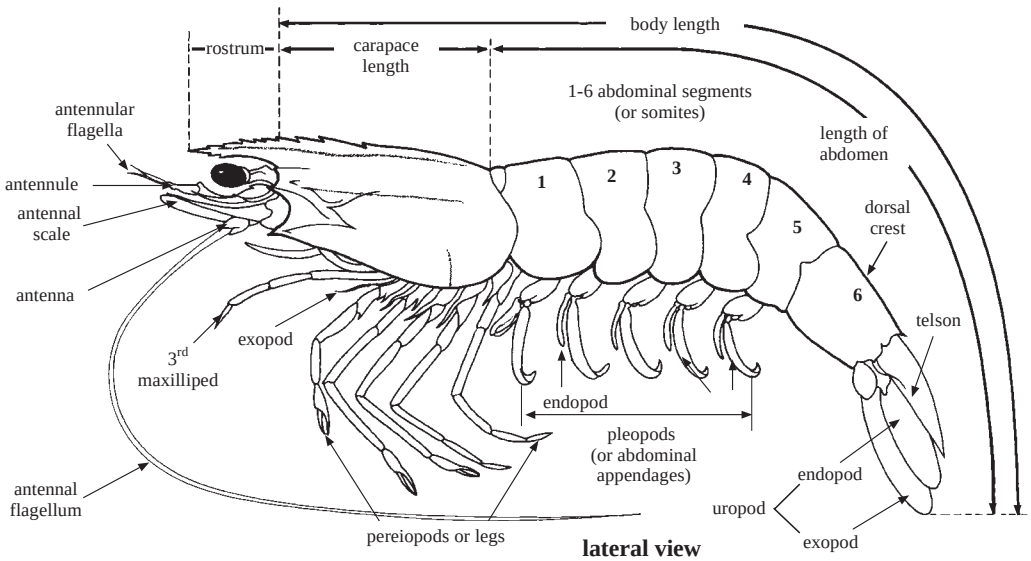
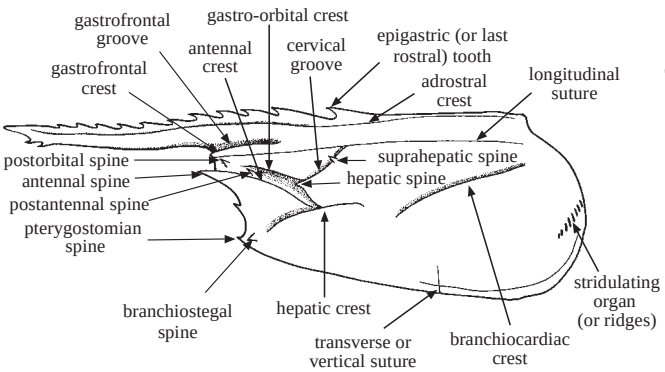
SHRIMPS AND PRAWNS

by T.Y. Chan

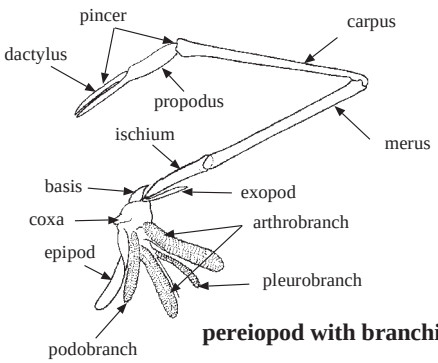
TECHNICAL TERMS AND MEASUREMENTS



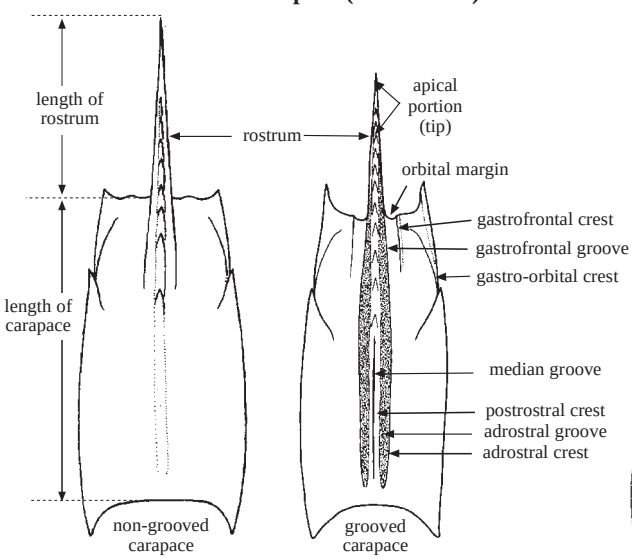
lateral view



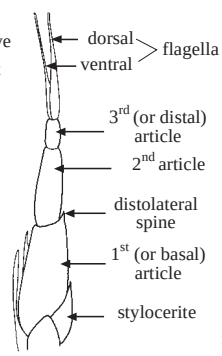
carapace (lateral view)



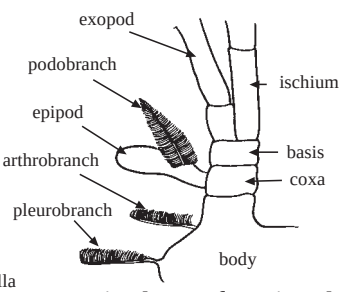
pereiopod with branchiae



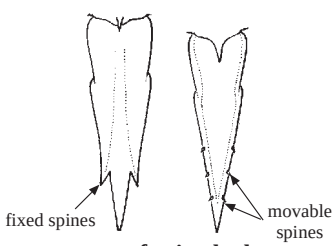
carapace (dorsal view)



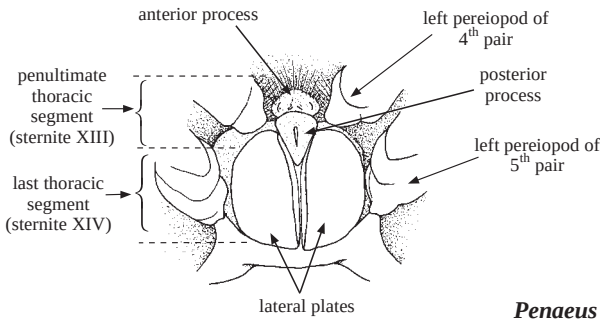
antennule

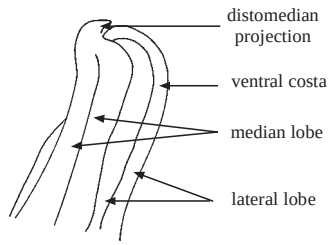


proximal part of pereiopod (schematic)

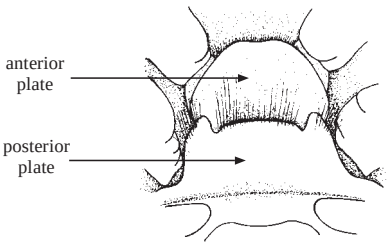


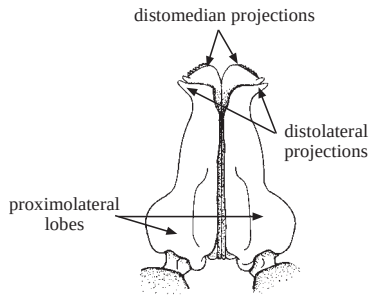
types of spined telsons



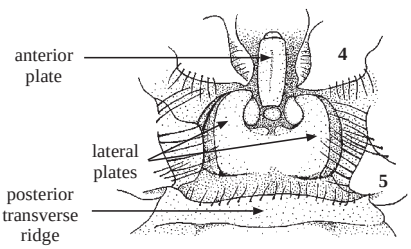


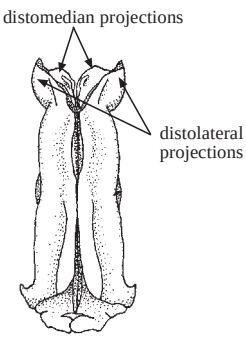
Penaeus



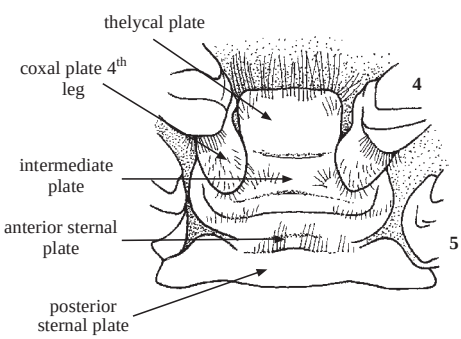


Parapenaeopsis

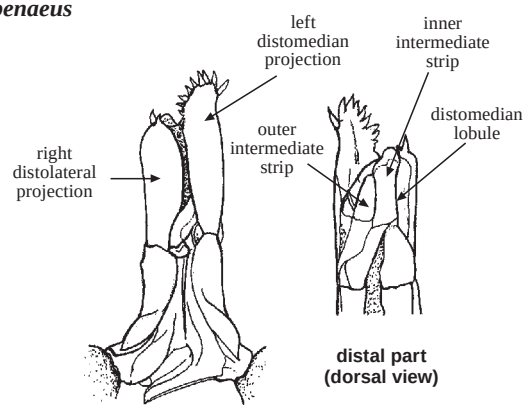




Metapenaeus



basic types of thelycum of female penaeid shrimps (ventral view)

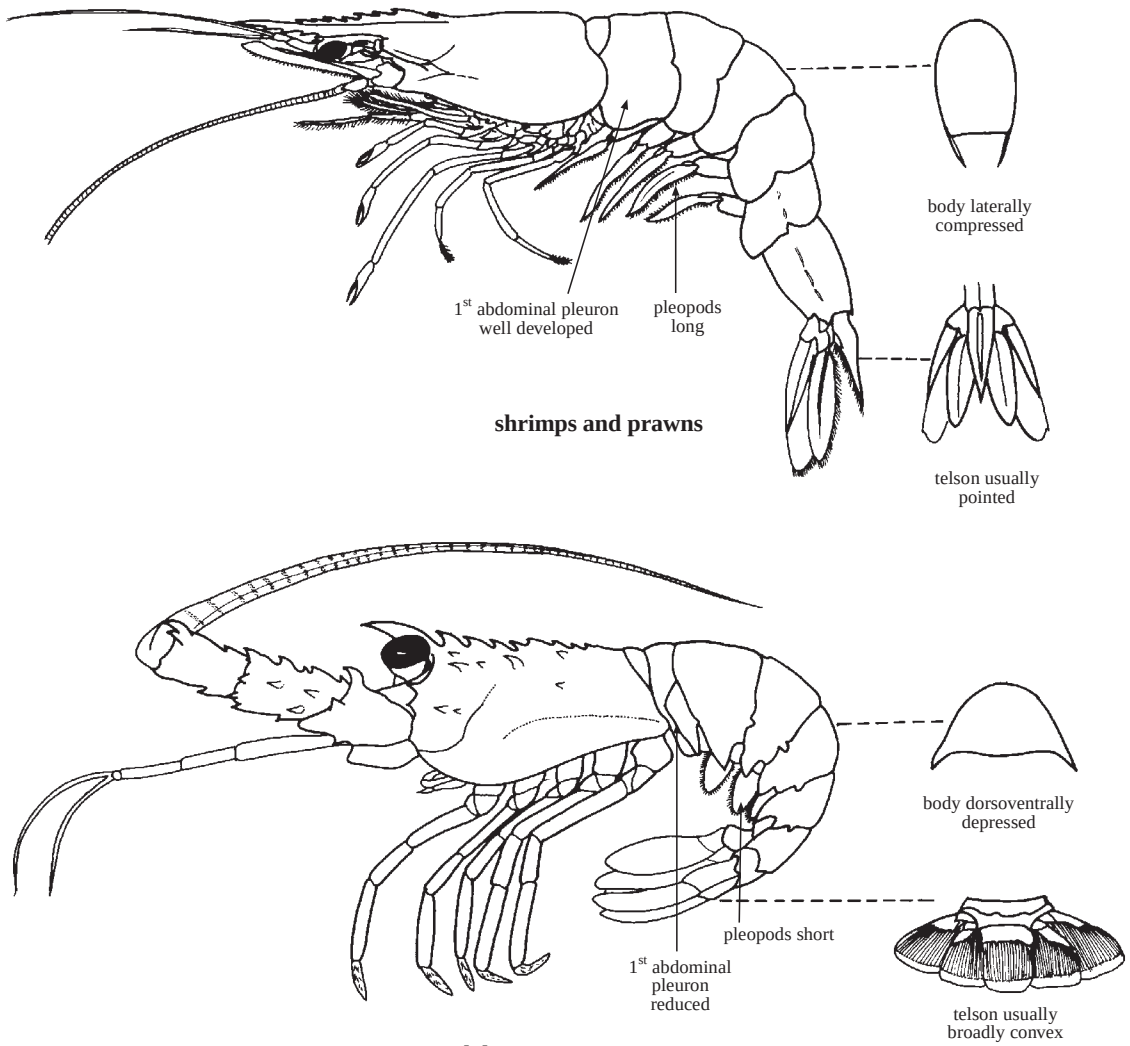


Metapenaeopsis

basic types of petasma (joined endopods of first pair of pleopods) of male penaeid shrimps (ventral view - except otherwise stated)

GENERAL REMARKS

Shrimps and prawns constitute a large group of crustaceans with an extended abdomen (or "tail"), varying in size from microscopic to about 35 cm body length (measured dorsally from the posterior orbital margin to the end of the tail, excluding the rostrum and the appendages). Taxonomically, shrimps and prawns belong to the "swimming group" of decapod crustaceans in the suborder Macrura Natantia. They differ from the lobsters (suborder Macrura Reptantia) by having the body generally more laterally compressed, the pleopods (abdominal appendages) well developed, the thoracic sternum (i.e. ventral part of thoracic body segments, between the legs) often narrow and not easy to observe, the first abdominal pleuron (or lateral plate) well developed (about as large as the pleura of following segments, see figure below), and the telson usually tapering distally.



(after Chan and Yu, 1993)

conspicuous morphological differences between shrimps and lobsters

The terms “shrimp” and “prawn” have no definite reference to any known taxonomic groups. Although the term “shrimp” is sometimes applied to smaller species, while “prawn” is more often used for larger forms, there is no clear distinction between both terms and their usage is often confused or even reverse in different countries or regions. Therefore, no attempt has been made here to restrict or define their meaning. Certain other crustaceans, such as the “mysid shrimps” (Mysidacea), “mantis shrimps” (Stomatopoda), and “mud shrimps” (Thalassinidea), are taxonomically not true shrimps.

Altogether, there are about 3 047 species of shrimps and prawns known to date, subdivided into 4 major groups, namely Sergestoidea (about 94 species), Penaeoidea (about 376 species), Stenopodidea (at least 60 species), and Caridea (at least 2 517 species). Although the Caridea comprise the majority of species, only some are abundant enough to be of interest to fisheries. Most of the commercial shrimps and prawns belong to the Penaeoidea. At present, only slightly less than 300 species of shrimps and prawns are of economic interest worldwide, and out of these, only about 100 comprise the principal share of the annual world catch. FAO’s Yearbook of Fishery Statistics reports in 1995 a worldwide production of all shrimps and prawns of around 3 200 000 t (both from capture fishery and aquaculture). Around 710 000 t of this production originated in the Western Central Pacific.

The exact number of species of shrimps and prawns present in the Western Central Pacific is uncertain. This is especially true for the carideans and stenopodids, most species of which have no economic value and thus only very few studies exist on them. However, recent extensive studies on carideans from the Philippines and adjacent areas have shown that 528 species occur in that region alone. Although caridean shrimps are widely distributed in marine waters, brackish and fresh waters, and are found from high mountain regions to coral reefs and the deep sea, at present only the giant river prawn *Macrobrachium rosenbergii* is of high economic importance in the Western Central Pacific. This is a very large species, sometimes found in marine waters, and extensively fished and cultured in several countries. The other coastal or fresh-water caridean shrimps in the area are either too small or not abundant enough to be fished on a large scale, although a few of them may locally be used as food. It should be noted, however, that the present commercial fishing activities in the area are generally rather simple and mainly limited to shallow waters with depths less than 100 m. Several deep-sea caridean shrimps, mostly belonging to the family Pandalidae, can often be caught in large quantities during exploratory trawling operations and may eventually prove to be of commercial interest with the development of a deep-sea fishery.

The Stenopodidea (with the single family Stenopodidae) generally have no economic importance, although a few of them, as well as some coral reef carideans, are sporadically seen in the aquarium trade and thus have some commercial value.

Most of the commercial species of shrimps and prawns belong to the Penaeoidea. Studies on penaeoids are more comprehensive and at present 4 families including 191 species are known to occur in the Western Central Pacific, with the Penaeidae being the most important family. As species of the Penaeidae are generally of moderate to large size and often occur in large quantities in shallow waters along the continental shelf on trawlable bottoms, they are fished extensively by trawls, seines, set nets, traps, and artisanal gear. Large-scale pond culture of penaeid shrimps is practised in several countries. Species of the penaeoid families Aristeidae and Solenoceridae are mainly deep-water dwellers and largely unexploited. The fact that larger representatives of these 2 families are often caught on the basis of exploratory deep-sea trawling, indicates that they have a high commercial potential with the future development of a deep-sea fishery in the area. In contrast, species of the penaeoid family Sicyoniidae are generally small, nowhere abundant, and do not have any commercial potential.

Sergestoid shrimps are usually small and of no interest to fisheries, except for the genus *Acetes*, 7 species of which are found in the Western Central Pacific. These epipelagic shrimps inhabit shallow coastal estuarine waters and often occur in great abundance. They are extensively fished by push nets, bag nets and seines, and are of considerable economic importance, particularly in the Southeast Asian countries of the area.

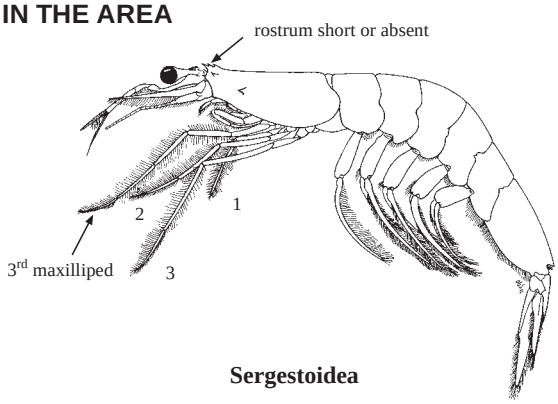
Shrimps and prawns in the Western Central Pacific are generally marketed fresh or frozen, sometimes live, except for species of *Acetes* which are usually processed into shrimp paste. They are locally consumed or exported. In the Philippines, Indonesia and Thailand, altogether 94 200 t of shrimps and prawns were exported in 1987.

GUIDE TO THE MAJOR GROUPS OF SHRIMPS AND PRAWNS OCCURRING IN THE AREA

SERGESTOIDEA **Page 858**

Sergestoid shrimps

Usually small to microscopic, body strongly compressed laterally, shell rather soft; rostrum and last 2 pairs of legs (pereiopods) reduced (absent in Luciferidae); abdomen with posterior part of pleura (lateral plates) covering anterior part of succeeding pleura; males with large copulatory organ (petasma) on first pair of pleopods (abdominal appendages); generally pelagic, with eggs released directly into the water (eggs carried on second pair of legs in Luciferidae).

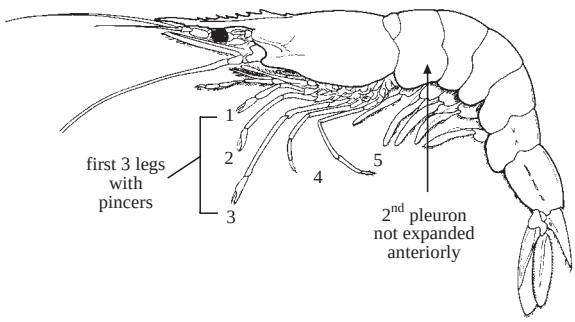


Sergestoidea

PENAEOIDEA **Page 866**

Penaeoid shrimps

Small to large; all 5 pairs of legs (pereiopods) well developed, with first 3 pairs forming a pincer, none of the pincers particularly large; abdomen with posterior part of pleura (or lateral plates) covering anterior part of succeeding pleura; with large specific copulatory organ on first pair of pleopods (abdominal appendages) in males (petasma), and on posterior thoracic sternites in females (thelycum); eggs released directly into the water, not retained by the females.

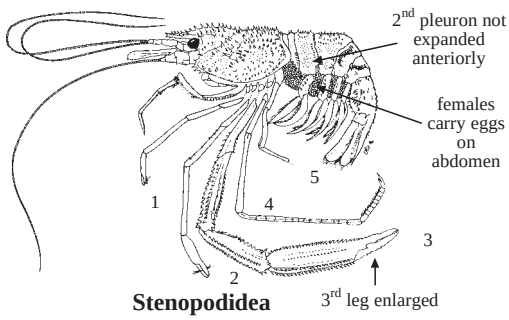


Penaeoidea

STENOPODIDEA **Page 955**

Stenopodid shrimps

Usually small; all 5 pairs of legs (pereiopods) well developed, with first 3 pairs forming a pincer, third pair huge and massive; abdomen with posterior part of pleura (lateral plates) covering anterior part of succeeding pleura; males and females without large specific copulatory organ on first pair of pleopods (abdominal appendages) or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.

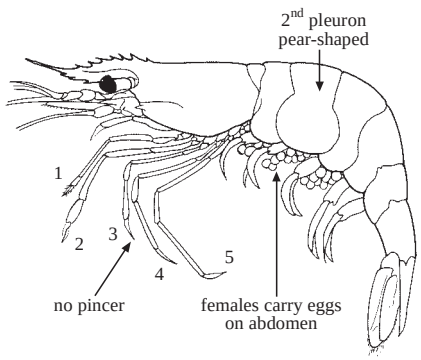


Stenopodidea

CARIDEA **Page 957**

Caridean shrimps

Size very small to large; all 5 pairs of legs (pereiopods) well developed, the first 2 pairs with or without pincer, but third pair never bearing a pincer; second abdominal pleuron (lateral plate) greatly expanded, pear-shaped and overlapping posterior part of first pleuron and anterior part of third pleuron; males and females without large specific copulatory organ on first pair of pleopods (abdominal appendages) or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.



Caridea

LIST OF FAMILIES OCCURRING IN THE AREA

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

Infraorder PENAEIDEA

Superfamily SERGESTOIDEA

LUCIFERIDAE

 SERGESTIDAE

Superfamily PENAEOIDEA

 ARISTEIDAE

 SOLENOCERIDAE

 PENAEIDAE

 SICYONIIDAE

Infraorder STENOPODIDEA

 STENOPODIDAE

Infraorder Caridea

Superfamily PASIPHAEOIDEA

PASIPHAEIDAE

Superfamily OPLOPHORIDEA

OPLOPHORIDAE

Superfamily ATYOIDEA

 ATYIDAE

Superfamily BRESILIOIDEA

BRESILIIDAE

Superfamily NEMATOCARCINOIDEA

EUGONATONOTIDAE

NEMATOCARCINIDAE

 RHYNCHOCINETIDAE

Superfamily PSALIDOPODOIDEA

PSALIDOPODIDAE

Superfamily STYLODACTYLOIDEA

STYLODACTYLIDAE

Superfamily CAMPYLONOTIDEA

BATHYPALAEMONELLIDAE

Superfamily PALAEMONOIDEA

ANCHISTIOIDIDAE

GNATHOPHYLLIDAE

 HYMENOCERIDAE

 PALAEMONIDAE

Superfamily ALPHEOIDEA

ALPHEIDAE

 HIPPOLYTIDAE

OGYRIDIDAE

Superfamily PROCESSOIDEA

PROCESSIDAE

Superfamily PANDALOIDEA

 PANDALIDAE

THALASSOCARIDIDAE

Superfamily CRANGONOIDEA

CRANGONIDAE

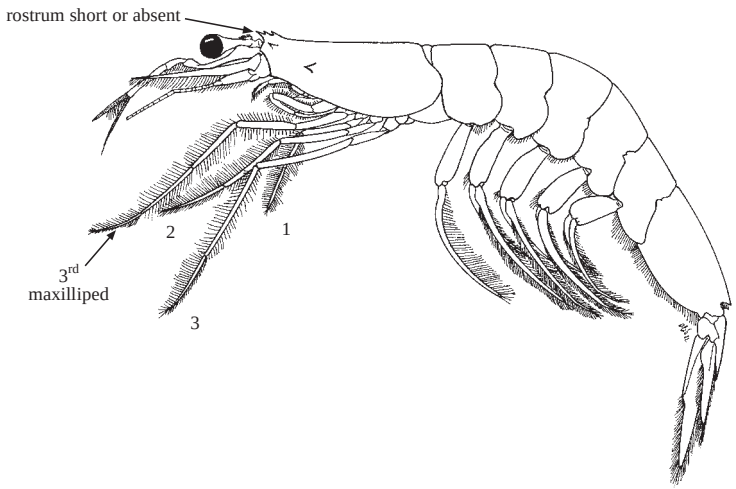
GLYPHOCRANGONIDAE

Infraorder PENAEIDEA

Superfamily SERGESTOIDEA

Sergestoid shrimps

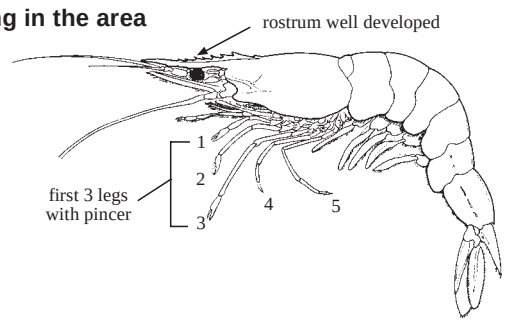
Diagnostic characters: Usually microscopic to small sized, with a body length from 1 to about 5 cm (exceptionally over 8.5 cm). **Body strongly compressed laterally**, shell soft. Carapace with crests and grooves poorly developed, often wanting. **Rostrum very short and small, sometimes absent**. In males, lower antennular flagella with a clasping organ. First leg with or without pincer, second and third legs bearing small pincers; **fourth and fifth legs reduced or absent**. Abdomen with **posterior part of pleura (lateral plates) covering anterior part of succeeding pleura**. **Males with large copulatory organ (petasma)** on first pair of pleopods (abdominal appendages). Generally pelagic; eggs released directly into the water (family Sergestidae), or carried on second pair of legs until hatching (family Luciferidae).



Habitat, biology, and fisheries: Members of this superfamily (including 2 families and 7 genera) mainly inhabit brackish and marine environments (a single species is found in pure fresh water). They can be found from shallow to deep waters (deeper than 2 100 m) and are generally pelagic, although a few (in the genus *Sicyonella*) have adapted to a benthic way of life. At present, 2 families and 4 genera of sergestoid shrimps are known from the Western Central Pacific, but all except the genus *Acetes* are without any economic importance as they are either too small, not abundant enough, or occur in very deep water. Members of the genus *Acetes* mainly occur in estuarine or shallow coastal waters and are seasonally very abundant. These are small shrimps with a body length of adults ranging between 1 and 4 cm. Their bodies are translucent or semi-translucent, with black eyes and several pairs of red pigment spots (chromatophores) on the bases of uropods. In the course of their fishing seasons, they are extensively caught by push nets, bag nets, and seines. They are mainly fished in the Southeast Asian countries of the area and are of significant commercial importance. From 1990 to 1995, the reported annual catch of sergestoid shrimps in the Western Central Pacific ranged from around 38 500 to 45 700 t (FAO Yearbook of Fishery Statistics). Only a small part of the catch is marketed fresh, and the greater fraction is dried, salted or fermented with salt and processed into shrimp paste. As only species of *Acetes* are of commercial interest, a key to species of this genus is given here.

Other major groups of shrimps and prawns occurring in the area

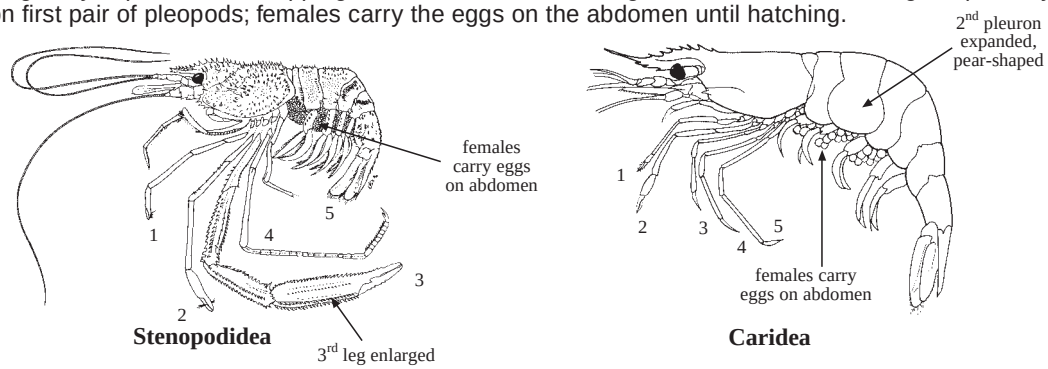
Penaeoidea: all 5 pairs of legs well developed, with first 3 pairs forming a pincer, none of the pincers particularly large; rostrum usually well developed, extending beyond eyes; numerous branchiae (more than 8 on each side).



Penaeoidea

Stenopodidea: all 5 pairs of legs well developed, first 3 pairs forming a pincer, third pair huge and massive; males without large copulatory organ on first pair of pleopods; females carry the eggs on the abdomen until hatching.

Caridea: all 5 pairs of legs well developed, third pair without pincer; abdomen with pleuron of second segment greatly expanded, overlapping those of first and third segments; males without large copulatory organ on first pair of pleopods; females carry the eggs on the abdomen until hatching.



Key to families and genera[1/] **of Sergestoidea occurring in the area**

1a. Head greatly elongated (Fig. 1); no branchiae; size very small, about 1 cm body length . . . . . **Luciferidae**

1b. Head not particularly elongate; branchiae present; size small, but generally adults with more than 2 cm body length . . . . . **(Sergestidae)** → *2*

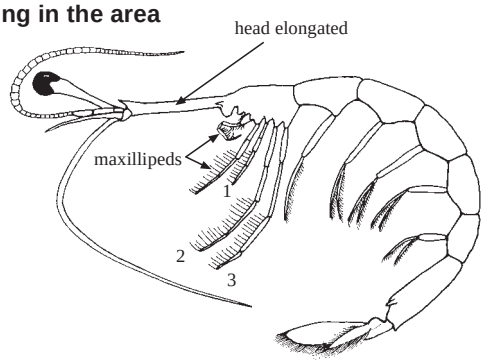


Fig. 1 Luciferidae

2a. Fourth and fifth legs entirely lacking, reduced to a pair of protuberances (genital coxae) in males (Fig. 2); first maxillae and first maxillipeds without palp; second maxillae with a single undivided lobe . . . . . ***Acetes***

2b. Fourth and fifth legs present, with fifth leg much shorter than fourth (Fig. 3); first maxillae and first maxillipeds with palp; second maxillae with 2 lobes . . . . . **other genera**

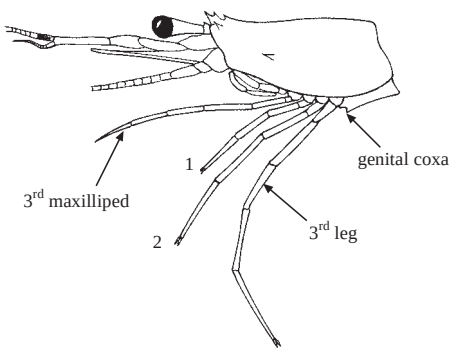


Fig. 2 *Acetes*

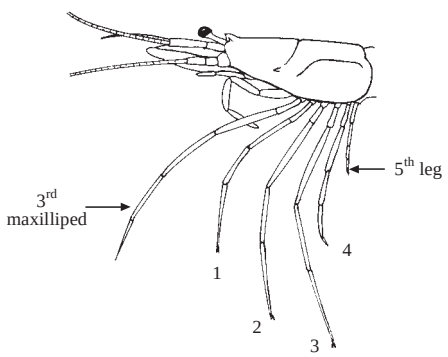


Fig. 3 *Sergestes*

1/ Restricted to the identification of *Acetes*, the only genus of interest to fisheries in the area.

SERGESTIDAE

Key to sexes of *Acetes*

1a. A pair of protuberances (genital coxae; Fig. 2) between third legs and first pleopods; lower antennular flagella with 1 or 2 clasping spines, or modification of these (Fig. 4); petasma (Fig. 5) present on first pleopods . . . . . **male**

1b. No protuberance in genital area; lower antennular flagella without spine; petasma absent . . . . . **female**

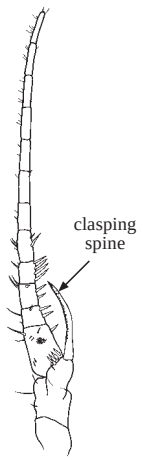


Fig. 4 lower antennular flagellum of a male

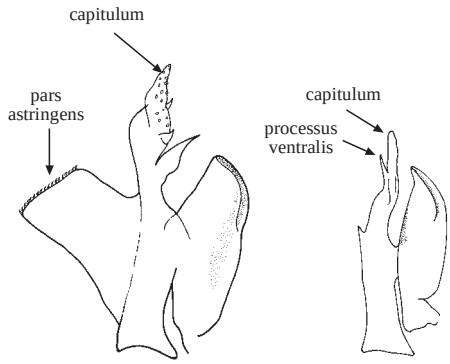


Fig. 5 examples of the petasma

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

Remark on key characters: see the respective species accounts for illustrations of the petasma and lower antennular flagellum of males, and the basis of third leg of females.

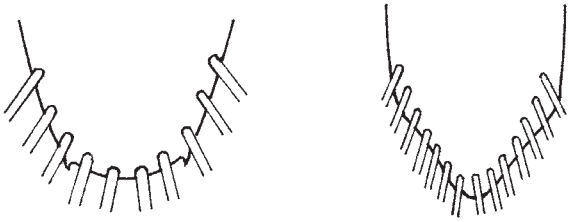
Females

1a. Apex of telson rounded or truncated (Fig. 6a) . . . . . → *2*

1b. Apex of telson triangular (Fig. 6b) . . . . . → *3*

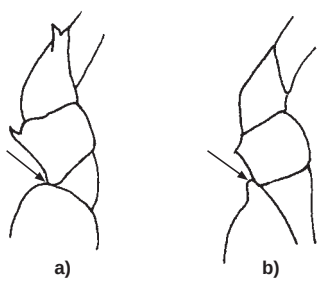
2a. Third thoracic sternite produced posteriorly (Fig. 7b) . . . . . ***Acetes japonicus***

2b. Third thoracic sternite not produced posteriorly (Fig. 7a) . . . . . ***Acetes serrulatus***



a) rounded or truncated **b) triangular**

Fig. 6 apex of telson



a) **b)**

Fig. 7 base of third leg

3a. Procurved tooth present between bases of first pleopods . . . . . → *4*

3b. Procurved tooth absent between bases of first pleopods . . . . . → *6*

4a. Inner margin of basis of third leg with sharply pointed projection; third and fourth thoracic sternites deeply channeled longitudinally . . . . . ***Acetes indicus***

4b. Inner margin of basis of third leg without sharply pointed projection; third and fourth thoracic sternites not channeled longitudinally . . . . . → *5*

5a. First segment of antennular peduncle at most as long as second and third segments together; distal inner margin of basis of third leg ending in blunt projection . . . ***Acetes intermedius***

5b. First segment of antennular peduncle longer than second and third segments together; distal inner margin of basis of third leg without projection . . . . . ***Acetes erythraeus***

6a. Lower antennular flagellum with 20 segments or less; distal inner margin of basis of third leg ending in projection; pair of small protuberances on anterior part of third thoracic sternite . . . . . ***Acetes sibogae***

6b. Lower antennular flagellum with 20 segments or more; distal inner margin of basis of third leg without projection; pair of large protuberances on anterior part of third thoracic sternite . . . . . ***Acetes vulgaris***

Males

1a. Anterior margin of genital coxa rounded; petasma without pars astringens (Fig. 5) . . . . . → ***2***

1b. Anterior margin of genital coxa pointed; petasma with pars astringens (Fig. 5) . . . . . → ***4***

2a. Procurved tooth present between bases of first pleopods; lower antennular flagellum with 1 clasping spine . . . . . ***Acetes indicus***

2b. Procurved tooth absent between bases of first pleopods; lower antennular flagellum with 2 clasping spines . . . . . → ***3***

3a. Lower antennular flagellum with triangular projection from upper end of first segment of main branch . . . . . ***Acetes serrulatus***

3b. First segment of main branch of lower antennular flagellum without triangular projection . . . . . ***Acetes japonicus***

4a. Procurved tooth present between bases of first pleopods . . . . . → ***5***

4b. Procurved tooth absent between bases of first pleopods . . . . . → ***6***

5a. First segment of antennular peduncle shorter than second and third segments together; capitulum of petasma with 3 to 5 subequally large hooks along outer margin . . ***Acetes intermedius***

5b. First segment of antennular peduncle longer than second and third segments together; capitulum of petasma with 1 large hook at outer margin . . . . . ***Acetes erythraeus***

6a. Lower antennular flagellum with 12 segments or less; capitulum of petasma with 1 large hook and often additionally 1 small hook along outer margin . . . . . ***Acetes sibogae***

6b. Lower antennular flagellum with 17 segments or more; capitulum of petasma with 3 large hooks along outer margin . . . . . ***Acetes vulgaris***

List of genera and commercial species occurring in the area

The symbol is given when species accounts are included.

LUCIFERIDAE

Genus *Lucifer*

SERGESTIDAE

Genus *Acetes*

Acetes erythraeus Nobili, 1905
Acetes indicus H. Milne Edwards, 1830
Acetes intermedius Omori, 1975
Acetes japonicus Kishinouye, 1905
Acetes serrulatus (Krøyer, 1855)
Acetes sibogae Hansen, 1919
Acetes vulgaris Hansen, 1919

Genus *Sergestes*

Genus *Sergia*

Genus *Sicyonella*

References

Miquel, J.C. 1984. Shrimps and Prawns. In *FAO species identification sheets for fisheries purposes. Western Indian Ocean (Fishing Area 51),* edited by W. Fischer and G. Bianchi. Rome, FAO.

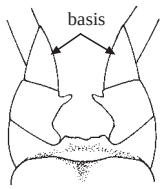
Omori, M. 1975. The systematics, biogeography, and fishery of epipelagic shrimps of the genus *Acetes* (Crustacea, Decapoda, Sergestidae). *Bull. Ocean Res. Inst., Univ. Tokyo*, 7:1-89.

Pérez Farfante, I. and B.F. Kensley. 1997. Penaeoid and sergestoid shrimps and prawns of the world. Keys and diagnosis for the families and genera. *Mem. Mus. Natn. Hist. Nat.*, 175:1-233.

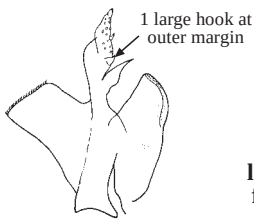
Acetes erythraeus Nobili, 1905

En - Tsivakihini paste shrimp; **Fr** - Chevrette tsivakihini; **Sp** - Camaroncillo tsivakihini.

Maximum body length 1.6 to 4.0 in females (rarely 4.8 cm) and 1.6 to 3.2 cm in males. Epipelagic, found over muddy or sandy bottoms, from the surface to a depth of 55 m. Marine or brackish, but usually brackish and fished in the intertidal zone and estuaries with mangroves. Probably the most common species of the genus in the area and of major commercial importance in its range, despite its very small size. Caught with triangular nets, lift nets, scoop nets, push nets, bag nets, set filter nets, and seines, occasionally encountered in penaeid shrimp culture ponds. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Indo-West Pacific from the eastern coast of Africa to southern China and northeastern Australia.



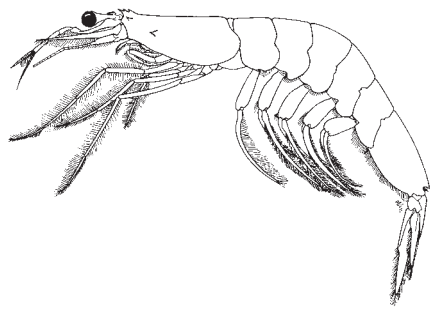
bases of 3rd legs (female)

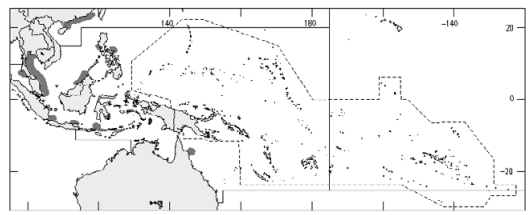


petasma

lower antennular flagellum (male)

(after Omori, 1975)

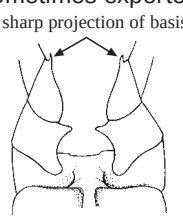




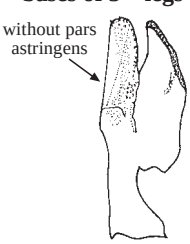
Acetes indicus H. Milne Edwards, 1830

En - Jawla paste shrimp; **Fr** - Chevrette jawla; **Sp** - Camaroncillo javlá.

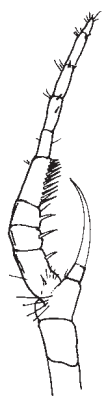
Maximum body length 2.3 to 4.0 cm (females) and 1.5 to 2.5 cm (males). Inhabits shallow, sometimes brackish coastal waters; epipelagic, usually swims in midwater or near the surface. One of the more common species of the genus in the area and of considerable economic importance. Caught with push nets, bag nets and seines, and sometimes by light fishing at night. Taken throughout its range. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Indo-West Pacific from India to Viet Nam and Indonesia.



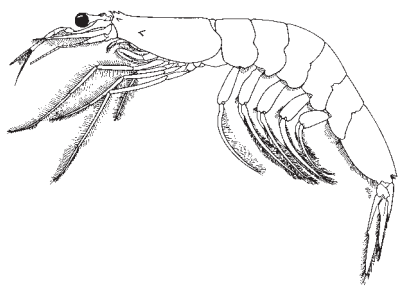
bases of 3rd legs (female)

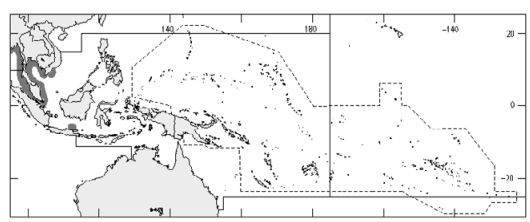


petasma



lower antennular flagellum (male)

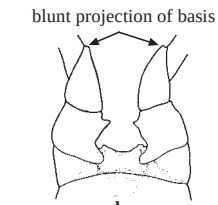




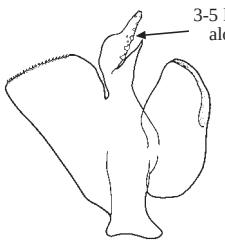
Acetes intermedius Omori, 1975

En - Taiwan mauxia shrimp; **Fr** - Chevrette mauxia de Formose; **Sp** - Camaroncillo mauxia dè Formosa.

Maximum body length 2.0 to 2.6 cm (females) and 1.7 to 2.4 cm (males). Epipelagic, found mainly at sea. Within the area, reported from commercial catches made in the Philippines and Indonesia, and probably of moderately commercial importance. Caught with midwater trawls, triangular nets, lift nets, and scoop nets, and sometimes by light fishing at night. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Found in the western Pacific, but so far only reported from Taiwan Province of China, Philippines, and the southern coast of Java.



bases of 3rd legs (female)



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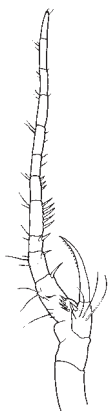
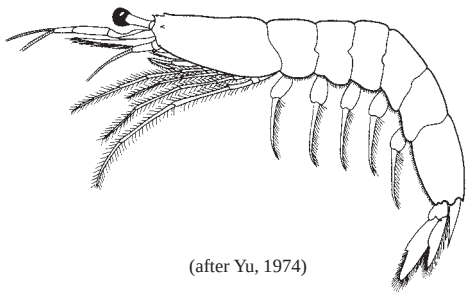
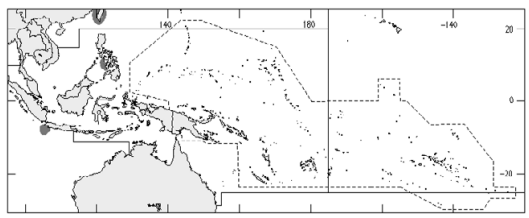


lower antennular flagellum (male)

(after Omori, 1975)



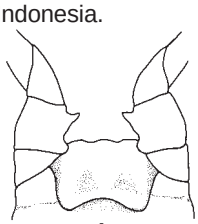
(after Yu, 1974)



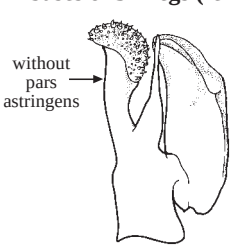
Acetes japonicus Kishinouye, 1905

En - Akiami paste shrimp; **Fr** - Chevrette akiami; **Sp** - Camaroncillo akiami.

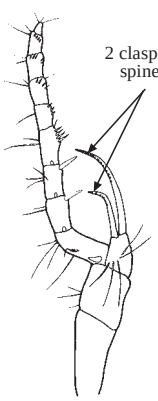
Maximum body length 1.5 to 3.0 cm (females) and 1.1 to 2.4 cm (males). Epipelagic, inhabits shallow coastal waters over muddy bottoms. One of the more common species of the genus in the area and of considerable economic importance; reported from commercial catches made in Viet Nam, Thailand, and Malaysia. Caught with push nets, bag nets, and seines, and sometimes by light fishing at night. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. In 1995, the reported production from culture ponds of this species in Indonesia amounted to 3 500 t (FAO Aquaculture Production Statistics). Widely distributed in the Indo-West Pacific from the Persian Gulf to Japan and Indonesia.



bases of 3rd legs (female)

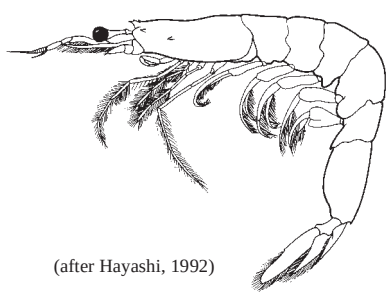


petasma

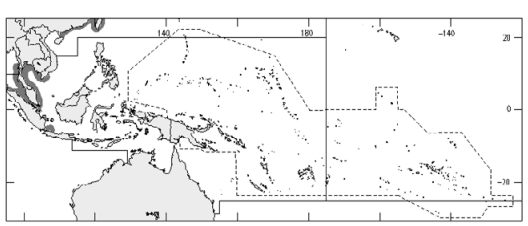


lower antennular flagellum (male)

(after Omori, 1975)



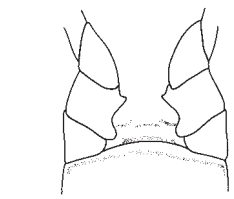
(after Hayashi, 1992)



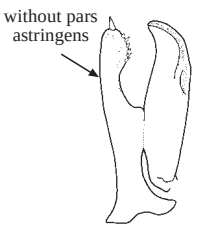
Acetes serrulatus (Krøyer, 1855)

En - Southern mauxia shrimp; **Fr** - Chevrette mauxia méridionale; **Sp** - Camaroncillo mauxia sureño.

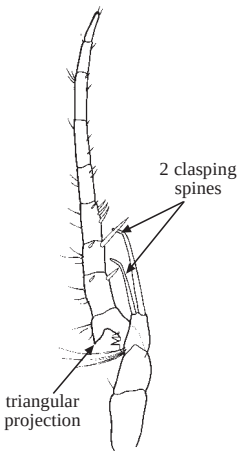
Maximum body length 1.5 to 2.1 cm (females) and 1.2 to 1.7 cm (males). Epipelagic, inhabits shallow coastal water. Probably less common than the other species of the genus. Within the area, reported from commercial catches made in Malaysia and Indonesia, but no further information on its economic status is presently available. Caught by push nets, bag nets, and seines. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Western Pacific and so far known only from southern China, Singapore, Malaysia, and Indonesia.



bases of 3rd legs (female)

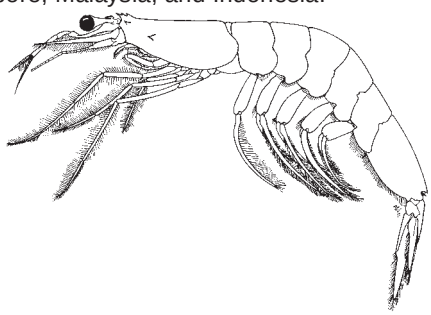


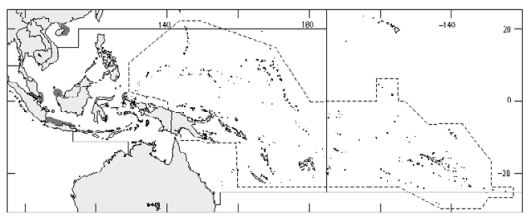
petasma



lower antennular flagellum (male)

(after Omori, 1975)

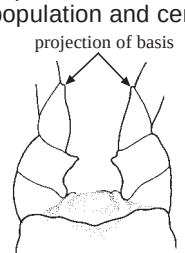




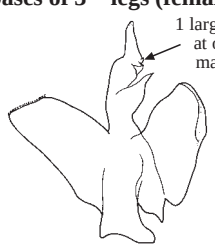
Acetes sibogae Hansen, 1919

En - Alamang shrimp; **Fr** - Chevrette alamang; **Sp** - Camaroncillo alamang.

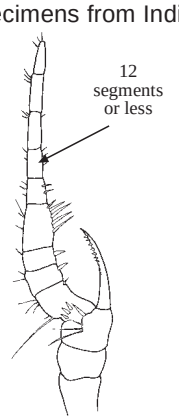
Maximum body length 1.4 to 3.4 cm (females) and 1.3 to 2.5 cm (males). Epipelagic, found over muddy bottoms in estuarine and marine waters to a depth of 55 m. Probably caught throughout its range in the area and of moderate commercial importance. Taken by triangular nets, lift nets and scoop nets. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Indo-West Pacific from India to the Philippines and eastern Australia (the Australian population and certain specimens from India are sometimes considered to be 2 subspecies).



bases of 3rd legs (female)

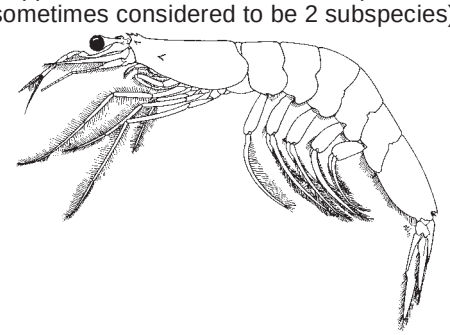


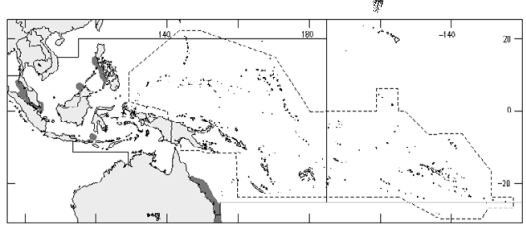
petasma



lower antennular flagellum (male)

(after Omori, 1975)

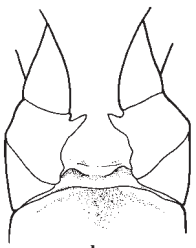




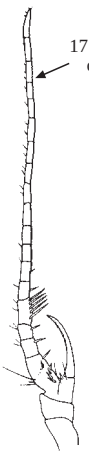
Acetes vulgaris Hansen, 1919

En - Jembret shrimp; **Fr** - Chevrette jembre; **Sp** - Camaroncillo jembre.

