

CEPHALOPODS

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GENERAL REMARKS

Cephalopoda first appeared about 500 million years ago in the Upper Cambrian and form 1 of the 3 largest classes of the phylum Mollusca. They have bilateral symmetry with a well developed head that contains a circumoral crown of mobile arms, surrounding the mouth, that bear suckers and/or hooks. The mouth has chitinous beak-like jaws and a chitinous tongue-like radula (band of teeth). They share with other molluscs the ability to secrete a shell, which is reduced, modified, or absent and is enclosed by the mantle. However, an external shell occurs in the primitive form *Nautilus*. Cephalopods are soft-bodied animals with their primary skeletal features, a cranium and, in most forms, a mantle support (cuttlebone or gladius), or an internal shell where fins attach, which has an unusual consistency (i.e. cartilage-like structure) and an unusual shape (i.e. a U, V or saddle-shape). One pair of gills is present, although *Nautilus* has 2 pairs