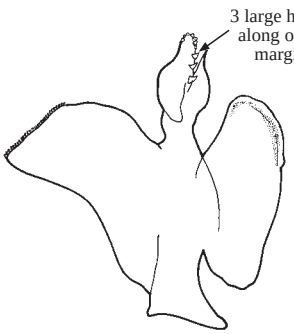
Maximum body length 2.0 to 3.4 cm (females) and 1.7 to 2.6 cm (males). Epipelagic, found over sandy and muddy bottoms in marine waters from depths of 9 to 55 m. One of the more common species of the genus in the area and of considerable economic importance; reported from commercial catches made in Thailand, Singapore, and Indonesia. Caught with push nets, bag nets, scoop nets, and seines, sometimes by light fishing at night. Marketed dried, boiled, salted, fermented with salt, fresh, or processed in other ways; consumed locally, mainly in the form of seasoning such as shrimp paste or shrimp sauce, sometimes exported. Western Pacific from southern China to the Strait of Malacca and Indonesia.



bases of 3rd legs (female)

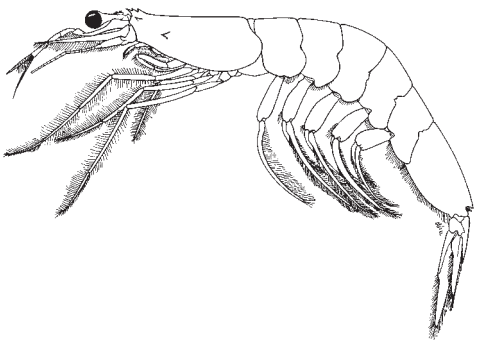


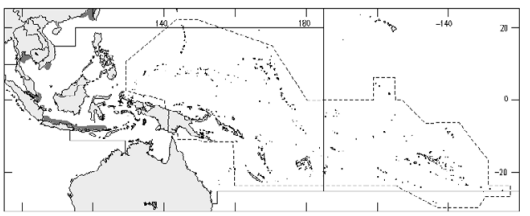
lower antennular flagellum (male)



petasma

(after Omori, 1975)

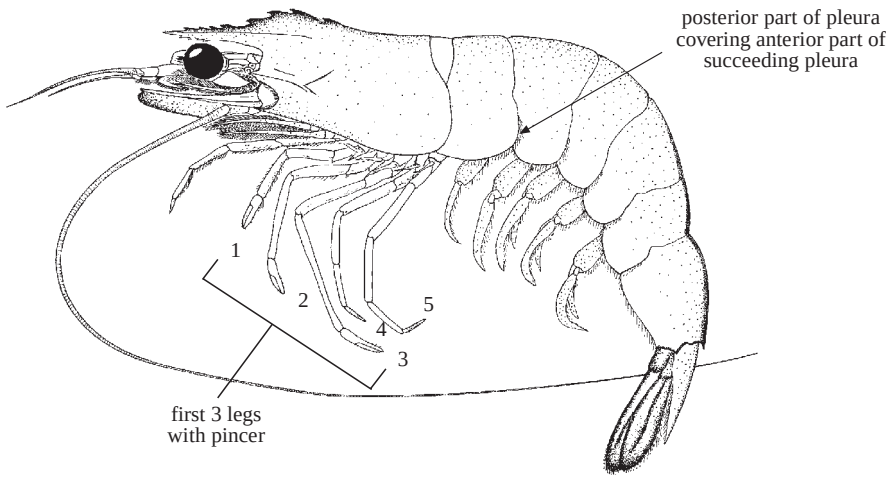




Superfamily PENAEOIDEA

Penaeoid shrimps

Diagnostic characters: Small to large sized, with a body length from 2.5 to about 35 cm. All 5 pairs of legs well developed, with **first 3 pairs of legs forming a pincer**, none of the pincers particularly large. Abdomen with **posterior part of pleura (lateral plates) covering anterior part of succeeding pleura**. **With large copulatory organ, on first pair of pleopods in males (petasma), and on posterior thoracic sternites in females (thelycum)**. Eggs are released directly into the water and not retained by the females on the abdomen.

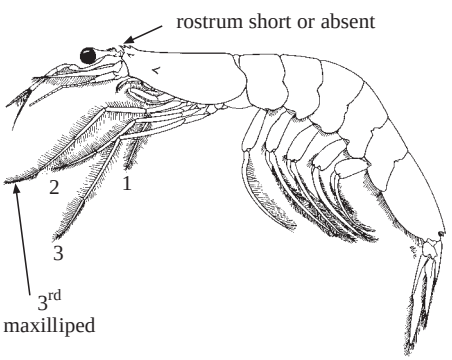


Habitat, biology, and fisheries: Members of this superfamily are all marine, although the juveniles of some species of Penaeidae inhabit brackish water and occasionally are even found in almost fresh water. The 4 families of penaeoids can all be found in the Western Central Pacific, with the family Penaeidae being of great economic importance in capture fisheries and aquaculture. Members of the 2 families Aristeidae and Solenoceridae mainly occur in deep water and are presently not exploited in the area. As some of them can reach a large size and are often taken on the basis of exploratory deep-water trawling, they may eventually prove to be of commercial interest. In contrast, species of the family Sicyoniidae are usually small and nowhere abundant. They are caught incidentally in prawn fisheries but do not have any economic importance.

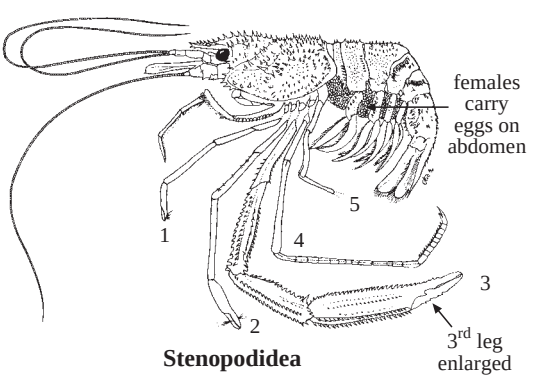
Other major groups of shrimps and prawns occurring in the area

Sergestoidea: usually small sized to microscopic; body strongly compressed laterally; shell rather soft; rostrum as well as last 2 pairs of legs reduced or absent; branchiae few, not more than 8 on each side.

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

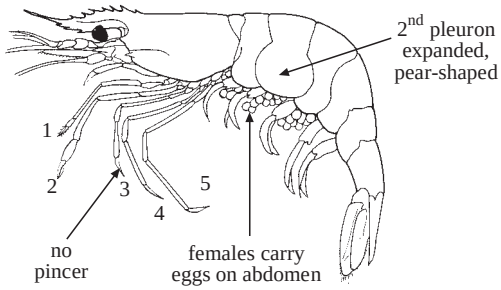


Sergestoidea



Stenopodidea

Caridea: third leg always without pincer; pleuron of second abdominal segment greatly expanded and overlapping those of first and third segments; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.



Caridea

Key to the families of Penaeoidea occurring in the area

1a. Either rostrum very short and armed with 1 or 2 upper teeth only, or upper antennular flagellum very short and attached to the base of distal antennular segment (Fig. 1) . . . . . **Aristeidae** (p. 868)

1b. Rostrum always armed with more than 3 upper teeth, and both upper and lower antennular flagella of similar length and attached to the tip of antennular peduncle . . . . . → ***2***

2a. Pleopods (abdominal appendages) with 1 branch only; abdomen often with many distinct furrows and grooves (Fig. 2) . . . . . **Sicyoniidae** (p. 952)

2b. Pleopods (abdominal appendages) with 2 branches; abdomen without or with very few distinct grooves . . . . . → ***3***

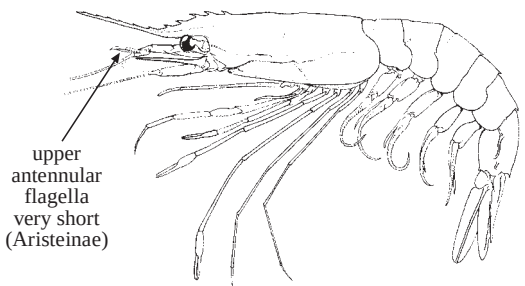


Fig. 1 Aristeidae

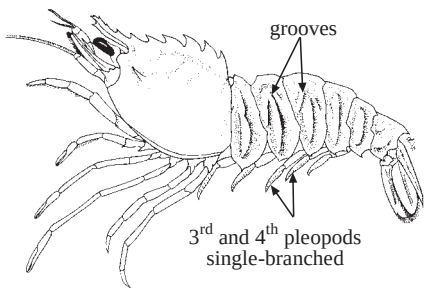


Fig. 2 Sicyoniidae

3a. Cervical groove prominent and extending to about dorsal carapace; either postorbital or postantennal spine present (Fig. 3) . . . . . **Solenoceridae** (p. 875)

3b. Distinct part of cervical groove far from dorsal carapace; postorbital and postantennal spine absent (Fig. 4) . . . . . **Penaeidae** (p. 889)

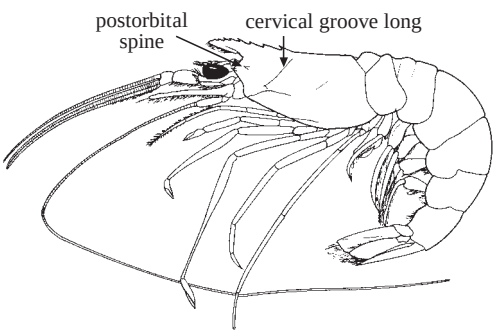


Fig. 3 Solenoceridae

(after Hayashi, 1992)

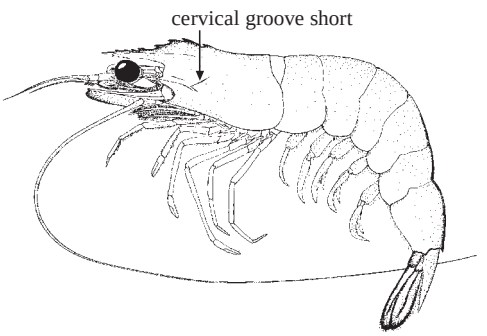
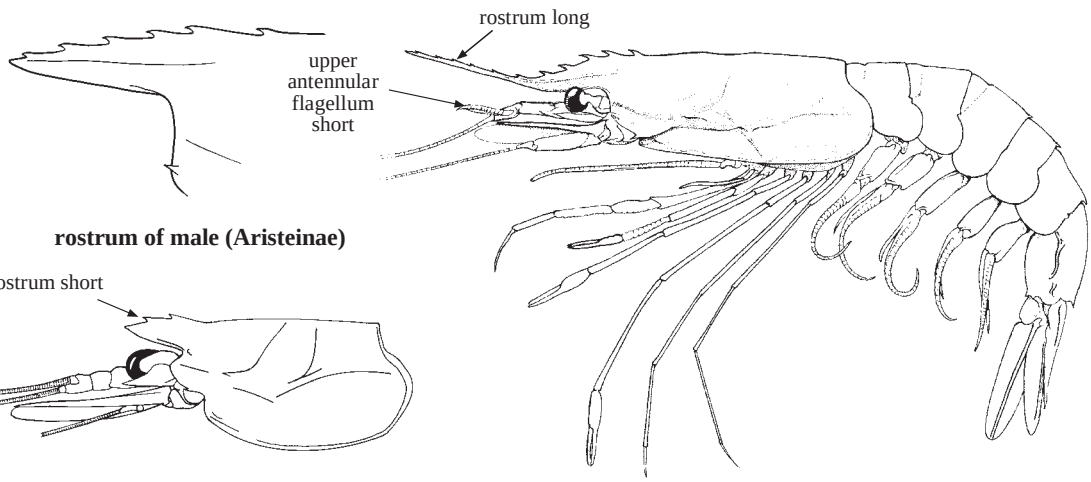


Fig. 4 Penaeidae

ARISTEIDAE

Aristeid shrimps

Diagnostic characters: Animals either a) with rostrum very long in females and young males, but becoming rather short in adult males, and **always bearing more than 2 upper teeth (subfamily Aristeinae)**; or b) **rostrum short, not extending beyond eyes and armed with 1 or 2 upper teeth (subfamily Benthesicyminae)**. No styliform projection at base of eyestalk, but a tubercle present on its inner border (very small in *Aristaeomorpha*). **In the subfamily Aristeinae, upper antennular flagellum very short and attached to the base of distal antennular segment. Carapace lacks both postorbital and postantennal spines;** cervical groove either long, extending almost to dorsal carapace, or very short. All 5 pairs of legs well developed, **fourth leg bearing 2 well-developed arthrobranchs (hidden beneath carapace). In males, endopod of second pair of pleopods (abdominal appendages) with appendix masculina and appendix interna, but without lateral projection**. Third and fourth pleopods divided into 2 branches. Telson with 1 to 4 pairs of movable lateral spines. **Colour: typical coloration of deep-sea crustaceans:** body reddish or scarlet, sometimes pale white and with red cross bands on abdomen.



rostrum of male (Aristeinae)

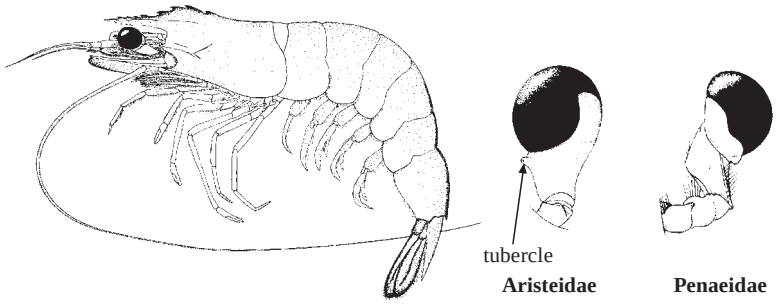
Subfamily Benthesicyminae

subfamily Aristeinae female

Habitat, biology, and fisheries: All representatives of this family are marine and occur in very deep waters (generally deeper than 300 m), with the members of the subfamily Benthesicyminae being exclusively bathypelagic (to depths of at least 5 413 m), whereas those of the Aristeinae are benthic and prefer soft bottom. Aristeid shrimps are generally of large size and can reach a body length of 33 cm. The sexes are easily distinguished by the presence of a large copulatory organ (petasma) on the first pair of pleopods (abdominal appendages) of males, while the females have the posterior thoracic sternites modified into a large sperm receptacle process (thelycum) which holds the spermatophores or sperm sacs (usually whitish or yellowish in colour) after mating. The shape of the petasma and thelycum is often specific and very useful for species identification. The eggs are small and numerous, and are released directly into the water and not retained on the female abdomen. The larvae are planktonic and have the nauplius stage. At present, 11 genera and 29 species of aristeid shrimps are known from the Western Central Pacific, but none of them are fished commercially because there is virtually no deep-sea fishery in the area. Nevertheless, the fact that some species reach a large size and are commonly taken on the basis of exploratory deep-water trawling, suggests they may have future commercial potential once that suitable deep-sea fishing gear is used in the area. In view of the present non-commercial status of the whole family in the area, no identification key to all species is provided here. Instead, a simplified key and species accounts are given for 3 species that have high potential interest.

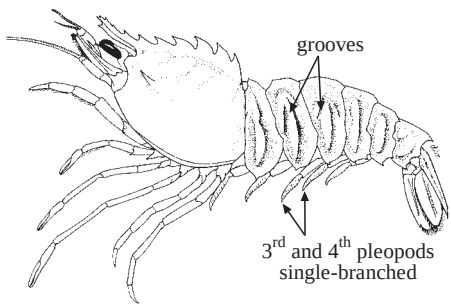
Similar families occurring in the area

Penaeidae: rostrum always armed with more than 3 upper teeth; both upper and lower antennular flagella of similar length, attached to tip of antennular peduncle; eyestalk without tubercle on inner border; in males, endopod of second pair of pleopods with appendix masculina only; a single well-developed arthrobranch on fourth leg (hidden beneath carapace).

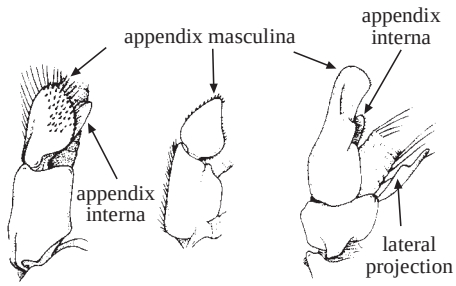


Penaeidae **eyes**

Sicyoniidae: shell generally hard and body "stony" in appearance; abdomen often with deep grooves and numerous tubercles; rostrum always armed with more than 3 upper teeth; both upper and lower antennular flagella of similar length, attached to tip of antennular peduncle; third and fourth pleopods single-branched.



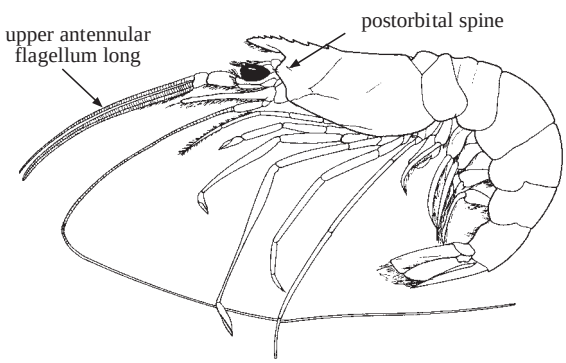
Sicyoniidae



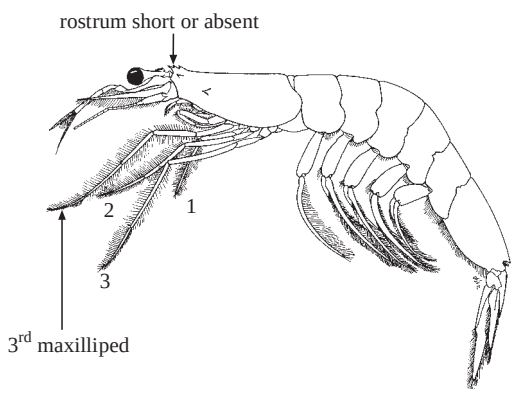
various types of appendices masculinae on endopods of 2nd pair of pleopods

Solenoceridae: either postorbital or postantennal spine present on carapace; rostrum always armed with more than 3 upper teeth; both upper and lower antennular flagella long, of similar length and attached to tip of antennular peduncle; telson usually armed with fixed lateral spines; in males, endopod of second pair of pleopods with appendix masculina, appendix interna, and lateral projection.

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



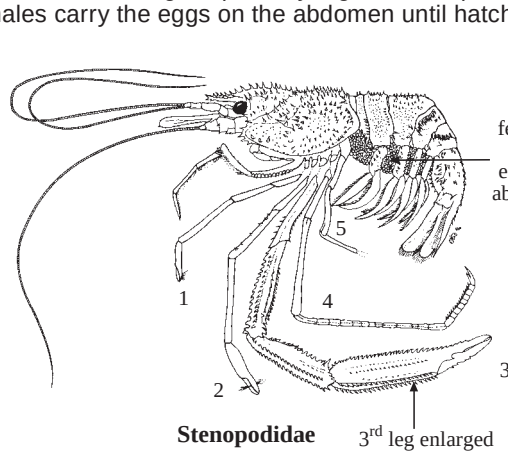
Solenoceridae

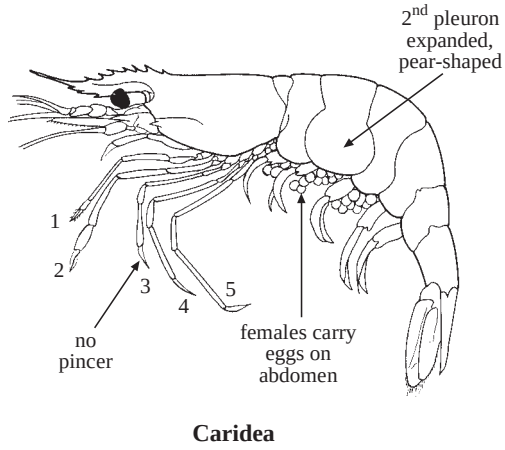


Sergestidae

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

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





Key to species with commercial potential in the area

1a. Rostrum armed with more than 5 upper teeth; hepatic spine present (Fig. 1) (*Aristaeomorpha*) . . . . . ***Aristaeomorpha foliacea***

1b. Rostrum armed with 3 upper teeth only; hepatic spine absent (Fig. 2) . . . . . → ***2***

2a. Crests on carapace without sharp edges (*Aristeus*) . . . . . ***Aristeus virilis***

2b. Crests on carapace very prominent and sharply edged (*Plesiopenaeus*) . . . . . ***Plesiopenaeus edwardsianus***

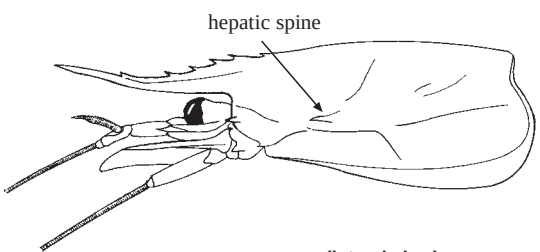


Fig. 1 ***Aristaeomorpha***

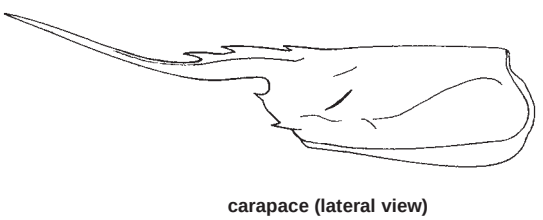


Fig. 2 ***Aristeus***

List of species occurring in the area

The symbol is given when species accounts are included.

Aristaeomorpha foliacea (Risso, 1827)

Aristeus mabahissae Ramadan, 1938
Aristeus semidentatus Bate, 1881
Aristeus virilis (Bate, 1881)

Benthonectes filipes Smith, 1885

Betheogennema pasithea (De Man, 1907)

Bethesicymus altus Bate, 1881
Bethesicymus bartletti Smith, 1882
Bethesicymus investigatoris Alcock and Anderson, 1889
Bethesicymus iridescens Bate, 1881
Bethesicymus tirmiziae Crosnier, 1978
Bethesicymus urinator Burkenroad, 1936

Gennadas bouvieri Kemp, 1909
Gennadas capensis Calman, 1925
Gennadas gilchristi Calman, 1925
Gennadas incertus (Balss, 1927)
Gennadas kempi Stebbing, 1914
Gennadas propinquus Rathbun, 1906
Gennadas scutatus Bouvier, 1906

Hemipenaeus carpenteri Wood-Mason, 1891
Hemipenaeus spinidoralis Bate, 1881

Hepomadus tener Smith, 1884

Parahepomadus vaubani Crosnier, 1978

Plesiopenaeus armatus (Bate, 1881)
Plesiopenaeus edwardsianus (Johnson, 1867)

Pseudaristeus crassipes (Wood-Mason, 1891)
Pseudaristeus gracilis (Bate, 1888)
Pseudaristeus kathleenae Pérez Farfante, 1987
Pseudaristeus sibogae (De Man, 1911)

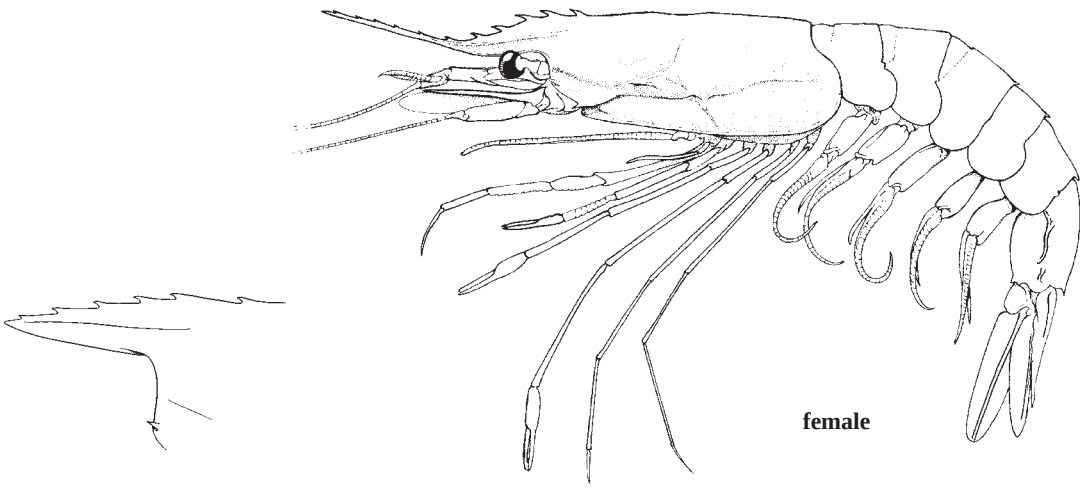
References

Crosnier, A. 1978. Crustacés Décapodes Péneides Aristaeidae (Benthesicyminae, Aristeinae, Solenocerinae). *Faune de Madagascar*, 46:1-197.

Crosnier, A. 1989. Benthesicymidae, Aristeidae, Solenoceridae (Crustacea Penaeoidea). In Résultats des Campagnes MUSORSTOM, Vol. 5, edited by J. Forest. *Mém. Mus. natn. Hist. nat.*, (A), 144:37-67.

Aristaeomorpha foliacea (Risso, 1827)

Frequent synonyms / misidentifications: *Aristaeomorpha rostridentata* (Risso, 1827) / None.
FAO names: En - Giant red shrimp; **Fr** - Gambon rouge; **Sp** - Gamba española.



female

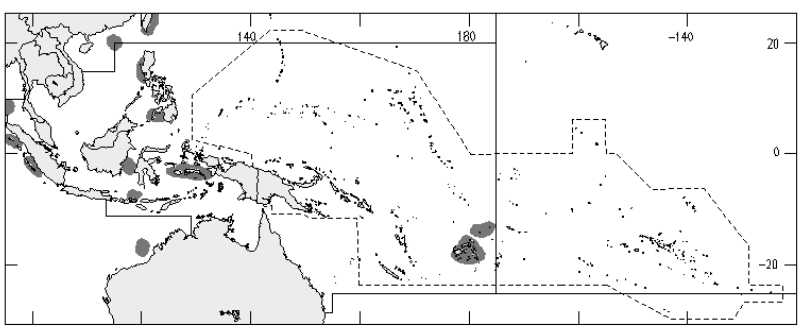
rostrum of male

Diagnostic characters: A large shrimp. **Rostrum with 6 to 12 upper teeth (including 2 teeth on carapace)**; very long in females and extending far beyond antennal scale, but short in males and not exceeding tip of antennular peduncle. **Carapace with antennal, hepatic, and branchiostegal spines. Upper antennal flagella very short. Third to sixth abdominal segments each bearing a strong posteromedian spine.** Telson with 4 pairs of small movable lateral spines. **Colour:** body uniformly vermilion; eyes black.

Size: Maximum body length 22.5 cm in females (carapace length 5.9 cm) and 17 cm in males (carapace length 4.5 cm); commonly between 12 and 16 cm.

Habitat, biology, and fisheries: Found from depths of 61 to 1 300 m, but more often between 300 and 750 m; prefers mud bottoms. Moves to midwater at night. One of the common larger shrimps caught during deep-water exploratory trawling operations, often encountered in large quantities. Not yet fished commercially in the area, but with high potential for deep-sea fisheries.

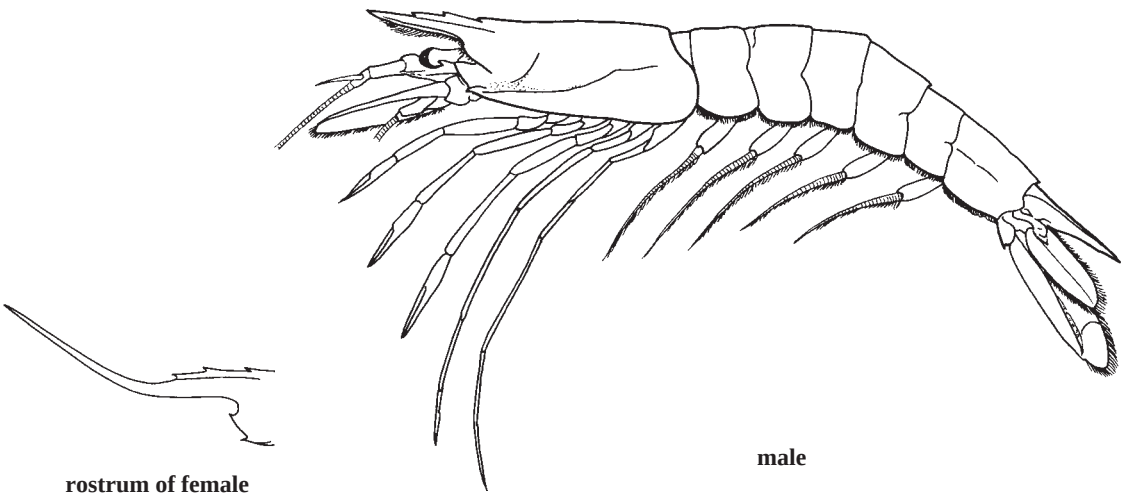
Distribution: Cosmopolitan, reported to be widely distributed in the Western Atlantic, Mediterranean, and Indo-West Pacific.



Aristeus virilis (Bate, 1881)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Stout red shrimp; **Fr** - Gambon gaillard; **Sp** - Gambón colorado.



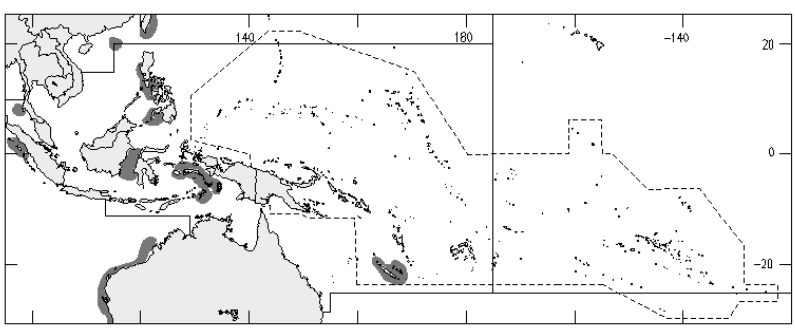
(after Lee and Yu, 1977)

Diagnostic characters: A large shrimp; **body covered with pubescence**. **Rostrum armed with 3 upper teeth only (including 1 tooth on carapace)**; very long in females and extending far beyond antennal scale, but short in males and not exceeding tip of antennal scale. Carapace with antennal and branchiostegal spines but **lacking hepatic spine. Crests on carapace without sharp edges. Upper antennal flagella very short. Legs with photophores; first to third legs armed with a movable spine on merus. Fourth to sixth abdominal segments each bearing a strong posteromedian spine**. Telson with 4 pairs of small movable lateral spines. **Colour: body pale white, with red bands on posterior margin of abdominal segments**; eyes black; tip of rostrum, antennal scale, distal half of uropods, antennular and antennal flagella reddish; upper and lateral carapace, as well as legs and pleopods somewhat reddish; photophores on legs purple-red; some young individuals with body rather uniformly reddish.

Size: Maximum body length about 22.2 cm in females (carapace length 6.1 cm) and 14.6 cm in males (carapace length 4.6 cm); commonly between 9 and 12 cm.

Habitat, biology, and fisheries: Found on sand and mud bottom, at depths from 188 to 936 m, usually between 350 and 700 m, apparently not migrating into midwater at night. Not yet fished commercially in the area. However, the size of this species and the fact that it is commonly taken during experimental trawling operations in the Philippines, Indonesia, and New Caledonia suggest it has high potential with the development of a deep-sea fishery in these countries.

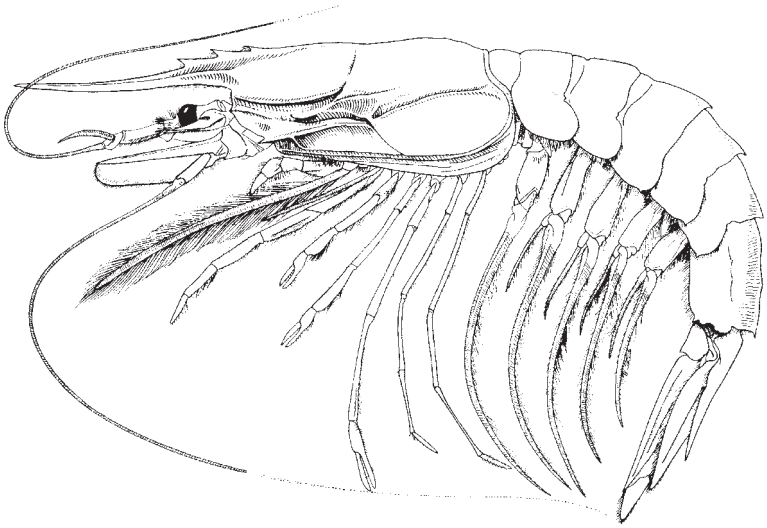
Distribution: Indo-West Pacific from eastern coast of Africa to India, western Australia, the Philippines, Japan, Indonesia, New Caledonia, and Vanuatu.



Plesiopenaeus edwardsianus (Johnson, 1867)

Frequent synonyms / misidentifications: *Aristaeopsis edwardsiana* (Johnson, 1867) / None.

FAO names: En - Scarlet shrimp; **Fr** - Gambon écarlat; **Sp** - Gamba carabinero.

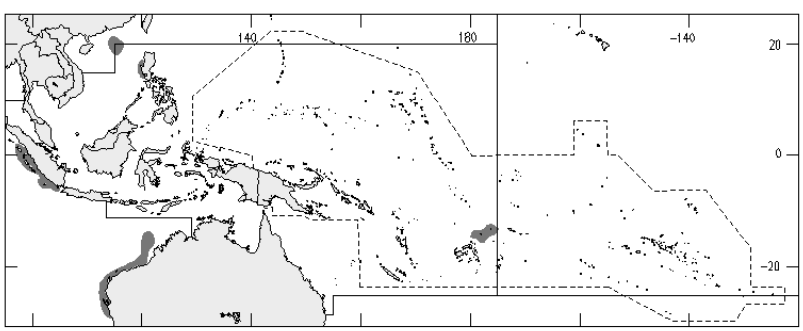


Diagnostic characters: Size very large. **Rostrum armed with 3 upper teeth only (including 1 tooth on carapace)**; very long in females, reaching far beyond antennal scale, but short in males and not exceeding tip of antennal scale. Carapace with antennal and branchiostegal spines but **lacking hepatic spine. Crests on carapace very sharp and prominent. Upper antennal flagella very short. Exopod of second maxilliped about 2 times as large as endopod. Legs without exopods. Third to sixth abdominal segments each bearing a sharp posteromedian spine.** Telson with 4 pairs of small movable lateral spines. **Colour:** uniformly scarlet; eyes black.

Size: Maximum body length 33.4 cm in females (carapace length 10.4 cm) and 19.3 cm in males (carapace length 6.3 cm); commonly between 15 and 19.5 cm.

Habitat, biology, and fisheries: Found on sandy or muddy bottom, at depths of 200 to 1 850 m, usually between 400 and 900 m. A very large species, often trawled at depths of more than 500 m. With very high potential for deep-sea fisheries in the area, although so far only encountered during exploratory trawling operations off the Philippines, Willis and Fortuna islands.

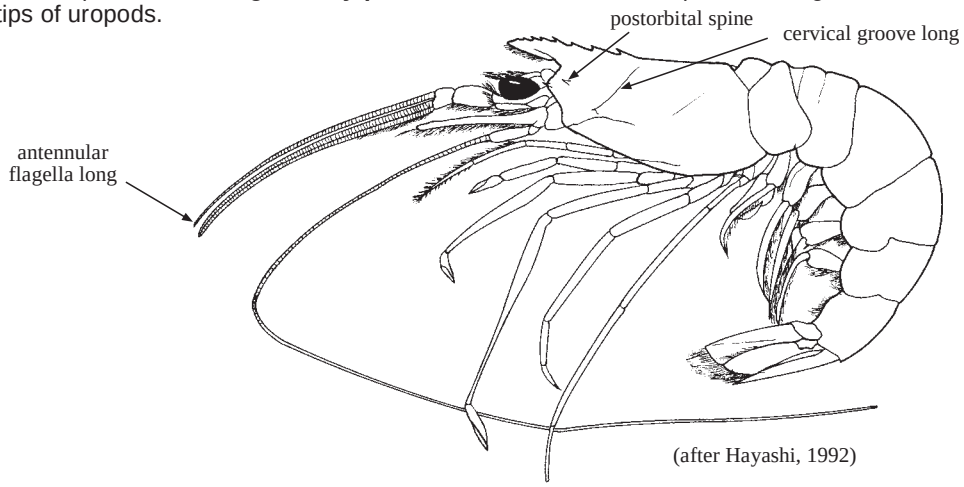
Distribution: Cosmopolitan, widely distributed in the Atlantic and the Indo-West Pacific.



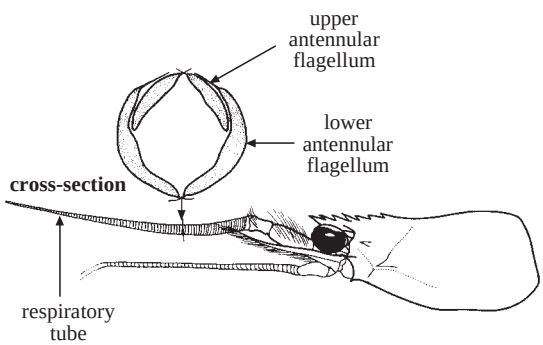
SOLENOCERIDAE

Solenocerid shrimps

Diagnostic characters: Rostrum well developed (extending at least to middle of eye), always bearing more than 3 upper teeth (including those on carapace); **no styliform projection at base of eyestalk, but a tubercle present on its inner border. Both upper and lower antennular flagella long (additionally strongly compressed laterally and tube-like in *Solenocera*), of the same length, and attached to tip of antennular peduncle. Carapace either with postorbital or postantennal spine; cervical groove long, extending to about dorsal carapace.** All 5 pairs of legs well developed, fourth leg bearing 2 well-developed arthrobranchs (hidden beneath carapace). **In males, endopod of second pair of pleopods (abdominal appendages) with appendix masculina, appendix interna, and lateral projection.** Third and fourth pleopods divided into 2 branches. Telson generally armed with at least 1 pair of fixed lateral spines. **Colour: generally pink to red**; sometimes with pale markings on antennular flagella and tips of uropods.



(after Hayashi, 1992)



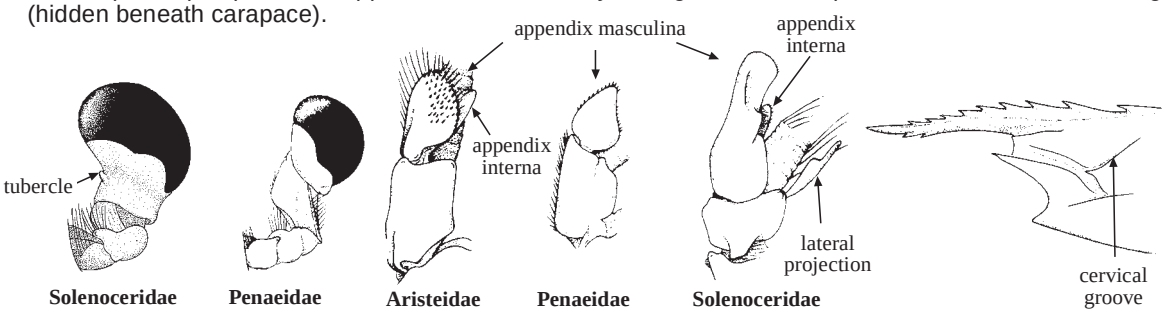
(genus *Solenocera*)

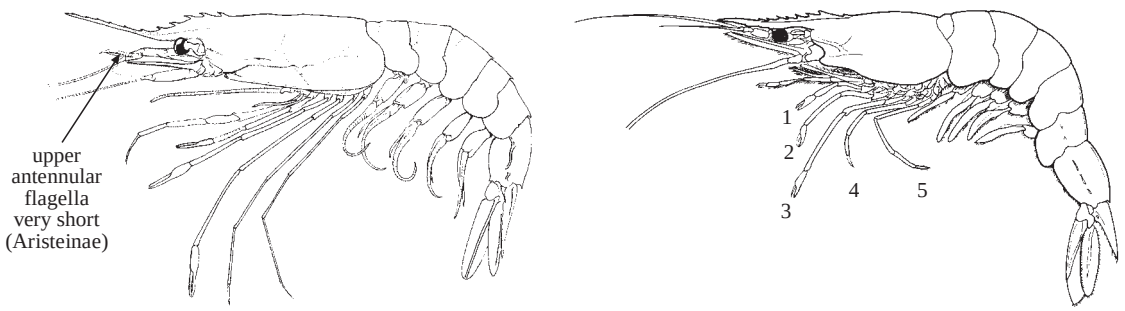
Habitat, biology, and fisheries: Found in deeper marine waters offshore from depths of 2 to over 5 700 m (usually deeper than 20 m). Generally benthic animals with preference for soft bottoms. Species of the genus *Solenocera* often burrow in mud during the daytime, with only the tube-like antennular flagella sticking out for respiration. Their size range from 2.5 to 21.5 cm body length but most species are of moderate size. The sexes are easily distinguished by the presence of a large copulatory organ (petasma) on the first pair of pleopods (abdominal appendages) of males, while the females have the posterior thoracic sternites modified into a large sperm receptacle process (thelycum) which holds the spermatophores or sperm sacs (usually whitish or yellowish in colour) after mating. The shape of the petasma and thelycum is often specific and very useful for species identification. The eggs are small and numerous, and are released directly into the water and not retained on the female abdomen. The larvae are planktonic and have the nauplius stage. In the Western Central Pacific, about 8 genera and 36 species of solenocerid shrimps have been recorded. Since they are generally found in deeper waters, at present only a few of them are taken as bycatch in commercial trawl fisheries. Nevertheless, results of many exploratory deep-water trawling operations have shown that several species are abundant and have fishery potential. Nevertheless, no key to all species of Solenoceridae occurring in the area is given here as most of them are not yet commercially caught and the taxonomic status of some species is still unclear. Species accounts and a key are included below for 2 genera and 11 species which are either more commonly found in commercial catches or that can be easily confused with those commercial species.

Similar families occurring in the area

Aristeidae: either rostrum very short and armed with 1 or 2 upper teeth only, or upper antennular flagellum very short and not attached to tip of antennular peduncle; no postorbital or postantennal spine present on carapace; telson armed only with movable lateral spines; in males, endopod of second pair of pleopods with appendix masculina, appendix interna, but without lateral projection.

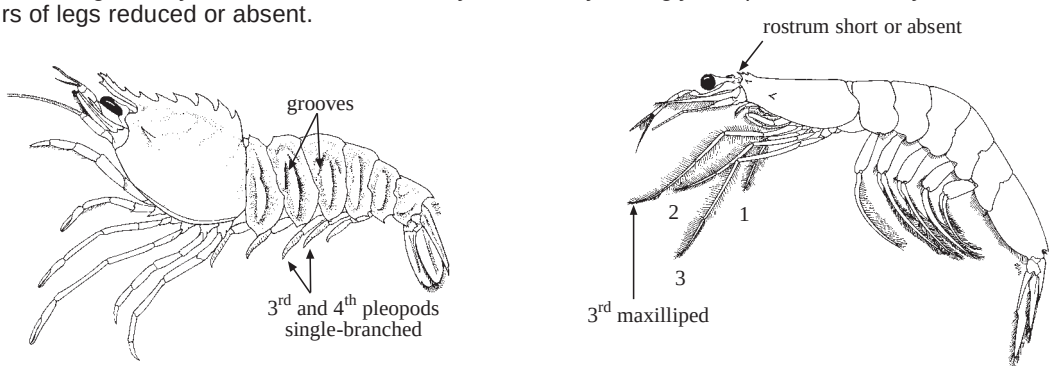
Penaeidae: no postorbital or postantennal spine present on carapace; cervical groove short, with distinct part always far from dorsal carapace; eyestalk without tubercle on inner border; in males, endopod of second pair of pleopods with appendix masculina only; a single well-developed arthrobranch on fourth leg (hidden beneath carapace).





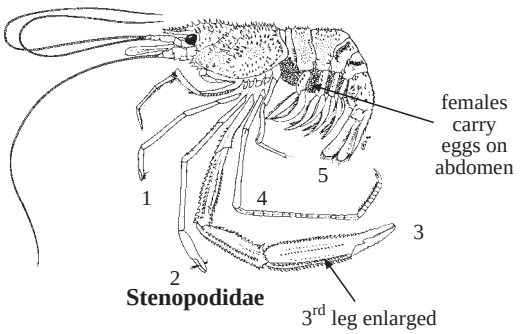
Sicyoniidae: shell generally hard and body “stony” in appearance; abdomen often with deep grooves and numerous tubercles; no postorbital or postantennal spine present on carapace, cervical groove generally indistinct or absent; third and fourth pleopods single-branched.

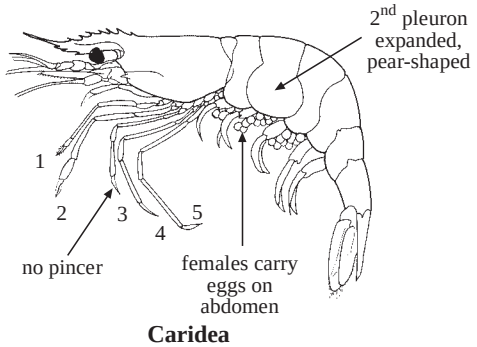
Sergestidae: generally small sized; rostrum very short; body strongly compressed laterally, shell soft; last 2 pairs of legs reduced or absent.



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

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





Key to species of interest to fisheries occurring in the area

1a. Antennular flagella subcylindrical and thread-like (Fig. 1a); rostrum strongly convex (Fig. 2a); exopod of uropod armed with a distolateral spine (*Haliporoides*) . . ***Haliporoides sibogae***

1b. Antennular flagella flattened and tube-like (Fig. 1b); rostrum nearly horizontal (Fig. 2b); exopod of uropod without distolateral spine . . . . . **(*Solenocera*)** → ***2***

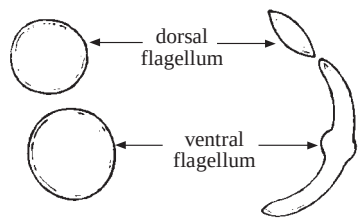


Fig. 1 cross-section of antennular flagella

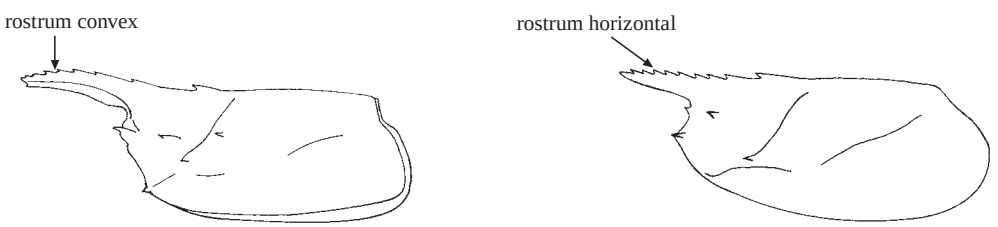


Fig. 2 carapace (lateral view)

2a. Telson without lateral spine (Fig. 3a) . . . . ***Solenocera crassicornis***

2b. Telson armed with lateral spines (Fig. 3b) . . . . . → ***3***

3a. Postrostral crest elevated . . . . . → ***4***

3b. Postrostral crest weak and low . . . . . → ***10***

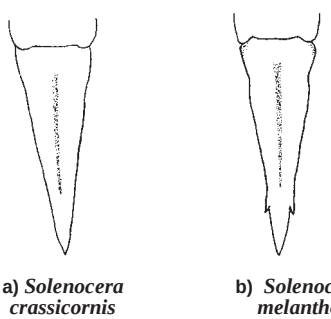


Fig. 3 telson (dorsal view)

4a. Postrostral crest very high and plate-like (Figs 4 and 5) . . . . . → ***5***

4b. Postrostral crest distinct but not plate-like (Figs 6 and 7) . . . . . → ***6***

5a. Rostrum extending to 2/3 of eye; postrostral crest behind cervical notch with anterior part distinctly higher than posterior part (Fig. 4) . . . . . ***Solenocera choprai***

5b. Rostrum extending to 1/2 of eye; postrostral crest behind cervical notch with posterior part distinctly higher than anterior part (Fig. 5) . . . . . ***Solenocera alticarinata***

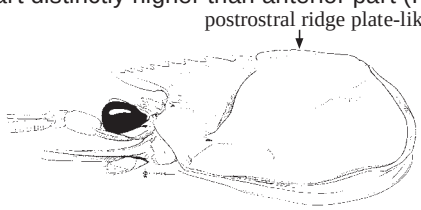


Fig. 4 ***Solenocera choprai***
(from Crosnier, 1978)

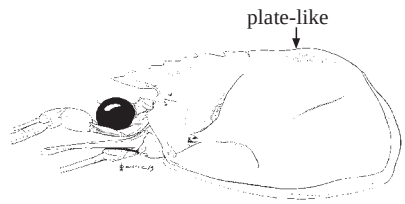


Fig. 5 ***Solenocera alticarinata***
(from Crosnier, 1978)

6a. Postrostral crest well separated from postrostral teeth by a distinct notch above cervical groove (Fig. 6) . . . . . ***Solenocera koelbeli***

6b. No distinct notch present between postrostral teeth and postrostral crest (Fig. 7) . . . . . → ***7***

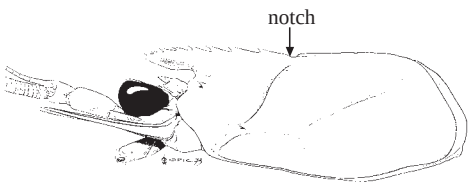


Fig. 6 ***Solenocera koelbeli***
(from Crosnier, 1978)

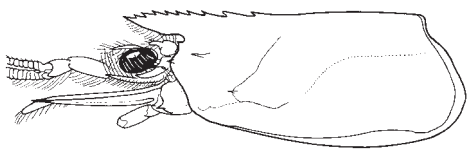
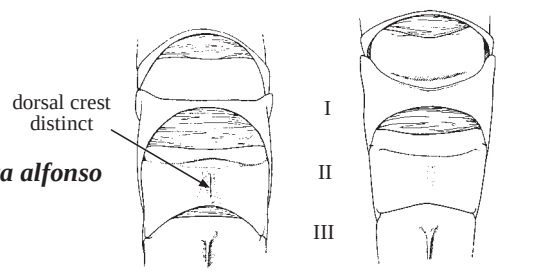


Fig. 7 ***Solenocera australiana***
(after Pérez Farfante and Grey, 1980)

7a. Posterior part of hepatic groove and anterior part of brachiocardiac groove both very distinct and strongly curving downward; postrostral crest behind cervical groove sometimes with an upper tooth; median part of first abdominal segment very narrow and dorsal crest of second abdominal segment distinct (Fig. 8a) . . . . . ***Solenocera alfonso***

7b. Never both posterior part of hepatic groove and anterior part of brachiocardiac groove distinct and curving downward together; postrostral crest behind cervical groove without any teeth; median part of first abdominal segment moderately wide and dorsal crest of second abdominal segment indistinct (Fig. 8b) . . . . . → ***8***

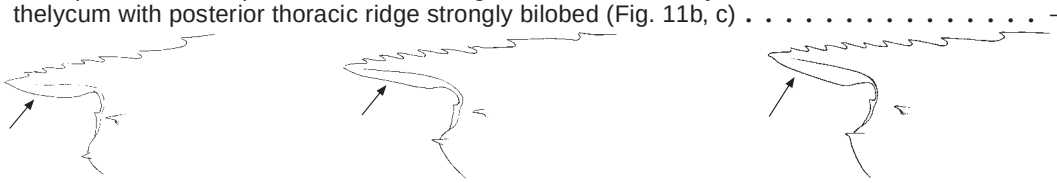


a) ***Solenocera alfonso*** **b)** ***Solenocera melantho***

Fig. 8 abdomen (dorsal view)
(from Crosnier, 1989)

8a. Rostrum with lower border nearly convex (Fig. 9a); male petasma with distal margin armed with many well-defined long spinules (Fig. 10a); female thelycum with posterior thoracic ridge almost straight (Fig. 11a) . . . . . ***Solenocera australiana***

8b. Rostrum with lower border razor-shaped, very straight or slightly concave (Figs 9b, c); male petasma with spinules on distal margin short and not very well defined; female thelycum with posterior thoracic ridge strongly bilobed (Fig. 11b, c) . . . . . → ***9***



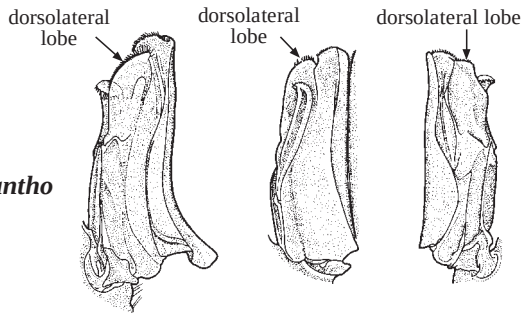
a) ***Solenocera australiana*** **b)** ***Solenocera melantho*** **c)** ***Solenocera halli***

(from Crosnier, 1989)

Fig. 9 rostrum (lateral view)

9a. Anterior end of hepatic crest very strongly convex (Fig. 12a); male petasma with dorsolateral lobule bearing 0 to 13 terminal spinules (Fig. 10a); female thelycum bearing 2 or 3 pairs of protuberances in the middle, with submedian pair larger than lateral ones (Fig. 11b) . . . . . ***Solenocera melantho***

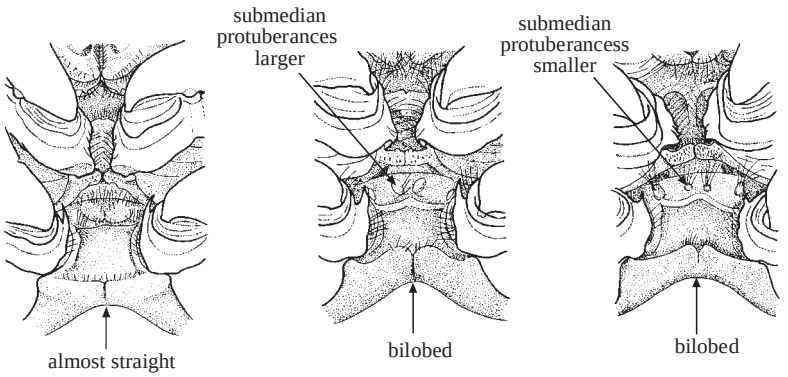
9b. Anterior end of hepatic crest only slightly convex or nearly straight (Fig. 12b); male petasma with dorsolateral lobule bearing 18 to 40 terminal spinules (Fig. 10c); female thelycum always bearing 2 pairs of protuberances in the middle, with submedian pair smaller than lateral pair (Fig. 11c) . . . ***Solenocera halli***



a) ***Solenocera australiana*** **b)** ***Solenocera melantho*** **c)** ***Solenocera halli***

Fig. 10 petasma

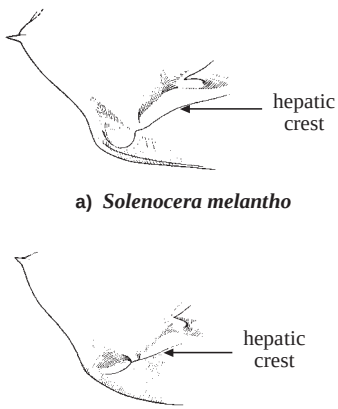
(after Pérez Farfante and Grey, 1980)



a) ***Solenocera australiana*** **b)** ***Solenocera melantho*** **c)** ***Solenocera halli***

Fig. 11 thelycum

(after Pérez Farfante and Grey, 1980)



a) ***Solenocera melantho***

b) ***Solenocera halli***

Fig. 12 anterolateral corner of carapace

(from Crosnier, 1989)

10a. Rostrum with 6 or 7 large and well-separated upper teeth (Fig. 13); antennular flagella 0.8 to 1.2 times as long as carapace and generally composed of less than 60 articles . . . . . ***Solenocera pectinulata***

10b. Rostrum generally with 8 or 9 densely packed small upper teeth (Fig. 14); antennular flagella 1.3 to 1.9 times as long as carapace and composed of more than 60 articles . . . . . ***Solenocera pectinata***

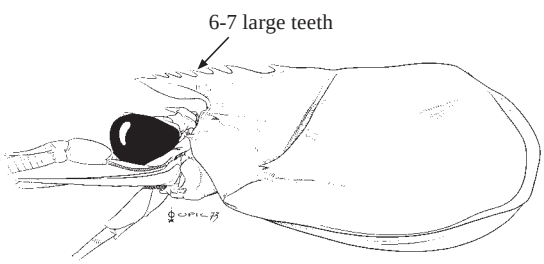


Fig. 13 ***Solenocera pectinulata***

(from Crosnier, 1978)

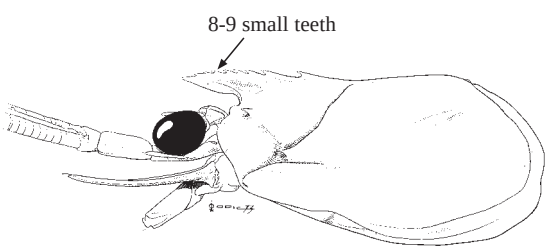


Fig. 14 ***Solenocera pectinata***

(from Crosnier, 1978)

List of species occurring in the area

The symbol is given when species accounts are included.

Cryptopenaeus clevai Crosnier, 1985
Cryptopenaeus crosnieri Pérez Farfante and Kensley, 1985

Gordonella kensleyi Crosnier, 1988
Gordonella paravillosa Crosnier, 1988

Hadropenaeus lucasii (Bate, 1881)

Haliporoides cristatus Kensley, Tranter, and Griffin, 1987
Haliporoides sibogae (De Man, 1907)

Haliporus curvirostris Bate, 1881
Haliporus taprobanensis Alcock and Anderson, 1899

Hymenopenaeus equalis (Bate, 1881)
Hymenopenaeus halli Bruce, 1966
Hymenopenaeus laevis (Bate, 1881)
Hymenopenaeus neptunus (Bate, 1881)
Hymenopenaeus propinquus (De Man, 1907)

Mesopenaeus brucei Crosnier, 1986
Mesopenaeus mariae Pérez Farfante and Ivanov, 1982

Solenocera alfonso Pérez Farfante, 1981
Solenocera alticarinata Kubo, 1949
Solenocera annectens (Wood-Mason, 1891)
Solenocera australiana Pérez Farfante and Grey, 1980
Solenocera barunajaya Crosnier, 1994
Solenocera bedokensis Hall, 1962
Solenocera choprai Nataraj, 1945
Solenocera comata Stebbing, 1915
Solenocera crassicornis (H. Milne Edwards, 1837)
Solenocera faxoni De Man, 1907
Solenocera halli Starobogatov, 1972
Solenocera koelbeli De Man, 1911
Solenocera melantho De Man, 1907
Solenocera moosai Crosnier, 1985
Solenocera pectinata (Bate, 1888)
Solenocera pectinulata Kubo, 1949
? *Solenocera phuongi* Starobogatov, 1972
Solenocera rathbunae Ramadan, 1938
Solenocera spinajugo Hall, 1961
Solenocera waltairensis George and Muthu, 1970

References

Crosnier, A. 1978. Crustacés Décapodes Pénéides Aristaeidae (Benthesicyminae, Aristeinae, Solenocerinae). *Faune de Madagascar*, 46:1-197.

Crosnier, A. 1985. Penaeoid shrimps (Benthesicymidae, Aristeidae, Solenoceridae, Sicyoniidae) collected in Indonesia during the Corindon II and IV expeditions. *Mar. Res. Indonesia*, 24:19-47.

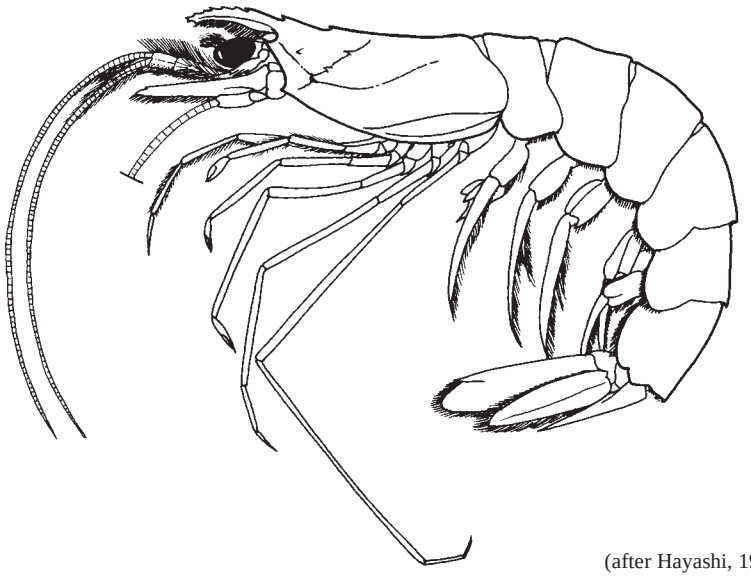
Crosnier, A. 1989. Benthesicymidae, Aristeidae, Solenoceridae (Crustacea Penaeoidea). In Résultats des Campagnes MUSORSTOM, Vol. 5, edited by J. Forest. *Mém. Mus. natn. Hist. nat.*, (A), 144:37-67.

Crosnier, A. 1994. Crustacea Decapoda: Penaeoidea récoltés lors de la campagne KARUBAR en Indonésie. In Résultats des Campagnes MUSORSTOM, Vol. 12, edited by A. Crosnier. *Mém. Mus. natn. Hist. nat.*, (A), 161: 351-365.

Haliporoides sibogae (De Man, 1907) JAQ

Frequent synonyms / misidentifications: *Haliporoides sibogae australiensis* Kensley, Tranter, and Griffin, 1987; *H. sibogae madagascariensis* Crosnier, 1987; *Hymenopenaeus sibogae* (De Man, 1907) / None.

FAO names: En - Jack-knife shrimp; **Fr** - Salicoque canif; **Sp** - Camarón cortapluma.



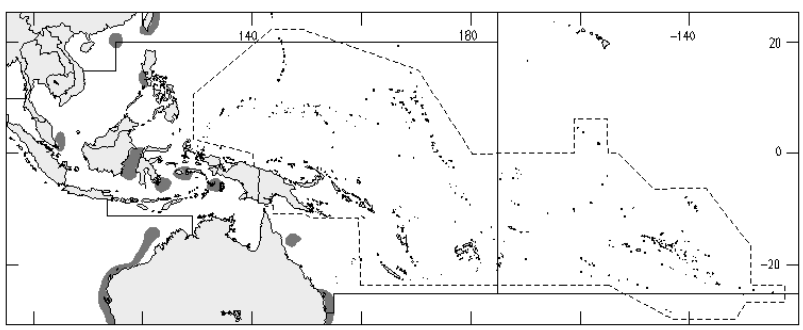
(after Hayashi, 1992)

Diagnostic characters: Body somewhat hairy. **Both upper and lower antennular flagella very long, thread-like. Rostrum strongly convex and short, extending just beyond eyes;** upper border armed with 4 to 7 teeth; lower border concave, armed with 1 to 3 teeth. **Carapace with 1 postrostral and 1 epigastric tooth, as well as antennal, postantennal, branchiostegal, hepatic, and suprahepatic spines. Cervical groove distinct, extending to dorsal carapace.** Legs progressively longer posteriorly. Telson with a pair of fixed lateral spines. **Colour:** body orange to pink; **antennal flagella whitish**; eyes dark brown; **uropods reddish with white tips.**

Size: Maximum body length 16.5 cm in males (carapace length 3.3 cm) and 20 cm in females (carapace length 4.9 cm), commonly between 7 and 10 cm.

Habitat, biology, and fisheries: Deep sea from depths of 100 to 1 463 m, usually between 300 and 600 m, on soft bottom. Taken in large quantities on the basis of experimental deep-water trawling in the Philippines and Indonesia. Generally considered as a species with high potential for commercial deep-sea fisheries. In the area, so far only fished on a small scale off the northeastern coast of Australia (about 50 t in the annual period of 1989/1990). Marketed mainly frozen, consumed locally, sometimes exported.

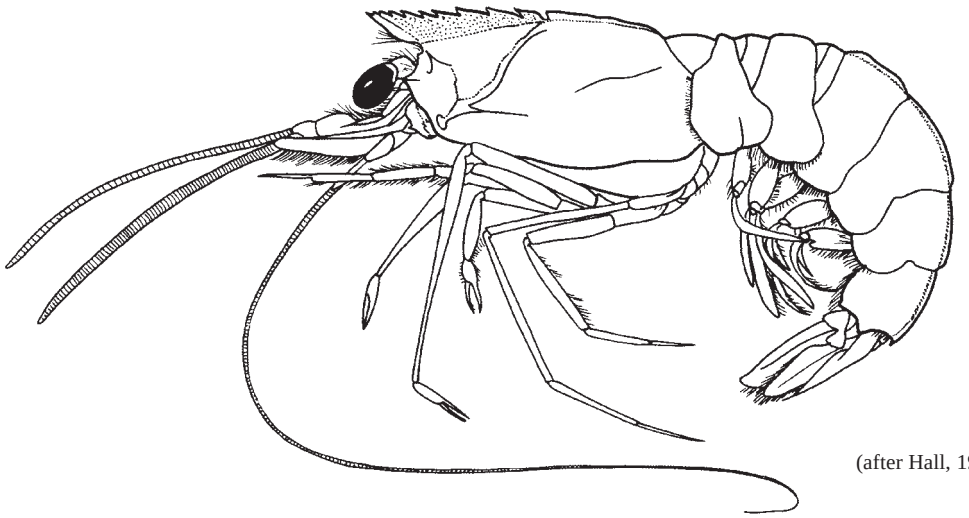
Distribution: Widely distributed in the Indo-West Pacific from Madagascar to Japan, Australia, and New Zealand (populations from Madagascar and eastern Australia are sometimes considered as 2 different subspecies).



Solenocera choprai Nataraj, 1945

Frequent synonyms / misidentifications: None / *Solenocera alticarinata* Kubo, 1949.

FAO names: En - Ridgeback shrimp; **Fr** - Salicoque balafrée; **Sp** - Camarón costurón.



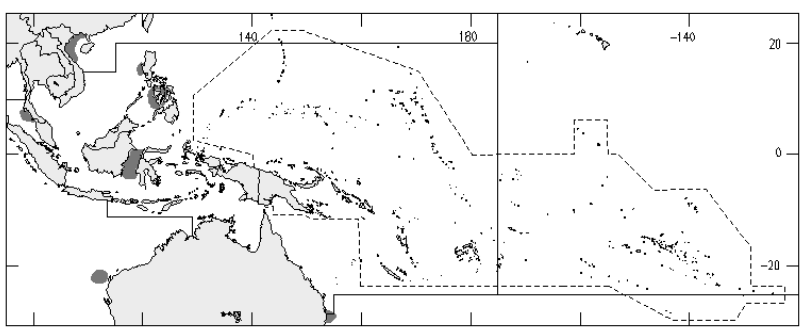
(after Hall, 1962)

Diagnostic characters: Rostrum short, extending to about 2/3 of eyes; upper border with 8 to 10 teeth (including 4 teeth on carapace); lower border moderately convex. **Postrostral crest markedly elevated and plate-like, slightly interrupted by a small notch above cervical groove; height of posterior part progressively decreasing posteriorly**. Carapace with orbital, postorbital, antennal and hepatic spines, but without pterygostomian spines. Antennular flagella moderately long and tube-like. **Telson with a pair of lateral spines. Colour:** body and legs reddish; **antennae banded with dark red and white**; uropods dark red, except for some white areas.

Size: Maximum body length 13 cm (females) and 9.5 cm (males).

Habitat, biology, and fisheries: Found on soft bottoms at depths between 50 and 175 m. Probably burrows in mud during the daytime, with only the tube-like antennular flagella sticking out for respiration. A bycatch of trawling operations in slightly deeper waters. Nowhere abundant, but of some commercial value because of its moderately large size. In the Philippines, this shrimp is occasionally marked together with other *Solenocera* species. Marketed mainly fresh for local consumption. Often confused with *Solenocera alticarinata*, which has a more northeastern distribution (from Japan to the Philippines), but they are both sometimes considered as a single species.

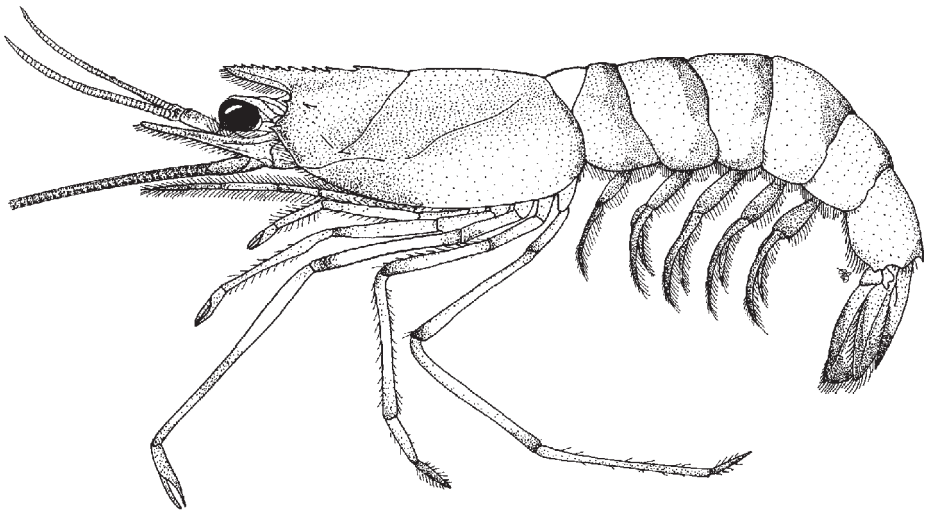
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Philippines and Australia.



Solenocera crassicornis (H. Milne Edwards, 1837)

Frequent synonyms / misidentifications: *Solenocera indicus* Nataraj, 1945; *S. kuboi* Hall, 1956; *S. sinensis* Yu, 1937; *S. subnuda* Kubo, 1949 / None.

FAO names: En - Coastal mud shrimp; **Fr** - Salicoque des vases côtières; **Sp** - Camarón fanguero de orilla.

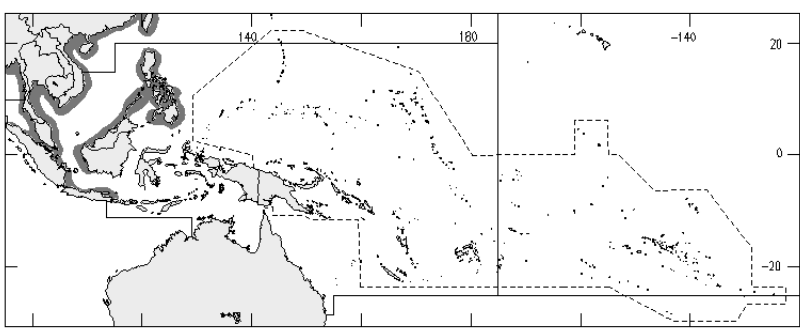


Diagnostic characters: Rostrum short and nearly straight, about as long as eyes; upper border armed with 4 to 7 (mostly 5) teeth; lower border unarmed and somewhat convex. Carapace with 3 postrostral teeth and 1 epigastric tooth, and orbital, postorbital, antennal and hepatic spines, but without pterygostomian spines; **postrostral crest low and rounded.** Antennular flagella moderately long and tube-like. **Telson unarmed, without lateral spines. Colour:** body pink to pinkish orange; **posterior border of each abdominal segment covered with a red cross band**; eyes dark brown; antennular flagella and distal part of tail fan reddish.

Size: Maximum body length 9 cm (males) and 14 cm (females), commonly between 6 and 8 cm.

Habitat, biology, and fisheries: Inhabits muddy bottoms close to shore, at depths from 20 to 85 m. Probably burrows in mud during the daytime, with only the tube-like antennular flagella sticking out for respiration. Mainly forms a bycatch of trawlers. In the area, this shrimp seems to be more common around Thailand and is of minor commercial importance.

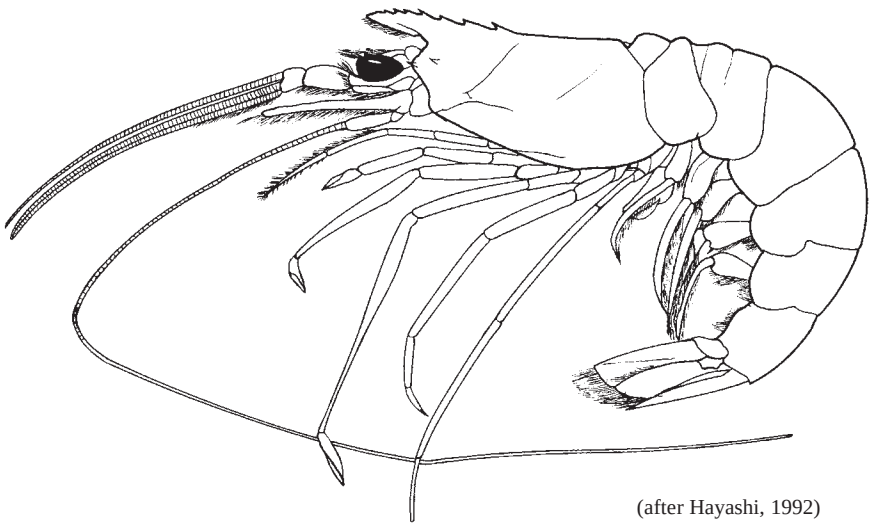
Distribution: Widely distributed in the Indo-West Pacific from the Persian Gulf to Japan and Indonesia.



Solenocera melantho De Man, 1907

Frequent synonyms / misidentifications: *Solenocera prominentis* Kubo, 1949 / *Solenocera alfonso* Pérez Farfante, 1981; *S. australiana* Pérez Farfante and Grey, 1980; *S. halli* Starobogatov, 1972; *S. koelbeli* De Man, 1911.

FAO names: En - Razor mud shrimp.



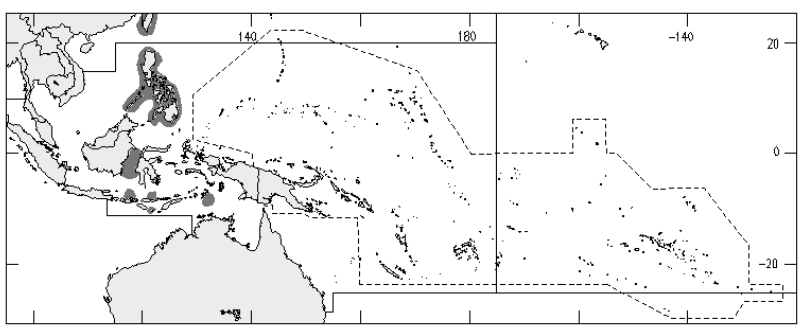
(after Hayashi, 1992)

Diagnostic characters: Rostrum short, not extending beyond eyes; upper border with 6 to 10 teeth (including 3 teeth on carapace); **lower border straight or slightly concave, razor-shaped. Postrostral crest distinct but not very high and plate-like, without a distinct notch above cervical groove.** Carapace with orbital, postorbital, antennal and hepatic spines, but without pterygostomian spines. **Anterior end of hepatic crest strongly concave and curving upward.** Antennular flagella moderately long and tube-like. Telson with a pair of lateral spines. **Colour:** body pink to red and somewhat semi-transparent; **some irregular red markings on abdomen**; eyes black-brown; **antennular flagella reddish with a white (or pale yellowish) band at midlength;** distal part of uropods slightly yellowish.

Size: Maximum body length 15 cm, commonly between 7 and 12 cm.

Habitat, biology, and fisheries: Inhabits the upper slopes of continental shelves at depths from 78 to 400 m, on sandy mud bottom. Mainly forms a bycatch of trawling operations in slightly deeper waters. Probably the most common species of the genus in the Philippines, but still not very abundant and only occasionally sold in local fish markets. Marketed mainly fresh for local consumption. This species, *Solenocera alfonso*, *S. australiana*, and *S. halli* are probably often confused with each other.

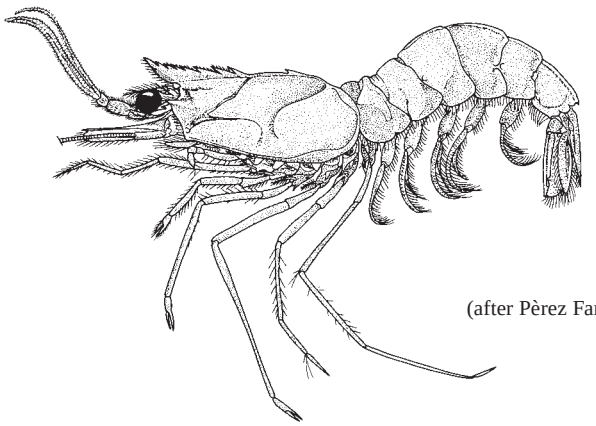
Distribution: Western Pacific and definitely known from Japan, Korea, Taiwan Province of China, coasts of China, the Philippines, and Indonesia.

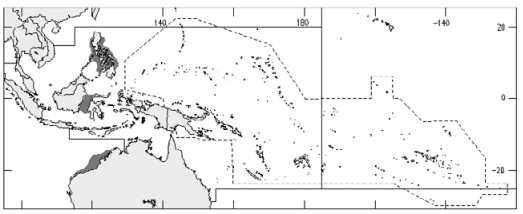


Solenocera alfonso Pérez Farfante, 1981

En - Deep-water mud shrimp.

Maximum body length about 12 cm (at a maximum carapace length of 4 cm). Inhabits the upper slopes of island shelves at depths from 176 to 547 m, on bottoms of green mud or fine sandy mud. So far only taken on the basis of experimental deep-water trawling. However, the size of this species and the fact that it is sometimes found in large quantities suggest it may have commercial potential with the development of a deep-sea fishery in the area. Indo-West Pacific and so far only known with certainty from the Philippines, Indonesia, and Northwestern Australia.



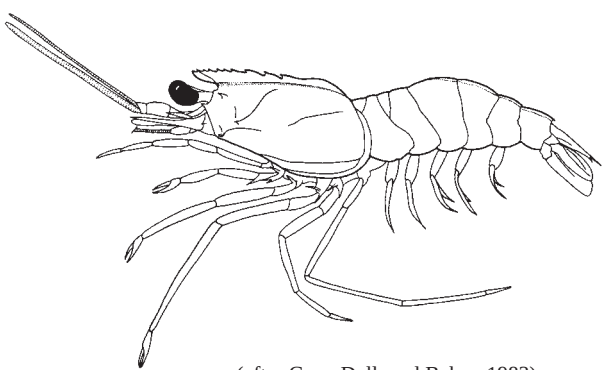


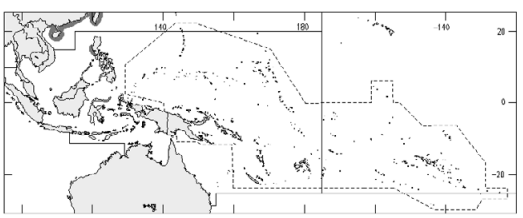
(after Pèrez Farfante, 1981)

Solenocera alticarinata Kubo, 1949

En - High ridge mud shrimp.

Maximum body length 11 cm (females) and 9 cm (males), commonly between 7 and 9 cm. On sandy mud bottom, at depths from 50 to 180 m. Taken by trawls. Apparently restricted to the Western Pacific from Japan to Taiwan Province of China, the South China Sea, and the Philippines. Often confused with the closely related *Solenocera choprai*. In the area, so far only recorded from the Philippines where it is probably less common than *S. choprai*.



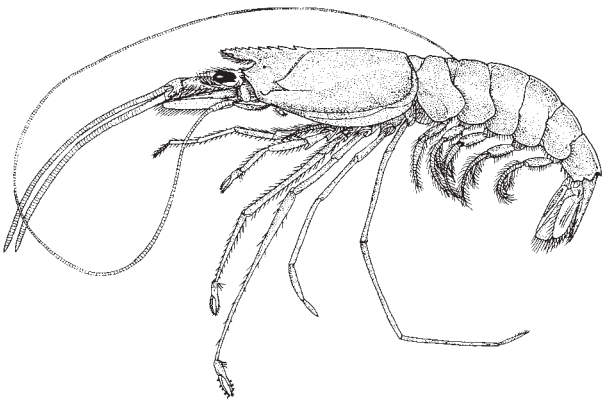


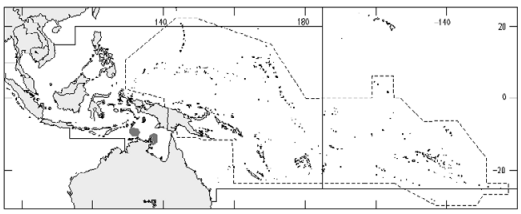
(after Grey, Dall, and Baker, 1983)

Solenocera australiana Pérez Farfante and Grey, 1980

En - Australia mud shrimp.

Maximum body length 12 cm (females) and 9 cm (males). In shallow water at depths from 15 to 40 m, over mud bottom with or without coral debris, rock, shell, or vegetation. Taken by commercial trawlers fishing for large penaeids in northern Australia, but so far without significant economic importance. Restricted to northern Australia.



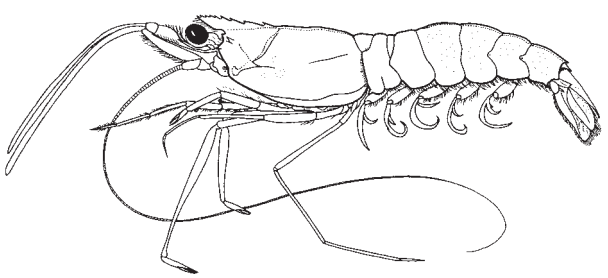


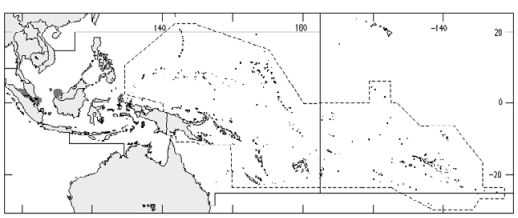
(after Pèrez Farfante and Grey, 1980)

Solenocera halli Starobogatov, 1972

En - Malayan mud shrimp.

Maximum body length about 10 cm (at a maximum carapace length of 2.75 cm). Found in shallow waters at depths from 48 and 75 m. So far mainly caught by experimental trawlers but probably more common around Malaysia and Singapore. Indo-West Pacific; thus far known from Bay of Bengal, Strait of Malacca, Singapore, and the South China Sea. Often confused with *Solenocera melantho*.



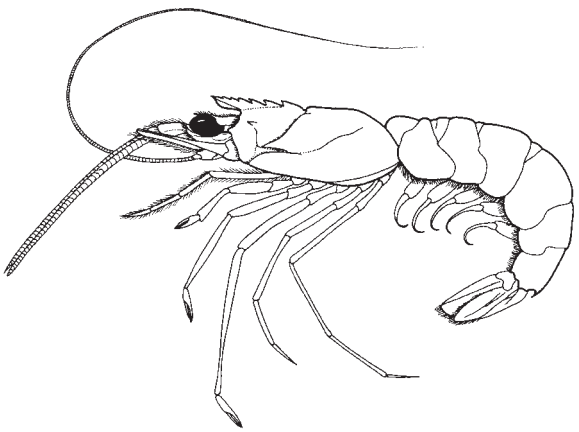


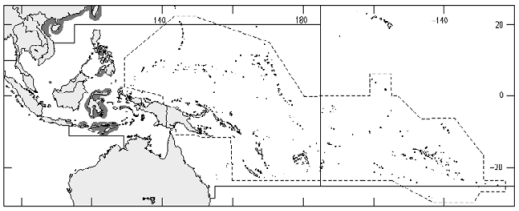
(after Hall, 1962)

Solenocera koelbeli De Man, 1911

En - Chinese mud shrimp; **Fr** - Salicoque chinoise de vase; **Sp** - Camarón fanguero chino.

Maximum body length 15 cm, commonly between 5 and 10 cm. On soft bottom at depths from 21 to 241 m, usually between 60 and 90 m. A bycatch in trawl fisheries. Western Pacific from Japan to Taiwan Province of China, the South China Sea, Viet Nam, the Philippines, and Indonesia. Apparently not abundant in the area. Sometimes confused with *Solenocera alticarinata*, *S. choprai*, or *S. melantho*.



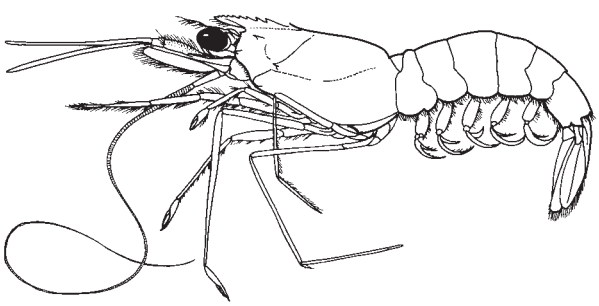


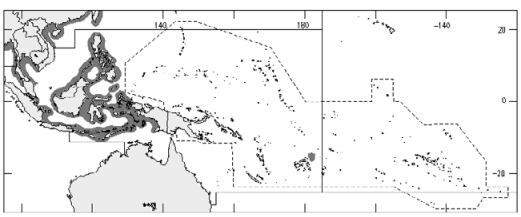
(after Lee and Yu, 1977)

Solenocera pectinata (Bate, 1888)

En - Comb shrimp; **Fr** - Salicoque peigne; **Sp** - Camarón peine.

Maximum body length 6 cm. On soft bottom at depths from 4 to 205 m. A common bycatch of commercial trawlers but of no economic importance, due to its small size. Widely distributed in the Indo-West Pacific, from the eastern coast of Africa to Japan and Wallis Island in the South Pacific. Often confused with *Solenocera pectinulata* but generally found at shallower depths.



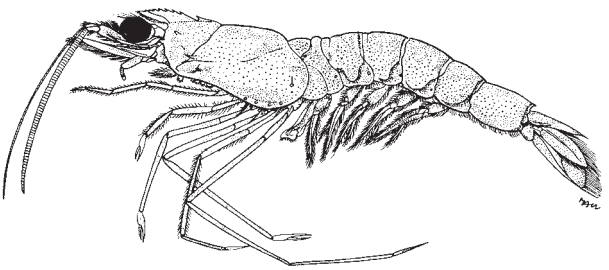


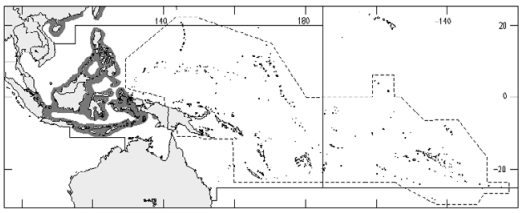
(after Hall, 1962)

Solenocera pectinulata Kubo, 1949

En - False comb shrimp.

Maximum body length 6.5 cm (carapace length to 2.2 cm), commonly between 3 and 5.5 cm. On bottoms of sand and/or mud, at depths from 75 to 350 m, usually deeper than 175 m. A common bycatch of commercial trawlers but without economic importance, due to its small size. Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan and Indonesia. Often confused with *Solenocera pectinata* but generally has a deeper distribution.

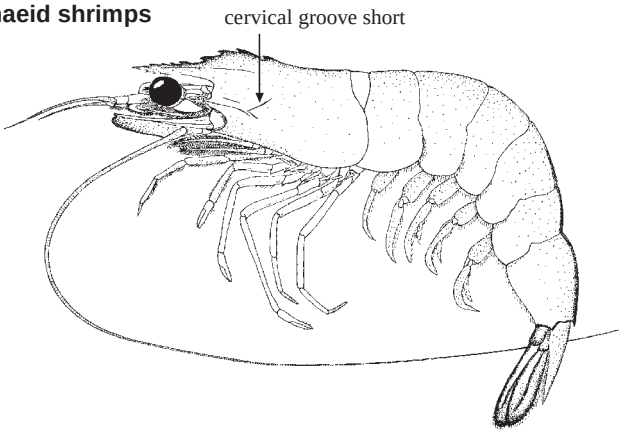




(after Motoh and Buri, 1984)

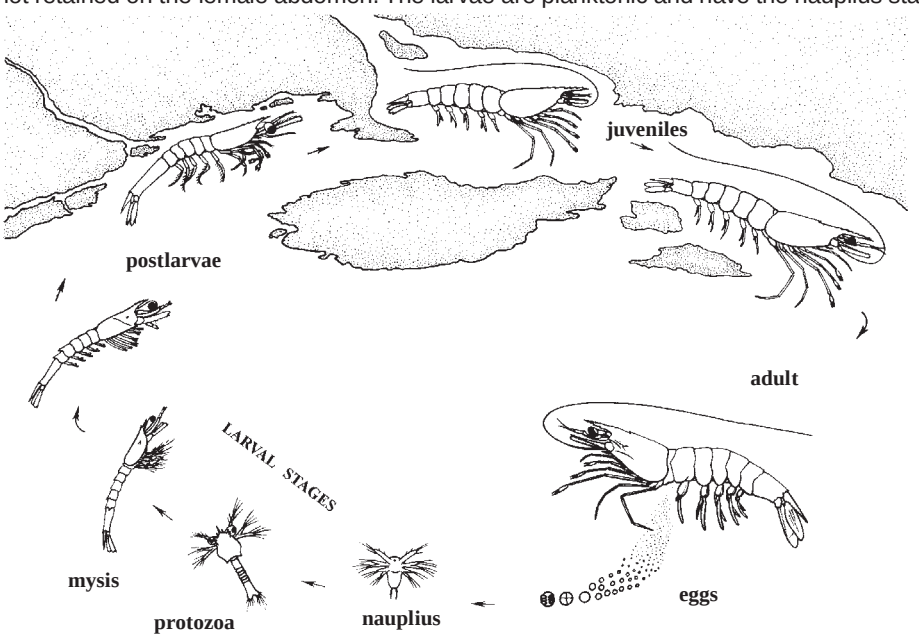
PENAEIDAE

Penaeid shrimps



Diagnostic characters: Rostrum well developed and generally extending beyond eyes, **always bearing more than 3 upper teeth. No styliform projection at base of eyestalk and no tubercle on its inner border**. Both upper and lower antennular flagella of similar length, attached to tip of antennular peduncle. **Carapace lacking both postorbital or postantennal spines. Cervical groove generally short, always with a distance from dorsal carapace.** All 5 pairs of legs well developed, **fourth leg bearing a single well-developed arthrobranch (hidden beneath carapace, occasionally accompanied by a second, rudimentary arthrobranch)**. In males, endopod of second pair of pleopods (abdominal appendages) with appendix masculina only. Third and fourth pleopods divided into 2 branches. Telson sharply pointed, with or without fixed and/or movable lateral spines. **Colour:** body colour varies from semi-translucent to dark greyish green or reddish, **often with distinct spots, cross bands and/or other markings on the abdomen and uropods; live or fresh specimens, particularly those of the genus *Penaeus*, can often be easily distinguished by their coloration.**

Habitat, biology, and fisheries: Members of this family are usually marine, although juveniles and young are often found in brackish water or estuaries, sometimes with very low salinities (a few unconfirmed fresh-water records exist). Some penaeids, mainly those of the genera *Parapenaeus* and *Penaeopsis*, occur in deep water at depths of more than 750 m. Penaeids are mostly benthic and mainly found on soft bottom of sand and/or mud, but a few species (e.g. genus *Funchalia*) are pelagic and others are known to inhabit coral reefs (e.g. the genera *Heteropenaeus*, *Trachypenaeopsis*, also some *Metapenaeopsis*). Their size ranges from 2.5 to 35 cm body length. The sexes are easily distinguished by the presence of a very large copulatory organ (petasma) on the first pair of pleopods (abdominal appendages) of males, while the females have the posterior thoracic sternites modified into a large sperm receptacle process (thelycum) which holds the spermatophores or sperm sacs (usually whitish or yellowish in colour) after mating. The shape of the petasma and thelycum is often specific and very useful for species identification. The eggs are small and numerous, and are released directly into the water and not retained on the female abdomen. The larvae are planktonic and have the nauplius stage.



life-cycle of shrimps of the genus *Penaeus*

The life cycle of species of *Penaeus* and *Metapenaeus*, the 2 most important commercial shrimp genera, is complex (see figure on previous page). Adults generally move from shallow coastal waters to offshore and spawn at depths between 10 to 80 m. The eggs hatch within 14 to 24 hours and release very small, simple larvae, the nauplii. The nauplius larva passes through several substages before it metamorphoses into the mysis stage. These larvae are planktonic and are carried by currents toward shore where they arrive as postlarvae; this occurs about three weeks after hatching when the animals are 6 to 14 mm long and shrimp-like in appearance. The postlarvae invade inshore brackish waters, abandon their planktonic way of life, and become bottom dwellers living in shallow littoral areas. In these rich nursery grounds they grow rapidly, develop into juveniles and, as size increases, move gradually back toward the mouths of bays or estuaries, where they become subadults. Soon the shrimps migrate offshore, continue growing and mate, and when they finally reach the spawning grounds, the mature females spawn and the cycle is repeated; most shrimps in these grounds are about 1 year old, rarely older than 2 (or perhaps 3) years old.

At present, 11 genera and 112 species of penaeids are known to occur in the Western Central Pacific. Among these, the genus *Penaeus* is of greatest economical importance. Species of *Penaeus* are caught extensively by trawls, seines, set nets, traps, and artisanal gear, with *P. merguiensis* and *P. monodon* probably being the 2 most important species. Moreover, aquaculture of *Penaeus* is very popular in many countries, mostly using Penaeus monodon. The genus of secondary importance is *Metapenaeus*, often taken together with Penaeus and also extensively cultured in ponds. The third commercially important genus is probably *Parapenaeopsis*, which is quite common in the western part of the area and often forms a significant part of the bycatch in prawn fisheries. Therefore, species accounts are provided here for all species of *Penaeus*, *Metapenaeus*, and *Parapenaeopsis* that are known from the Western Central Pacific. The other genera seem to be less abundant, although species of *Metapenaeopsis* and *Trachypenaeus* are frequently found among catches of prawn fisheries and have some commercial value. The 2 deep-water genera *Parapenaeus* and *Penaeopsis* are not fished at present, although experimental deep-water trawling operations have shown that representatives of these 2 genera, particularly *Parapenaeus*, can be caught in large quantities and are potentially of interest to fisheries. The remaining 4 genera are all without economic interest: species of *Atypopenaeus* are generally too small and not abundant, *Heteropenaeus* and *Trachypenaeopsis* occur in coral reefs and are small, and *Funchalia* is a pelagic deep-sea genus.

Since this family is of greatest commercial importance in the area, identification keys are given here for all penaeids, except for *Metapenaeopsis*, 40 species of which occur in the area, but most of these are either not common enough or found in deep waters, without any commercial potential. Therefore, an identification key is provided only for those species of *Metapenaeopsis* that may be found in commercial catches. For a full key to *Metapenaeopsis*, see the detailed revisions by A. Crosnier (1987-1994, published in "*Bull. Mus. natn. Hist. nat.*, Paris", and "Rèsultats des Campagnes MUSORSTOM").

Identification note

The shapes of the male petasma and female thelycum are very important taxonomic characters in several genera of penaeid shrimps, such as *Metapenaeopsis*, *Metapenaeus*, *Parapenaeopsis*, *Parapenaeus*, and *Trachypenaeus*. However, as the petasma and thelycum are not fully developed in juveniles, a positive identification of juvenile specimens is often difficult. Therefore, it is highly recommended to use, if possible, adult specimens rather than juveniles when using the keys.

For the differentiation between adult and juvenile males, it should be remembered that, in adult males, the left and right parts of the petasma are very rigid and strongly fused to each other (i.e. very difficult to separate), while in juvenile males the left and right parts of the petasma are either not fused or only weakly united (i.e. easy to separate) and somewhat soft with the scultpure not well defined.

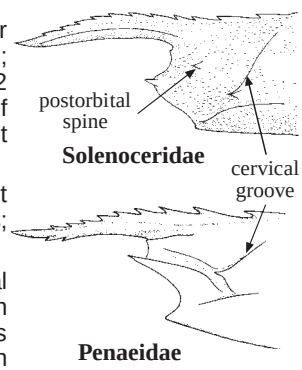
In adult females, the thelycum is clearly sculptured with the ridges and depressions very well marked, while in juvenile females the thelycum has only a shallow sculpture, not well defined.

Similar families occurring in the area

Aristeidae: either rostrum very short, armed with 1 or 2 upper teeth only, or upper antennular flagellum very short, not attached to tip of antennular peduncle; eyestalks generally with a tubercle on inner border; fourth leg bears 2 well-developed arthrobranchs (hidden beneath carapace); in males, endopod of second pair of pleopods with appendix masculina, appendix interna, but without lateral projection.

Sicyoniidae: shell generally hard and body "stony" in appearance; exopod present on first maxilliped only; abdomen often with deep grooves and numerous tubercles; third and fourth pleopods single-branched.

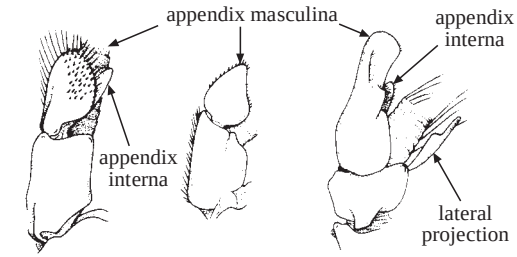
Solenoceridae: carapace either with postorbital or postantennal spine; cervical groove distinct and extending to about dorsal carapace; eyestalks generally with a tubercle on inner border; fourth leg bears 2 well-developed arthrobranchs (hidden beneath carapace); in males, endopod of second pair of pleopods with appendix masculina, appendix interna, and lateral projection.



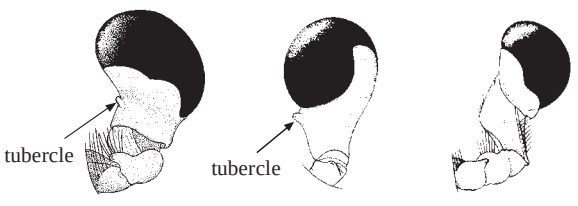
Sergestidae: size small; rostrum very short; body strongly compressed laterally; shell soft; last 2 pairs of legs reduced or absent.

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

Shrimps of the infraorder Caridea: third leg without pincer; second abdominal pleuron (lateral plate) greatly expanded, overlapping posterior part of first pleuron and anterior part of third pleuron; males and females without large copulatory organ on first pair of pleopods or posterior thoracic sternites, respectively; females carry the eggs on the abdomen until hatching.



endopod of 2nd pleopod in males

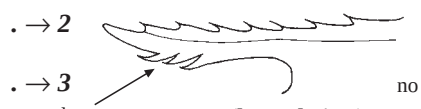


eyes

Key to the genera of Penaeidae occurring in the area

1a. Rostrum with lower teeth (Fig. 1) . . . . . → ***2***

1b. Rostrum without lower teeth (Fig. 2) . . . . . → ***3***



rostrum (lateral view)

Fig. 1 ***Penaeus***

rostrum (lateral view)

Fig. 2 ***Metapenaeus***

2a. Abdomen with many deep pubescent grooves (Fig. 3) . . . . . ***Heteropenaeus*** (a single species, *H. longimanus*)

2b. Abdomen glabrous and smooth (Fig. 4) . . . . . ***Penaeus***

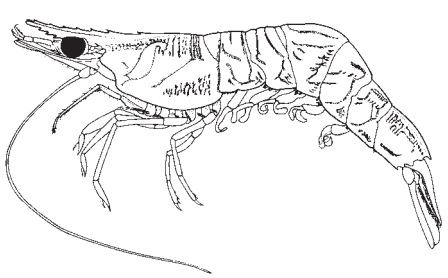


Fig. 3 ***Heteropenaeus longimanus***

(after Hall, 1961)

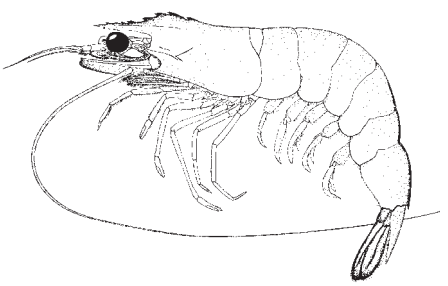
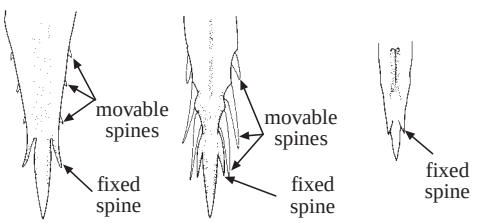


Fig. 4 ***Penaeus***

3a. Telson with a pair of large subapical fixed lateral spines (Fig. 5) . . . . . → ***4***

3b. Telson without large subapical fixed lateral spines . . . . . → ***7***



a) ***Penaeopsis*** **b)** ***Metapenaeopsis*** **c)** ***Parapenaeus***

Fig. 5 telson (dorsal view)

(after Lee and Yu, 1977)

4a. Body densely covered with short hairs, with grooves and crests on carapace obscure (Fig. 6a); petasma asymmetrical (Fig. 6b) . . . . . ***Metapenaeopsis***

4b. Body almost naked, with crests and grooves on carapace distinct (Fig. 7a); petasma symmetrical (Figs 7b and 8b) . . . . . → ***5***

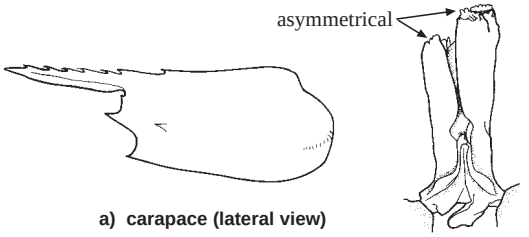


Fig. 6 ***Metapenaeopsis***

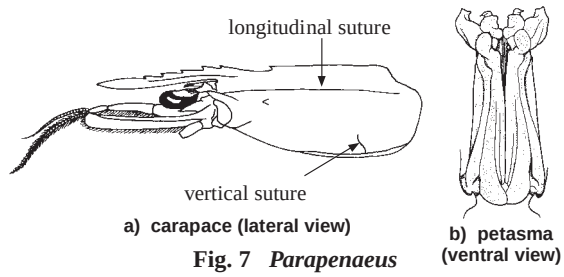


Fig. 7 ***Parapenaeus***

5b. Carapace with longitudinal and vertical sutures (Fig. 7a); telson without movable lateral spines (Fig. 5c) . . . . . ***Parapenaeus***

5a. Carapace lacking longitudinal and vertical sutures (Fig. 8a); telson with movable lateral spines . . . . . → ***6***

6a. Rostrum extending far beyond eye; pterygostomian spine present (Fig. 8a); deep water. ***.Penaeopsis***

6b. Rostrum short, not extending beyong eye; pterygostomian spine absent (Fig. 9); on reefs . . . . . ***Trachypenaeopsis***
(a single species, *T. richtersii*, in the area)

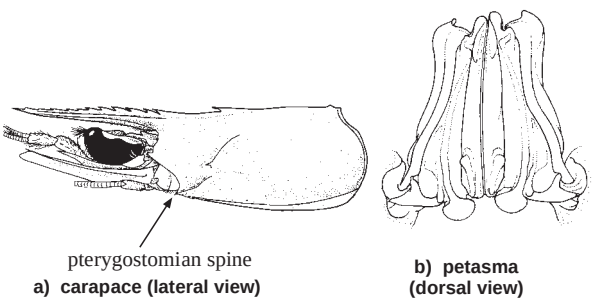


Fig. 8 ***Penaeopsis***

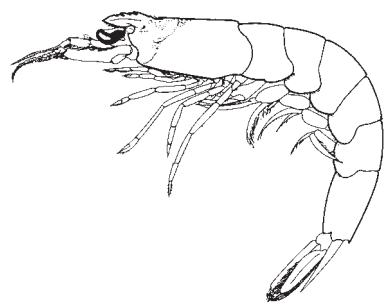


Fig. 9 ***Trachypenaeopsis richtersii***
(after Hayashi, 1992)

7a. Third maxilliped with epipod; male petasma asymmetrical (Fig. 10b); pelagic (Fig. 10a) . ***.Funchalia***
(a single species, *F. taaningi*, in the area)

7b. Third maxilliped without epipod; male petasma symmetrical (Fig. 11b); benthic . . . . . → ***8***

8a. Fifth leg without exopod (carapace without longitudinal or vertical sutures, Fig. 11a). ***.Metapenaeus***

8b. Fifth leg with exopod . . . . . →***9***

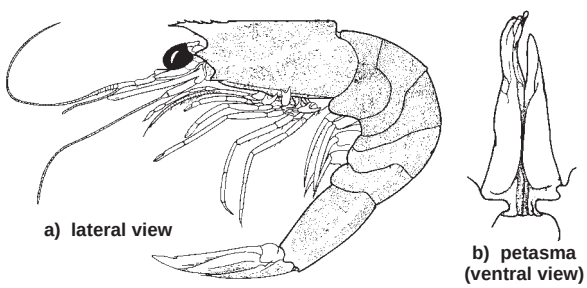


Fig. 10 ***Funchalia taaningi***
(after Hayashi, 1992)

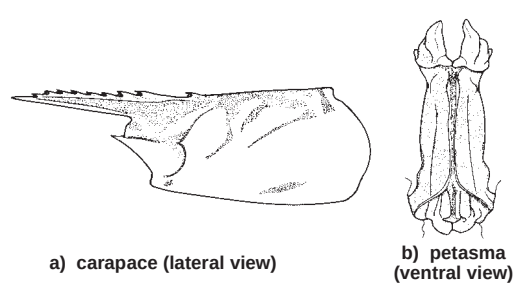


Fig. 11 ***Metapenaeus***

9a. Carapace without longitudinal or vertical sutures; second leg with ischial spine; eyes small (Fig. 12) . . . . . ***Atypopenaeus***
(the genus *Miyadiella* is not included in this key, as its status is rather controversial and specimens are interpreted as juveniles of *Atypopenaeus* by some authors)

9b. Carapace with both longitudinal and vertical sutures (Figs 13 and 14); second leg without ischial spine; eyes large . . . . . →***10***

10a. Body naked, with crests and grooves on carapace distinct; longitudinal suture usually long (Fig. 13); third leg without epipod . . . . . ***Parapenaeopsis***

10b. Body usually hairy, with crests and grooves on carapace obscure (Fig. 14); longitudinal suture short; third leg generally with epipod . . . . . ***Trachypenaeus***

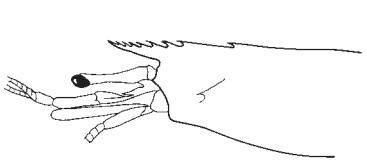


Fig. 12 ***Atypopenaeus***

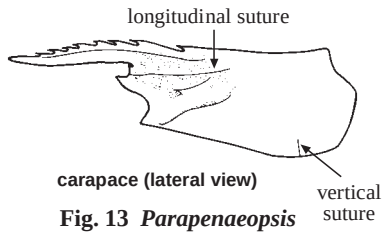


Fig. 13 ***Parapenaeopsis***

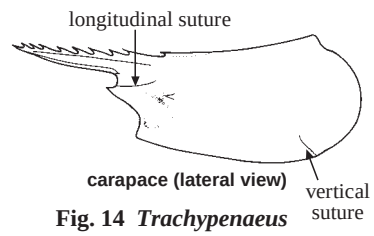


Fig. 14 ***Trachypenaeus***

Key to the species of *Atypopenaeus* occurring in the area

1a. Rostrum short, not extending beyond eye . . . . . → ***2***

1b. Rostrum extending far beyond eye . . . . . → ***3***

2a. Hepatic spine present . . . . . ***Atypopenaeus stenodactylus***

2b. Hepatic spine absent . . . . . ***Atypopenaeus dearmatus***

3a. Crests on fourth and fifth abdominal segments very high and blade-like; fifth leg very slender, extending beyond body; colour pale pink . . . . . ***Atypopenaeus bicornis***

3b. Crests on fourth and fifth abdominal segments not blade-like; fifth leg about 2/3 the length of the body; colour reddish orange . . . . . ***Atypopenaeus formosus***

Key to species of *Metapenaeopsis* likely to be encountered in fishing activities in the area

Note: in addition to the following key characters, the shape of the petasma and thelycum can be very helpful for quick identification of mature specimens (see figures shown in the respective species accounts). For a full key to *Metapenaeopsis*, see the revisions by A.Crosnier (1987-1994), in "*Bull. Mus. natn. Hist. nat.*, Paris" and "Rèsultats des Campagnes MUSORSTOM".

1a. Posterolateral carapace with stridulating organs (Fig. 15) . . . . . → ***2***

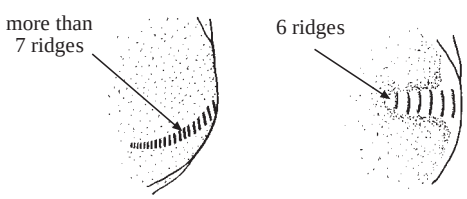
1b. Posterolateral carapace without stridulating organs . . . . . → ***7***

2a. Stridulating ridges usually 4 to 6 (Fig. 15b) . . . . . ***Metapenaeopsis stridulans***

2b. Stridulating ridges more than 7 (Fig. 15a) . . . . . → ***3***

3a. Rostrum far exceeding antennular peduncle, usually bearing 5 widely spaced upper teeth (Fig. 16) . . . . . ***Metapenaeopsis novaeguineae***

3b. Rostrum extending to about tip of antennular peduncle, bearing more than 6 regularly spaced upper teeth . . . . . → ***4***



a) ***Metapenaeopsis toloensis*** **b)** ***Metapenaeopsis stridulans***

Fig. 15 stridulating ridges on posterolateral carapace

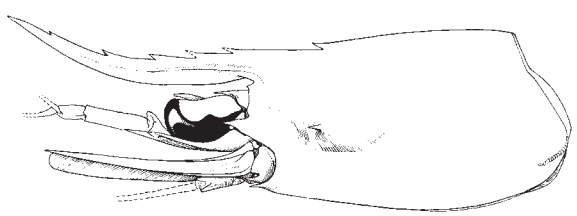


Fig. 16 ***Metapenaeopsis novaeguineae***

(from Crosnier, 1994)

4a. Pterygostomian spine moderately to well developed (Fig. 17) . . . . . → ***5***

4b. Pterygostomian spine reduced (Fig. 18) . . . . . → ***6***

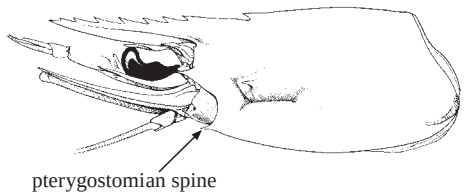


Fig. 17 ***Metapenaeopsis barbata***
(from Crosnier, 1994)

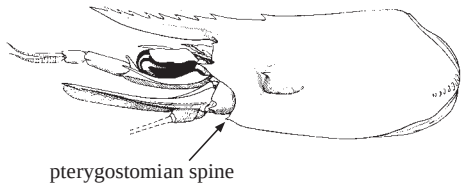


Fig. 18 ***Metapenaeopsis palmensis***
(from Crosnier, 1994)

5a. Dorsal crest of third abdominal segment flat or very slightly concave (Fig. 19a) . . ***Metapenaeopsis barbata***

5b. Dorsal crest of third abdominal segment with deep median groove (Fig. 19b) . . ***Metapenaeopsis toloensis***

6a. Rostrum with 9 or 10 upper teeth . . ***Metapenaeopsis rosea***

6b. Rostrum with 7 or 8 upper teeth (Fig. 18) . . . . . ***Metapenaeopsis palmensis***

7a. Rostrum forming a crest (Fig. 20) . . . . . ***Metapenaeopsis lamellata***

7b. Rostrum not forming a crest . . . . . → ***8***

8a. Pterygostomian spine very strong (Fig. 21) . . . . . ***Metapenaeopsis wellsi***

8b. Pterygostomain spine minute or absent (Fig. 22) . . . . . ***Metapenaeopsis mogiensis***

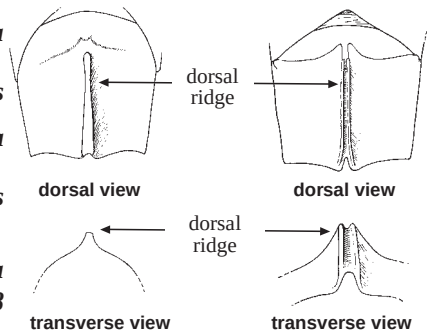


Fig. 19 third abdominal segment
(from Crosnier, 1994)

Fig. 20 ***Metapenaeopsis lamellata***

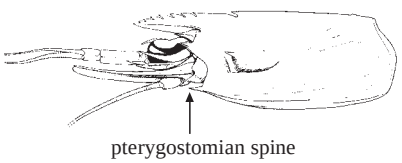


Fig. 21 ***Metapenaeopsis wellsi***
(from Crosnier, 1991)

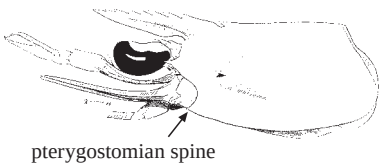


Fig. 22 ***Metapenaeopsis mogiensis***
(from Crosnier, 1991)

Key to the species of *Metapenaeus* occurring in the area

Remarks on key characters: the shape of the petasma and thelycum are the main taxonomic characters to separate species of this genus (see figures shown in the respective species accounts). Therefore, correct identification of juveniles and immature specimens is sometimes difficult. See Miquel (1982, *Zool. Verh.*, 195) for more information on the species of this genus.

1a. Rostrum very short and high, not extending beyond eye (Fig. 23) . . . ***Metapenaeus lysianassa***

1b. Rostrum extending beyond eye . . . . . → ***2***

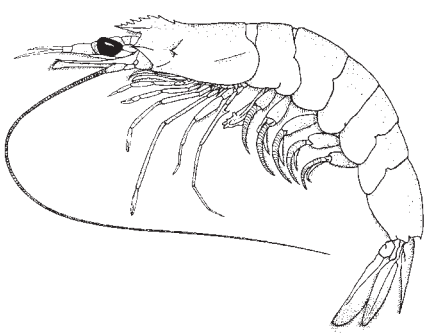


Fig. 23 ***Metapenaeus lysianassa***

2a. Rostrum armed with teeth along entire upper border (Fig. 24) . . . . . → ***3***

2b. Rostrum unarmed in its distal 1/3 to 1/2 (Figs 25 and 26) . . . . . →***16***

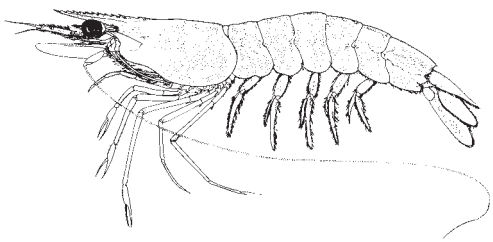


Fig. 24 ***Metapenaeus ensis***

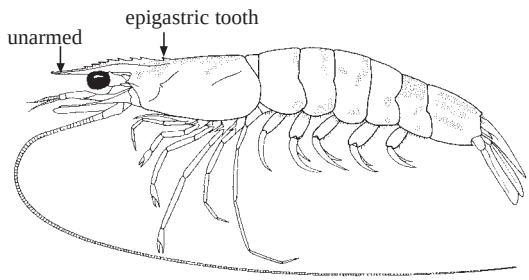


Fig. 25 ***Metapenaeus eboracensis***
(after Miguel, 1982)

3a. Telson with 3 pairs of large movable spines (Fig. 27b) . . . . . → ***4***

3b. Telson without large movable spines (although sometimes with many minute spinules; Fig. 27a) . . . . . → ***6***

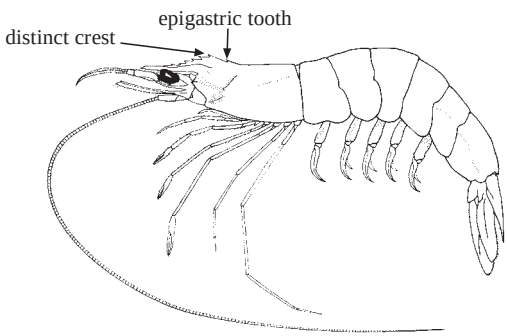
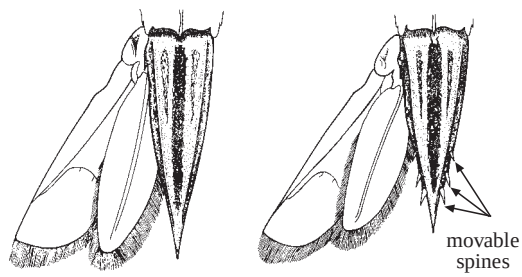


Fig. 26 ***Metapenaeus tenuipes***
(after Miguel, 1982)



a) ***Metapenaeus ensis*** **b)** ***Metapenaeus anchistus***

Fig. 27 telson and left uropod (dorsal view)
(after Motoh and Buri, 1984)

4a. In males, distolateral projections of petasma not reaching as far as distomedian ones, armed with a pair of spinules on each externodistal side; in females, thelycum with a posteromedian ogival boss, coxal projection of fourth leg very long, flat and truncate . . . . . ***Metapenaeus intermedius***

4b. In males, distolateral projections of petasma exceeding distomedian ones, without external spinules; in females, thelycum without a posteromedian boss, coxal projection of fourth leg a conical process . . . . . → ***5***

5a. In males, a wide space between distomedian projections of petasma; in females, lateral plates of thelycum with raised posterior edge, a deep fissure between lateral plates and posterior transverse ridge . . . . . ***Metapenaeus endeavouri***

5b. In males, a narrow space between distomedian projections of petasma; in females, lateral plates of thelycum without raised posterior edge and continuous to posterior transverse ridge . . . . . ***Metapenaeus anchistus***

6a. First leg with ischial spine subequal to basial spine . . . . . ***Metapenaeus suluensis***

6b. Ischial spine of first leg much smaller then basial spine, minute or absent . . . . . → ***7***

7a. In males, distomedian projection of petasma swollen; in females, lateral plates of thelycum with raised lateral or ventral ridges . . . . . → ***8***

7b. In males, distomedian projection of petasma not swollen; in females, lateral plates of thelycum without raised ridges . . . . . → ***12***

8a. In males, each distomedian projection of petasma forming a broad outward curved distal tooth; in females, anterior plate of thelycum with a pair of anterolateral rounded tubercles, each lateral plate with a short anteromedian ridge and a patch of setae . . . . . ***Metapenaeus insolitus***

8b. In males, each distomedian projection of petasma without distolateral teeth; in females, anterior plate of thelycum without tubercles, lateral plates with long ridges and without patches of setae . . . . . →***9***

9a. In males, distomedian projections of petasma concealing distolateral ones in ventral view, merus of fifth leg with a long inward curved spiniform process followed by a distinct row of tubercles; in females, ridges on lateral plates of thelycum subparallel or forming posteriorly distinctly inward curved processes . . . . . →***10***

9b. In males, distomedian projections of petasma not concealing distolateral ones in ventral view, merus of fifth leg with a tubercle; in females, ridges on lateral plates of thelycum closer to each other posteriorly and without distinctly inward curved processes . . . . . →***11***

10a. Rostrum armed with 7 to 9 upper teeth; in males, distomedian projections of petasma reaching about as far as distolateral ones; in females, lateral plates of thelycum with strongly raised crescent-shaped ventral ridges, coming close together posteromedially . . . . . ***Metapenaeus conjunctus***

10b. Rostrum armed with 8 to 12 upper teeth; in males, distomedian projections of petasma reaching well beyond distolateral ones; in females, lateral plates of thelycum with strongly raised externolateral edges, a wide space separating them . . . . . ***Metapenaeus ensis***

11a. In males, distomedian projections of petasma directed forward, their inner margins almost parallel, tubercle on merus of fifth leg slightly bent inward; in females, ridges on lateral plates of thelycum curved outward posteriorly . . . . . ***Metapenaeus papuensis***

11b. In males, distomedian projections of petasma directed anterolaterally, diverging, with distinct longitudinal grooves, tubercle on merus of fifth leg slightly bent outward; in females, ridges on lateral plates of thelycum curved inward posteriorly . . . . ***Metapenaeus elegans***

12a. Branchiocardiac crest reaching posterior extension of hepatic spine; in males, distomedian projections of petasma crescent-shaped; in females, posterior transverse ridge behind thelycum with 2 anterolateral rounded projections . . . . . ***Metapenaeus affinis***

12b. Branchiocardiac crest ending near posterior 1/3 of carapace; in males, distomedian projections of petasma never crescent-shaped; in females, posterior transverse ridge behind thelycum without projections . . . . . →***13***

13a. In males, distolateral projections of petasma widening distally, distomedian projections not reaching as far as distolateral ones; in females, anterior plate of thelycum very broad in its distal half and very narrow posteriorly, lateral plates fused and rounded W-shape . . . . . ***Metapenaeus demani***

13b. In males, distolateral projections of petasma tapering distally, distomedian projections exceeding distolateral ones; in females, anterior plate of thelycum about same width on anterior and posterior margins, lateral plates not rounded W-shape . . . . . →***14***

14a. In males, distomedian projections of petasma tubular and diverging; in females, anterior margin of anterior plate of thelycum with 2 fang-like teeth and a median indistinct tubercle . . . . . ***Metapenaeus dalli***

14b. In males, distomedian projections of petasma either tubular and subparallel or laminose and diverging; in females, anterior margin of anterior plate of thelycum with 3 tubercles . . . . . →***15***

15a. In males, distomedian projections of petasma tubular and almost parallel, their distal part twisted dorsoventrally; in females, distal margin of anterior plate of thelycum triangular, median tubercle more prominent than lateral ones . . . . . ***Metapenaeus bennettae***

15b. In males, distomedian projections of petasma laminose and diverging; in females, distal margin of anterior plate of thelycum convex, all tubercles of subequal size . . ***Metapenaeus moyebi***

16a. Telson armed with 4 pairs of large movable spines . . . . . ***Metapenaeus macleayi***

16b. Telson without large movable lateral spines (though sometimes with many minute spinules) . . . . . →***17***

17a. In males, basal spine of third leg extremely long and barbed; in females, lateral plates of thelycum partially sheathing anterior plate . . . . . ***Metapenaeus dobsoni***

17b. In males, basal spine of third leg sample, not barbed; in females, lateral plates of thelycum not sheathing anterior plate . . . . . →***18***

18a. Rostrum without a distinct crest; adrostral groove extending beyond epigastric tooth (Fig. 25) . . . . . ***Metapenaeus eboracensis***

18b. Rostrum with a distinct crest; adrostral groove not reaching epigastric tooth (Fig. 26) . . . . . →***19***

19a. In males, distolateral projections of petasma directed outward, distomedian projections with slender apical filaments; in females, thelycum with a large anterior and small lateral plates . . . . . ***Metapenaeus brevicornis***

19b. In males, distolateral projections of petasma directed forward, distomedian projections with ribbon-like apical filaments; in females, thelycum with a small anterior and large lateral plates . . . . . ***Metapenaeus tenuipes***

Key to the species of *Parapenaeopsis* occurring in the area[1/]

Note: in addition to the following key characters, the shape of the petasma and thelycum can also be very helpful for quick identification of mature specimens (see figures shown in the respective species accounts).

1a. First and second legs with epipods . . . . . → ***2***

1b. First and second legs without epipods . . . . . → ***8***

2a. First leg without basial spine . . . . . ***Parapenaeopsis gracillima***

2b. First leg with basial spine . . . . . → ***3***

3a. Second leg with basial spine absent or minute; carapace with a large dorsoposterior dark brown patch . . . . . ***Parapenaeopsis uncta***

3b. Second leg usually with a distinct basial spine; carapace without conspicuous dark patches on dorsal surface . . . . . → ***4***

4a. Telson armed with 1 or 2 pairs of fixed lateral spines (Fig. 28) . . . . . ***Parapenaeopsis coromandelica***

4b. Telson without fixed lateral spines . . . . . → ***5***

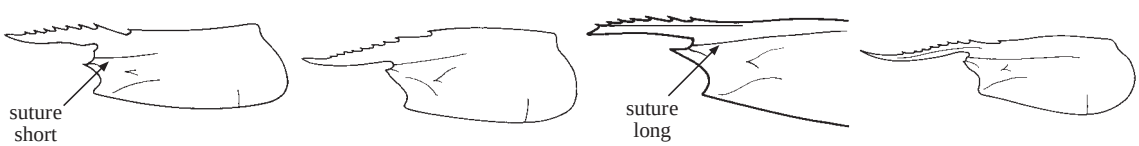
Fig. 28 ***Parapenaeopsis coromandelica***

5a. Longitudinal suture short, reaching to about level of hepatic spine (Figs 29a, b); male petasma horn-like; in females, anterior and posterior plates of thelycum fused medially . . . . . → ***6***

5b. Longitudinal suture long, extending near to posterior carapace (Figs 29c, d); male petasma not horn-like; in females, anterior and posterior plates of thelycum separated . . . . . → ***7***

6a. Rostrum usually with 7 or 8 upper teeth (Fig. 29a); third leg without basial spine; in males, tip of distolateral projection of petasma with a small dorsal spiniform process; in females, posterior plate of thelycum without a median boss . . . . . ***Parapenaeopsis cornuta***

6b. Rostrum usually with 9 or 10 upper teeth (Fig. 29b); third leg with a basial spine; in males, tip of distolateral projection of petasma without dorsal spiniform processes; in females, posterior plate of thelycum with a median boss . . . . . ***Parapenaeopsis maxillipedo***



a) ***Parapenaeopsis cornuta*** **b)** ***Parapenaeopsis maxillipedo*** **c)** ***Parapenaeopsis hardwickii*** **d)** ***Parapenaeopsis sculptilis***

Fig. 29 carapace (lateral view)

1/ The taxonomic status and the relationships of some species of this genus are still unclear. For example, *Parapenaeopsis probata* Hall, 1961 is here treated as a synonym of *P. uncta* Alcock, 1905, but its status probably should be re-examined.

7a. In males, distomedian projections wing-like, wider than long and with anterior margin often crenulate; in females, posterior plate of thelycum with a pair of anterolateral tooth-like projections and anteromedian margin bearing a transverse row of long hairs; body not strikingly cross-banded . . . . . ***Parapenaeopsis hardwickii***

7b. In males, distomedian projections rabbit ear-shaped, long and deeply concave ventrally; in females, posterior plate of thelycum without anterolateral tooth-like projections but with a median tubercle bearing a tuft of long hairs; body strikingly cross-banded . . ***Parapenaeopsis sculptilis***

8a. Epigastric tooth present . . . . . → ***9***

8b. Epigastric tooth absent . . . . . →***10***

9a. Rostrum long and exceeding antennular peduncle; longitudinal suture extending almost to posterior carapace . . . . . ***Parapenaeopsis hungerfordii***

9b. Rostrum short and extending just beyond eyes; longitudinal suture only reaching as far as level of hepatic spine . . . . . ***Parapenaeopsis venusta***

10a. Rostrum extending far beyond antennular peduncle; longitudinal suture reaching as far as level of hepatic spine; vertical suture absent . . . . . .***Parapenaeopsis arafurica***

10b. Rostrum not exceeding second antennular segment; longitudinal suture extending far behind level of hepatic spine; vertical suture present . . . . . ***Parapenaeopsis tenella***

Key to the species of *Parapenaeus* occurring in the area

Note: the shape of the petasma and thelycum can be very helpful for quick identification of mature specimens, and these are therefore depicted at the end of the key (Figs 39, 40, and 41). For more information on the species of this genus, see the work of Crosnier (1986, Résultats des Campagnes MUSORSTOM, Vol 2).

1a. Branchiostegal spine absent (Fig. 30) . . . . . ***Parapenaeus longipes***

1b. Branchiostegal spine present (Figs 31 to 38) . . . . . → ***2***

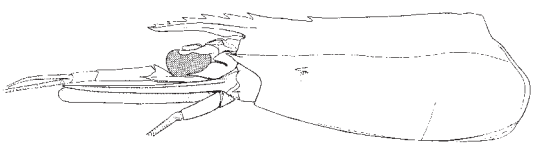


Fig. 30 ***Parapenaeus longipes***
(from Crosnier, 1985)

2a. Branchiostegal spine situated behind anterior edge of carapace (Figs 31and 32) . . . . . → ***3***

2b. Branchiostegal spine situated on anterior edge of carapace (Figs 33 to 38) . . . . . → ***4***

3a. Rostrum slightly curved downward; postrostral crest extending close to posterior border of carapace (Fig. 31) (see also Figs 39a and 41a) . . . . . ***Parapenaeus investigatoris***

3b. Rostrum slightly curved upward; postrostral crest extending to slightly beyond midcarapace (Fig. 32; see also Figs 39b and 41b) . . . . . ***Parapenaeus murrayi***

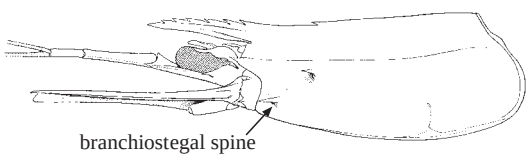


Fig. 31 ***Parapenaeus investigatoris***
(from Crosnier, 1985)

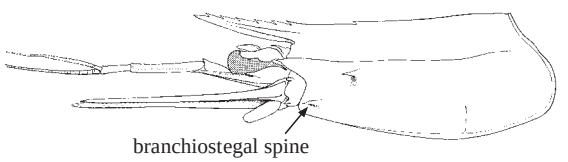


Fig. 32 ***Parapenaeus murrayi***
(from Crosnier, 1985)

4a. Rostrum usually not exceeding basial segment of antennular peduncle (Figs 33; see also Figs 39c and 41c) . . . ***Parapenaeus fissurus***

4b. Rostrum extending far beyond basial segment of antennular peduncle . . . . . → ***5***

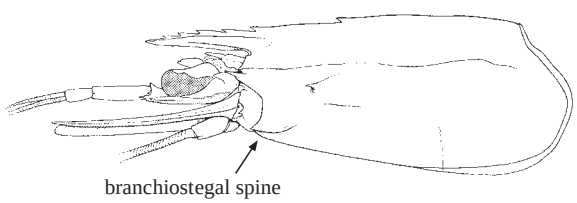


Fig. 33 ***Parapenaeus fissurus***
(from Crosnier, 1985)

5a. Epigastric spine approximately above level of hepatic spine (Fig. 34; see also Figs 39d and 41d) . . . . . ***Parapenaeus perezfarfante***

5b. Epigastric spine distinctly behind level of hepatic spine (Fig. 35) . . . . . → ***6***

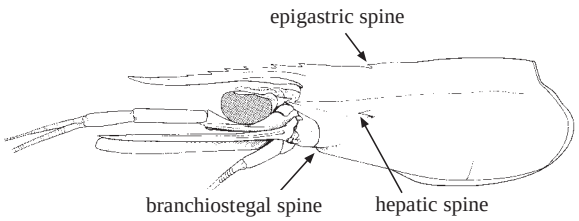


Fig. 34 ***Parapenaeus perezfarfante***
(from Crosnier, 1985)

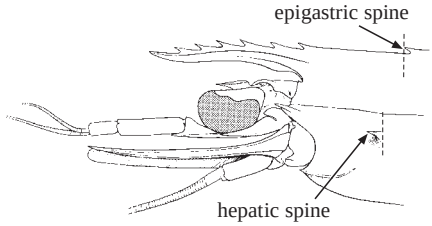


Fig. 35 ***Parapenaeus sextuberculatus***
(from Crosnier, 1985)

6a. Rostrum slender and almost straight (see also Fig. 40a) . . ***Parapenaeus ruberoculatus***

6b. Rostrum robust and sinuous . . . . . → ***7***

7a. Rostrum extending to about the middle of second segment of antennular peduncle (Fig. 35; see also 40b and 41e) . . . . . ***Parapenaeus sextuberculatus***

7b. Rostrum extending beyond second segment of antennular peduncle (Figs 36 to 38) . . . . . → ***8***

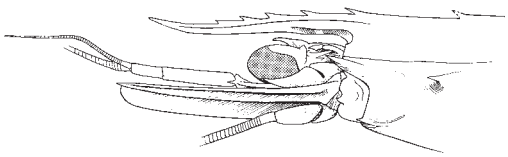


Fig. 36 ***Parapenaeus fissuroides***
(from Crosnier, 1985)

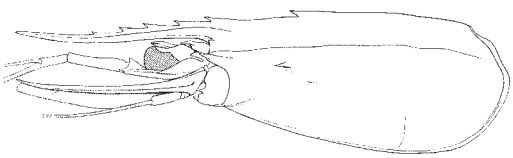


Fig. 37 ***Parapenaeus lanceolatus***
(from Crosnier, 1985)

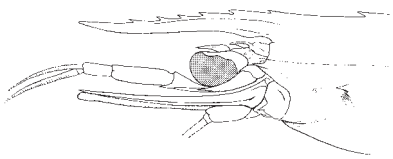


Fig. 38 ***Parapenaeus australiensis***
(from Crosnier, 1985)

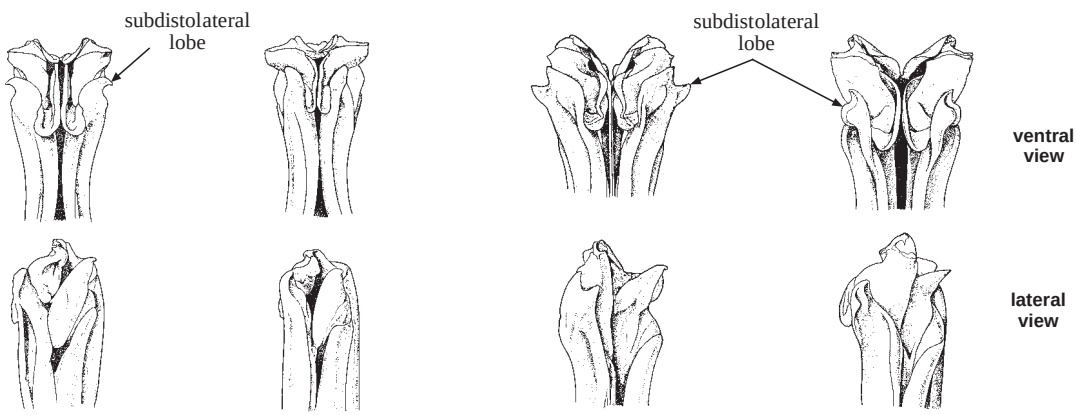


Fig. 39 distal part of petasma
(after Crosnier, 1985)

8a. In males, petasma with subdistolateral lobes bifurcate (Fig. 40c); in females median part of thelycum bearing a pair of longitudinal swellings (Fig. 41f) . . . . . ***Parapenaeus fissuroides***

8b. In males, petasma with subdistolateral lobes not bifurcate; in females, median part of thelycum without longitudinal swellings . . . . . → ***9***

9a. In males, petasma with subdistolateral lobes pointed (Fig. 40d); in females, thelycum with a distinct median pit (Fig. 41g) . . . . . ***Parapenaeus lanceolatus***

9b. In males, petasma with subdistolateral lobes rounded (Fig. 40e); in females, thelycum without a pit at middle (Fig. 41h, sometimes bearing a tubercle) . . . . . ***Parapenaeus australiensis***

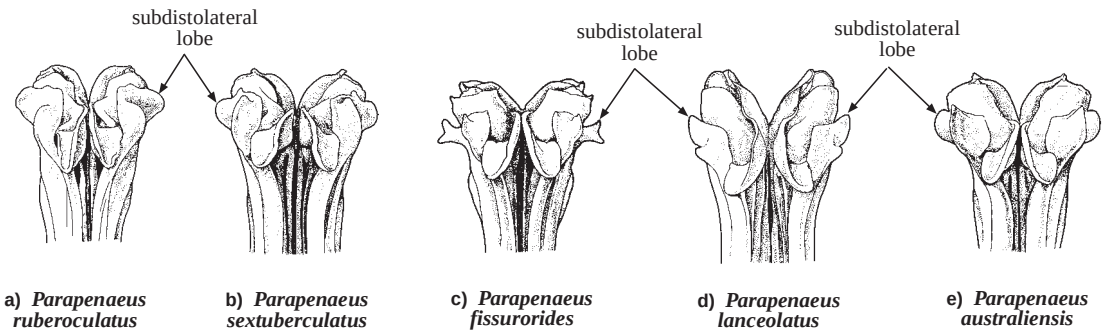


Fig. 40 distal part of petasma (ventral view)
(after Crosnier, 1985)

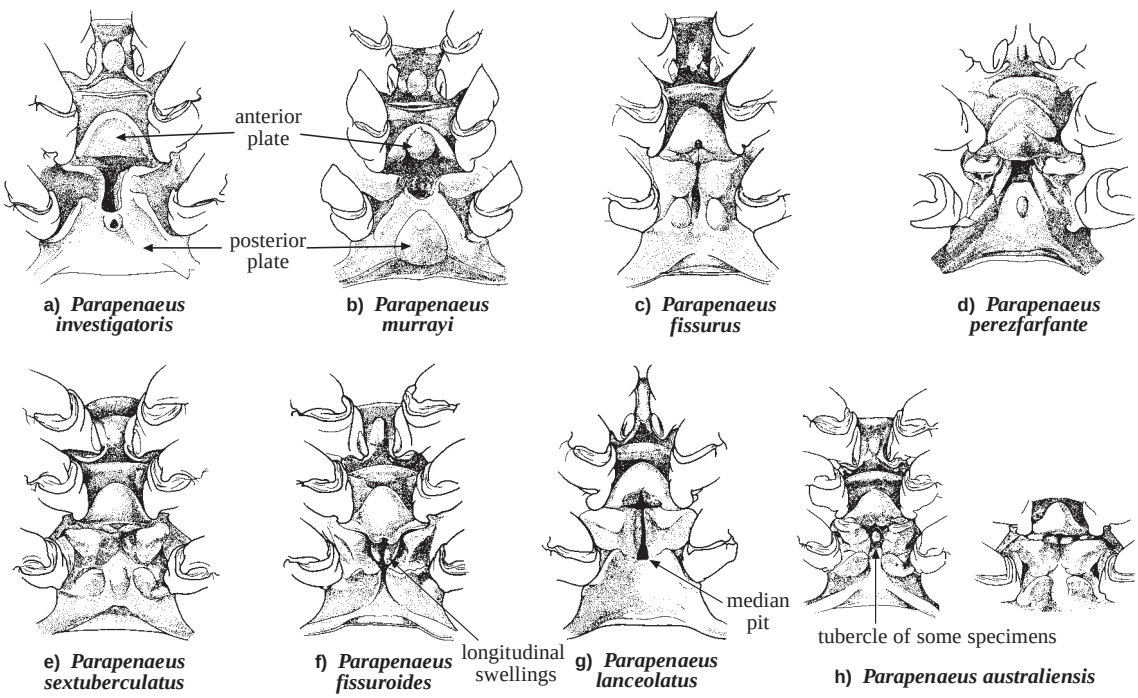


Fig. 41 thelycum
(after Crosnier, 1985)

Key to the species of *Penaeopsis* occurring in the area

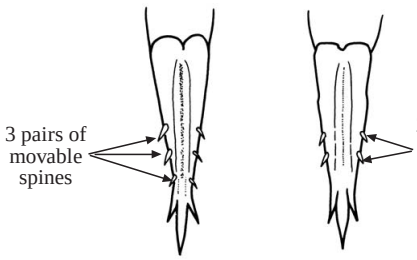
Note: for more information on the species of this genus, see the work of Pérez Farfante (1980, *Fish. Bull.*: 77).

1a. Telson generally with 3 pairs of movable spines (Fig. 42a); pterygostomian spine above anterolateral corner of carapace (Fig. 43a) . . . . . ***Penaeopsis rectacuta***

1b. Telson generally with 2 pairs of movable spines (Fig. 42b); pterygostomian spine at anterolateral corner of carapace (Fig. 43b) . . . . . → ***2***

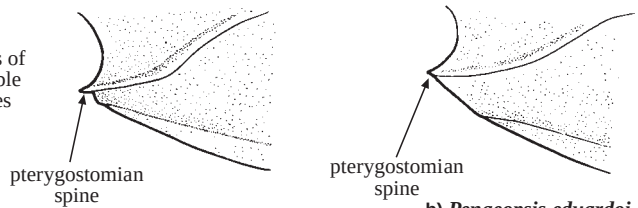
2a. In males, petasma with ventral costa produced distally into long spine considerably extending beyond level of row of cincinnuli; in females, thelycum with lateral plates turning abruptly mesially posterior to midlength, plate bearing short, pedunculate posteromedian protuberance . . . . . ***Penaeopsis eduardoi***

2b. In males, petasma with ventral costa ending distally in a blunt, short process or spine not extending beyond level of row of cincinnuli; in females, thelycum with lateral plates not turning abruptly mesially posterior to midlength, plate bearing short, subrectangular posteromedian protuberance . . . . . ***Penaeopsis challengeri***



a) ***Penaeopsis rectacuta*** b) ***Penaeopsis eduardoi***

Fig. 42 telson (dorsal view)



a) ***Penaeopsis rectacuta*** b) ***Penaeopsis eduardoi, P. challengeri***

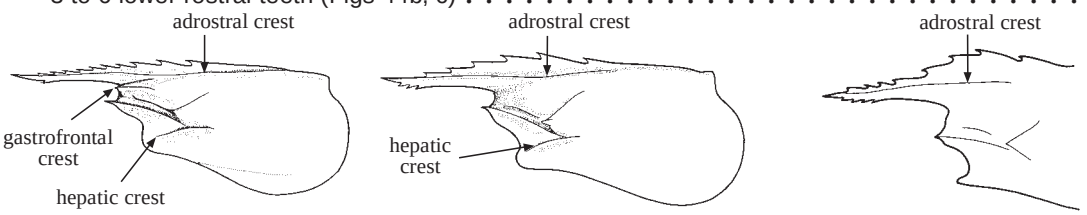
Fig. 43 anterolateral corner of carapace

Key to the species of *Penaeus* occurring in the area[2l]

Note: live or fresh specimens of this genus can often be easily distinguished on the basis of their coloration.

1a. Adrostral crest extending almost to posterior border of carapace; gastrofrontal crest present; generally 1 or 2 lower rostral teeth (Fig. 44a) . . . . . → ***2***

1b. Adrostral crest not extending beyond midcarapace; gastrofrontal crest absent; generally 3 to 6 lower rostral teeth (Figs 44b, c) . . . . . → ***7***

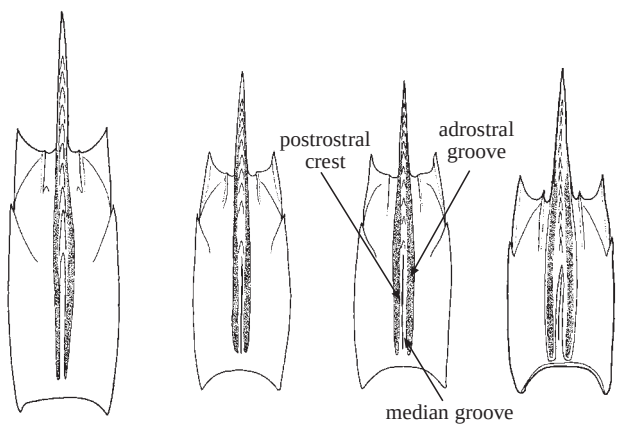


a) ***Penaeus japonicus*** b) ***Penaeus semisulcatus*** c) ***Penaeus merguiensis***

Fig. 44 carapace (lateral view)

2a. Postrostral crest without median groove (Fig. 45a); usually 2 lower rostral teeth (body uniform colour) . . . . . ***Penaeus marginatus***

2b. Postrostral crest with median groove (Figs 45b, c, d); usually 1 lower rostral tooth . . . . . → ***3***



a) ***Penaeus marginatus*** b) ***Penaeus japonicus*** c) ***Penaeus latisulcatus*** d) ***Penaeus longistylus***

Fig. 45 carapace (dorsal view)

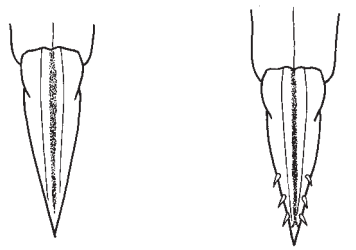
2l This genus is sometimes subdivided into many subgenera or genera by some authors.

3a. Telson unarmed (Fig. 46a; body covered with cross bands) . . . . . ***Penaeus canaliculatus***

3b. Telson armed with movable lateral spines (Fig. 46b) . . . . . → ***4***

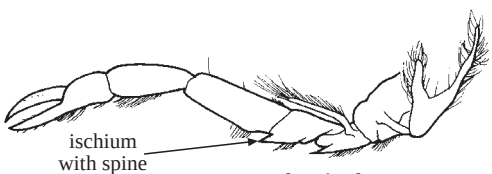
4a. First leg bearing a distinct ischial spine (Fig. 47a); median groove on postrostral crest less than half carapace length (Fig. 45d, body without cross bands). . . . . ***Penaeus longistylus***

4b. First leg with ischial spine minute or absent (Fig. 47b); median groove on postrostral crest extending almost to posterior carapace (Figs 45b, c). . . . . → ***5***

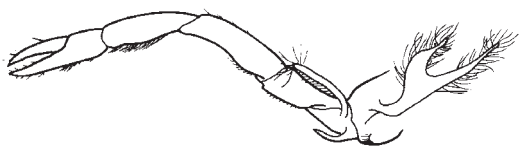


a) ***Penaeus canaliculatus*** b) ***Penaeus japonicus***

Fig. 46 telson (dorsal view)



a) ***Penaeus longistylus***

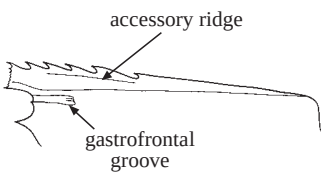


b) ***Penaeus japonicus***

Fig. 47 first leg
(after Hayashi, 1992)

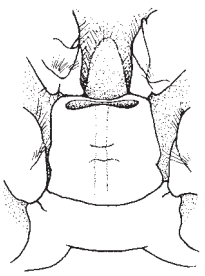
5a. Rostrum with accessory ridges; gastrofrontal groove divided into 3 at posterior end (Fig. 48; body uniformly coloured) . . . . . ***Penaeus plebejus***

5b. Rostrum without distinct accessory ridges; gastrofrontal groove divided into 2 at posterior end. . . . . → ***6***



upper part of carapace (lateral view)

Fig. 48 ***Penaeus plebejus***



thelycum

Fig. 49 ***Penaeus***

6a. Adrostral groove about as long as wide as postrostral crest (Fig. 45b, body covered with cross bands; shape of thelycum unique and pouch-like, Fig. 49, those of all other species flap-like) . . . . . ***Penaeus japonicus***

6b. Adrostral groove distinctly wider than postrostral crest (Fig. 45c, body without cross bands) . . . . . ***Penaeus latisulcatus***

7a. Hepatic crest present; body covered with cross bands; generally 3 lower rostral teeth (Fig. 44b) . . . . . → ***8***

7b. Hepatic crest absent; body semi-translucent and densely covered with minute dark brown dots; generally 4 to 6 lower rostral teeth (Fig. 44c) . . . . . →***10***

8a. Fifth leg without exopod; hepatic crest nearly horizontal (Fig. 50); antennal flagella not banded . . . . . ***Penaeus monodon***

8b. Fifth leg bearing a small exopod; hepatic crest sloping anteroventrally (Fig. 51); antennal flagella banded . . . . . → ***9***

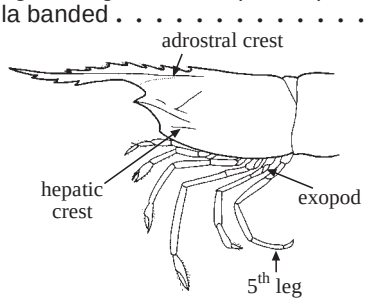


Fig. 50 ***Penaeus monodon***
(after Yu and Chan, 1986)

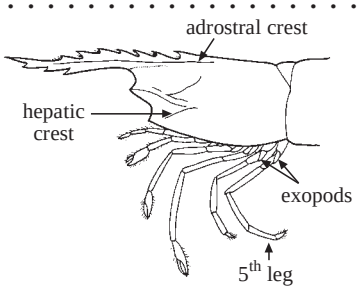
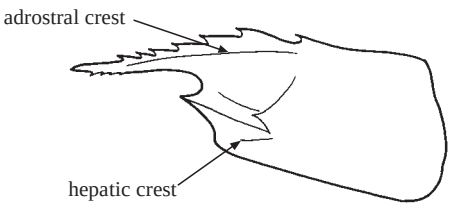


Fig. 51 ***Penaeus semisulcatus***
(after Yu and Chan, 1986)

9a. Adrostral crest extending behind last postrostral tooth (Fig. 51); postrostral crest distinctly grooved (Fig. 53a); hepatic crest extending well behind antennal crest (Fig. 51) . . . . . .***Penaeus semisulcatus***

9b. Adrostral crest at most extending to last postrostral tooth (Fig. 52); postrostral crest without a distinct groove (Fig. 53b); hepatic crest not extending behind antennal crest (Fig. 52) . . . . . ***Penaeus esculentus***



carapace (lateral view)
Fig. 52 ***Penaeus esculentus***

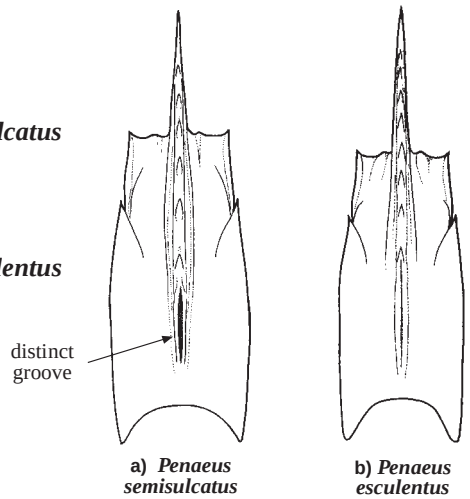


Fig. 53 dorsal view of carapace

10a. Third maxilliped of males with distal segment about half as long as second segment which bears a tuft of hairs at tip (Fig. 54a, rostral crest high and broadly triangular in both sexes; body yellowish to greenish, antennal flagella reddish brown) . . . ***Penaeus merguiensis***

10b. Third maxilliped of males with distal segment longer or as long as second segment . . . . . → ***11***

11a. Rostrum slightly curved at tip and sigmoidal shaped; antennal flagella yellowish (third maxilliped of males with second segment as long as distal segment and bearing a tuft of long hairs at tip, Fig. 54b; rostral crest slightly elevated in both sexes; body yellowish white to greyish green) . . . . . ***Penaeus indicus***

11b. Rostrum nearly horizontal straight; antennal flagella reddish brown . . . . . → ***12***

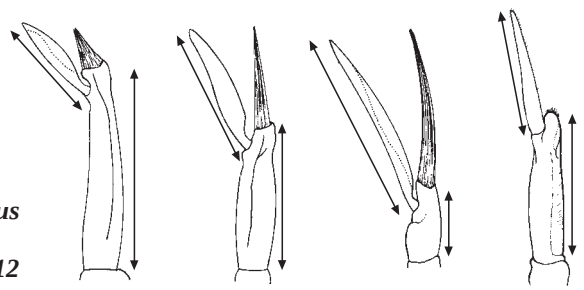


Fig. 54 distal part of third maxilliped in adult males

12a. Third maxilliped of males with distal segment 1.5 to 2.5 times longer than second segment which bearing a tuft of very long hairs at tip (Fig. 54c); rostral crest slightly elevated in males and moderately high in large females; body somewhat greenish . . . . . ***Penaeus penicillatus***

12b. Third maxilliped of males with distal segment as long as second segment which only bears a rudimentary tuft of hairs at tip (Fig. 54d); rostral crest slightly to moderately elevated in males but broadly triangular in large females; body yellowish white to pinkish . . . . . ***Penaeus silasi***

Key to the species of *Trachypenaeus* occurring in the area[3/]

Remarks on key characters: occasionally, spermatophores or sperm sacs (a white or yellowish cement-like mass) are attached to the thelycum of mature females, making observation difficult. Nevertheless, they can be easily removed by using a pin, forceps, or finger nail.

1a. Second leg with epipod . . . . . → ***2***

1b. Second leg without epipod . . . . . → ***6***

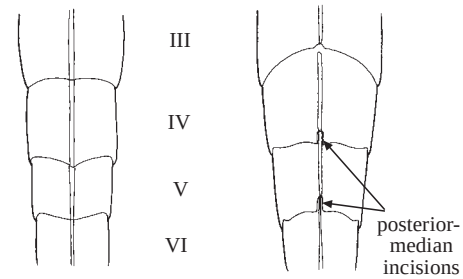
3/ The taxonomic status and relationships of some species of this genus are still unclear, and this genus is sometimes subdivided into many genera by some authors.

2a. First leg without epipod . . . . . ***Trachypenaeus villaluzi***
2b. First leg with epipod . . . . . → ***3***

3a. Rostrum curved downward (female thelycum with sharply pointed apex) . ***Trachypenaeus gonospinifer***
3b. Rostrum straight or curved upward . . . . . → ***4***

4a. Male petasma horn-like; female thelycum with sharply pointed apex . . . . . .***Trachypenaeus sedili***
4b. Male petasma T-shaped, female thelycum with round apex . . . . . → ***5***

5a. Rostrum straight and armed with 8 to 11 upper teeth; fourth and fifth abdominal segments without posteromedian incisions (Fig. 55a); fifth leg extending beyond antennal scale; posterior plate of female thelycum without distinct notch . . ***Trachypenaeus longipes***
5b. Rostrum upturned at tip and armed with 6 to 8 upper teeth; fourth and fifth abdominal segments with posteromedian incisions (Fig. 55b); fifth leg not reaching tip of antennal scale; posterior plate of female thelycum having a distinct median notch . . . . ***Trachypenaeus curvirostris***



a) ***Trachypenaeus longipes*** **b)** ***Trachypenaeus curvirostris***

Fig. 55 abdominal segments (dorsal view)
(after Hayashi, 1992)

6a. Male petasma T-shaped; posterior plate of female thelycum as a forwardly directed pocket . . . . . .***Trachypenaeus malaiana***
6b. Male petasma horn-like; posterior plate of female thelycum not forming a pocket . . . . . →***7***

7a. In males, distolateral projections of petasma narrow; in females, anterior plate of thelycum without a backwardly directed projection . . . . . ***Trachypenaeus anchoralis***
7b. In males, distolateral projections of petasma widely apart; in females, anterior plate of thelycum with a backwardly directed projection . . . . . ***Trachypenaeus granulosus***

List of species occurring in the area

The symbol is given when species accounts are included.

Atypopenaeus bricornis Racek and Dall, 1965
Atypopenaeus dearmatus De Man, 1907
Atypopenaeus formosus Dall, 1957
Atypopenaeus stenodactylus (Stimpson, 1860)

Funchalia taaningi Burekenroad, 1940

Heteropenaeus longimanus De Man, 1896

Metapenaeopsis aegyptia Galil and Golani, 1990
Metapenaeopsis angusta Crosnier, 1987
Metapenaeopsis assimilis (De Man, 1920)
Metapenaeopsis barbata (De Haan, 1844)
Metapenaeopsis ceylonica Starobogatov, 1972
Metapenaeopsis commensalis Borradaile, 1898
Metapenaeopsis costata Crosnier, 1991
Metapenaeopsis difficilis Crosnier, 1991
Metapenaeopsis distincta (De Man, 1907)
Metapenaeopsis evermanni (Rathbun, 1906)
Metapenaeopsis fusca R.J.G. Manning, 1988
Metapenaeopsis gaillardi Crosnier, 1991
Metapenaeopsis gallensis (Pearson, 1905)
Metapenaeopsis hilarula (De Man, 1911)
Metapenaeopsis lamellata (De Haan, 1844)
Metapenaeopsis laubieri Crosnier, 1991
Metapenaeopsis liui Crosnier, 1987

Metapenaeopsis mannarensis De Bruin, 1965
Metapenaeopsis marquesas Crosnier, 1991
Metapenaeopsis menoui Crosnier, 1991
Metapenaeopsis mogiensis (Rathbun, 1902)
Metapenaeopsis novaeguineae (Haswell, 1879)
Metapenaeopsis palmensis (Haswell, 1879)
Metapenaeopsis parahilarula Crosnier, 1991
Metapenaeopsis parapalmensis Crosnier, 1994
Metapenaeopsis philippii (Bate, 1881)
Metapenaeopsis propinqua Crosnier, 1991
Metapenaeopsis provocatoria Racek and Dall, 1965
Metapenaeopsis quinquedentata (De Man, 1907)
Metapenaeopsis richeri Crosnier, 1991
Metapenaeopsis rosea Racek and Dall, 1965
Metapenaeopsis sibogae (De Man, 1907)
Metapenaeopsis sinica Liu and Zhong, 1988
Metapenaeopsis sinuosa Dall, 1957
Metapenaeopsis spatulata Crosnier, 1991
Metapenaeopsis stridulans (Alcock, 1905)
Metapenaeopsis tarawensis Racek and Dall, 1965
Metapenaeopsis toloensis Hall, 1962
Metapenaeopsis velutina (Dana, 1852)
Metapenaeopsis wellsi Racek, 1967

Metapenaeus affinis (H. Milne Edwards, 1837)
Metapenaeus anchistus (De Man, 1920)
Metapenaeus benettae Racek and Dall, 1965
Metapenaeus brevicornis (H. Milne Edwards, 1837)
Metapenaeus conjunctus Racek and Dall, 1965
Metapenaeus dalli Racek, 1957
Metapenaeus demani (Roux, 1921)
Metapenaeus dobsoni (Miers, 1878)
Metapenaeus eboracensis Dall, 1957
Metapenaeus elegans De Man, 1907
Metapenaeus endeavouri (Schmitt, 1926)
Metapenaeus ensis (De Haan, 1844)
Metapenaeus insolitus Racek and Dall, 1965
Metapenaeus intermedius (Kishinouye, 1900)
Metapenaeus lysianassa (De Man, 1888)
Metapenaeus macleayi (Haswell, 1879)
Metapenaeus moyebi (Kishinouye, 1896)
Metapenaeus papuensis Racek and Dall, 1965
Metapenaeus suluensis Racek and Dall, 1965
Metapenaeus tenuipes Kubo, 1949

Parapenaeopsis arafurica Racek and Dall, 1965
Parapenaeopsis cornuta (Kishinouye, 1900)
Parapenaeopsis coromandelica Alcock, 1906
Parapenaeopsis gracillima Nobili, 1903
Parapenaeopsis hardwickii (Miers, 1878)
Parapenaeopsis hungerfordi Alcock, 1905
Parapenaeopsis maxillipedo Alcock, 1906
Parapenaeopsis sculptilis (Heller, 1862)
Parapenaeopsis tenella (Bate, 1888)
Parapenaeopsis uncta Alcock, 1905
Parapenaeopsis venusta De Man, 1907

Parapenaeus australiensis Dall, 1957
Parapenaeus fissuroides Crosnier, 1986
Parapenaeus fissurus (Bate, 1881)
Parapenaeus investigatoris Alcock and Anderson, 1899

Parapenaeus lanceolatus Kubo, 1949
Parapenaeus longipes Alcock, 1905
Parapenaeus murrayi Ramadan, 1938
Parapenaeus perezfarfante Crosnier, 1986
Parapenaeus ruberoculatus Hall, 1962
Parapenaeus sextuberculatus Kubo, 1949

Penaeopsis challengeri De Man, 1911
Penaeopsis eduardoi Pérez Farfante, 1977
Penaeopsis rectacuta (Bate, 1881)

Penaeus canaliculatus (Olivier, 1811)
Penaeus esculentus Haswell, 1879
Penaeus indicus H. Milne Edwards, 1837
Penaeus japonicus Bate, 1888
Penaeus latisulcatus Kishinouye, 1896
Penaeus longistylus Kubo, 1943
Penaeus marginatus Randall, 1840
Penaeus merguiensis De Man, 1888
Penaeus monodon Fabricius, 1798
Penaeus penicillatus Alcock, 1905
Penaeus plebejus Hess, 1865
Penaeus semisulcatus De Haan, 1844
Penaeus silasi Muthu and Motoh, 1979

Trachypenaeopsis richtersii (Miers, 1844)

Trachypenaeus anchoralis (Bate, 1881)
Trachypenaeus curvirostris (Stimpson, 1860)[4/]
Trachypenaeus gonospinifer Racek and Dall, 1965
Trachypenaeus granulosus (Haswell, 1879)[5/]
Trachypenaeus longipes (Paulson, 1875)
Trachypenaeus malaiana Balss, 1933
Trachypenaeus sedili Hall, 1961
Trachypenaeus villaluzi Muthu and Motoh, 1979

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Crosnier, A. 1991. Crustacea Decapoda: Les *Metapenaeopsis* indo-ouest-pacifiques sans appareil stridulant (Penaeidae). Deuxiéme partie. In Résultats des Campagnes MUSORSTOM, Vol. 9, edited by A. Crosnier. *Mém. Mus. natn. Hist. nat.*, (A), 152:155-297.

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Crosnier, A. 1994. Crustacea Decapoda: Les *Metapenaeopsis* indo-ouest-pacifiques sans appareil stridulant (Penaeidae). Description de deux espéces nouvelles. In Résultats des Campagnes MUSORSTOM, Vol. 12, edited by A. Crosnier. *Mém. Mus. natn. Hist. nat.*, (A), 16:339-349.

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Miguel, J.C. 1982. Le genera *Metapenaeus* (Crustacea, Penaeidae): taxonomie, biologie et peches mondiales. *Zool. Verh.*, 195:1-137.

Pérez Farfante, I. and B.F. Kensley. 1997. Penaeoid and Sergestoid shrimps and prawns of the world. Keys and diagnosis for the families and genera. *Mém. Mus. natn. Hist. nat.*, 175:1-233.

Yu, H.P. and T.Y. Chan. 1986. *The illustrated penaeoid prawns of Taiwan*. Taipei, Taiwan, Southern Material Center, Inc., 183 p.

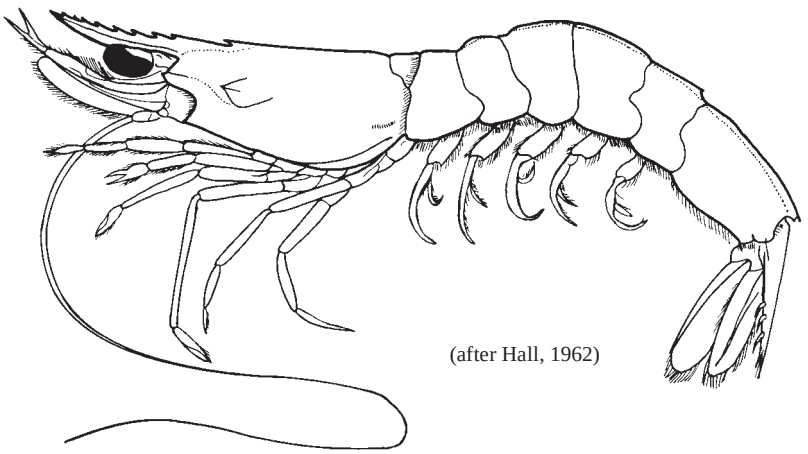
4/ Includes *Trachypenaeus asper* Alcock, 1905 which is probably a synonym of *T. curvirostris*.
5/ Includes *Trachypenaeus pescadoreensis* Schmitt, 1931 which is probably a synonym of *T. granulosus*.

click for next page

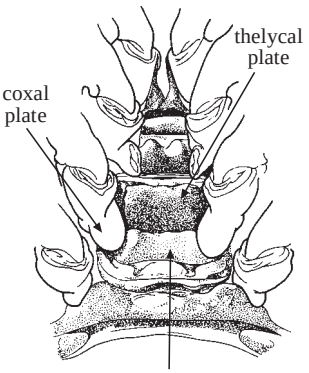
Metapenaeopsis barbata (De Haan, 1844)

Frequent synonyms / misidentifications: None / None.

FAO names: En - Whiskered velvet shrimp; **Fr** - Crevette chamois barbulée; **Sp** - Camarón gamuza barbudo.



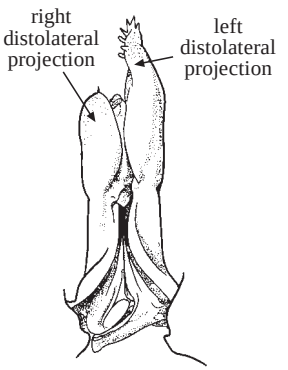
(after Hall, 1962)



thelycum

(after Crosnier, 1994)

Diagnostic characters: Body densely covered with short hairs; grooves and crests on carapace obscure. **Rostrum directed slightly upward, almost straight and armed with 6 or 7 regularly spaced upper teeth** (excluding epigastric tooth on carapace); rostrum **extending to about tip of antennal scale. Pterygostomian spine well developed; generally 16 to 27 stridulating organs present on posterolateral carapace. Abdomen with dorsal crest on third segment narrow and more than 9 times as long as broad, median groove on crest indistinct or very shallow**; sixth segment about 2 times as long as fifth segment. **Petasma of males asymmetrical, left distoventral projection longer, bearing 7 to 12 well-developed sharp projections at tip, while right distoventral projection bears 1 or 2 small spinule(s) at tip. Thelycum of females with thelycal plate broadly subquadrate, 0.5 to 0.6 times as long as broad; intermediate plate broadly trapezoidal and slightly concave, posterior ridge with a small but distinct median tubercle.** Telson with 1 pair of fixed and 3 pairs of movable lateral spines. **Colour: body whitish and mottled with irregular red blotches**; eyes dark brown; antennal flagella indistinctly crossed with red and white bands; legs reddish; pleopods with white markings on sides; **uropods reddish, with distal and basal parts pale yellowish.**



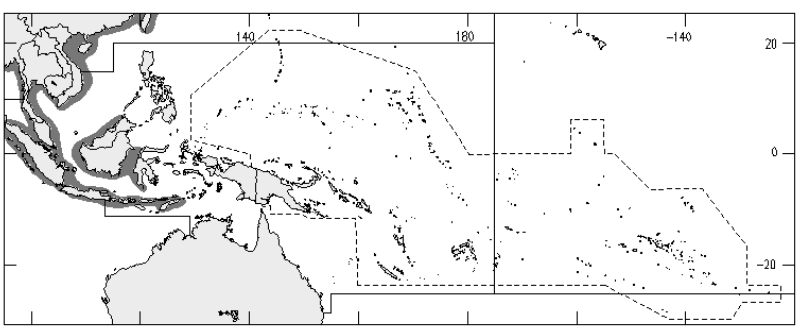
petasma (ventral view)

(after Crosnier, 1994)

Size: Maximum body length 11.6 cm (females) and 7.8 mm (males), commonly between 7 and 9 cm.

Habitat, biology, and fisheries: Found on sand, mud or sandy-mud bottoms, from depths of 2 to 219 m, usually less than 90 m. Taken mainly by trawls. Appears to be common but nowhere abundant throughout its range in the area. Of minor commercial importance, generally taken as bycatch. Marketed mainly fresh for local consumption.

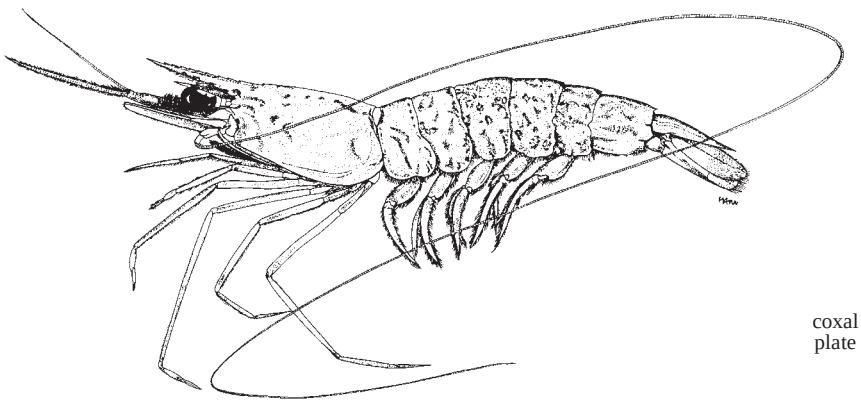
Distribution: Indo-West Pacific from the Gulf of Bengal to Japan and Indonesia.



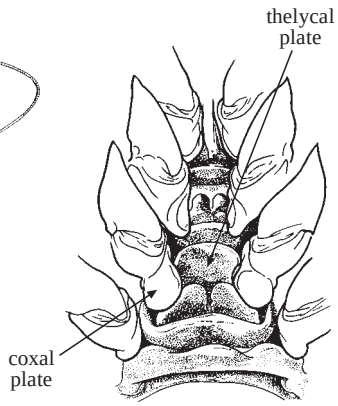
Metapenaeopsis palmensis (Haswell, 1879)

Frequent synonyms / misidentifications: *Metapenaeopsis barbeensis* Hall, 1962 / *Metapenaeopsis novaeguineae* (Haswell, 1879); *M. stridulans* (Alcock, 1905).

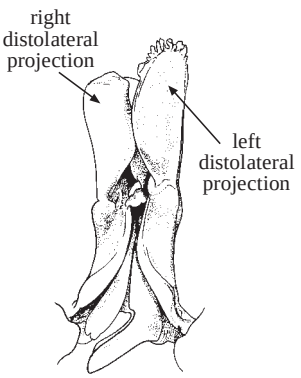
FAO names: En - Southern velvet shrimp; **Fr** - Crevette chamois méridionale; **Sp** - Camarón gamuza sureño.



(after Motoh and Buri, 1984)



thelycum
(after Crosnier, 1994)



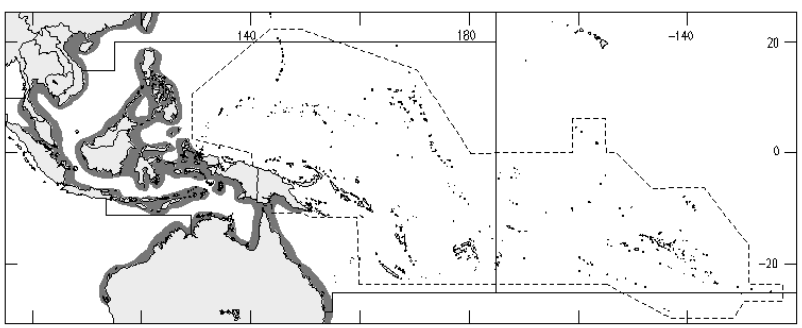
petasma (ventral view)
(after Crosnier, 1994)

Diagnostic characters: Body densely covered with hairs; grooves and crests on carapace obscure. **Rostrum nearly straight or slightly curved upward, armed with 7 or 8 regularly spaced upper teeth** (excluding epigastric tooth on carapace); rostrum **extending just to distal antennular segment. Pterygostomian spine reduced and small; 8 to 13 (mostly 9 or 10) stridulating organs present on posterolateral carapace**. Abdomen with dorsal crest on third segment narrow and more than 9 times as long as broad, **median groove on crest narrow but deep**; sixth segment about 2 times as long as fifth segment. **Petasma of males asymmetrical, left distoventral projection longer, bearing about 10 rather blunt projections at tip; right distoventral projection usually without spinules at tip. Thelycum of females with thelycal plate slightly concave, inverted trapezoidal, 0.6 to 0.7 times as long as broad; intermediate plate concave, with lateral parts expanded into 2 small flaps, posterior edge very thick**. Telson with 1 pair of fixed and 3 pairs of movable lateral spines. **Colour: body whitish, mottled with irregular red stripes**; eyes dark brown; antennal flagella pale red; legs whitish, with some red spots on the sides of pleopods; **distal half of uropods reddish.**

Size: Maximum body length 12 cm (females) and 8.5mm (males), commonly between 5 and 8 cm.

Habitat, biology, and fisheries: Found on sandy-mud or mud bottoms, from depths of 5 to 100 m, usually less than 90 m. Taken mainly as bycatch in trawls. Probably the most common species of the genus in the area, but nowhere very abundant and only of limited commercial importance, due to its small size. Marketed mainly fresh for local consumption.

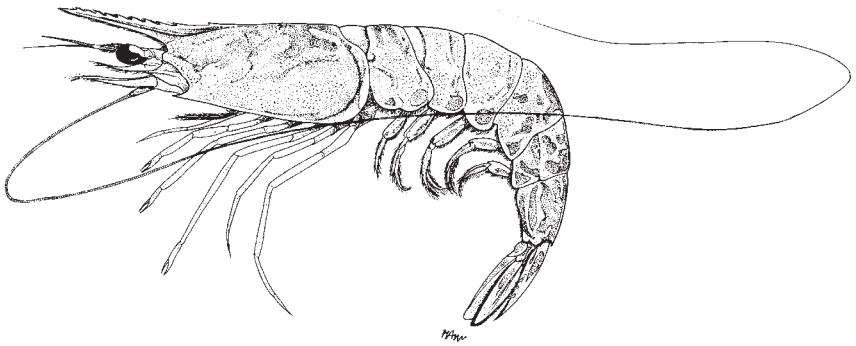
Distribution: Indo-West Pacific from the western coast of Thailand to Japan and Australia.

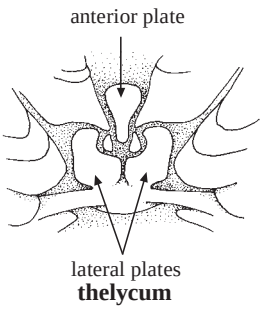


Metapenaeus anchistus (De Man, 1920)

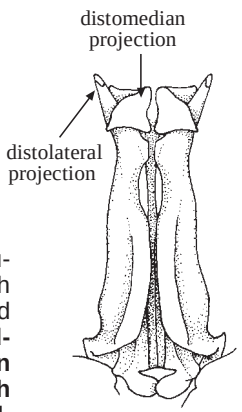
Frequent synonyms / misidentifications: None / *Metapenaeus endeavouri* Schmitt, 1926; *M. intermedius* (Kishinouye, 1900).

FAO names: En - Spiny greasyback shrimp.





merus of fifth leg (male)



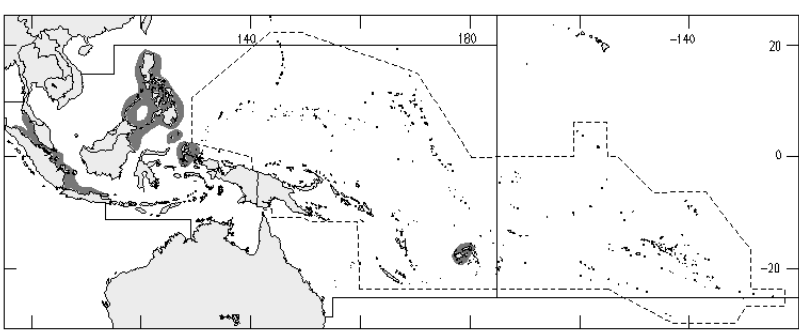
petasma (ventral view)

Diagnostic characters: Body covered with fine pubescence. **Rostrum distinctly directed upward, bearing 10 to 12 teeth along entire upper margin, almost straight and slightly curved downward at tip**; rostrum extending to about distal segment of antennular peduncle. Postrostral crest low. **Branchiocardiac crest distinct**. First leg with distinct ischial spine. In adult males, merus of fifth leg with a basal notch followed by a prominent keel. **Petasma of males with distolateral projections exceeding distomedian processes and without external spinules; distomedian processes triangular and close to each other. Thelycum of females with anterior plate expanded at anterior half; lateral plates generally leveled, posterior margin not raised and continuous with posterior transverse ridge; coxal projections of fourth leg conical. Telson with 3 pairs of large lateral spines. Colour: body rather yellowish** and covered with dense dark brown dots; eyes dark brown; rostrum and dorsal abdominal crest black-brown; antennal flagella reddish brown; legs somewhat yellowish or pink; pleopods more pinkish, with white markings on outer sides; **distal part of uropods bluish, with margins reddish brown to somewhat purplish.**

Size: Maximum body length 16.5 cm (females) and 14.6 cm (males), commonly between 7 and 14 cm.

Habitat, biology, and fisheries: Found mainly in depths to about 30 m. Caught by trawls and fish corrals. Commonly found in the Philippines and of moderate commercial importance because of its relatively large size; apparently less common or even rare in other parts of the area. Marketed mainly fresh for local consumption.

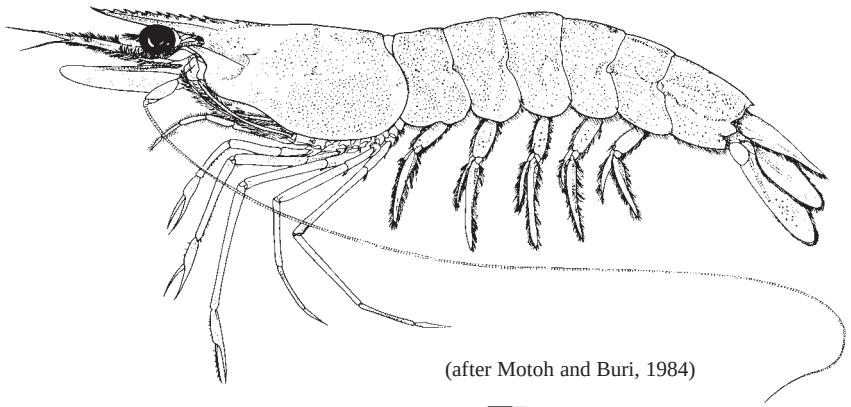
Distribution: Western Pacific from the Strait of Malacca to the Philippines and Fiji.



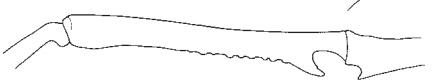
Metapenaeus ensis (De Haan, 1844)

Frequent synonyms / misidentifications: *Metapenaeus ensis baramensis* Hall, 1962; *M. incisipes* (Bato, 1888); *M. mastersii* (Haswell, 1879); *M. philippinensis* Motoh and Muthu, 1979 / *Metapenaeus monoceros* (Fabricius, 1798).

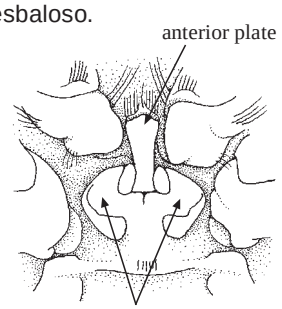
FAO names: En - Greasyback shrimp; **Fr** - Crevette glissante; **Sp** - Camarón resbaloso.



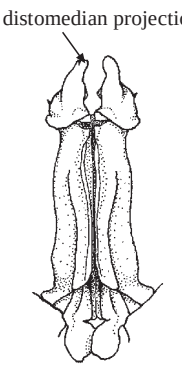
(after Motoh and Buri, 1984)



merus of fifth leg (male)



thelycum

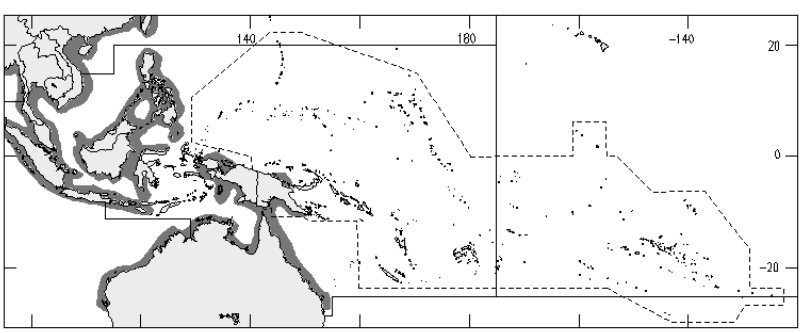


petasma (ventral view)

Diagnostic characters: Body covered with fine pubescence. **Rostrum armed with 8 to 11 teeth along entire upper margin, nearly straight** and extending to about tip of antennular peduncle. **Postrostral crest low. Branchiocardiac crest generally distinct and curved, almost reaching hepatic spine**. First leg bearing a small ischial spine. **In adult males, merus of fifth leg with a basal notch followed by a long, inwardly curved spine-like process and a row of tubercles. Petasma of males with distomedian process very large and triangular, covering almost entire distolateral projection in ventral view. Thelycum of females with long anterior plate; lateral plates with posterolateral edges strongly raised and curving inward, forming a pair of triangular projections.** Telson without distinct lateral spines. **Colour: body greyish green or dark green and covered with dense dark brown dots, large adults somewhat pinkish**; eyes black-brown; antennal flagella reddish; legs generally whitish, in large adults basal segments covered with red bands; **distal part of uropods somewhat bluish with reddish brown margins**.

Size: Maximum body length 18.9 cm (females) and 15.4 cm (males), commonly between 7 and 14 cm.

Habitat, biology, and fisheries: Mainly in turbid waters down to a depth of 95 m over bottoms of mud, sandy-mud or silt. Juveniles are found in estuaries and backwaters, sometimes also in seagrass beds, mangrove banks, mud flats, and open channels. Caught by trawls, set nets, scoop nets, traps, and artisanal gear. Also a common byproduct or a secondary species in prawn culture. Probably the most abundant and the most commercially important species of the genus in the area, constituting a large part of the *Metapenaeus* catches and pond industry in the Philippines (609 t and 670 t, respectively, in 1987), Singapore, Thailand (11 400 t and 2 700 t, respectively, in 1987), Indonesia (17 588 t and 13 784 t, respectively, in 1987), Viet Nam, and Malaysia. Fished commercially in northern Australia, with a catch of about 2 400 t (together with *Metapenaeus endeavouri*, catches from western Australia not included) during the annual period of 1989/1990. Marketed mainly fresh or frozen, also cooked or salted and sometimes used as bait, consumed locally and exported.

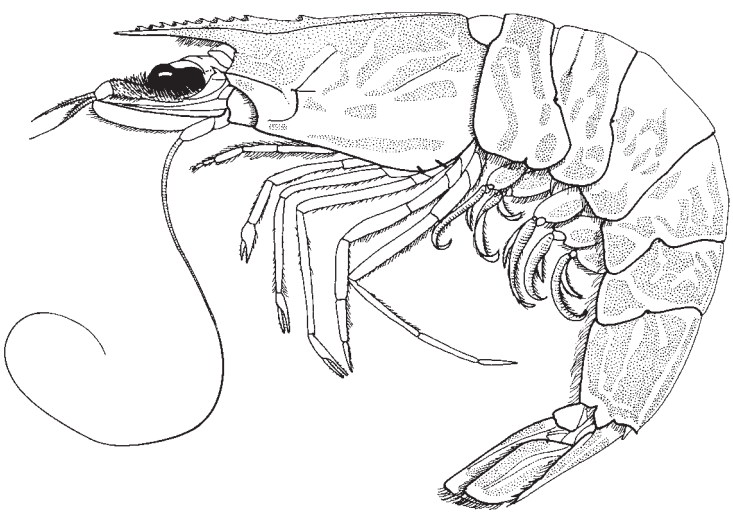


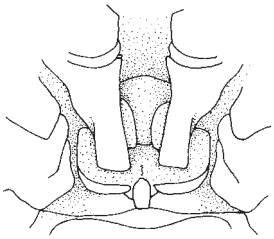
Distribution: Indo-West Pacific from the eastern coast of India and Sri Lanka to Japan and Australia.

Metapenaeus intermedius (Kishinouye, 1900)

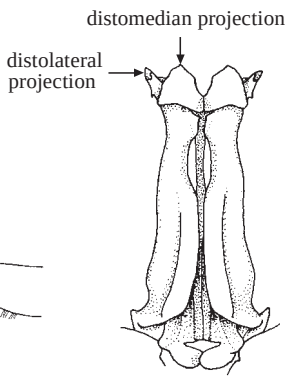
Frequent synonyms / misidentifications: None / None.

FAO names: En - Middle shrimp; **Fr** - Crevette ceinture; **Sp** - Camarón cintura.





thelycum



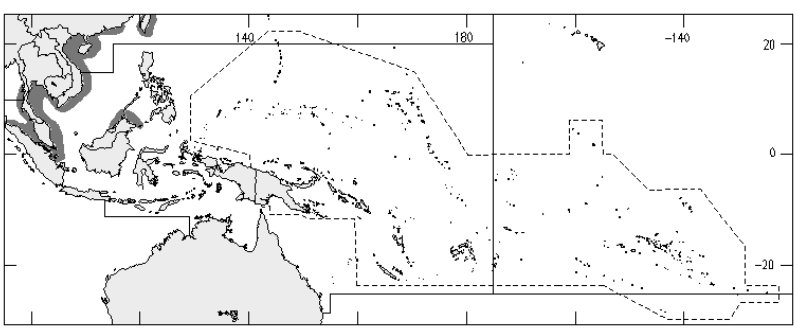
petasma (ventral view)

merus of fifth leg (male)

Diagnostic characters: Body covered with fine pubescence. **Rostrum distinctly directed upward and very straight, bearing 8 to 12 teeth along entire upper margin** and extending to about distal segment of antennular peduncle. **Postrostral crest low. Branchiocardiac crest distinct.** First leg bearing a distinct ischial spine. In adult males, merus of fifth leg with a basal notch followed by a distinct keel. **Petasma of males with distomedian processes triangular and exceeding distolateral projections; outer margin of distomedian processes bearing an external spinule. Thelycum of females bearing a posteromedian ogival boss; posterior edges of lateral plates slightly raised; coxal projections of fourth leg long, flat and truncate. Telson with 3 pairs of large lateral spines. Colour: body somewhat whitish, becoming slightly pinkish in large adults, covered with dense dark brown dots**; eyes dark brown; rostrum, outer margin of antennal scale, and dorsal abdominal crest black-brown; antennal flagella reddish brown; legs whitish; pleopods slightly reddish with white markings on outer sides; **distal part of uropods bluish, with margins reddish brown to somewhat purplish.**

Size: Maximum body length 19.3 cm (females) and 13.6 cm (males), commonly between 10 and 14 cm.

Habitat, biology, and fisheries: Found mainly in depths to 130 m, usually between 20 and 60 m. Taken mainly by trawls. Very common in the Strait of Malacca and Gulf of Thailand, probably also abundant in Viet Nam. Of moderate commercial importance because of its relatively large size. Marketed mostly fresh for local consumption.

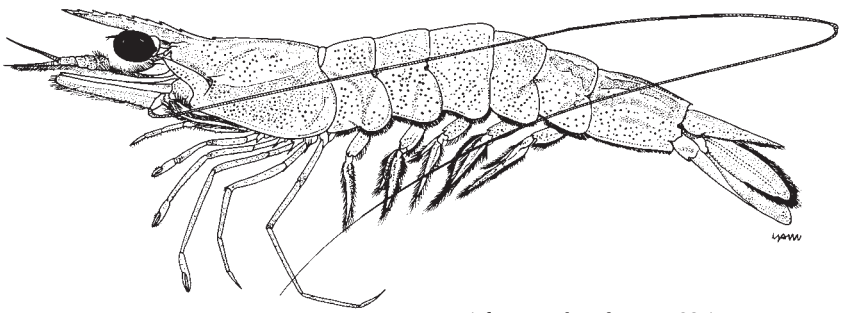


Distribution: Indo-West Pacific from the Andaman Sea to Malaysia, southern coast of China, and Japan.

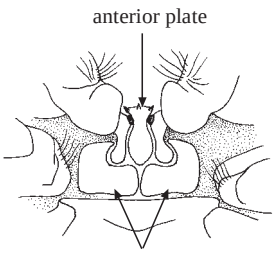
Metapenaeus moyebi (Kishinouye, 1896)

Frequent synonyms / misidentifications: *Metapenaeus burkenroadi* Kubo, 1954 / *Metapenaeus dalli* Racek, 1957; *M. mastersii* (Haswell, 1879) (= *M. ensis* (De Haan, 1844)).

FAO names: En - Moyebi shrimp; **Fr** - Crevette moyebi; **Sp** - Camarón moyebi.

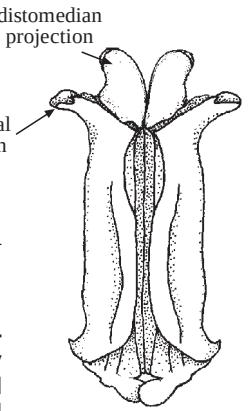


(after Motoh and Buri, 1984)



thelycum

merus of fifth leg (male)

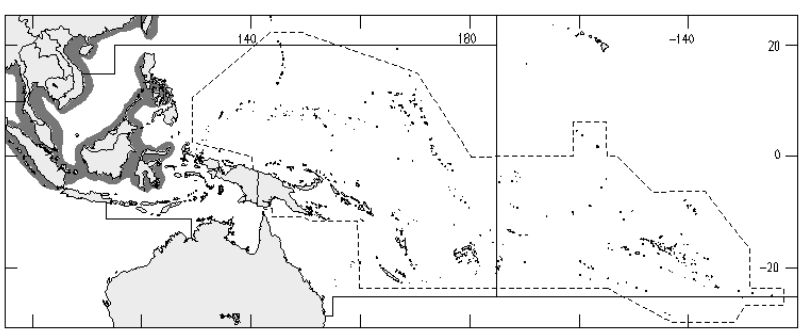


petasma (ventral view)

Diagnostic characters: Body covered with fine pubescence. **Rostrum armed with 7 to 10 teeth along entire upper margin, nearly straight or slightly uptilted at tip, extending to about middle of distal antennular article. Postrostral crest low. Branchiocardiac crest weak and indistinct**. First leg with ischial spine small or nearly absent. In adult males, merus of fifth leg with a basal notch followed by a twisted keeled tubercle. **Petasma of males with distomedian process enlarged and laminose or flap-like, strongly projected forward and diverging; distolateral projection directed anterolaterally. Thelycum of females with anterior plate flask-shaped, its anterior margin slightly convex and bearing 3 tubercles of subequal size; lateral plates kidney-shaped and often with angular contours. Telson without distinct lateral spines. Colour: body semi-translucent, somewhat pale green and covered with with dense dark brown dots;** eyes black-brown; antennal flagella reddish; pleopods slightly pinkish; **distal part of uropods somewhat yellowish green and with reddish brown margins.**

Size: Maximum body length 12.6 cm (females) and 8.3 cm (males), commonly between 5.5 and 9.5 cm.

Habitat, biology, and fisheries: Found on mud or sandy-mud bottom in estuaries, backwaters, and nearshore waters to depths of about 45 m. Caught by trawls, set nets, seines, traps, and artisanal gear. Appears to be quite abundant throughout its range in the area and is frequently seen in local markets, but only of secondary economic importance due to its relatively small size. Also reported to be used for aquaculture in Malaysia and Singapore but probably not the main cultured species there. Marketed mainly fresh for local consumption.

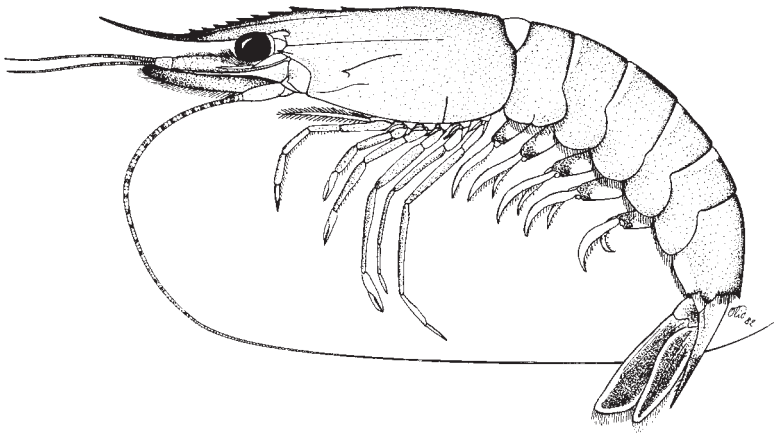


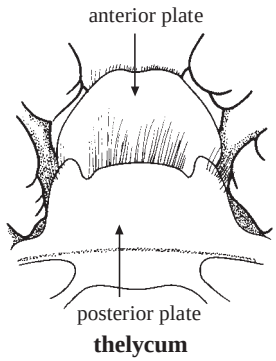
Distribution: Indo-West Pacific from the eastern coast of India and Sri Lanka to Japan and Indonesia.

Parapenaeopsis hardwickii (Miers, 1878)

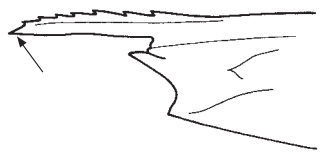
Frequent synonyms / misidentifications: None / *Parapenaeopsis cultrirostris* Alcock, 1906 (undetermined taxonomic status; generally considered as a synonym of *Parapenaeopsis sculptilis* (Heller, 1862).

FAO names: En - Spear shrimp; **Fr** - Crevette javelot; **Sp** - Camarón lanzón.

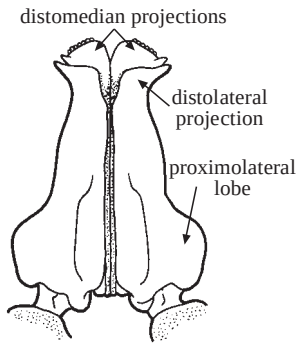




thelycum



rostrum of large males



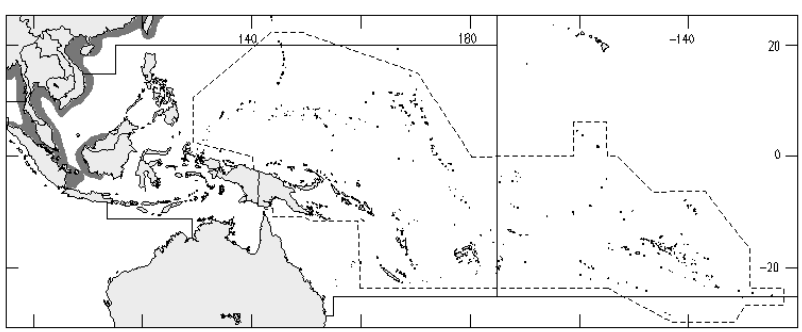
petasma (ventral view)

Diagnostic characters: Body naked and smooth. **Rostrum armed with 9 to 11 upper teeth; in females, rostrum very long and of sigmoidal shape, with distal 1/3 to 1/2 toothless, extending far beyond antennular peduncle; in adult males, unarmed portion absent and slightly curving downward, only reaching to middle of second antennular segment. Longitudinal suture extending to about 3/4 or more carapace length.** First and second legs bearing epipod and basial spine, basis of third leg unarmed. **Petasma of males with distomedian projection bluntly protruded and short, somewhat wing-like,** anterior margin often crenulate; distolateral projection short and directed laterally. **Thelycum of females with anterior plate concave and semi-circular in shape; posterior plate flat, its anterior margin slightly convex and bearing a transverse row of long hairs, with anterolateral angles strongly protruded forward.** Telson bearing only 3 to 5 pairs of minute movable lateral spinules. **Colour: body greyish to greenish grey, sometimes pink, and densely covered with dark-coloured dots**; eyes dark brown; rostrum black-brown; basal 1/3 of antennal flagella crossed with brown narrow bands; legs generally whitish to pinkish; pleopods reddish and with white and yellowish green markings on lateral surfaces; **uropods dark reddish brown with yellowish margins.**

Size: Maximum body length 13.5 cm (females) and 11.1 cm (males), commonly between 6 and 10 cm.

Habitat, biology, and fisheries: Found from the coastline to depths of about 90 m, usually less than 20 m, on bottom of mud, sandy-mud or sand. Juveniles mainly inhabit estuaries and backwaters. Caught by trawls, sometimes also by boat seines and stake nets, with females usually outnumbering males in the catches. Probably the most common species of the genus in the area and of moderate commercial importance. Appears to be rather abundant along the Malay Peninsula and in adjacent waters, where it often constitutes a significant part of the bycatch of prawn fishery. Marketed mainly fresh for local consumption.

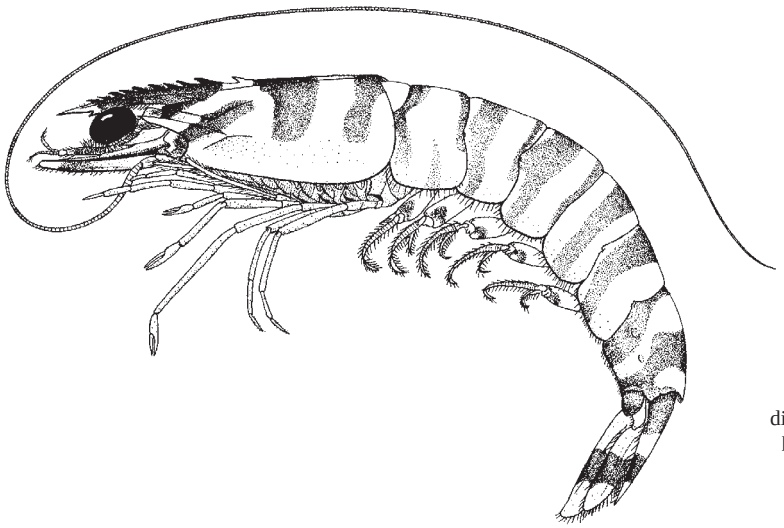
Distribution: Indo-West Pacific from Pakistan to Taiwan Province of China and Indonesia.

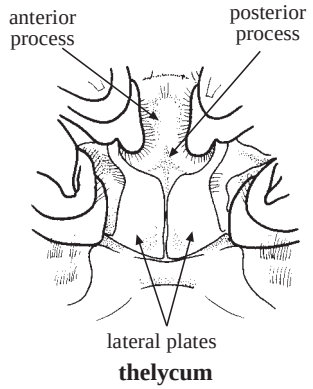


Penaeus canaliculatus (Olivier, 1811)

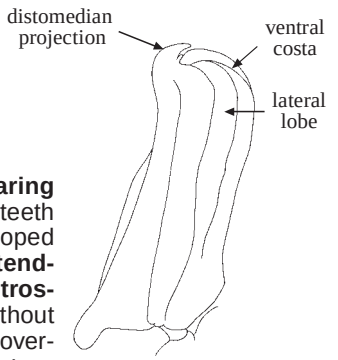
Frequent synonyms / misidentifications: None / *Penaeus japonicus* Bate, 1888.

FAO names: En - Witch prawn; **Fr** - Crevette soricère; **Sp** - Camarón brujo.





thelycum



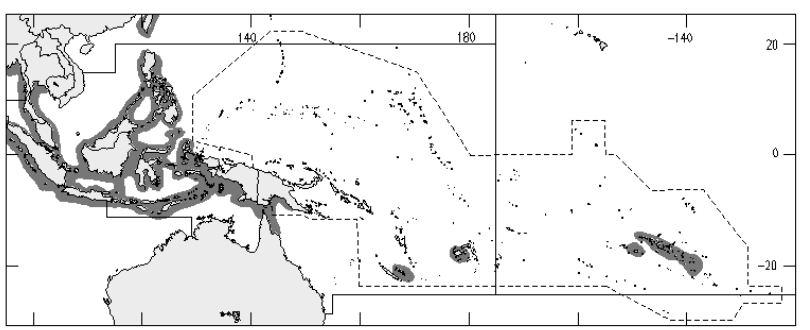
petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum armed with 10 or 11 upper teeth (including those on carapace) and **1 lower tooth;** postrostral crest well developed and with a deep median groove throughout its length; **adrostral groove extending almost to posterior margin of carapace and slightly wider than postrostral crest;** posterior end of gastrofrontal groove divided into 2. First leg without ischial spine. Petasma of males with very short distomedian projections overhanging distal margin of costae. **Thelycum of females formed by 2 subrectangular lateral plates, with their anterolateral angles diverging; anterior process suboval;** posterior process somewhat triangular. **Telson without lateral spines. Colour: body pale yellowish and crossed with dark brown transverse bands; those on carapace not extending over lower half of carapace while those on last abdominal segment usually continuous to the ventral margin**; eyes dark brown; antennal scale somewhat greenish and with white tips, flagella yellowish; legs yellowish to whitish; pleopods yellowish to reddish and with brown and white spots at bases; **distal part of uropods with a patch of bright yellow, followed by another patch of bright blue, and with reddish margins.**

Size: Maximum body length 18.2 cm (females) and 14.5 cm (males), commonly between 10 and 13 cm.

Habitat, biology, and fisheries: Found on sandy bottoms, from shallow water to depths of about 50 m. Taken by trawls and artisanal gear. An occasional bycatch in fisheries for other *Penaeus* species throughout its range in the area, but reported to be rather common in eastern New Guinea. Marketed fresh and frozen, often mixed with other species of *Penaeus*, and consumed locally. Can be easily confused with *Penaeus japonicus* in colour, and *Penaeus latisulcatus* when without colour.

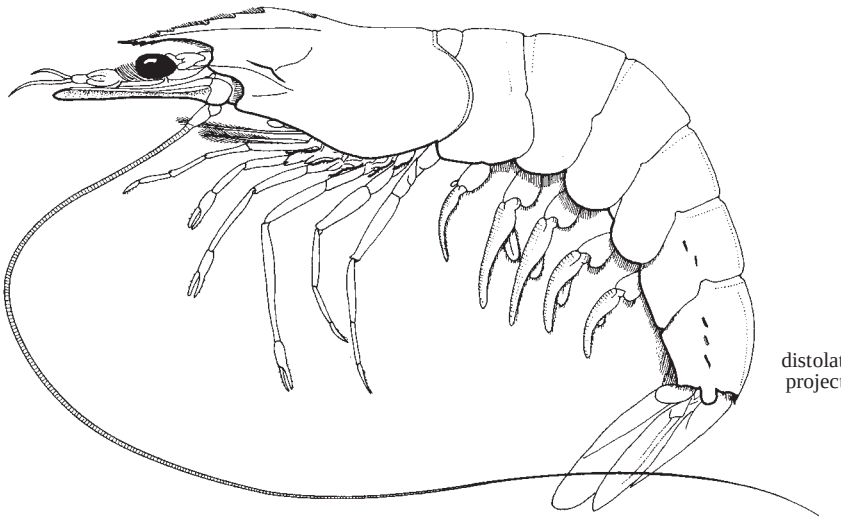
Distribution: Widely distributed in the Indo-West Pacific, from the eastern coast of Africa to the Red Sea, Taiwan Province of China, Okinawa, and Polynesia.

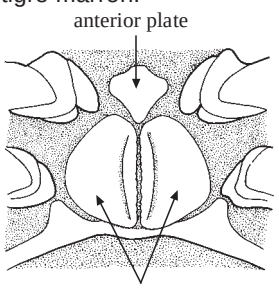


Penaeus esculentus Haswell, 1879

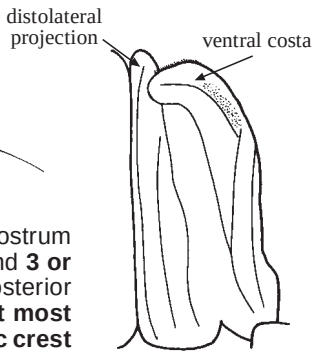
Frequent synonyms / misidentifications: None / None.

FAO names: En - Brown tiger prawn; **Fr** - Crevette tigrée brune; **Sp** - Camarón tigre marrón.





thelycum
(after Dall, 1957)

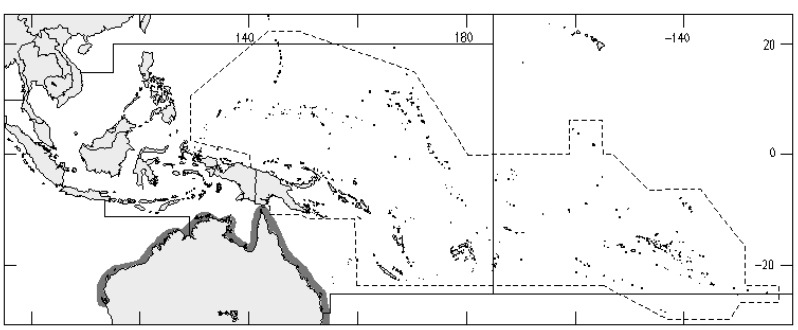


petasma (ventral view)
(after Dall, 1957)

Diagnostic characters: Carapace with grooves and crests distinct, rostrum generally armed with 5 to 7 upper teeth (including those on carapace) and **3 or 4 lower teeth**; postrostral crest well developed and reaching nearly to posterior margin of carapace, without a distinct median groove; **adrostral crest at most extending to last postrostral tooth; gastrofrontal crest absent; hepatic crest short, not extending behind antennal crest and slightly sloping anteroventrally. Fifth leg bearing an exopod (somewhat hidden beneath carapace)**. Petasma of males with distomedian projections overhanging distal margin of costae. Thelycum of females formed by 2 suboval lateral plates with tumid lips; anterior process rounded and with lateral edges somewhat raised, posterior process convex and partly inserted between lateral plates. Telson without lateral spines. **Colour: body brownish and covered with mud-yellow cross bands**; eyes light brown with many black dots; rostral teeth reddish brown; **antennal flagella alternated with white and brown bands**; both legs and pleopods reddish and with some white markings on basal segments; **distal half of uropods brown with red margins.**

Size: Maximum body length 23.5 cm (females) and 19 cm (males), commonly between 15 and 20 cm.

Habitat, biology, and fisheries: On the continental shelf from the coastline to a depth of 200 m, but usually between 10 and 20 m, on mud, sandy-mud or coarse bottoms. Juveniles inhabit shallow waters in estuaries, or are associated with seagrass beds, and sometimes found on the top of coral reef platforms. Feed primarily at night and are caught then by demersal otter trawls or beam trawls. Fished commercially in Australia, with a catch of about 3 300 t (together with *Penaeus semisulcatus*) in the Northern Prawn Fishery during the annual period of 1989/1990. Most of the catch is exported (mainly to Japan) and packed as frozen whole "green" (uncooked) prawns.

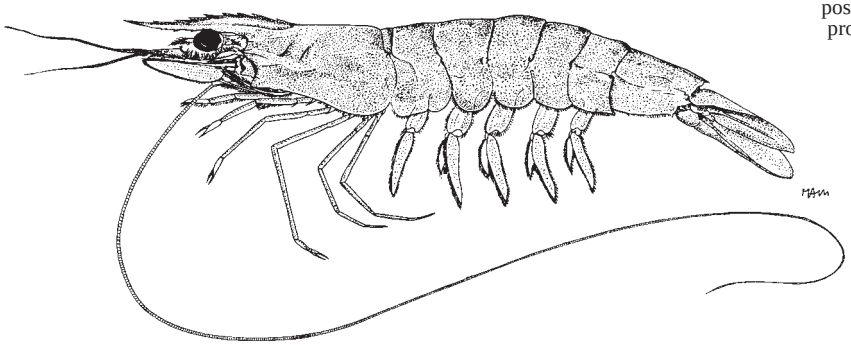


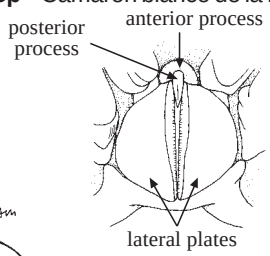
Distribution: Endemic to Australia from Sharks Bay (Western Australia) to Wallis Lake (New South Wales).

Penaeus indicus H. Milne Edwards, 1837 PNI

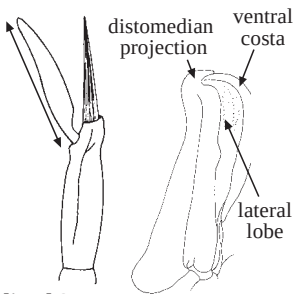
Frequent synonyms / misidentifications: None / *Penaeus merguiensis* De Man, 1888; *P. penicillatus* Alcock, 1905; *P. silasi* Muthu and Motoh, 1979.

FAO names: En - Indian white prawn; **Fr** - Crevette royale blanche (des Indes); **Sp** - Camarón blanco de la India.





thelycum



distal 2 segments of third maxilliped (male)

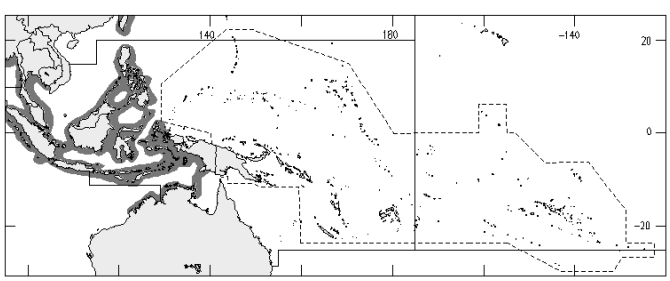
petasma (ventral view)

Diagnostic characters: Carapace rather smooth, **lacking gastrofrontal and hepatic crests**; adrostral crest extending as far as or just before epigastric tooth; **rostrum slightly curved at tip and sigmoidal-shaped**, usually bearing 7 to 9 upper teeth (including those on carapace) and **3 to 6 lower teeth; rostral crest generally slightly elevated in large specimens including adult females (but still with crest in females slightly higher than in males)**; postrostral crest extending near to posterior margin of carapace; **gastro-orbital crest distinct, extending over posterior 3/5 to 2/3 of distance between hepatic spine and orbital margin. In adult males, third maxilliped with distal segment about as long as second segment which bears a tuft of dense long hairs (same length as distal segment) at tip.** Petasma of males with distomedian projections strongly curved and overhanging distal margin of costae. Thelycum of females formed by 2 semi-circular lateral plates, with their median margins forming tumid lips; anterior process slightly rounded and slightly convex; posterior process elongated and inserted between anterior part of lateral plates; **both anterior and posterior processes rather distinct.** Telson lacking lateral spines. **Colour: body semi-translucent, somewhat yellowish white (small specimens) or greyish green and covered with numerous minute dark brown dots**; eyes light brown and covered with some dark brown mesh-like stripes; rostral and abdominal dorsal crests reddish brown to dark brown; **antennal flagella yellowish**; antennular flagella of same colour as body and covered with many dark spots; legs translucent and somewhat whitish, pleopods yellowish to pinkish; **distal part of uropods yellowish with red margins.**

Size: Maximum body length 23 cm (females) and 18.4 cm (males), usually less than 17 cm.

Habitat, biology, and fisheries: On sandy and muddy bottoms, from the coastline to depths of about 90 m. Caught by trawls, fish corrals, gill nets, beach seines, and artisanal gear. Also a suitable candidate for the prawn pond industry. An abundant species and of commercial importance in the Philippines, Singapore, and Australia. Also reported to be very abundant in Thailand (where it is one of the main pond cultured prawn species), Malaysia, and Indonesia. However, as this shrimp is often confused with *Penaeus silasi*, its reported abundance from Thailand to Indonesia remains uncertain. In the Philippines, it is often mixed and sold together with *Penaeus merguiensis*. In northern Australia, it occurs in deeper waters (deeper than 35 m) and is sold at slightly higher prices than *P. merguiensis* (together their catches were about 3 000 t in the annual period of 1989/1990). Marketed fresh and frozen, consumed locally and exported.

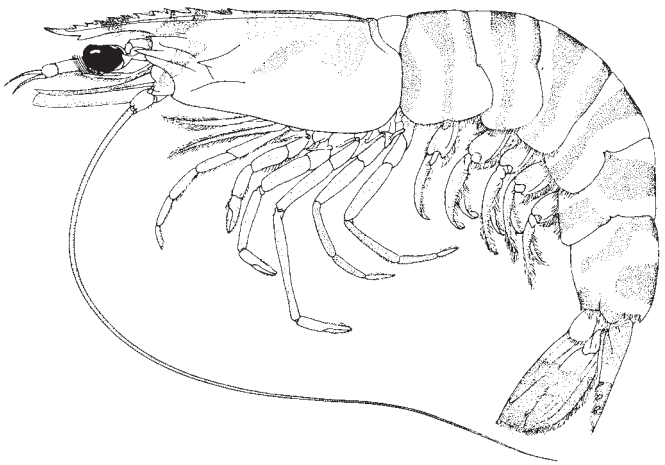
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Red Sea, Japan, and Australia.

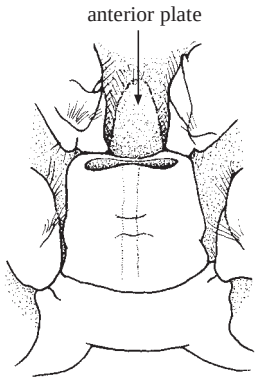


Penaeus japonicus Bate, 1888 KUP

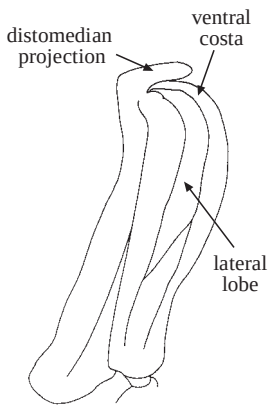
Frequent synonyms / misidentifications: None / None.

FAO names: En - Kuruma prawn; **Fr** - Crevette kuruma; **Sp** - Camarón kuruma.





thelycum

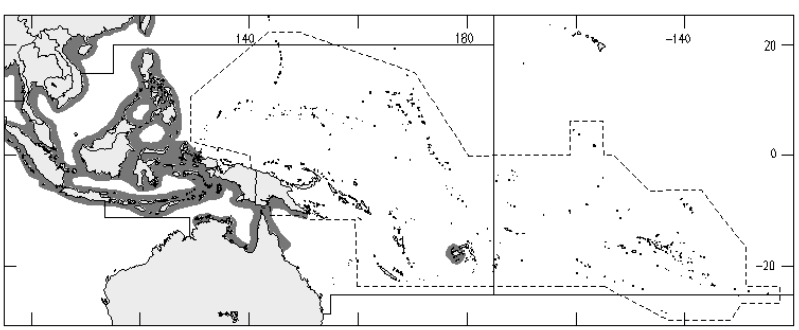


petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum generally armed with 9 or 10 upper teeth (including those on carapace) and **1 lower tooth, lacking distinct accessory crest on the blade;** postrostral crest well developed and with a deep median groove throughout its length; **adrostral groove extending near to posterior margin of carapace and almost as wide as postrostral crest; posterior end of gastrofrontal groove divided into 2**. First leg without ischial spine. Petasma of males with very long distomedian projections overhanging distal margin of costae. **Thelycum of females a well-developed pouch with double tubes, opened anteriorly;** anterior and posterior processes fused, forming a subtriangular concave plate. **Telson with 3 pairs of movable lateral spines. Colour: body pale yellowish and crossed with dark brown transverse bands; those on carapace generally extending to lower half of carapace, last abdominal band interrupted;** eyes dark brown; antennal scale somewhat greenish with white tips, flagella yellowish; legs whitish to yellowish (large specimens); pleopods yellowish to reddish (large specimens) and with brown and/or white spots at bases; **distal part of uropods with a patch of bright yellow, followed by another patch of bright blue, and with red margins.**

Size: Maximum body length 30 cm (females) and 20 cm (males), commonly between 11 and 20 cm.

Habitat, biology, and fisheries: Inhabits shelf areas from the coastline to depths of about 90 m, but usually less than 50 m, on sandy or sandy-mud bottoms. Adults usually are buried in the substrate during the daytime and are active at night. Caught by trawls, drift nets, set nets, traps, and artisanal gear. Common, but apparently not particularly abundant in the area; usually taken as bycatch in fisheries for other *Penaeus* species. Marketed fresh and frozen, often sold together with other species of *Penaeus*. Consumed locally and probably also exported to some extent.

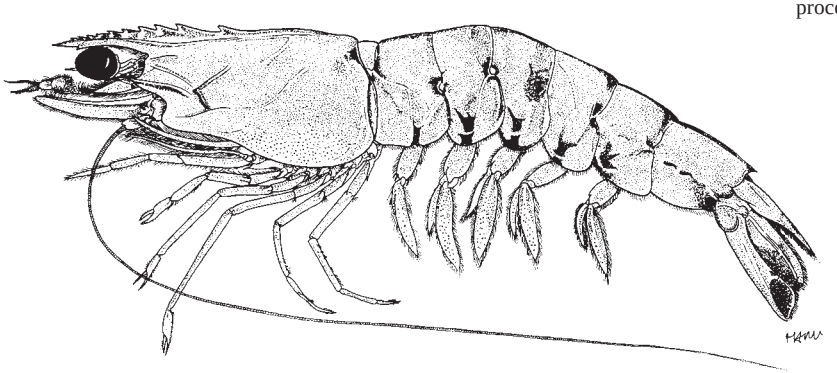


Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Red Sea, Japan, Australia, and Fiji; also entered the eastern Mediterranean through the Suez Canal.

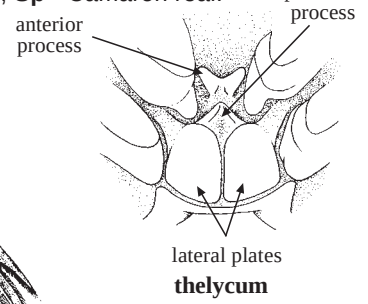
Penaeus latisulcatus Kishinouye, 1896 WKP

Frequent synonyms / misidentifications: *Penaeus latisulcatus hathor* Burkenroad, 1959 / None.

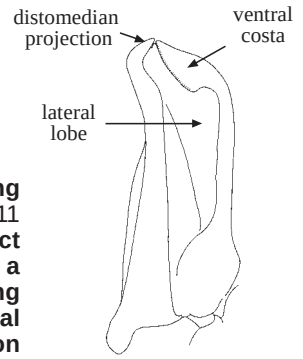
FAO names: En - Western king prawn; **Fr** - Crevette royale occidentale; **Sp** - Camarón real.



(after Motoh and Buri, 1984)



thelycum



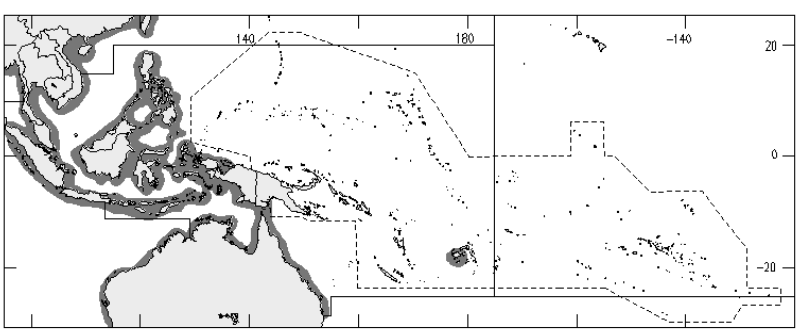
petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum generally armed with 10 or 11 upper teeth (including those on carapace) and **1 lower tooth, lacking distinct accessory crest on the blade; postrostral crest well developed and with a deep median groove throughout its length; adrostral groove extending almost to posterior margin of carapace and distinctly wider than postrostral crest; posterior end of gastrofrontal groove divided into 2. Ischial spine on first leg indistinct or nearly absent.** Petasma of males with short distomedian projections slightly overhanging distal margin of costae. **Thelycum of females formed by 2 subrectangular lateral plates and with anterolateral angles diverging; anterior process strongly bifurcate and horn-like**; posterior process triangular. Telson with 3 pairs of movable lateral spines. **Colour: body generally yellowish green, becoming slightly reddish in large adults; abdominal segments each with a short vertical black bar on pleuron;** hinges on abdomen often bearing dark brown spots and posterolateral part of carapace also sometimes with 2 black stripes positioned at a right angle (these 2 markings usually absent in specimens from Australia); eyes brownish and with many dark dots; rostrum, postrostral crest, antennal crest, and dorsal crests of abdomen dark brown to reddish brown; antennal scale with tip whitish and outer margin dark brown, **flagella whitish, becoming yellowish distally**; legs whitish to bluish or reddish; pleopods yellowish, with bases somewhat reddish; **uropods bright yellow, with distal half and outer margins of exopods bright blue, other margins reddish.**

Size: Maximum body length 20.2 cm (females) and 16.2 cm (males), commonly between 10 and 16 cm.

Habitat, biology, and fisheries: From the coastline to depths of about 90 m, on bottoms of sand, mud, or gravel, with a clear preference for sandy substrates. Adults are buried in the substrate during the daytime and come out to feed at night. Mainly taken offshore by trawls, sometimes also caught in shallow waters by traps, fish corrals, and other artisanal gear. Common in the area. From 1990 to 1995, the reported annual catch of *Penaeus latisulcatus* in the Western Central Pacific (Thailand) ranged from 1 271 to 1 624 t (FAO Yearbook of Fishery Statistics). Its annual catch (together with *Penaeus longistylus*) in northern Australia was about 100 t in the period of 1989/1990. Marketed fresh or frozen, consumed locally and exported.

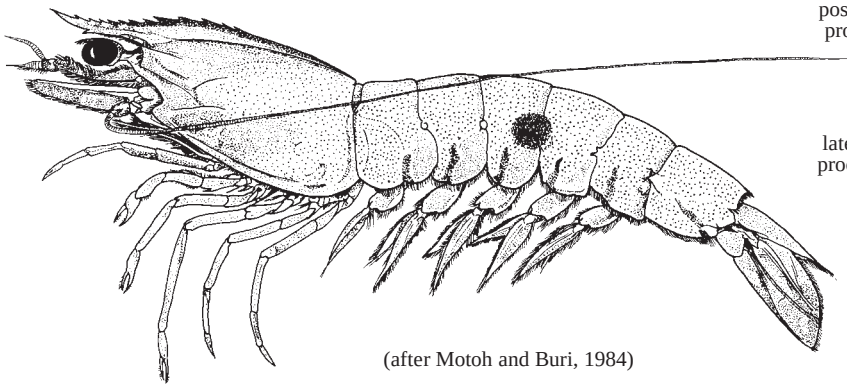
Distribution: Widely distributed in the Indo-West Pacific and reported from the eastern coast of Africa to the Red Sea, Japan, Australia, and Fiji (specimens from the Indian Ocean are sometimes treated as a different subspecies).



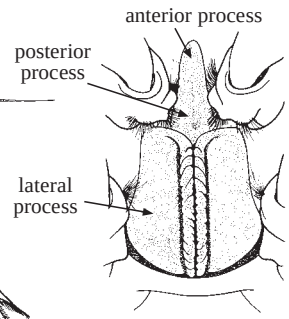
Penaeus longistylus Kubo, 1943

Frequent synonyms / misidentifications: *Penaeus caesius* Dall, 1957; *P. jejunus* Hall, 1956 / None.

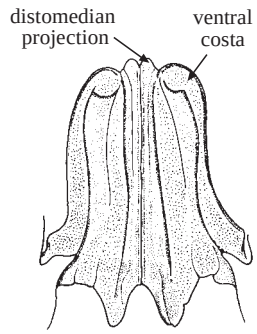
FAO names: En - Red-spot king prawn; **Fr** - Crevette royale à taches rouges; **Sp** - Camarón real manchado.



(after Motoh and Buri, 1984)



thelycum



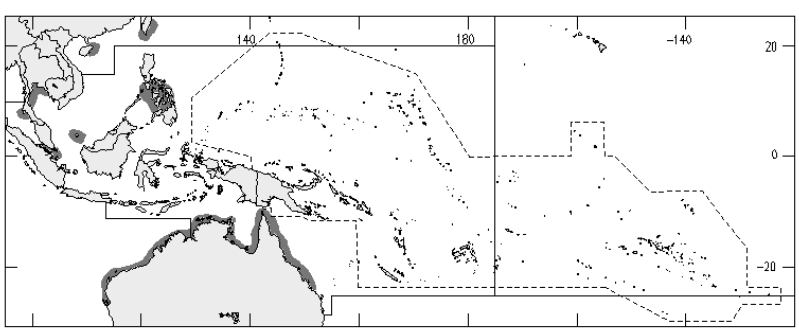
petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum with tip distinctly upturned, armed with 10 to 12 upper teeth (including those on carapace) and **1 lower tooth, lacking distinct accessory crest on the blade; postrostral crest well developed, with a deep median groove extending to about half of its length; adrostral groove extending almost to posterior margin of carapace and about twice as wide as postrostral crest;** posterior end of gastrofrontal groove divided into 2. **First leg bearing a strong ischial spine.** Petasma of males with short distomedian projections not overhanging distal margin of costae. Thelycum of females formed by 2 subrectangular lateral plates with tumid lips; anterior and posterior processes somewhat fused, with anterior end rounded. Telson with 3 pairs of movable lateral spines. **Colour: body generally yellowish green, becoming slightly pinkish in large adults; lower border of carapace reddish; posteroventral carapace and abdominal pleura each with a short vertical black bar except fifth pleuron which bears 2 vertical bars; lateral side of third abdominal segment often with a large red-brown circular spot**; eyes brownish and with many dark dots. Rostrum, postrostral crest, distal part of antennal scale, antennal carina, and dorsal crests of abdomen dark brown to red-brown; **antennal flagella yellowish white**; legs yellowish to reddish; pleopods yellowish; **uropods yellowish at basal half and purplish at distal half, with margins red and black except outer margins of exopods bright blue.**

Size: Maximum body length 18 cm (females) and 15 cm (males), commonly between 10 and 15 cm.

Habitat, biology, and fisheries: Inhabits reefs, sand or sandy-mud bottoms in depths from 18 to 60 m. Taken by trawlers offshore at night and in the vicinity of coral reefs, often together with *Penaeus latisulcatus*. Less common than *P. latisulcatus* in the area, except off northeastern Australia, where a commercial fishery has been developed for this species, with an annual catch ranging from 600 t to 1 800 t between 1983 and 1990. Marketed fresh or frozen, often sold together with *P. latisulcatus*, both locally consumed and exported.

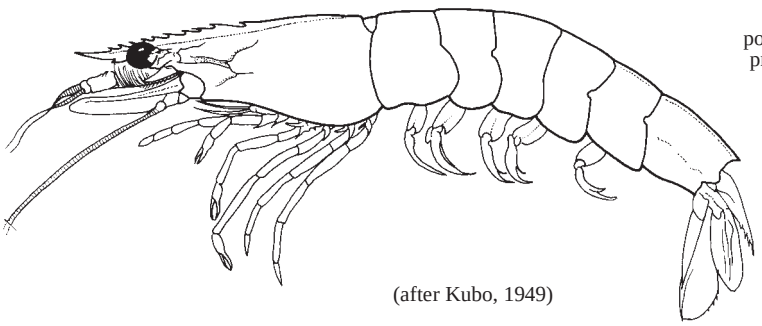
Distribution: Western Pacific; reported from Thailand, Malaysia, Singapore, South China Sea, Taiwan Province of China, the Philippines, Australia, and Lord Howe Island.



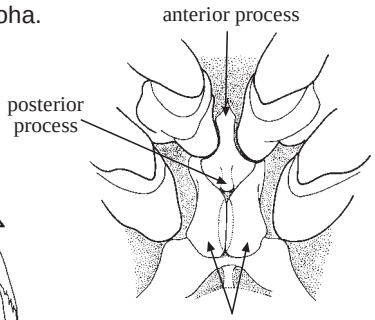
Penaeus marginatus Randall, 1840

Frequent synonyms / misidentifications: *Penaeus teraoi* Kubo, 1949 / None.

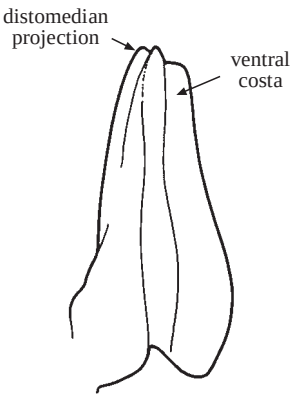
FAO names: En - Aloha prawn; **Fr** - Crevette aloha; **Sp** - Camarón aloha.



(after Kubo, 1949)



thelycum



petasma (ventral view)

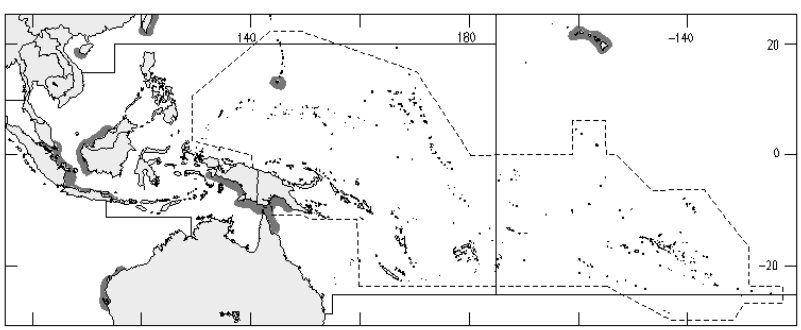
(after Lee and Yu, 1977)

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum armed with 9 or 10 upper teeth (including those on carapace) and 1 to 3 **(mostly 2) lower teeth; postrostral crest well developed but lacking median groove**; adrostral groove extending almost to posterior margin of carapace and about as long as wide as postrostral crest; posterior end of gastrofrontal groove divided into 2. First leg armed with a strong ischial spine. Petasma of males with very short distomedian projections. **Thelycum of females formed by 2 subrectangular lateral plates and with anterolateral angles diverging; anterior and posterior processes fused with anterior end sharply pointed**. Telson with 3 pairs of movable lateral spines. **Colour: body generally yellowish brown and becoming pinkish brown in large adults**; eyes brownish and with many dark dots; rostrum, and dorsal crests of abdomen dark brown; **antennal scale reddish brown with white tips, flagella whitish but distally becoming somewhat yellowish**; legs whitish at distal parts and orange-red at basal parts; pleopods pale red; **uropods bright yellow at basal part and pinkish purple at distal part, submarginal regions bright blue, margins reddish.**

Size: Maximum body length 20.5 cm, commonly between 13 and 17 cm.

Habitat, biology, and fisheries: Found on bottoms of sand and sandy mud, from the surface to a depth of 300 m, with adults preferring deeper waters. Mainly caught offshore by trawlers and apparently not very common in the area.

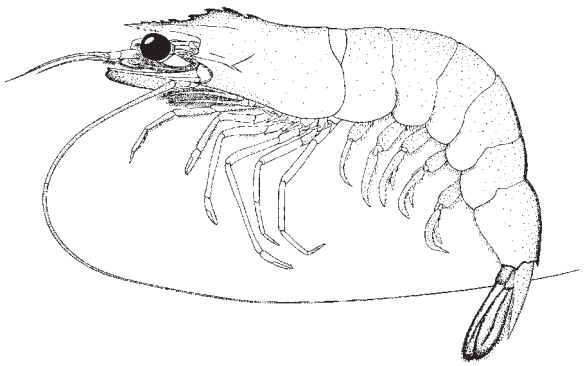
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan, Australia, Hawaii, and Cocos Islands.

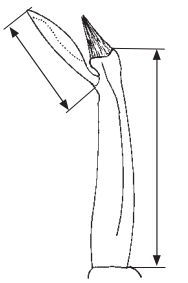


Penaeus merguiensis De Man, 1888 PBA

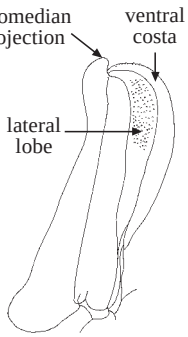
Frequent synonyms / misidentifications: None / *Penaeus indicus* H. Milne Edwards, 1837; *P. penicillatus* Alcock, 1905; *P. silasi* Muthu and Motoh, 1979.

FAO names: En - Banana prawn; **Fr** - Crevette banane; **Sp** - Camarón banana.

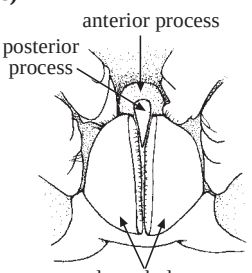




distal 2 segments of third maxilliped (male)



petasma (ventral view)

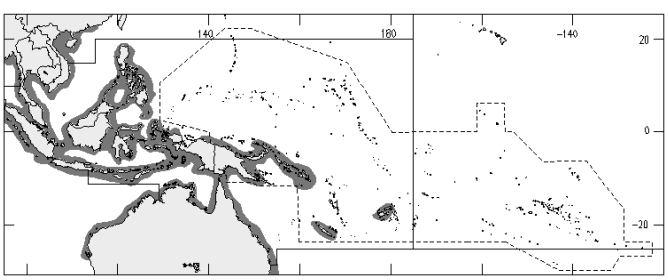


thelycum

Diagnostic characters: Carapace rather smooth, **lacking gastrofrontal and hepatic crests**; adrostral crest extending to, or just before, epigastric tooth; **tip of rostrum horizontally straight, and rostral crest becoming very high and broadly triangular in large specimens (even stronger in females)**, generally bearing 6 to 9 upper teeth (including those on carapace) and **mostly 3 to 5 lower teeth;** postrostral crest extending near to posterior margin of carapace; **gastro-orbital crest varying from distinct to nearly absent (in some specimens from the Philippines to Australia), extending over middle third to posterior 2/3 of the distance between hepatic spine and orbital margin. In adult males, third maxilliped with distal segment only about half as long as second segment which bears a tuft of dense short hairs (slightly shorter than distal segment) at tip.** Petasma of males with distomedian projections short, not reaching distal margin of costae. Thelycum of females formed by 2 semi-circular lateral plates, with their median margins forming tumid lips; **anterior process slightly rounded and concave, obscured by hairs**; posterior process elongated and inserted between anterior part of lateral plates. Telson lacking lateral spines. **Colour: body semi-translucent, somewhat yellowish (in youngs and moderate-sized specimens) to greenish (in very large specimens) and covered with numerous minute dark brown dots**; eyes light brown and covered with some dark brown mesh-like stripes; rostral and abdominal dorsal crests reddish brown to dark brown; **antennal flagella reddish brown**; antennular flagella of same colour as body and covered with many dark spots; legs translucent and somewhat whitish; pleopods pinkish to reddish; **distal part of uropods yellowish green with red margins; young specimens often with many longitudinal black broken lines on abdomen.**

Size: Maximum body length 24 cm (carapace length about 6 cm) in females and 20 cm (carapace length about 5 cm) in males, commonly between 13 and 15 cm.

Habitat, biology, and fisheries: On bottoms of sand and mud, from the coastline and river mouths to depths of about 55 m, usually less than 20 m; prefers turbid waters. Sometimes forms very dense shoals and good catches are often linked with heavy rainfall. One of the economically most important shrimp species in the area. From 1990 to 1995, the reported annual catch of *P. merguiensis* in the Western Central Pacific ranged from 44 303 to 52 087 t. About 4/5 of this production originated in Indonesia. Caught by trawls, fish corrals, pocket netting, beach seining, cast nets, and artisanal gear. Also plays an important role in pond culture in Thailand (1 814 t in 1995), Malaysia (66 t in 1995), Indonesia (24 610 t in 1995), and the Philippines (all these data from FAO Aquaculture Statistics). Marketed mostly fresh and frozen, consumed locally and exported. In the Philippines, this prawn has only about half the market value of *P. monodon* and in Australia it is sold at slightly lower prices than *P. indicus*.

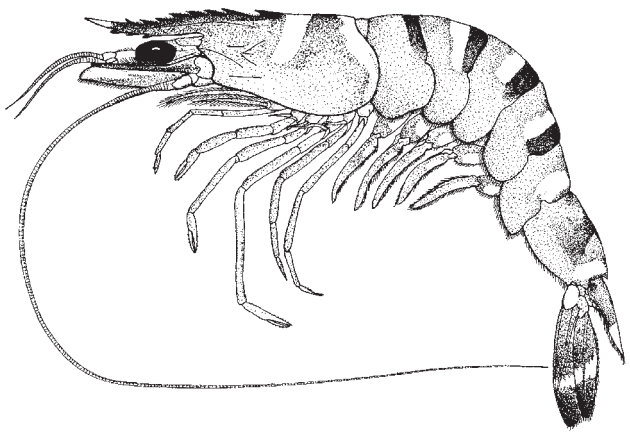


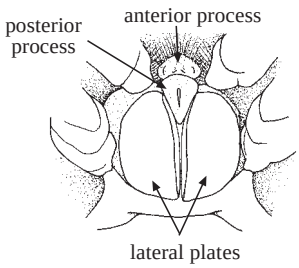
Distribution: Indo-West Pacific from the Arabian Sea to the South China Sea and Fiji.

Penaeus monodon Fabricius, 1798 GIT

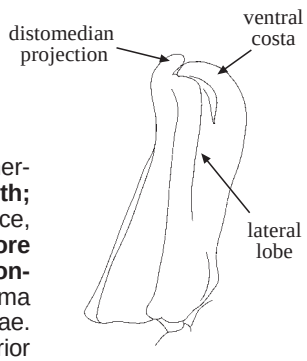
Frequent synonyms / misidentifications: *Penaeus bubulus* Kubo, 1949; *P. carinatus* Dana, 1852; *P. semisulcatus exsulcatus* Hilgendorf, 1879 / None.

FAO names: En - Giant tiger prawn; **Fr** - Crevette géante tigrée; **Sp** - Camarón tigre gigante.





thelycum

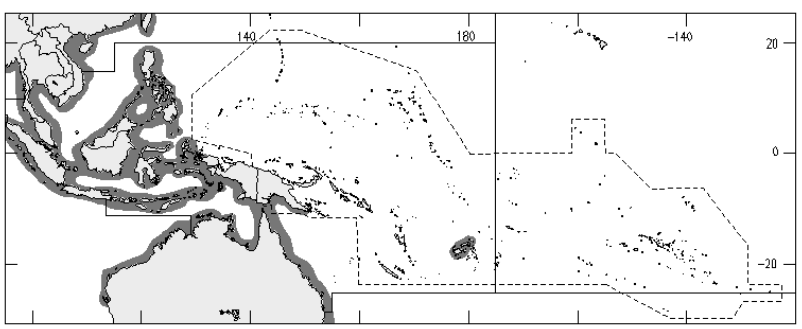


petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests distinct, rostrum generally armed with 6 to 8 upper teeth (including those on carapace) and **3 lower teeth;** postrostral crest well developed and reaching nearly to posterior margin of carapace, with or without a feeble median groove; **adrostral crest extending to just before last postrostral tooth; gastrofrontal crest absent; hepatic crest almost horizontal and extending far behind antennal crest. Fifth leg without exopod.** Petasma of males with distomedian projections slightly overhanging distal margin of costae. Thelycum of females formed by 2 suboval lateral plates with tumid lips; anterior process concave and rounded distally; posterior process subtriangular and partly inserted between lateral plates. Telson without lateral spines. **Colour: body greyish greenish or dark greenish blue; becoming reddish brown in large adults; carapace covered with mud-yellow transverse bands, while abdomen bears dark brown and mud-yellow cross bands**; eyes light brown with many black dots; **antennal flagella uniformly greenish brown**; legs of same colour as body but sometimes reddish or provided with bright yellow and blue bands; pleopods somewhat reddish or pale red, with bases bright yellow and blue; **distal half of uropods dark blue or dark brown with a red or mud-yellow median transverse band, and margins reddish.**

Size: Probably the largest known penaeid, with a maximum body length of 35 cm (females) and 26.8 cm (males), commonly between 12 and 20 cm.

Habitat, biology, and fisheries: From the coastline to depths of about 150 m, usually less than 30 m, on bottoms of sand, mud, or slits. Juveniles usually inhabit seagrass beds, mangrove swamps, and estuaries. Taken by trawls, gill nets, seine nets, stake nets, traps, and artisanal gear. More abundant in the western part of the area and of major economic importance. From 1990 to 1995, the reported yearly catch of *Penaeus monodon* in the Western Central Pacific ranged from 8 513 to 17 194 t (FAO Yearbook of Fishery Statistics). Also commercially very important for aquaculture. Large-scale pond culture of this prawn is practised in many Southeast Asian countries such as Thailand (276 982 t in 1995), Malaysia (6 713 t in 1995), Indonesia (84 100 t in 1995), Philippines (88 815 t in 1995), and Australia (1 613 t in 1995). Marketed mostly fresh and frozen, consumed locally and exported. In the Philippines, it is an expensive food item and ranks above other *Penaeus* species.



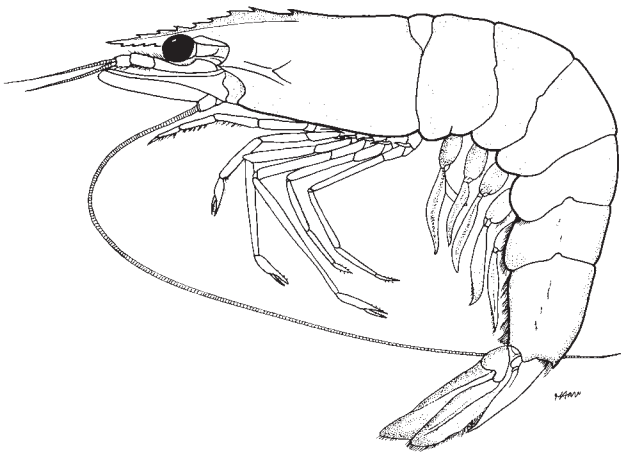
Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to the Red Sea, Japan, Australia, and Fiji.

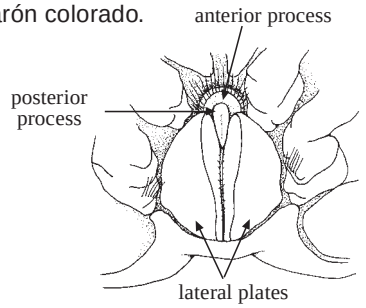
Penaeus penicillatus Alcock, 1905

REP

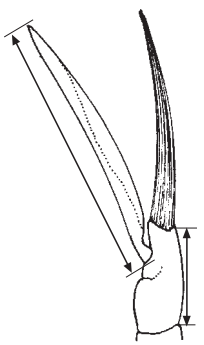
Frequent synonyms / misidentifications: None / *Penaeus indicus* H. Milne Edwards, 1837; *P. merguiensis* De Man, 1988; *P. silasi* Muthu and Motoh, 1979.

FAO names: En - Redtail prawn; **Fr** - Crevette queue rouge; **Sp** - Camarón colorado.

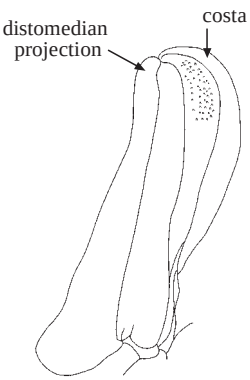




thelycum



distal 2 segments of third maxilliped (male)



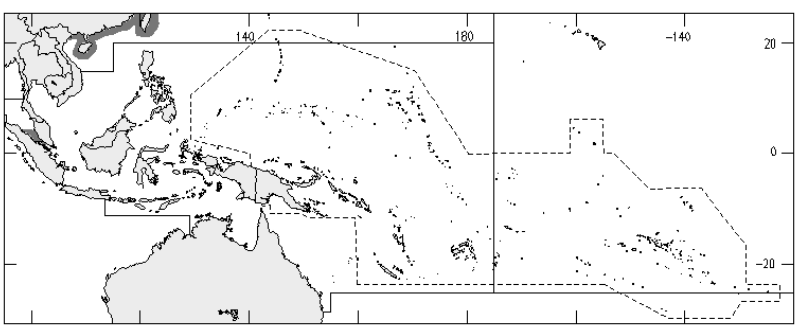
petasma (ventral view)

Diagnostic characters: Carapace rather smooth, **lacking gastrofrontal and hepatic crests**; adrostral crest extending just beyond epigastric tooth; **tip of rostrum horizontally straight, and rostral crest generally slightly elevated in youngs and adult males, to moderately high in large females**; rostrum usually armed with 7 to 9 upper teeth (including those on carapace) and **3 to 5 lower teeth;** postrostral crest extending near to posterior margin of carapace; **gastro-orbital crest distinct, occupying 1/2 to 1/3 the distance between hepatic spine and orbital margin. In adult males, third maxilliped with distal segment much longer than second segment which bears a tuft of dense long hairs (as long as distal segment) at tip.** Petasma of males with distomedian projections slightly bent and not reaching distal margin of costae. Thelycum of females formed by 2 semi-circular lateral plates, with their median margins as tumid lips; **anterior process slightly rounded and obscured by hairs**; posterior process elongated and inserted between anterior part of lateral plates. Telson lacking lateral spines. **Colour: body semi-translucent, slightly greenish and covered with numerous minute dark brown dots**; eyes light brown and covered with some dark brown mesh-like stripes; rostral and abdominal dorsal crests reddish brown to dark brown; **antennal flagella reddish brown**; antennular flagella of same colour as body and covered with many dark spots; legs translucent and somewhat whitish; pleopods rather reddish; **distal half of uropods yellowish to greenish but always with reddish tips.**

Size: Maximum body length 21.2 cm (carapace length 3.3 cm) in females and 16.3 cm (carapace length 3.1 cm) in males, commonly between 10 and 16 cm.

Habitat, biology, and fisheries: On soft bottoms, from the coastline to a depth of about 90 m. Caught by trawls, seines, scoop nets, and artisanal gear. Marketed fresh and frozen. Reported to be rather common in Malaysia, but can be easily confused with *Penaeus indicus*, *P. merguiensis,* and *P. silasi*, and is probably not so common in the area.

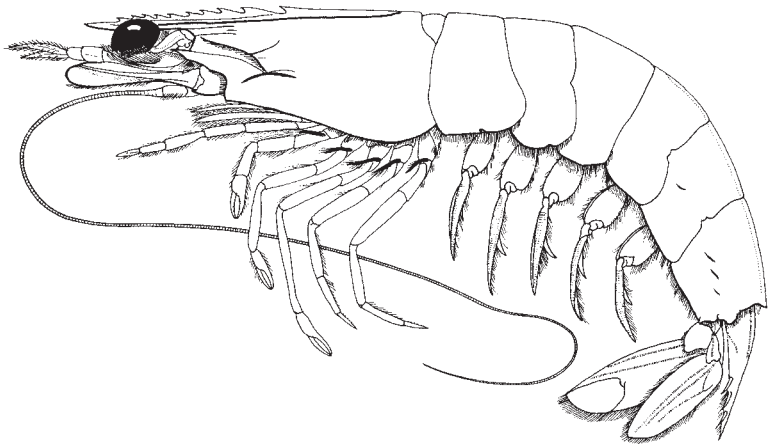
Distribution: Indo-West Pacific from Pakistan to Taiwan Province of China and Indonesia.

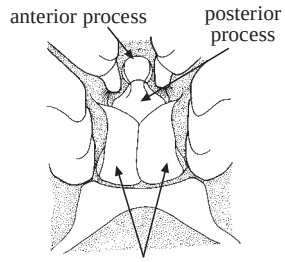


Penaeus plebejus Hess, 1865 PNP

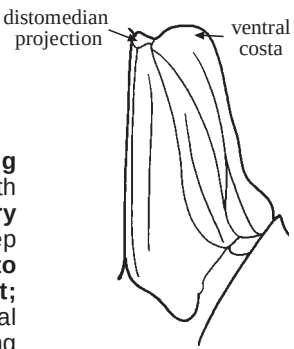
Frequent synonyms / misidentifications: None / None.

FAO names: En - Eastern king prawn; **Fr** - Crevette royale orientale; **Sp** - Camarón real oriental.





thelycum



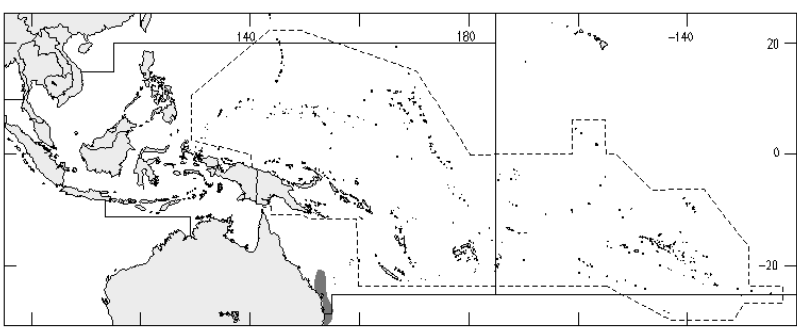
petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests very distinct, **bearing both gastrofrontal and hepatic crests;** rostrum armed with 10 or 11 upper teeth (including those on carapace) and **1 lower tooth, bearing distinct accessory crest on blade also in adults**; postrostral crest well developed, with a deep median groove all along its length; **adrostral groove extending almost to posterior margin of carapace and distinctly wider than postrostral crest; posterior end of gastrofrontal groove divided into 3.** First leg without ischial spine. Petasma of males with short distomedian projections not overhanging distal margin of costae. Thelycum of females formed by 2 subrectangular lateral plates and with anterolateral angles diverging; **anterior process bearing 2 minute, almost contiguous horns**; posterior process somewhat triangular. Telson with 3 pairs of movable lateral spines. **Colour: body generally yellowish cream, abdominal segments with faint dark spots at hinges and a faint dark vertical bar on each pleuron**; rostrum dark brown with white tip; eyes deep brown; **antennal scale with dark brown outer margins and white tip, flagella whitish**; postrostral crest and dorsal crests of abdomen dark brown to red-brown; legs slightly pinkish; pleopods pinkish to slightly yellowish; **uropods of same colour as body but with pale blue margins and red-brown fringes.**

Size: Maximum body length 30 cm (females) and 19 cm (males), commonly between 14 and 20.5 cm.

Habitat, biology, and fisheries: Found on sandy bottoms of bare and vegetated areas from depths of 2 to 220 m, with a migration pattern from estuaries to deeper marine waters northward along the coasts. This prawn forms the basis of an important fishery in eastern Australia, with a catch of about 3 250 t in the annual period of 1989/1990 (60% of the total commercial catch originating in southern Queensland). Subadults and adults are mainly caught by trawlers offshore at depths below 60 m. Juveniles are caught mainly within estuaries by trawling, set pocket, running netting, hauling, seining, and hand netting. Marketed locally fresh, frozen, or cooked. Larger specimens are exported mainly to Spain and Japan as “green” (uncooked), frozen, or headed prawns.

Distribution: Restricted to eastern Australia, from southern Queensland to Victoria and Lord Howe Island.

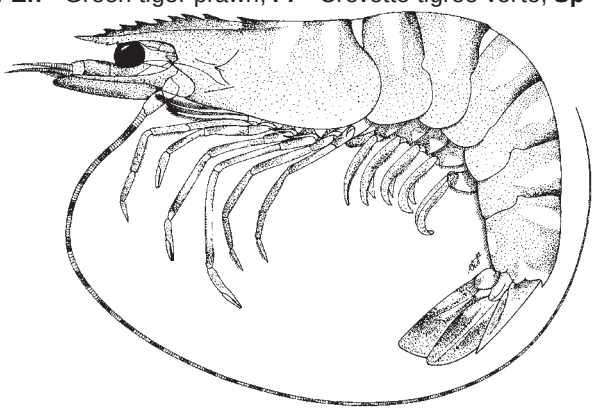


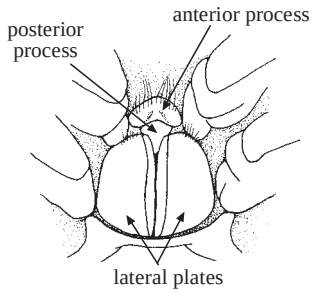
Penaeus semisulcatus De Haan, 1844

TIP

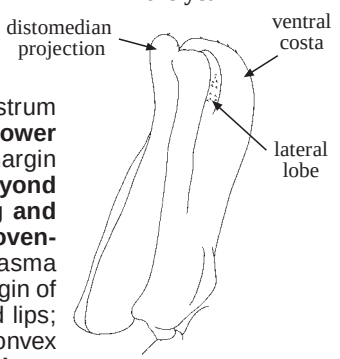
Frequent synonyms / misidentifications: *Penaeus ashiaka* Kishinouye, 1900; *P. monodon manillensis* Villaluz and Arriola, 1938; *P. semisulcatus paucidentatus* Parisi, 1919 / None.

FAO names: En - Green tiger prawn; **Fr** - Crevette tigrée verte; **Sp** - Camarón tigre verde.





thelycum

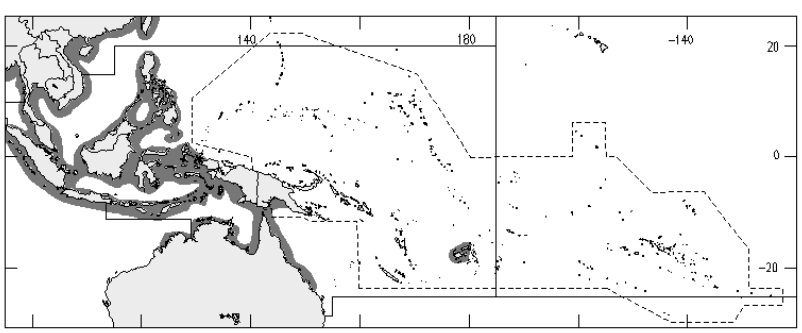


petasma (ventral view)

Diagnostic characters: Carapace with grooves and crests distinct, rostrum generally armed with 6 to 8 upper teeth (including those on carapace) and **3 lower teeth;** postrostral crest well developed and reaching nearly to posterior margin of carapace, with a distinct median groove; **adrostral crest extending beyond last postrostral tooth; gastrofrontal crest absent; hepatic crest long and extending behind antennal crest, straight but distinctly sloping anteroventrally. Fifth leg with exopod (somewhat hidden beneath carapace).** Petasma of males with distomedian projections short and not overhanging distal margin of costae. Thelycum of females formed by 2 suboval lateral plates with tumid lips; anterior process subtriangular and with raised edges, posterior process convex and partly inserted between lateral plates. Telson without lateral spines. **Colour: body reddish brown to pale brown or dark green, carapace covered with mud-yellow transverse bands while abdomen including tail fan bears greyish brown and mud-yellow cross bands;** eyes light brown with many black dots; rostral teeth dark brown; **antennal flagella alternated with white and brown bands**; both legs and pleopods reddish and covered with some white markings, with tips of legs whitish, and bases of legs and pleopods also whitish; **distal half of uropods dark reddish brown and with red margins.**

Size: Maximum body length 25 cm (females) and 18 cm (males), commonly between 13 and 18 cm.

Habitat, biology, and fisheries: On the continental shelf from the coastline to depths of about 130 m, usually less than 60 m, over bottoms of sand, mud, or sandy-mud. Seems to prefer high salinity waters, with juveniles often associated with seagrass beds and sometimes found on the top of coral reef platforms. Reported to form small shoals and to be predominantly nocturnal, buried in the substrate during the daytime. Mainly taken offshore by trawls, sometimes also caught by fish corrals in coastal areas. Commonly seen in the markets of Thailand and Indonesia, and the most dominant prawn species in offshore fisheries in the Philippines. FAO's Yearbook of Fishery Statistics records 650 t of this species taken in 1995 from the Western Central Pacific, this figure comprising exclusively catches from Thailand. Also caught commercially in Australia, with an annual catch of about 3 300 t (together with *Penaeus esculentus*) from the Northern Prawn Fishery during the annual period of 1989/1990. Marketed mostly fresh and frozen, consumed locally and exported.

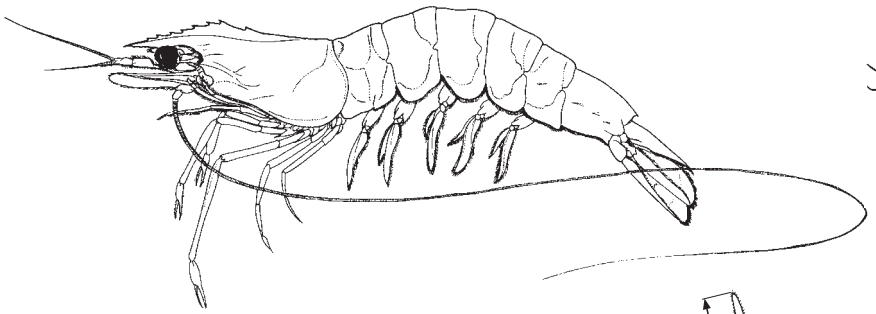


Distribution: Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan, Australia, and Fiji; also entered the eastern Mediterranean through the Suez Canal.

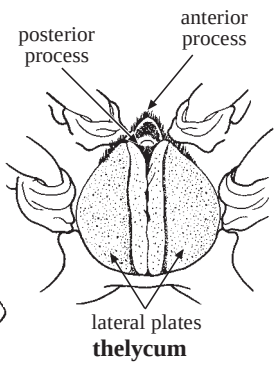
Penaeus silasi Muthu and Motoh, 1979

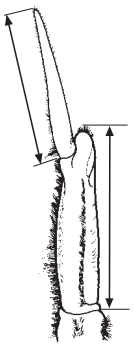
Frequent synonyms / misidentifications: None / *Penaeus indicus* H. Milne Edwards, 1837; *P. merguiensis* De Man, 1888; *P. penicillatus* Alcock, 1905.

FAO names: En - False white prawn.

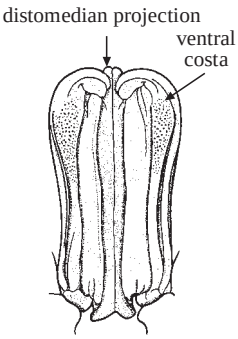


(after Muthu and Motoh, 1979)





distal 2 segments of third maxilliped (male)



petasma (ventral view)

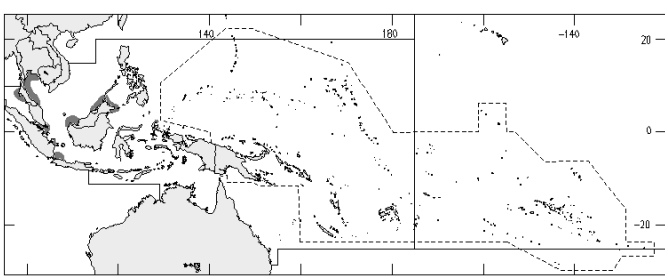
(after Muthu and Motoh, 1979)

Diagnostic characters: Carapace rather smooth, **lacking gastrofrontal and hepatic crests**; adrostral crest extending to about epigastric tooth; **tip of rostrum horizontally straight; rostral crest slightly to moderately elevated in youngs and adult males but high and broadly triangular in large females**, with 7 to 9 upper teeth (including those on carapace) and **4 or 5 lower teeth;** postrostral crest extending near to posterior margin of carapace; **gastro-orbital crest distinct, extending over posterior 3/5 to 2/3 of distance between hepatic spine and orbital margin. In adult males, third maxilliped with distal segment about as long as second segment which bears only a rudimentary tuft of hairs at tip.** Petasma of males with distomedian projections slightly bent and not overhanging distal margin of costae. Thelycum of females formed by 2 semi-circular lateral plates, with their median margins forming tumid lips; **anterior process rounded and slightly concave, generally distinct and not obscured by hairs (more clear in adults)**; posterior process elongated and inserted between anterior part of lateral plates. Telson without lateral spines. **Colour: body semi-translucent, somewhat yellowish white (small specimens) to pinkish (large specimens) and covered with numerous minute dark brown dots (dots becoming obscure in large specimens)**; eyes light brown and covered with some dark brown mesh-like stripes; rostral and abdominal dorsal crests reddish brown to dark brown; **antennal flagella reddish brown**; antennular flagella of same colour as body and covered with many dark spots; legs translucent and somewhat whitish, while pleopods yellowish to pinkish; **distal part of uropods yellowish with red margins; young specimens often with short longitudinal black broken lines on abdomen.**

Size: Maximum body length 20 cm in females (carapace length 4.8 cm) and 15.3 cm in males (carapace length 4.1 cm), commonly between 12 and 16 cm.

Habitat, biology, and fisheries: Found on muddy bottom in shallow waters to a depth of about 36 m. Caught by trawlers and probably artisanal gear. An abundant species in the markets of Singapore and of commercial importance. Probably also common in Thailand, Malaysia, and Indonesia, where it is often confused with *Penaeus indicus*. Marketed fresh and frozen, mainly for local consumption.

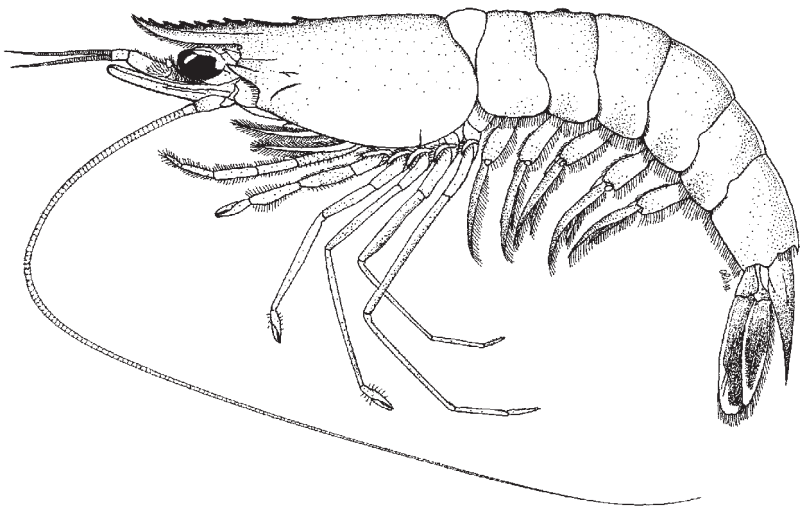
Distribution: Indo-West Pacific; so far only reported from Thailand (Andaman Sea and Gulf of Thailand), Indonesia, Malaysia, and Singapore. Since this shrimp can be easily confused with *P. indicus*, *P. merguiensis*, and *P. penicillatus*, its actual distribution is likely to be wider in the Indo-Malay region.

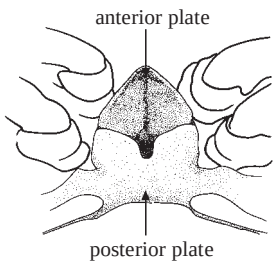


Trachypenaeus curvirostris (Stimpson, 1860) TRV

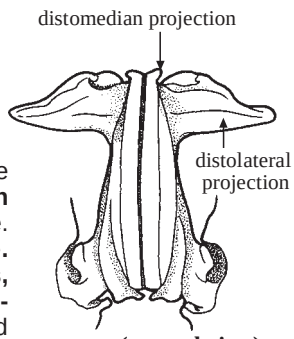
Frequent synonyms / misidentifications: ? *Trachypenaeus asper* Alcock, 1905 / *Trachypenaeus longipes* (Paulson, 1875); *T. malaiana* Balss, 1933.

FAO names: En - Southern rough shrimp; **Fr** - Crevette gambri archée; **Sp** - Camarón fijador arquero.





thelycum



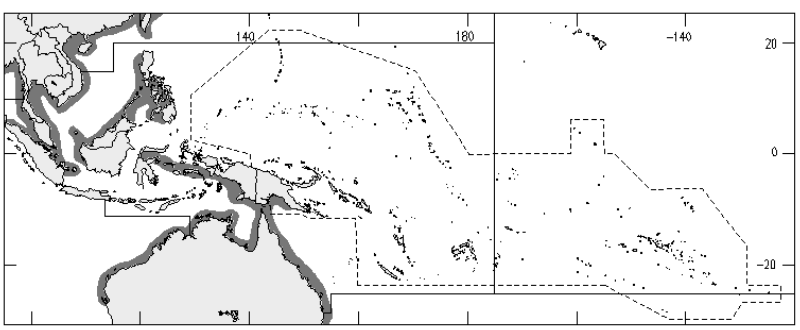
petasma (ventral view)

Diagnostic characters: Entire body hairy, with grooves and crests on carapace obscure. **Rostrum slightly upcurved at tip, armed with 6 to 8 upper teeth (including those on carapace)** and extending to about distal antennular article. **Postrostral crest low and extending almost to posterior margin of carapace.** Longitudinal suture on carapace short. **First 3 pairs of legs bearing epipods, first leg additionally armed with a distinct ischial spine, fifth leg not exceeding tip of antennal scale.** Abdomen with a small median tubercle on second segment, **last 4 segments with a low dorsal crest, distinctly incised posteriorly. Petasma of males T-shaped, distolateral projections broadly wing-like and directed laterally,** distomedian projections small. **Thelycum of females with anterior plate concave and bluntly pointed anteriorly, bearing a median groove; posterior plate with a distinct median notch on anterior margin.** Telson generally armed with 3 or 4 pairs of small movable lateral spines. **Colour: body greyish pink to greyish blue, sometimes whitish on sides**; eyes dark brown; **antennal flagella reddish**; legs pinkish and with some white patches; pleopods reddish with white markings on sides; **uropods almost entirely reddish, with margins whitish to yellowish.**

Size: Maximum body length 10.5 cm (females) and 8.1 cm (males), commonly between 5 and 8 cm.

Habitat, biology, and fisheries: Found on sand, mud, or sandy-mud bottom, from depths of 10 to 300 m, but usually between 30 and 60 m. Reported from many places in the area, but its actual distribution is unclear as it is often confused with other species of the genus. Probably of minor commercial importance. Caught mainly at night by trawls and bottom gill nets, also by artisanal gear. Marketed mainly fresh for local consumption.

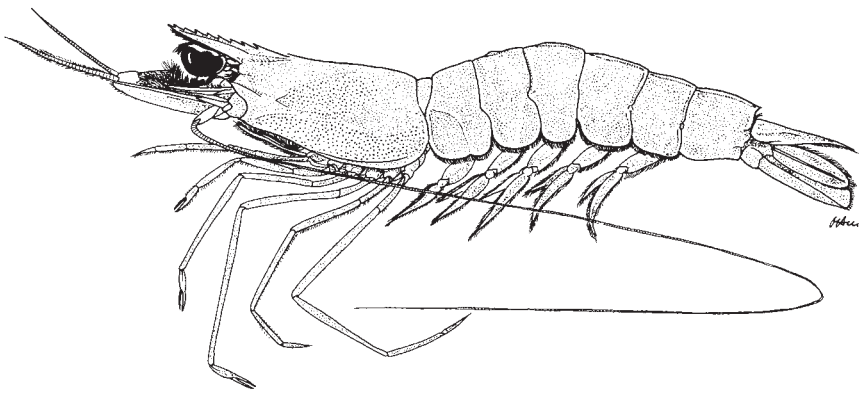
Distribution: Indo-West Pacific from eastern coast of Africa to Japan and northern Australia, also entered the eastern Mediterranean through the Suez Canal.



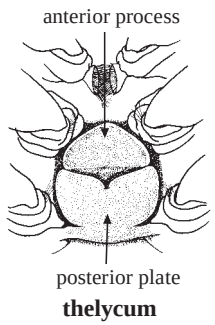
Trachypenaeus malaiana Balss, 1933

Frequent synonyms / misidentifications: *Trachypenaeus fulvus* Dall, 1957; *T. unicus* Hall, 1961 / *Trachypenaeus curvirostris* (Stimpson, 1860).

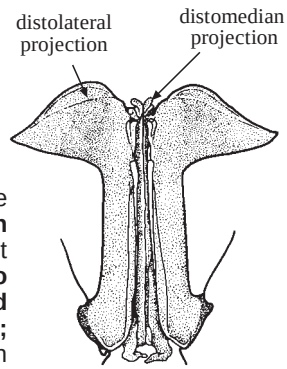
FAO names: En - Malayan rough shrimp; **Fr** - Crevette gambri malaise; **Sp** - Camarón fijador malayo. (these FAO names were previously used for *Trachypenaeus sedili*).



(after Motoh and Buri, 1984)



thelycum



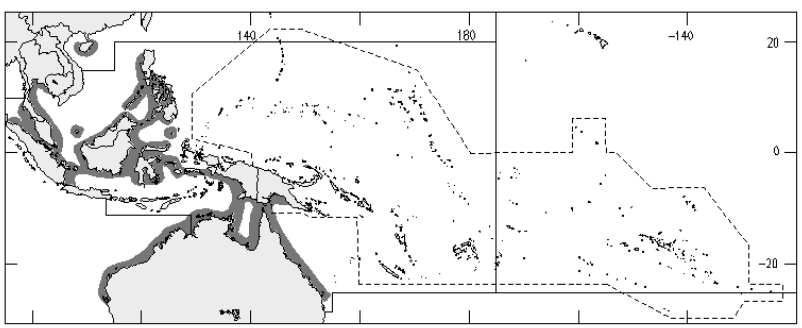
petasma (ventral view)
(after Motoh and Buri, 1984)

Diagnostic characters: Entire body hairy, with grooves and crests on carapace obscure. **Rostrum armed with 9 or 10 upper teeth (including those on carapace), nearly straight or slightly curved upward at tip,** extending to about second antennular article. **Postrostral crest low and extending almost to posterior margin of carapace.** Longitudinal suture on carapace short. **Epipod present only on third leg; ischial spine on first leg small to entirely absent; fifth leg extending beyond antennal scale.** Abdomen bearing a small median tubercle on second segment, last 4 segments with a low dorsal crest. **Petasma of males T-shaped, with distolateral projections broadly wing-like and directed laterally,** distomedian projections small. **Thelycum of females with anterior plate semi-circular and edges slightly raised, bearing a low median groove; posterior plate with anterior margin broadly V-shaped and bearing a narrow but deep median notch.** Telson generally armed with 1 pair of small movable lateral spines. **Colour: body generally greyish to greyish blue, posterior margin of each abdominal segment covered with an indistinct narrow dark grey band**; eyes dark brown; **antennal flagella greyish brown**; legs yellowish to pinkish; pleopods pinkish, with whitish to yellowish markings on sides; **uropods almost entirely dark grey to brownish and with yellowish margins.**

Size: Maximum body length 10.5 cm (females) and 8 cm (males), commonly between 5.5 and 8 cm.

Habitat, biology, and fisheries: Found in offshore waters at depths from 5 to 60 m, over muddy bottoms, juveniles in brackish water. Taken mainly by trawls. Probably the most common species of the genus in the area, but of limited commercial importance due to its small size and nowhere very abundant. Forms a bycatch in prawn fisheries. Marketed mainly fresh or frozen for local consumption.

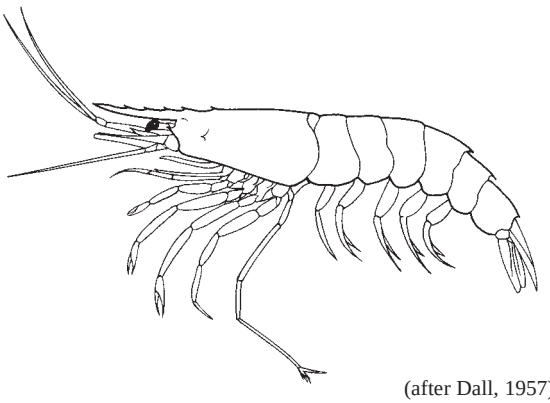
Distribution: Western Pacific from the Strait of Malacca to the Philippines, South China Sea, and northern Australia.



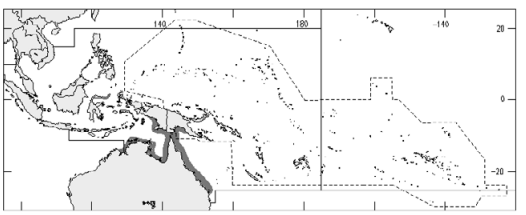
Atypopenaeus formosus Dall, 1957

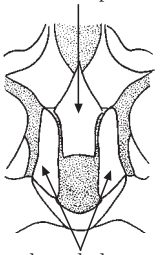
En - Orange shrimp; **Fr** - Crevette orange; **Sp** - Camarón naranji.

Maximum body length 10 cm (females) and 8 cm (males). Inhabits shallow inshore waters to depths of about 30 m, usually less than 10 m, over soft mud bottoms. Taken as bycatch in trawls. Of minor commercial importance. Its local name in Australia, “go home prawn”, refers to the common reaction of fishermen upon finding large numbers of this shrimp in their catches. Marketed fresh or frozen for local consumption. Restricted to the waters between New Guinea and northern Australia.



(after Dall, 1957)





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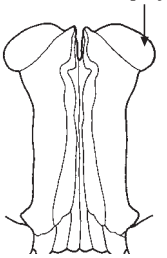
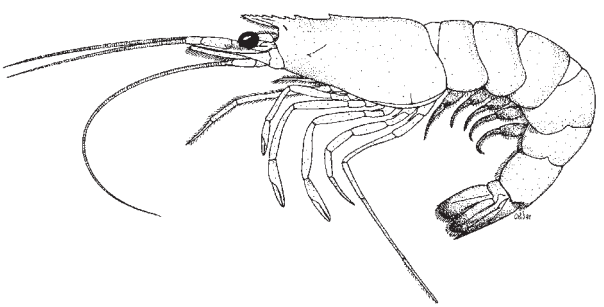


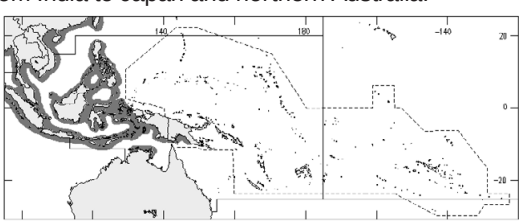
petasma (ventral view)

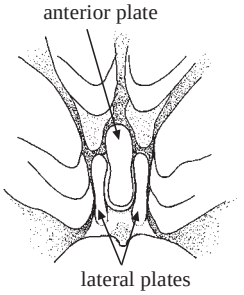
Atypopenaeus stenodactylus (Stimpson, 1860)

En - Periscope shrimp; **Fr** - Crevette périscope; **Sp** - Camarón periscopio.

Maximum body length 5 cm (females) and 4 cm (males). On muddy bottoms close to the shore, from depths of 10 to 30 m. Taken by trawls, bag nets, and artisanal gear. Generally of no commercial importance in the area, due to its very small size, and not particularly abundant in the catches. Marketed mainly fresh for local consumption. Indo-West Pacific from India to Japan and northern Australia.







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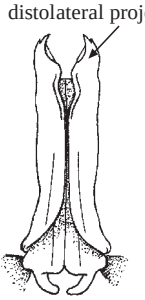


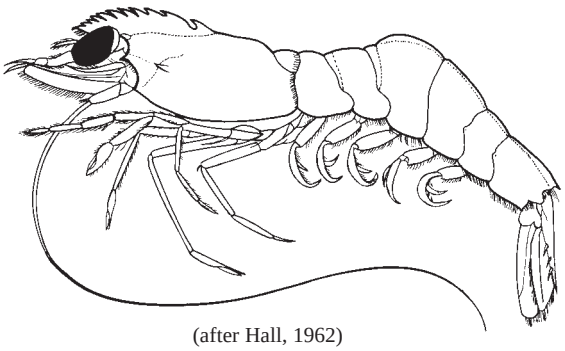
petasma (ventral view)

click for next page

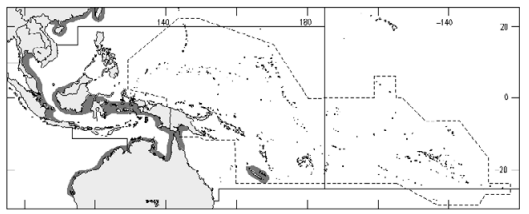
Metapenaeopsis lamellata (De Haan, 1844)

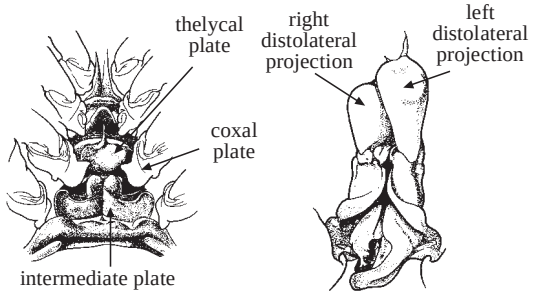
En - Humpback shrimp; **Fr** - Crevette bossue; **Sp** - Camarón jorobado.

Maximum body length 10 cm (females) and 6 cm (males). At depths between 4 and 200 m, associated with hard bottoms of reef and coral debris. Sometimes taken by trawls. Not very common throughout its range in the area and of very limited commercial interest. Marketed fresh for local consumption. Western Pacific from the Gulf of Thailand to Japan, Australia, and New Caledonia.



(after Hall, 1962)



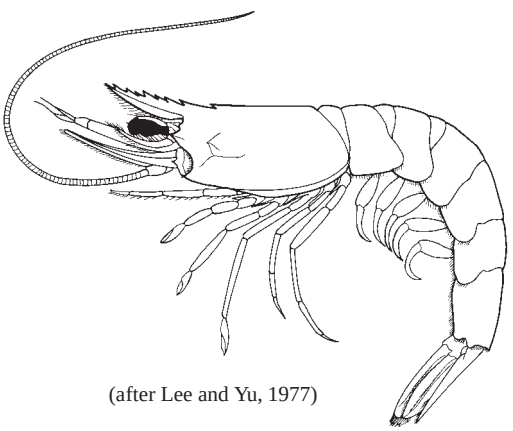


(after Crosnier, 1994)

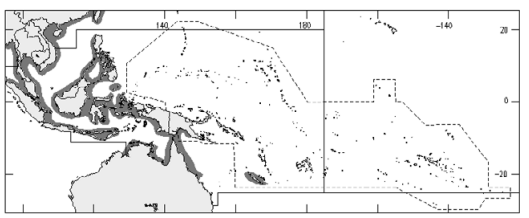
Metapenaeopsis mogiensis (Rathbun, 1902)

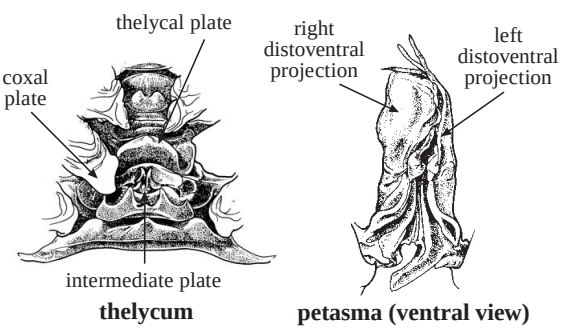
En - Mogi velvet shrimp; **Fr** - Crevette chamois mogi; **Sp** - Camarón gamuza mogi.

Maximum body length 10.1 cm (females) and 8.2 cm (males); commonly between 5 and 7 cm. Over hard bottoms adjacent to coral reefs, from depths of 10 to 156 m, usually less than 50 m. Not particularly common in the area and of very limited commercial importance; sometimes taken as bycatch in trawls. Marketed fresh for local consumption. Widely distributed in the Indo-West Pacific from the eastern coast of Africa to Japan, Australia, and New Caledonia (sometimes divided into 4 subspecies).



(after Lee and Yu, 1977)



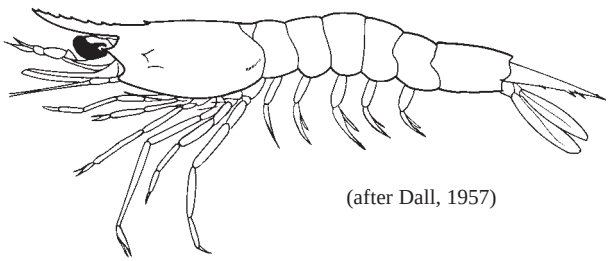


(after Crosnier, 1991)

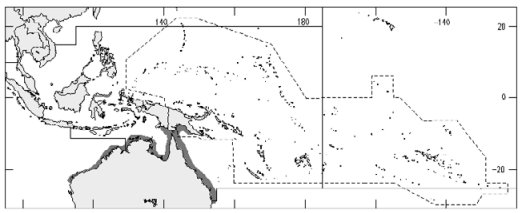
Metapenaeopsis novaeguineae (Haswell, 1879)

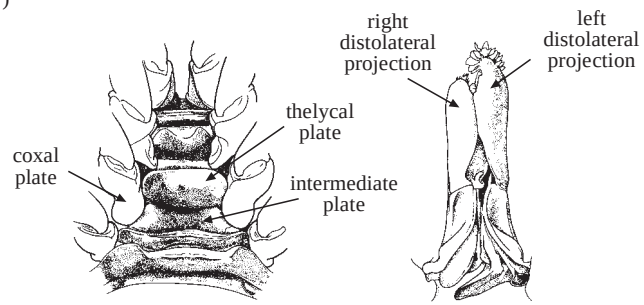
En - Northern velvet shrimp; **Fr** - Crevette chamois nordique; **Sp** - Camarón gamuza norteño.

Maximum body length 11.5 cm (females) and 7 cm (males). Over muddy to sandy bottoms, from depths of 5 to 30 m. Taken by trawls. A common bycatch in the prawn fishery operating in its range, but of minor commercial importance, due to its small size. Marketed fresh or frozen together with other small species and used for local consumption. Restricted to the waters between New Guinea and Australia.



(after Dall, 1957)





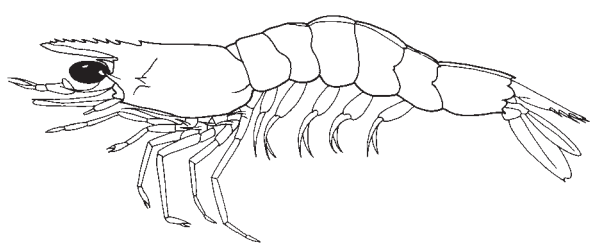
thelycum **petasma (ventral view)**

(after Crosnier, 1994)

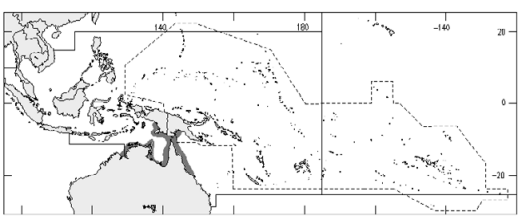
Metapenaeopsis rosea Racek and Dall, 1965

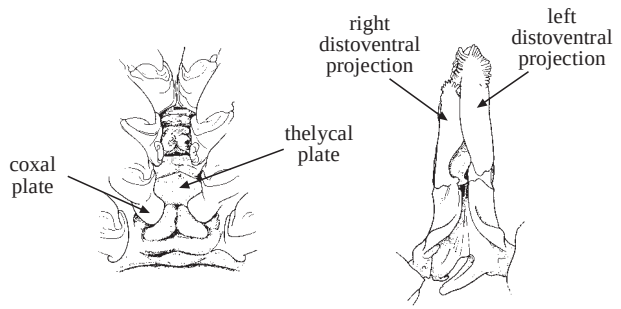
En - Pink velvet shrimp; **Fr** - Crevette chamois rosée; **Sp** - Camarón gamuza rosado.

Maximum body length 12.2 cm (females) and 11 cm (males). On muddy bottoms, from depths of 7 to 52 m. Restricted to the waters between New Guinea and Australia. Not abundant and of very limited commercial importance.



(from Crosnier, 1994)





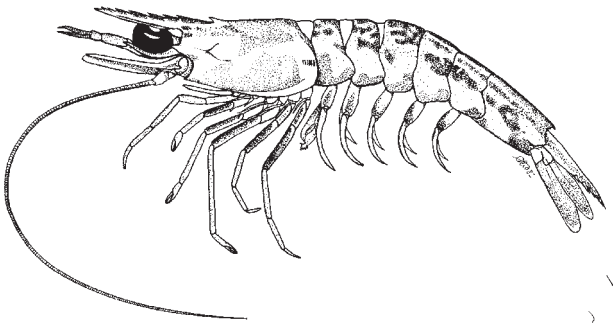
thelycum **petasma (ventral view)**

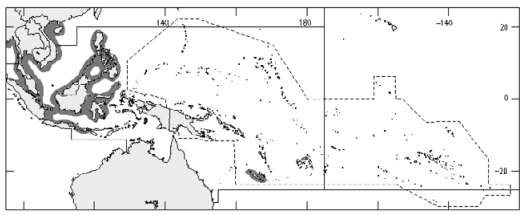
(after Crosnier, 1994)

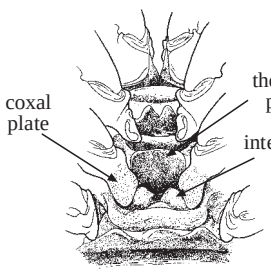
Metapenaeopsis stridulans (Alcock, 1905)

En - Fiddler shrimp; **Fr** - Crevette violoneux; **Sp** - Camarón violinista.

Maximum body length 10.6 cm (females) and 8.9 cm (males); commonly between 6 and 9 cm. On sandy or muddy bottoms, from depths of 9 to 90 m. Taken by trawls, gill nets, seines, and artisanal gear. Of limited commercial importance and apparently nowhere abundant in the area. Marketed mainly fresh for local consumption. Indo-West Pacific from the Persian Gulf to the South China Sea and New Caledonia.







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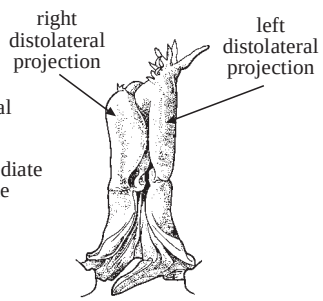


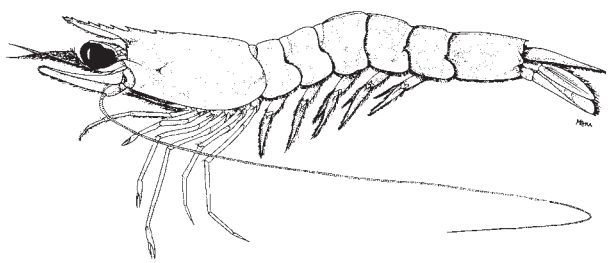
petasma (ventral view)

(after Crosnier, 1994)

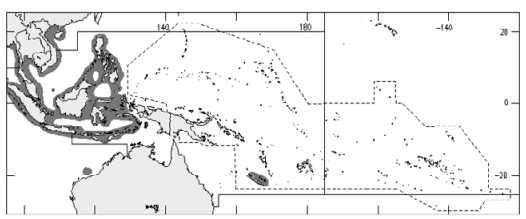
Metapenaeopsis toloensis Hall, 1962

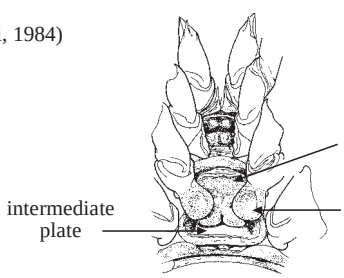
En - Tolo velvet shrimp; **Fr** - Crevette chamois tolo; **Sp** - Camarón gamuza tolo.

Maximum body length 10 cm (females) and 8 cm (males); commonly between 6 and 9 cm. On sandy or muddy bottoms, from depths of 8 to 73 m. Taken by trawls and artisanal gear. Not particularly common in the area and of minor or no commercial importance. Marketed mainly fresh for local consumption. Indo-West Pacific from the Maldives to Japan and New Caledonia.



(after Motoh and Buri, 1984)





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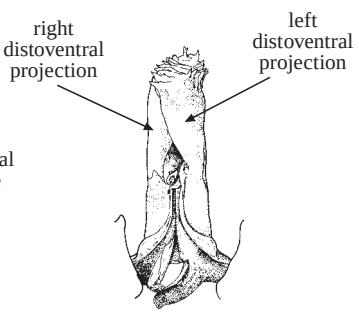


petasma (ventral view)

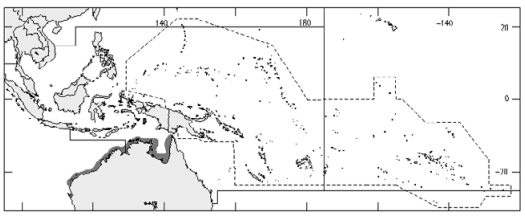
(after Crosnier, 1994)

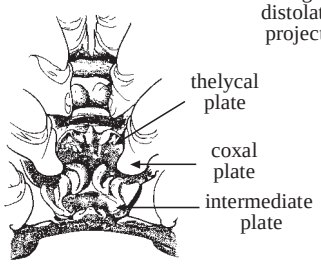
Metapenaeopsis wellsi Racek, 1967

En - Velvet shrimp.

Maximum body length 11 cm (females) and 11.8 cm (males). At depths between 13 and 78 m. Restricted to northern Australia from Shark Bay (Western Australia) to Gulf of Carpentaria (Queensland). Of minor commercial importance, taken as bycatch in trawls. Marketed fresh or frozen for local consumption.

(from Crosnier, 1991)





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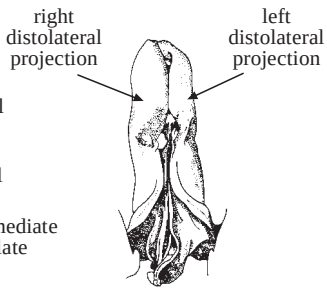


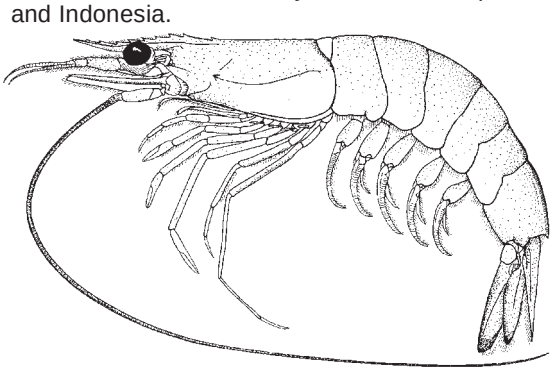
petasma (ventral view)

(after Crosnier, 1991)

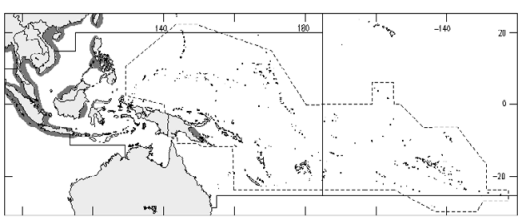
Metapenaeus affinis (H. Milne Edwards, 1837)

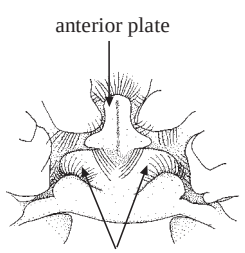
En - Jinga shrimp; **Fr** - Crevette jinga; **Sp** - Camarón jinga.

Maximum body length 18.6 cm for females (perhaps to 22.2 cm) and 14.6 cm for males; commonly between 10 and 14 cm. On mud or sandy-mud bottoms, from the coastline to depths of about 90 m, usually less than 55 m. Juveniles generally are found in estuaries and backwaters. Caught by trawlers, traps, seine nets, and artisanal gear. Marketed fresh or frozen, probably mainly for local consumption. Widespread in the Indo-West Pacific from the Persian Gulf to Taiwan Province of China, the Philippines, and Papua New Guinea. Can be easily confused with *Metapenaeus ensis* and seems to occur mainly in the western part of the area, from Viet Nam to Thailand, Malaysia, and Indonesia.



merus of fifth leg (male)





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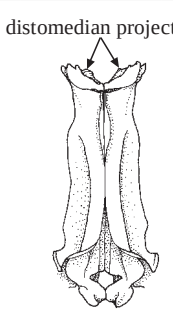
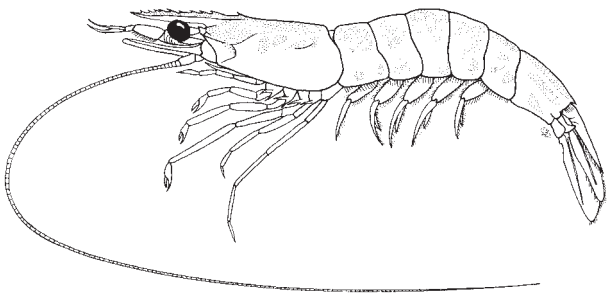


petasma (ventral view)

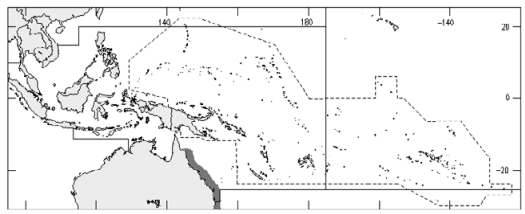
Metapenaeus benettae Racek and Dall, 1965

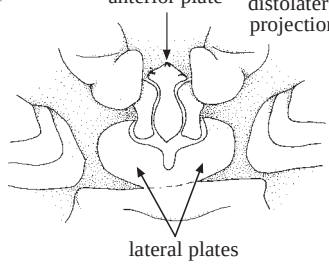
En - Greentail shrimp; **Fr** - Crevette queue verte; **Sp** - Camarón rabo verde.

Maximum body length 13 cm (females) and 10.5 cm (males). Found mainly on soft mud bottoms in estuaries, coastal lakes, and rivers, to a depth of 22 m. Juveniles generally inhabit upstream waters, mangrove canals or intertidal seagrass areas of low salinity and abundant algal cover. Caught by beam trawls in rivers and otter trawl in coastal waters, sometimes also by cast nets. Of commercial importance in eastern Australia, above all in southeastern Queensland (about 650 t in the annual period of 1989/1990). Marketed mainly fresh and consumed locally, also used as bait. Restricted to eastern Australia, from Rockhampton (Queensland) to eastern Victoria.



merus of fifth leg (male)





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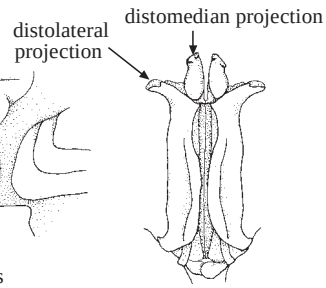
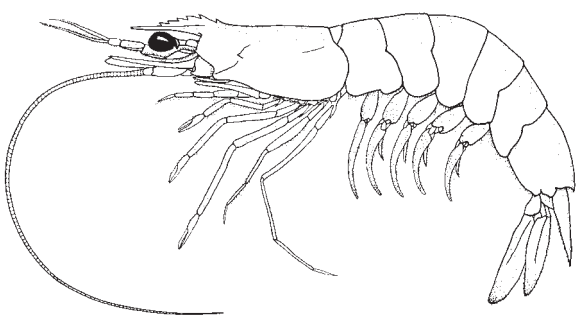


petasma (ventral view)

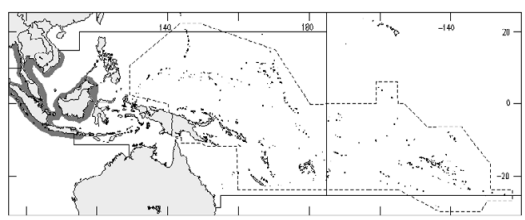
Metapenaeus brevicornis (H. Milne Edwards, 1837)

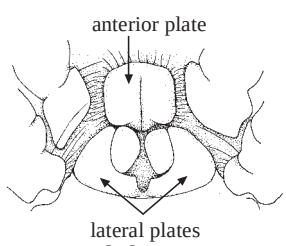
En - Yellow shrimp; **Fr** - Crevette jaune; **Sp** - Camarón amarillo.

Maximum body length 13.2 cm (perhaps to 15.2 cm) for females and 9.8 cm for males. A marine to almost fresh-water species, found on sand or mud to depths of about 90 m, usually less than 30 m. Juveniles generally found in estuaries, backwaters, and deltas. A common species in the western part of the area. Mainly fished by set nets, traps, cast nets, scoop nets, drag nets, and artisanal gear, sometimes also by trawls. Often enters *Penaeus* culture ponds in Thailand, Singapore, Indonesia, and Viet Nam, and is harvested together with the cultured species. Marketed usually fresh or frozen, probably mainly for localconsumtion. Indo-West Pacific from Pakistan to Viet Nam, and Indonesia.



merus of fifth leg (male)





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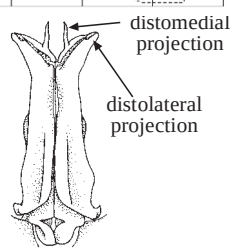
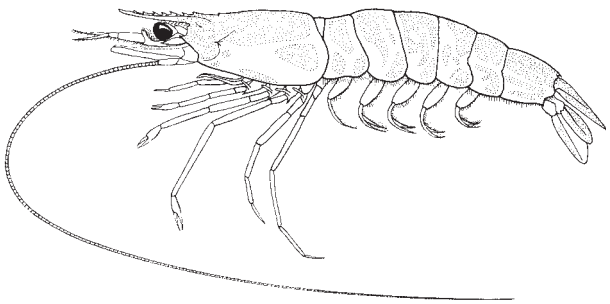


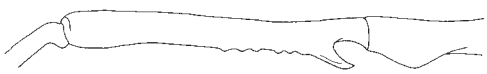
petasma (ventral view)

Metapenaeus conjunctus Racek and Dall, 1965

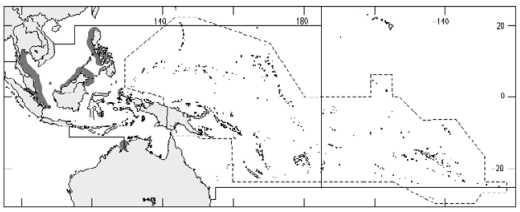
En - Wood shrimp; **Fr** - Crevette bois; **Sp** - Camarón leña.

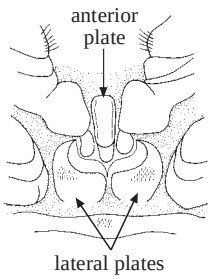
Maximum body length 14.3 cm (females) and 11.5 cm (males). Inhabits estuarine and brackish waters to depths less than 15 m. Taken by traps and seines. Generally not very common and of minor commercial importance. Found mainly mixed in the catches of *Metapenaeus ensis* or other species of the genus. Western Pacific from Thailand to Malaysia, Singapore, Indonesia, the Philippines, and northern Australia.





merus of fifth leg (male)





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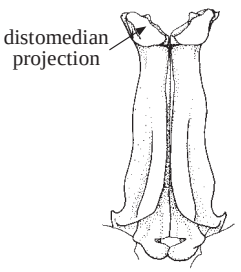
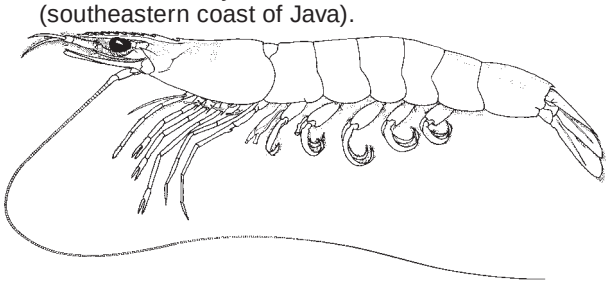


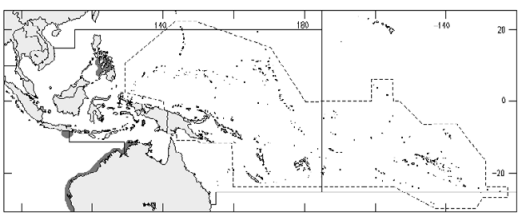
petasma (ventral view)

Metapenaeus dalli Racek, 1957

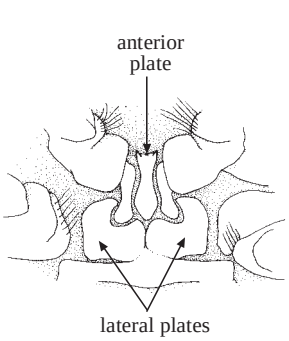
En - Western school shrimp; **Fr** - Crevette dali; **Sp** - Camarón dalí.

Maximum body length 9.8 cm (females) and 7.8 cm (males). On bottoms of mud and sand in estuarine and brackish waters, to a depth of about 33 m. Caught mainly with hand nets, also by seines and traps. Not common in the area and of very limited commercial importance, due to its small size. Mainly known from western Australia but also found in the Philippines and Indonesia (southeastern coast of Java).





merus of fifth leg (male)



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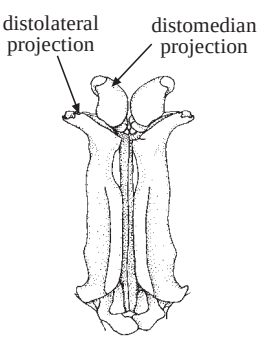
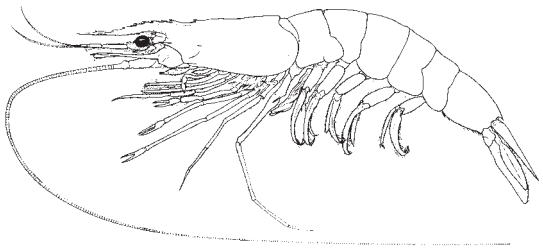


petasma (ventral view)

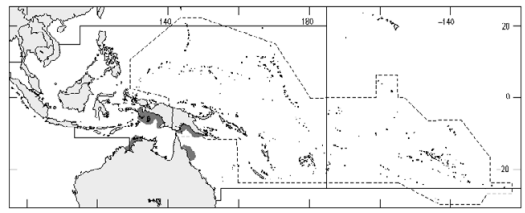
Metapenaeus demani (Roux, 1921)

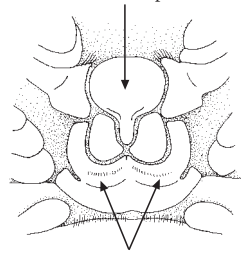
En - Demon shrimp; **Fr** - Crevette diable; **Sp** - Camarón diablo.

Maximum body length 12.2 cm (females) and 10.4 cm (males). Over muddy bottoms in estuarine and coastal waters, to a depth of 50 m, usually less than 30 m. Caught mainly by trawl nets and artisanal gear. Of some commercial importance in the Gulf of Papua prawn fishery where it constitutes about 50% of the shrimp catches. Probably mainly consumed locally. Restricted to the waters between New Guinea and Australia (sometimes divided into 2, eastern and western, subspecies).



merus of fifth leg (male)





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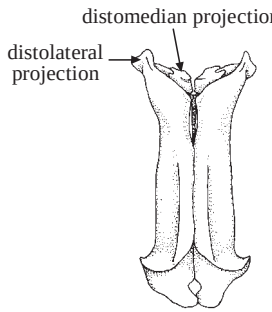
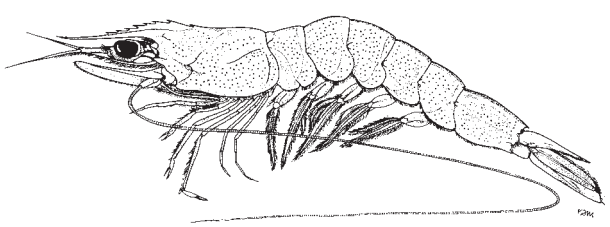


petasma (ventral view)

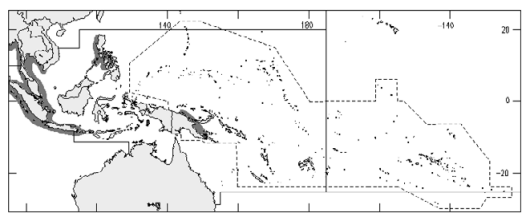
Metapenaeus dobsoni (Miers, 1878)

En - Kadal shrimp; **Fr** - Crevette kadal; **Sp** - Camarón kadal.

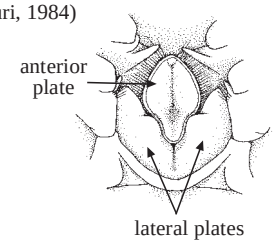
Maximum body length 13 cm (females) and 11.8 cm (males). Occurs mainly in low salinity lagoons and adjacent marine areas on muds to a depth of 37 m. Juveniles inhabit estuarine and backwaters. Caught mainly by trawls, seines, stake nets, and artisanal gear. Generally not very common in the area although reported to be quite abundant in New Guinea and appears in culture ponds in Thailand. Indo-West Pacific from India to the Philippines and New Guinea.



(after Motoh and Buri, 1984)



merus of fifth leg (male)



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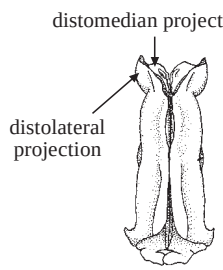


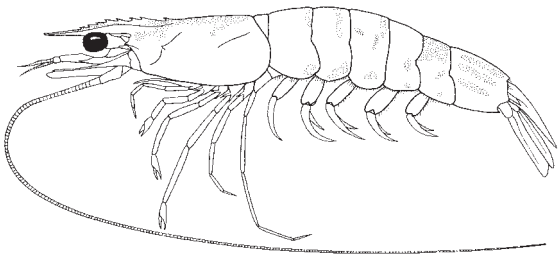
petasma (ventral view)

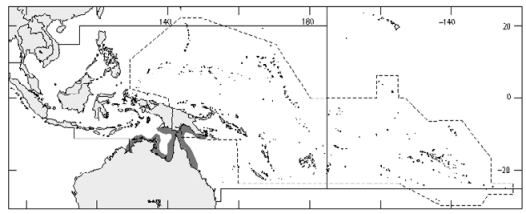
basial spine of third leg (male)

Metapenaeus eboracensis Dall, 1957

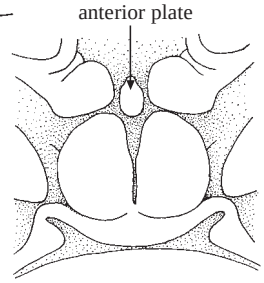
En - York shrimp; **Fr** - Crevette york; **Sp** - Camarón york.

Maximum body length 11.6 cm (females) and 9.8 cm (males). On sandy or muddy bottoms in inshore waters, rivers and estuaries, to a depth of 45 m, usually between 10 and 20 m. Caught by trawls, seines, hand nets, and artisanal gear. Of minor commercial importance, due to its small size. Constitutes only about 5% of the prawn fishery catches in the Gulf of Papua and supports a small amateur fishery in northern Australia. Mainly consumed locally. Restricted to the waters between southern New Guinea and northern Australia.





merus of fifth leg (male)



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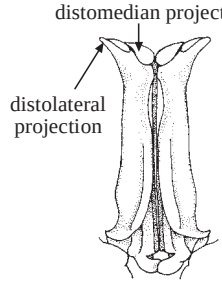
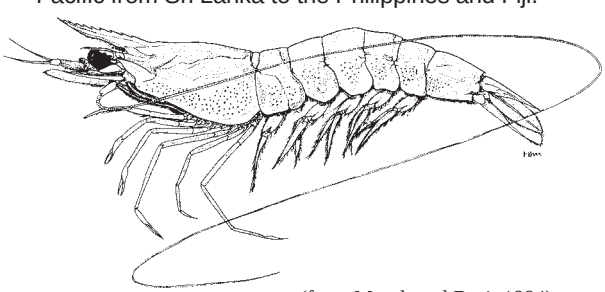


petasma (ventral view)

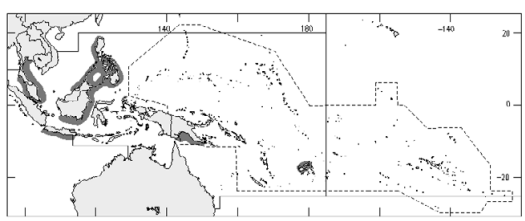
Metapenaeus elegans De Man, 1907

En - Fine shrimp; **Fr** - Crevette élégante; **Sp** - Camarón fino.

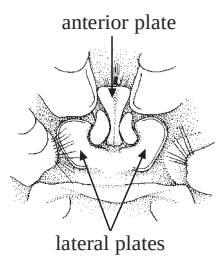
Maximum body length 11.8 cm (females) and 8.4 cm (males). Usually in estuaries, ponds, and inland lagoons with low salinity, but also found at sea to a depth of 55 m, on mud or sandy-mud bottoms. Caught mainly by traps, also by trawls, push nets, set nets, and artisanal gear. Reported to be of limited commercial importance in the area, but can be easily confused with the commercially important *Metapenaeus ensis*; seems to be rather common in markets of the Philippines and probably is more commonly marketed in other countries as well. Marketed mainly fresh for local consumption. Indo-West Pacific from Sri Lanka to the Philippines and Fiji.



(from Motoh and Buri, 1984)



merus of fifth leg (male)



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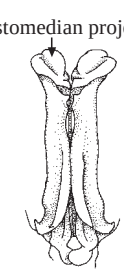
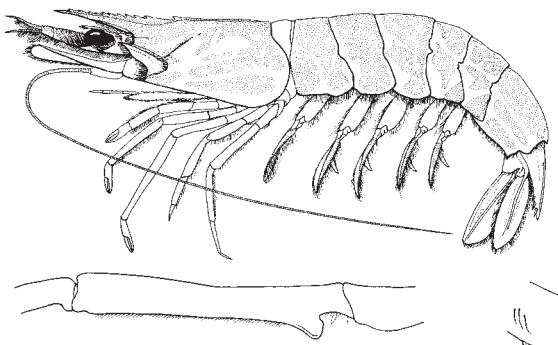


petasma (ventral view)

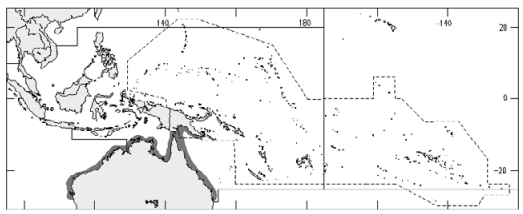
Metapenaeus endeavouri (Schmitt, 1926)

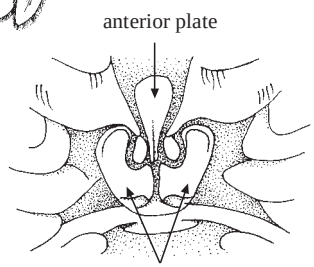
En - Endeavour shrimp; **Fr** - Crevette devo; **Sp** - Camarón devo.

Maximum body length 17.5 cm (females) and 14 cm (males). On sandy or sandy-mud bottoms, found from the coastline to depths of 50 or 60 m. Juveniles generally associated with seagrass areas in shallow estuaries. Caught mainly at night by demersal otter trawls, sometimes also by beam trawls. Caught commercially in northern Australia, with a catch of about 2 400 t (together with *Metapenaeus ensis*), catches from western Australia not included, in the annual period of 1989/1990. Marketed mainly frozen, cooked or salted, sometimes used as bait; consumed locally and also exported. In 1995, the reported aquaculture production of this species (probably a misidentification of *Metapenaeus anchistus*) in the Philippines amounted to 1 295 t (FAO Aquaculture Production Statistics). Restricted to northern Australia and the Gulf of Papua.



merus of fifth leg (male)





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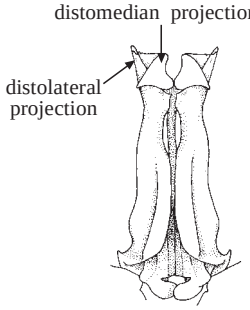
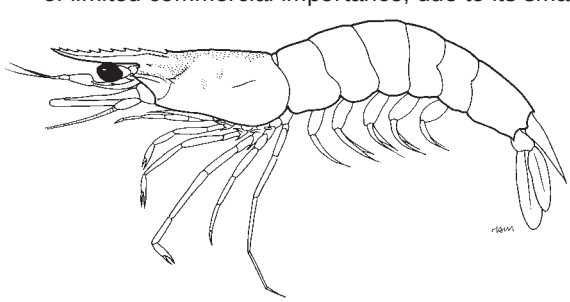


petasma (ventral view)

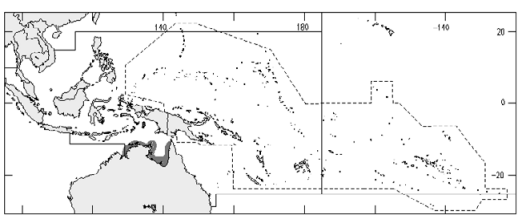
Metapenaeus insolitus Racek and Dall, 1965

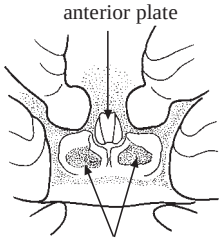
En - Emerald shrimp; **Fr** - Crevette émeraude; **Sp** - Camarón esmeralda.

Maximum body length 12 cm (females) and 8 cm (males). Over muddy or sandy bottoms in inshore waters, including creeks and estuaries, to a depth of 35 m, usually less than 8 m. Mainly caught by hand nets in amateur fisheries and consumed locally. Moderately abundant in inshore habitats, but of limited commercial importance, due to its small size. Restricted to northern Australia.



(after Racek and Dall, 1965)





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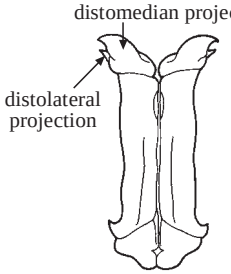
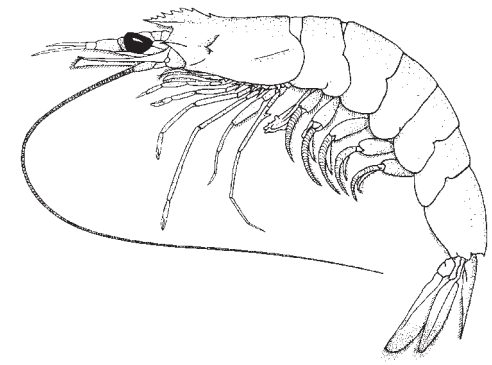


petasma (ventral view)

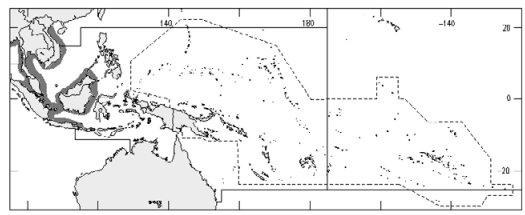
Metapenaeus lysianassa (De Man, 1888)

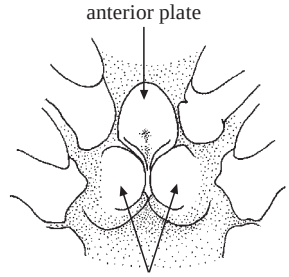
En - Bird shrimp; **Fr** - Crevette oiseau; **Sp** - Camarón parancero.

Maximum body length 9 cm (females) and 6.1 cm (males). On muddy bottom in inshore waters, to depths of about 28 m. Caught by stake nets, traps, set nets, push nets, seines, and trawls. Abundant in the western part of the area, but of secondary commercial importance, due to its small size. Marketed fresh, frozen, or dried and mainly for local consumption. Indo-West Pacific from India to Viet Nam, Malaysia, and Indonesia.



merus of fifth leg (male)





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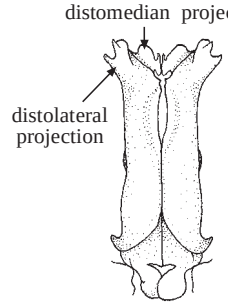
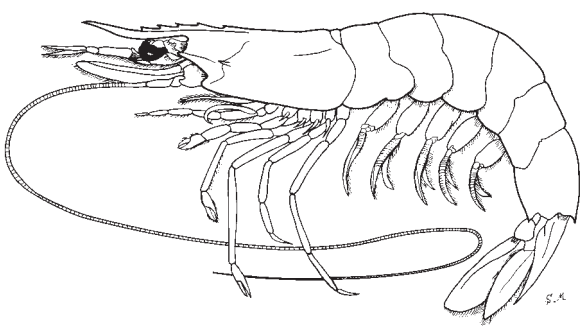


petasma (ventral view)

Metapenaeus macleayi (Haswell, 1879)

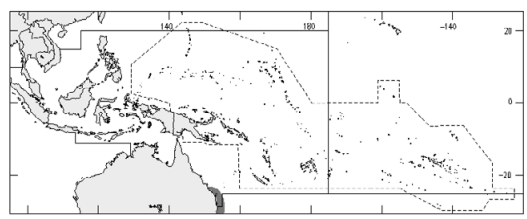
En - Eastern school shrimp; **Fr** - Crevette de maclay; **Sp** - Camarón maclayo.

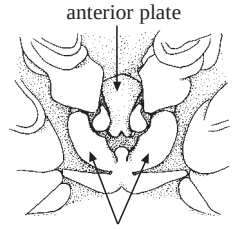
Maximum body length 17.5 cm (females) and 14.6 cm (males). In estuaries and inshore waters, to a depth of 55 m. Juveniles inhabit seagrass areas within estuaries. Caught by means of trawling (mainly), hauling, and seining; also obtained on the basis of small-scale aquaculture. Of commercial importance in eastern Australia, but its catch in Queensland was only about 100 t in the annual period of 1989/1990. Marketed cooked or uncooked ("green"), mainly for local consumption. Restricted to eastern Australia, from Tin Can Bay (Queensland) to Corner Inlet (Victoria).



(after Miguel, 1982)

merus of fifth leg (male)





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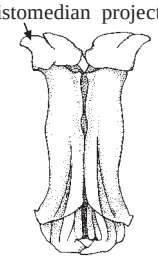
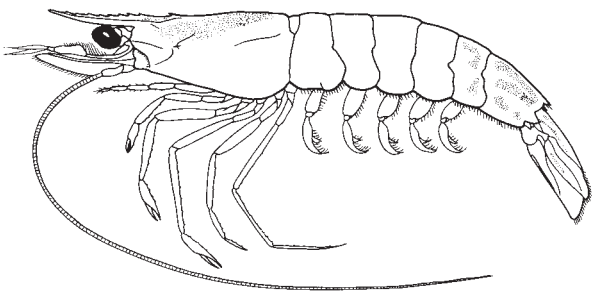


petasma (ventral view)

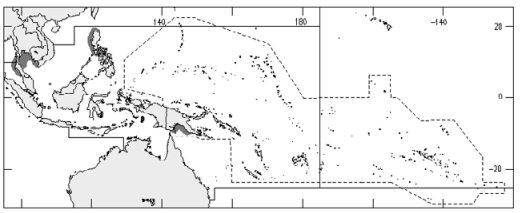
Metapenaeus papuensis Racek and Dall, 1965

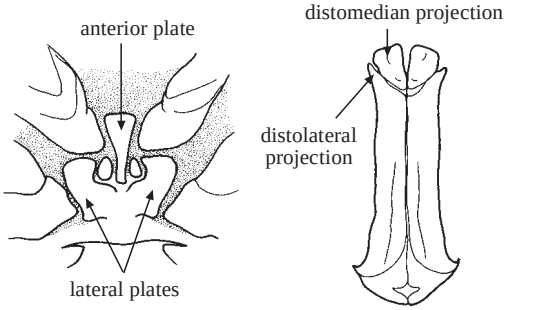
En - Papua shrimp; **Fr** - Crevette papou; **Sp** - Camarón papuense.

Maximum body length 11.8 cm (females) and 8.6 cm (males). Found in estuaries and inshore waters to depths of about 60 m. Probably not very common and without commercial importance. Very similar to *Metapenaeus elegans*. Indo-West Pacific, reported from the Philippines, Thailand, New Guinea, and probably also found in the Bay of Bangal.



(after Miguel, 1982)



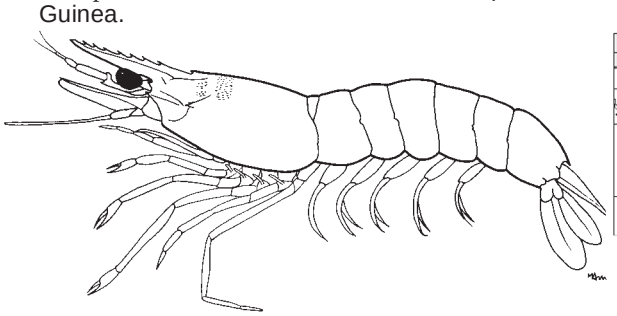


(after Miguel, 1982)

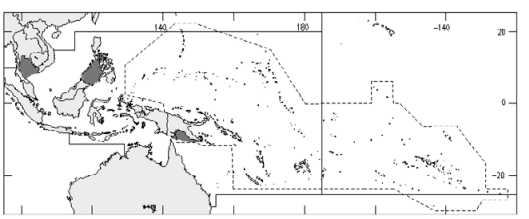
Metapenaeus suluensis Racek and Dall, 1965

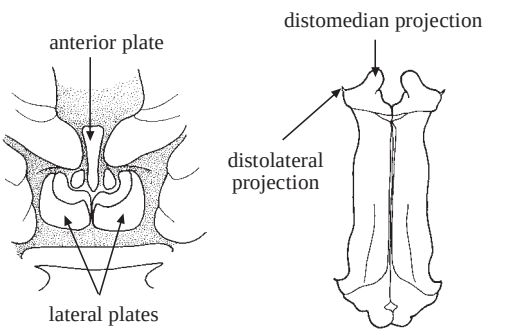
En - Sulu shrimp.

Maximum body length 12 cm (females) and 9.9 cm (males). Found from the coastline to depths of about 40 m. Probably not very common and without commercial importance. Very similar to *Metapenaeus ensis*. Indo-West Pacific, reported from the Philippines, Gulf of Thailand, and New Guinea.



(after Racek and Dall, 1965)



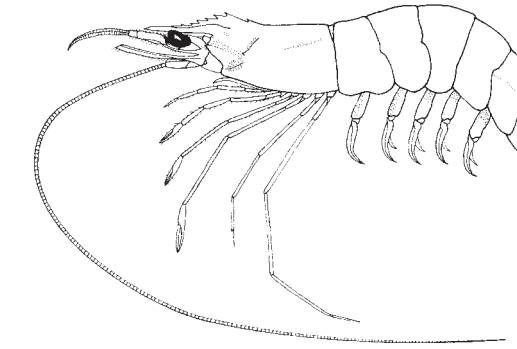


(after Miguel, 1982)

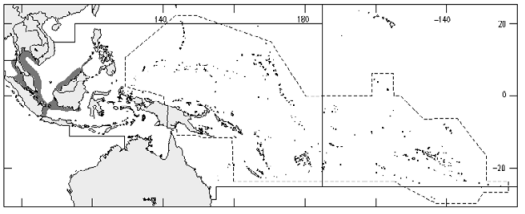
Metapenaeus tenuipes Kubo, 1949

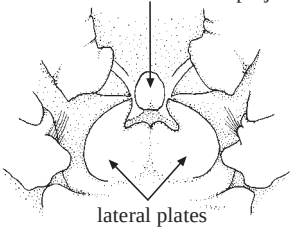
En - Stork shrimp; **Fr** - Crevette cigogne; **Sp** - Camarón cigueña.

Maximum body length 9.5 cm (females) and 7.5 cm (males). Occurs from the coastline and brackish waters to a depth of 30 m. Caught by trawls, set nets, traps, seines, and artisanal gear. Commonly found in the western part of the area, but nowhere very abundant and mainly forms a bycatch in prawn fisheries. Marketed fresh or frozen, mainly consumed locally. Western Pacific from Thailand to Malaysia, Singapore, and Indonesia.



merus of fifth leg (male)





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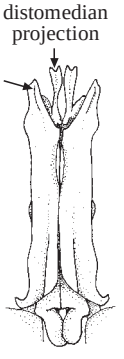


ventral view

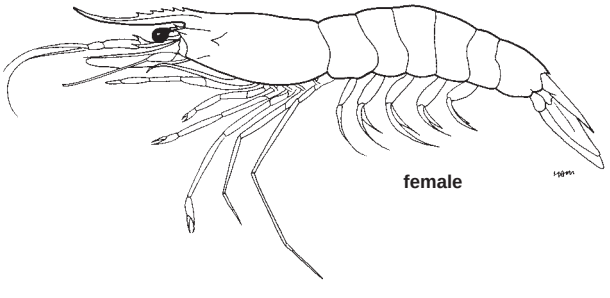
distal part in lateral view

petasma

Parapenaeopsis arafurica Racek and Dall, 1965

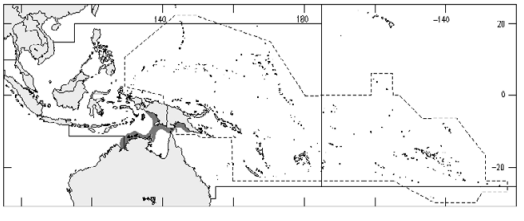
En - Arafura shrimp; **Fr** - Crevette arafura; **Sp** - Camarón arafura.

Maximum body length 14 cm (females) and 8 cm (males). Found over soft mud bottoms at depths from 5 to 30 m. Caught mainly as bycatch in trawls. Apparently not very common and of no commercial importance. Restricted to the area between New Guinea and northern Australia.



female

(after Racek and Dall, 1965)

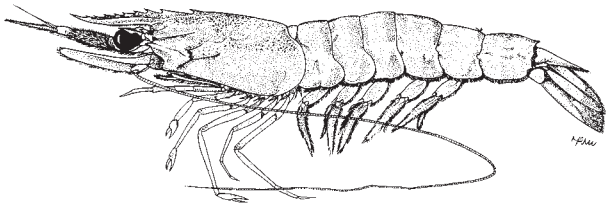


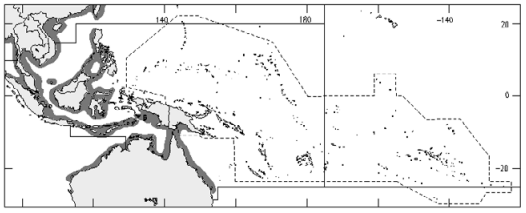
male

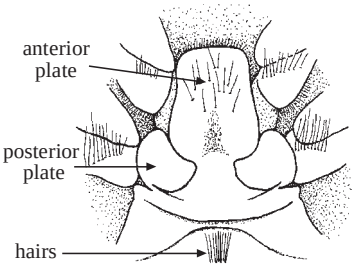
Parapenaeopsis cornuta (Kishinouye, 1900)

En - Coral shrimp; **Fr** - Crevette corail; **Sp** - Camarón coral.

Maximum body length 10 cm (females) and 8.5 cm (males), commonly between 5 and 8 cm. Generally inhabits river mouths and estuaries, but sometimes found at sea to depths of about 40 m, on bottom of sandy-mud or mud. Caught by trawls, seines, stake nets, and artisanal gear. Reported to be found occasionally in large quantities in Thailand and the Philippines. However, as this species can be easily confused with *Parapenaeopsis maxillipedo*, its abundance in the area remains uncertain. Indo-West Pacific from the western coast of India to Japan and northern Australia.







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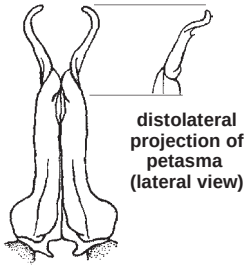


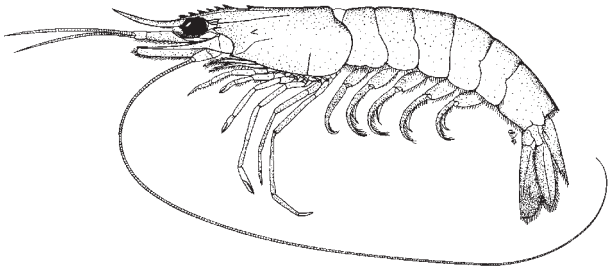
petasma (ventral view)

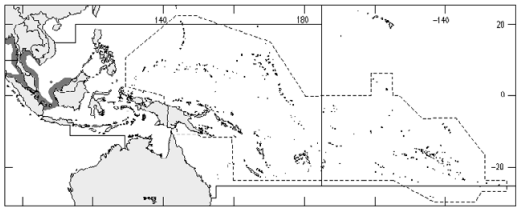
(after Motoh and Buri, 1984)

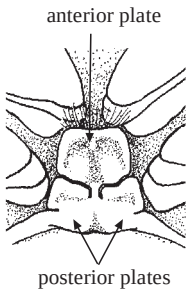
Parapenaeopsis coromandelica Alcock, 1906

En - Coromandel shrimp; **Fr** - Crevette coromandel; **Sp** - Camarón coromandel.

Maximum body length about 12 cm (males and females). Found in shallow waters to a depth of about 11 m, mainly on mud. Caught mainly by seine nets and shrimp gill nets, also by artisanal gear. Probably not very common in the Western Central Pacific, although reported to be moderately abundant at the northwestern coast of Malaysia and along the western coast of Thailand. Indo-West Pacific from southern India to the Gulf of Thailand, Indonesian Archipelago, and Borneo.







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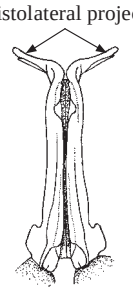
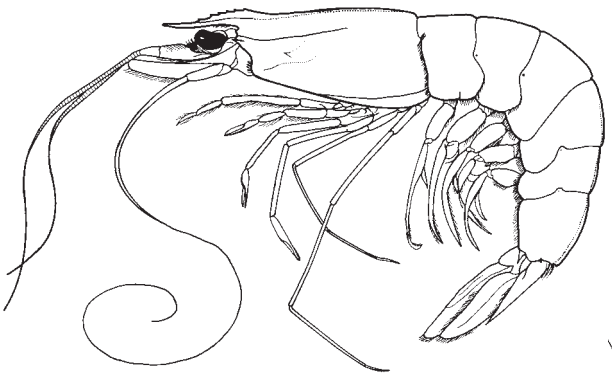


petasma (ventral view)

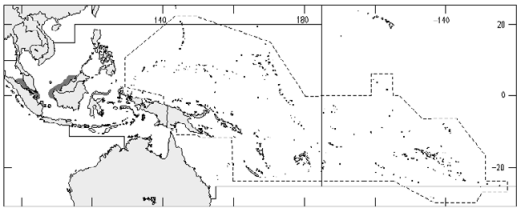
Parapenaeopsis gracillima Nobili, 1903

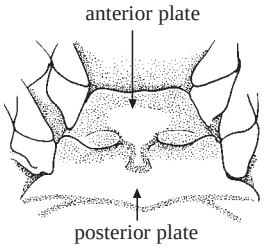
En - Thin shrimp.

Maximum body length about 7 cm for females, males smaller. Prefers sandy bottoms, occasionally also on mud, at depths from 30 to 60 m. Caught by trawlers. Probably not common and of no commercial importance. Only known from the Strait of Malacca and northern Borneo of Malaysia.



(after Hall, 1962)





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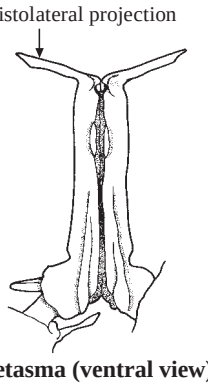
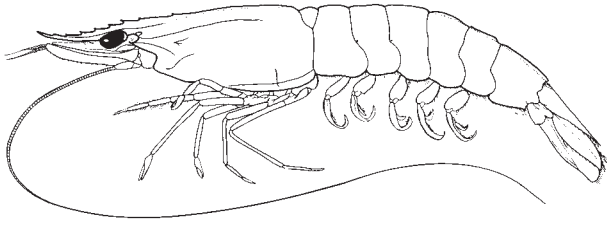


petasma (ventral view)

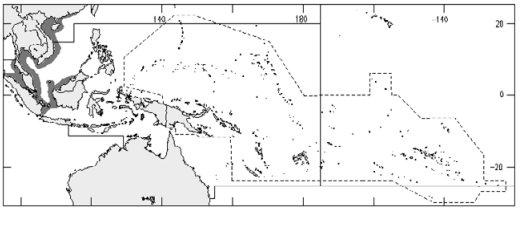
Parapenaeopsis hungerfordi Alcock, 1905

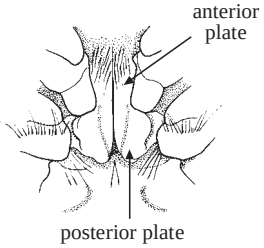
En - Dog shrimp; **Fr** - Crevette chien; **Sp** - Camarón perro.

Maximum body length 10.4 cm (females) and 7.8 cm (males), commonly between 4 and 9.5 cm. Found on mud or sandy mud bottoms, from depths of 5 to 45 m, usually less than 25 m. Taken mainly by trawls. Reported to be one of the dominant species in shrimp catches off northwestern Malaysia, the western coast of Thailand, and off the southern coast of China. Its abundance in the area is uncertain. Marketed fresh or frozen for local consumption. Indo-West Pacific from the western coast of Thailand to Malaysia, Indonesia, and along the southern coasts of China, including Hong Kong.



(after Hall, 1962)





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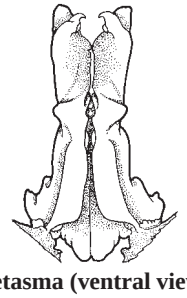
(after Hall, 1961)

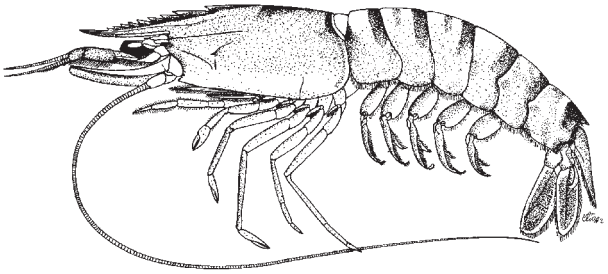


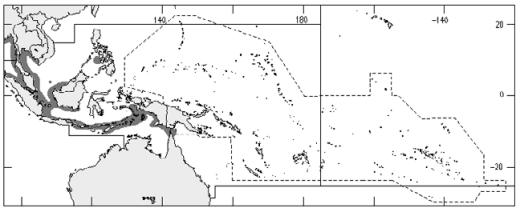
petasma (ventral view)

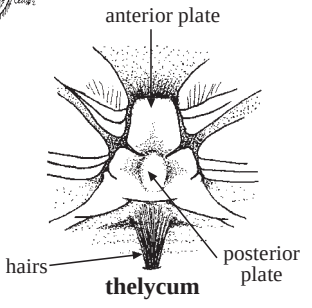
Parapenaeopsis maxillipedo Alcock, 1906

En - Torpedo shrimp; **Fr** - Crevette torpille; **Sp** - Camarón torpedo.

Maximum body length 12.5 cm (females; perhaps to 15 cm) and 10 cm (males). Found at sea in shallow depths of less than 30 m on mud-banks, sometimes also on sandy-mud bottom. Caught by trawls, bottom gill nets, push nets, and shore seines. Reported to be commonly found in commercial catches in Malayan waters. However, as this species is often confused with *Parapenaeopsis cornuta*, its abundance in the area remains uncertain. Indo-West Pacific from the western coast of India to the Philippines and northern Australia.







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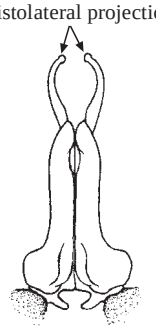
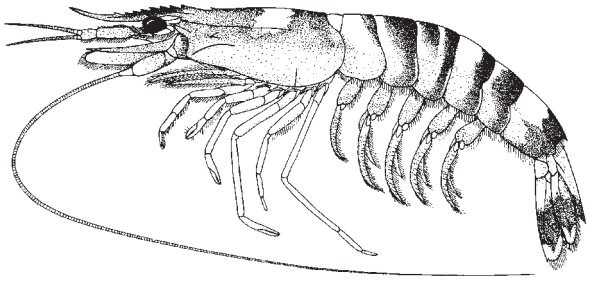


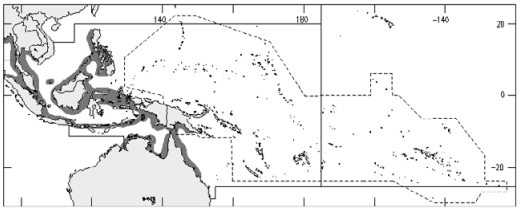
petasma (ventral view)

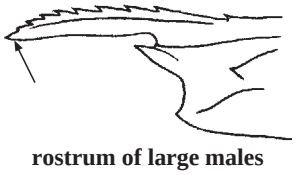
Parapenaeopsis sculptilis (Heller, 1862)

En - Rainbow shrimp; **Fr** - Crevette arc-en-ciel; **Sp** - Camarón arco iris.

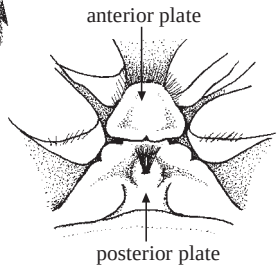
Maximum body length 17 cm (females) and 13 cm (males). Usually inhabits shallow waters from the coastline to depths of about 90 m, but mainly less than 40 m, on sand, mud, or mixed bottoms. Caught mainly by stake nets, seines, and trawls. Reported to be of some commercial importance in Malaysia and Singapore, but its abundance in these areas is uncertain. Relatively common in inshore commercial catches in northern Australia, but only of minor importance and mostly used as bait. Marketed mainly fresh or frozen for local consumption. Indo-West Pacific from Pakistan to the Philippines and northern Australia.







rostrum of large males



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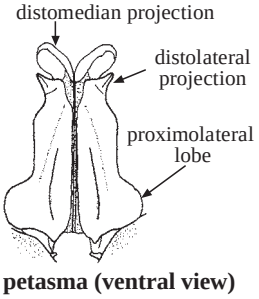
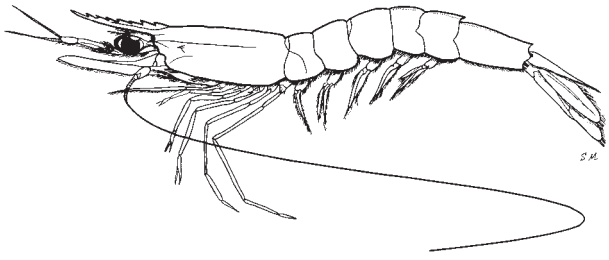


petasma (ventral view)

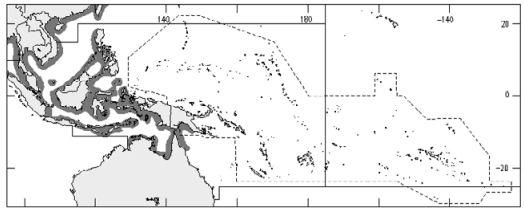
Parapenaeopsis tenella (Bate, 1888)

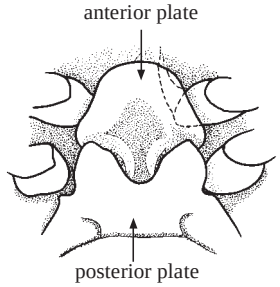
En - Smoothshell shrimp; **Fr** - Crevette glabre; **Sp** - Camarón liso.

Maximum body length 7 cm (females) and 5 cm (males), commonly between 4 and 6 cm. Found from depths of 5.5 to 50 m, but mostly around 10 m, on muddy or sandy mud bottoms. Taken mainly by trawls. Apparently common in the western part of the area, but of very limited commercial importance due to its small size. Marketed fresh for local consumption. Indo-West Pacific from Pakistan to Japan and northern Australia.



(after Motoh and Buri, 1984)





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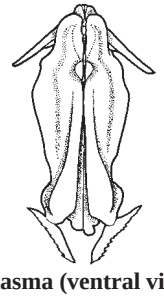
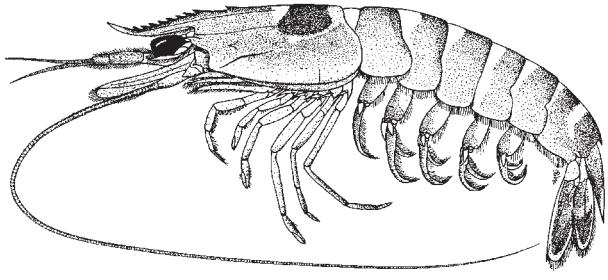


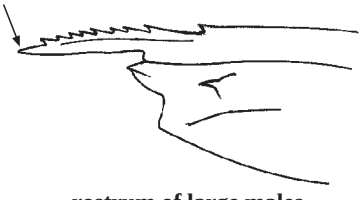
petasma (ventral view)

Parapenaeopsis uncta Alcock, 1905

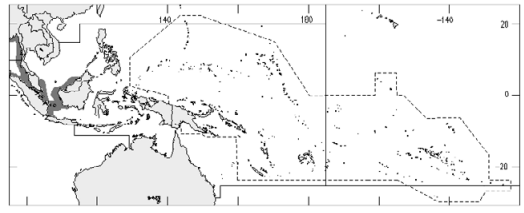
En - Uncta shrimp; **Fr** - Crevette uncta; **Sp** - Camarón uncta.

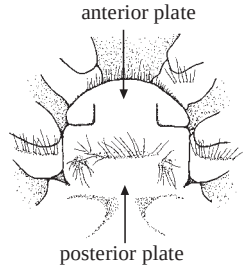
Maximum body length 13 cm (females) and 8.3 cm (males). Found from depths of 40 to 90 m on clean sand, sometimes mixed with shell fragments. Taken by trawls. One of the relatively larger representatives of the genus, but nowhere abundant and only sporadically found in shrimp catches. Marketed mainly fresh or frozen for local consumption. Indo-West Pacific from Kuwait to India, Malaysia, and Indonesia.





rostrum of large males





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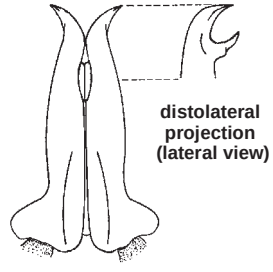
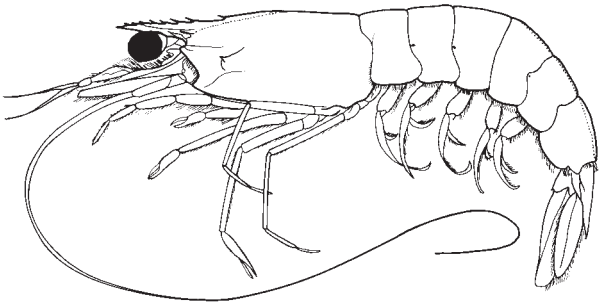


petasma (ventral view)

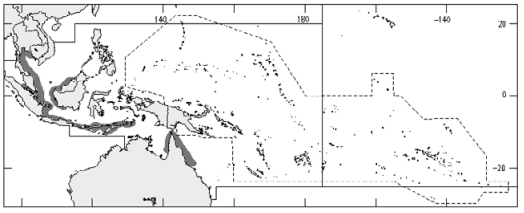
Parapenaeopsis venusta De Man, 1907

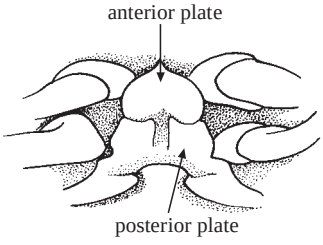
En - Adonis shrimp; **Fr** - Crevette adonis; **Sp** - Camarón adonis.

Maximum body length 4.5 cm. Found from depths of 11 to 44 m on bottoms of sand, shells, stones, and mud. Taken mainly by trawls. Probably not common and of no commercial importance, due to its small size. Western Pacific from the Gulf of Thailand to Malaysia, Indonesia, and Queensland (Australia).



(after Hall, 1962)





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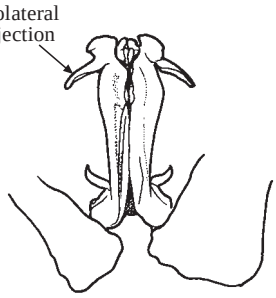


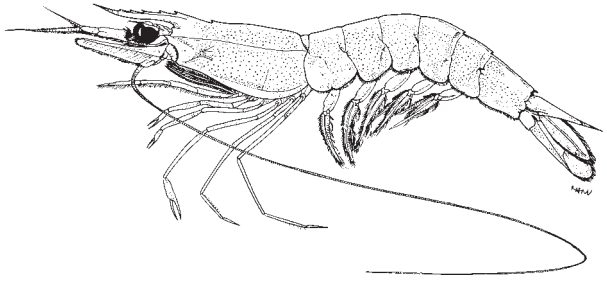
petasma (ventral view)

(after Hall, 1961)

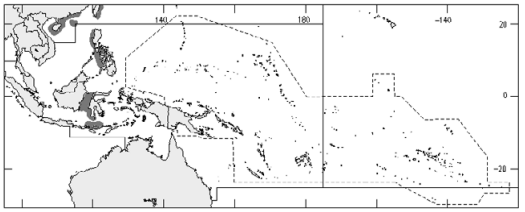
Parapenaeus fissuroides Crosnier, 1986

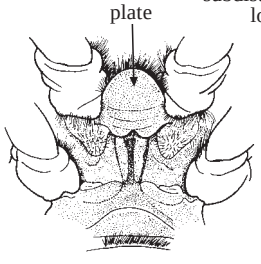
En - False rose shrimp.

Maximum body length 14 cm (females) and 11.7 cm (males), commonly between 7 and 11 cm. Found from depths of 65 to 908 m, mainly between 110 and 400 m, on bottoms of sand, mud, sandy mud, and soft mud. Taken by trawls. Of limited commercial importance and only sporadically taken as bycatch in deeper waters. It may have some economic potential with the development of a deep-sea fishery. Marketed mainly fresh for local consumption. Widely distributed from the eastern coast of Africa to Japan and Indonesia (populations in the Indian Ocean are sometimes considered to be 2 subspecies). Often confused with *Parapenaeus fissurus* and in the past mostly reported under this name.



(after Motoh and Buri, 1984)





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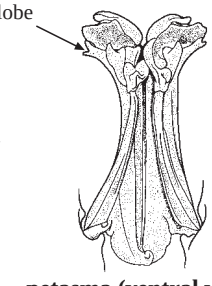
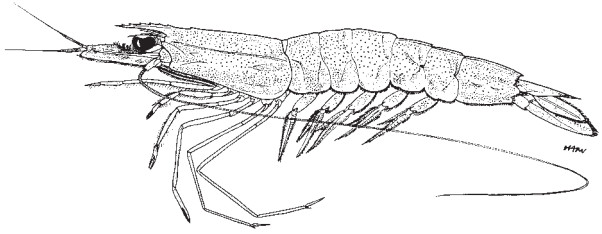


petasma (ventral view)

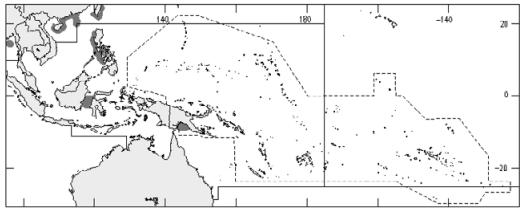
Parapenaeus longipes Alcock, 1905

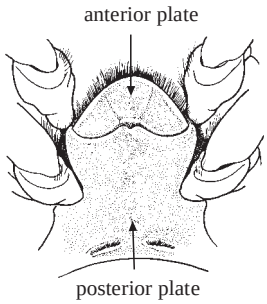
En - Flamingo shrimp; **Fr** - Crevette flamand; **Sp** - Camarón flamenco.

Maximum body length 11.5 cm (females) and 8.5 cm (males), commonly between 5 and 8 cm. Found usually between depths of 30 and 90 m, sometimes to a depth of 165 m. Taken mainly as bycatch in trawls. This species has the shallowest vertical distribution in the genus, but is nowhere abundant and of very limited commercial importance. Marketed mainly fresh for local consumption. Indo-West Pacific from eastern coast of Africa to Japan and New Guinea.



(after Motoh and Buri, 1984)





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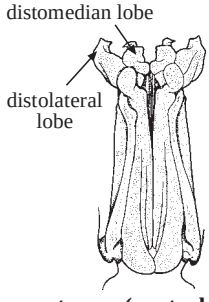
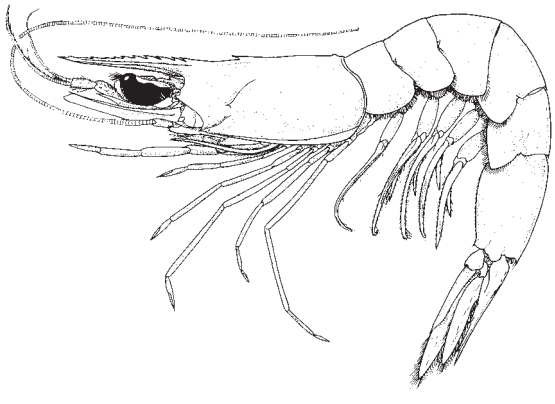


petasma (ventral view)

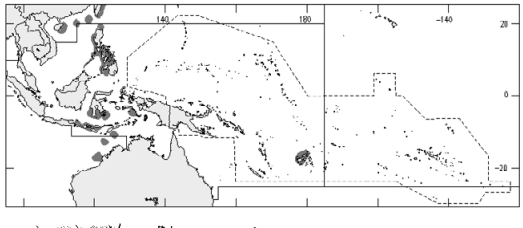
Penaeopsis eduardoi Pérez Farfante, 1977

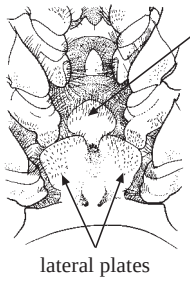
En - Four-spined needle shrimp.

Maximum body length 13 cm (females) and 12 cm (males), commonly between 8 and 11 cm. Found on sandy mud bottoms from depths of 289 to 570 m, usually deeper than 300 m. So far taken mainly during exploratory trawling operations, but sometimes found in large quantities and may therefore have some economic potential with the development of a deep-sea fishery. Western Pacific from Japan to the Timor Sea and Fiji. Can easily be confused with *Penaeopsis rectacuta*.



(after Pérez Farfante, 1977)





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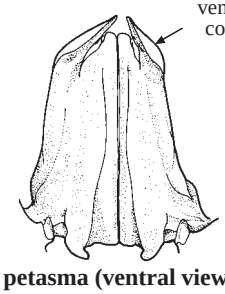
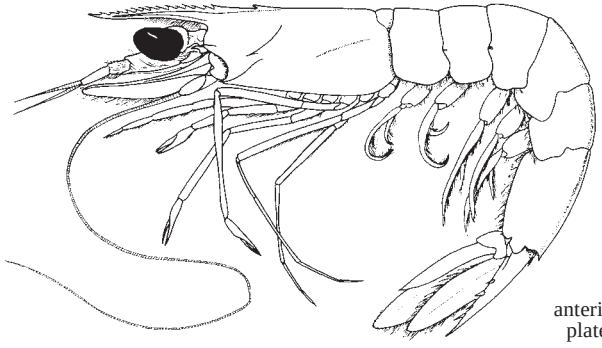


petasma (ventral view)

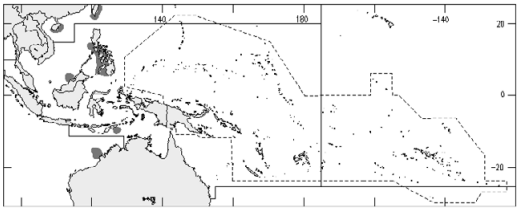
Penaeopsis rectacuta (Bate, 1881)

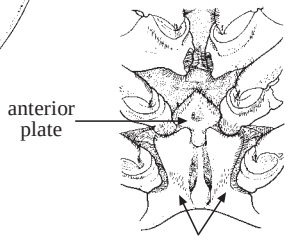
En - Needle shrimp; **Fr** - Crevette aiguille; **Sp** - Camarón aguji.

Maximum body length 13.5 cm (females) and 11 cm (males), commonly between 8 and 11 cm. Found on sandy mud bottom from depths of 174 to 410 m, usually deeper than 300 m. Mainly taken by experimental trawlers, but sometimes found in fair quantities and may therefore have some commercial potential once that a deep-sea fishery is developed in the area. Western Pacific from Taiwan Province of China to the Philippines, South China Sea, and Timor Sea. Often confused with *Penaeopsis eduardoi*.



(after Hall, 1962)





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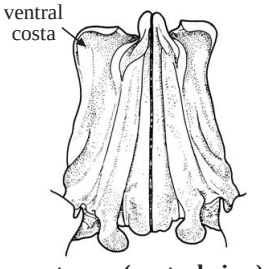


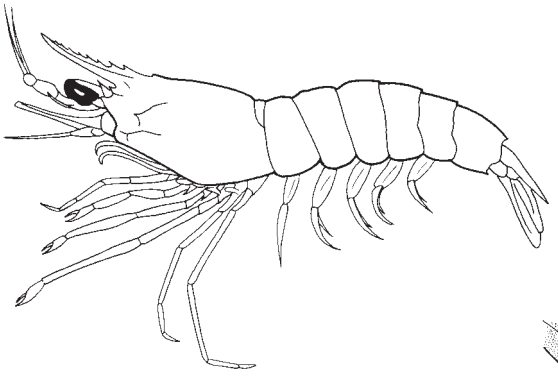
petasma (ventral view)

(after Pérez Farfante, 1979)

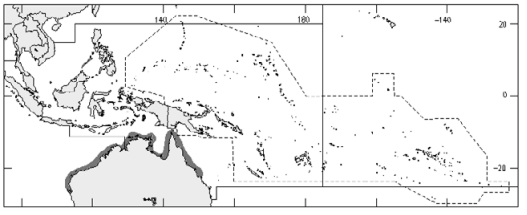
Trachypenaeus anchoralis (Bate, 1881)

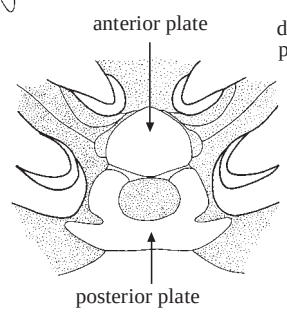
En - Hardback shrimp; **Fr** - Crevette os; **Sp** - Camarón huesudo.

Maximum body length 10.4 cm (females) and 7 cm (males). Found on bottoms of mud to coral debris, from depths of 12.5 to 60 m. Taken mainly by trawls. Caught incidentally in the northern prawn fishery of Australia, but without much economic importance, due to its relatively small size. Generally believed to be restricted to northern Australia from Shark Bay (western Australia) and Keppel Bay (Queensland), but probably also occurs in southern Taiwan Province of China.



(after Dall, 1957)





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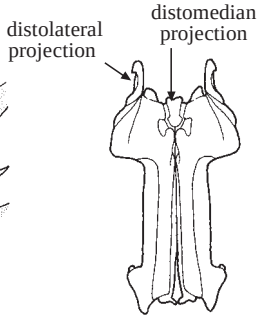
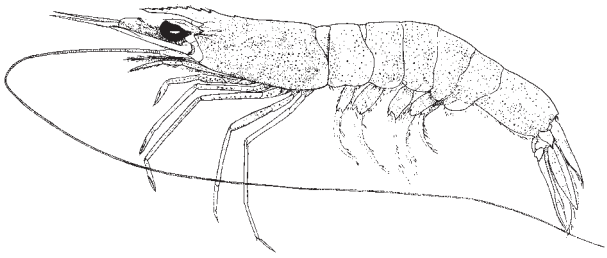


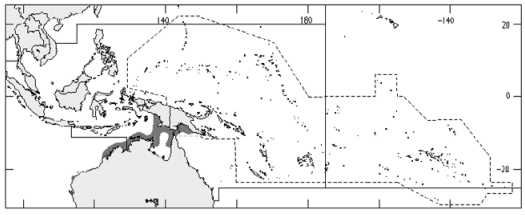
petasma (ventral view)

Trachypenaeus gonospinifer Racek and Dall, 1965

En - Northern rough shrimp; **Fr** - Crevette gambri nordique; **Sp** - Camarón fijador norteño.

Maximum body length 8 cm (females) and 5 cm (males). Found over muddy bottom from depths of 13 to 52 m. Taken as incidental catch by trawlers. Not particularly abundant and without commercial importance, due to its small size. Restricted to the waters between New Guinea and northern Australia.



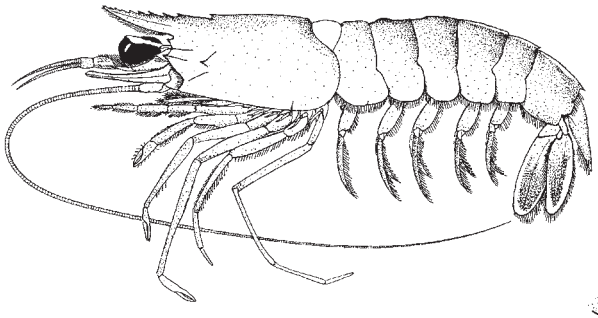


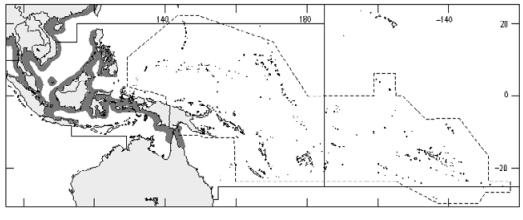
(after Grey, Dall, and Baker, 1983)

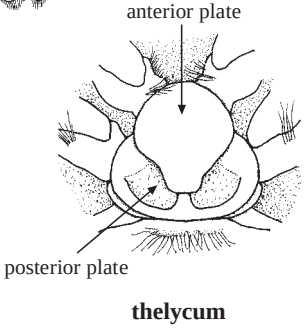
Trachypenaeus granulosus (Haswell, 1879)

En - Coarse shrimp; **Fr** - Crevette gambri grenue; **Sp** - Camarón fijador de granos.

Maximum body length 9.5 cm (females) and 7.2 cm (males), commonly between 6 to 8 cm. Found over bottoms of mud, hard sand or rocks, from depths of 5 to 81 m. Taken as incidental catch, mainly at night by trawlers, also with artisanal gear. Of minor economic importance because of its small size and hard shell. Marketed mainly fresh for local consumption. Indo-West Pacific from Persian Gulf to Taiwan Province of China and northern Australia.







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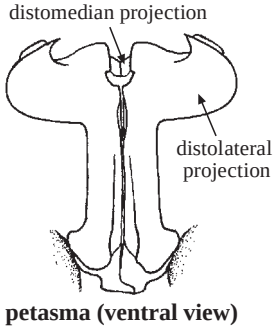

petasma (ventral view)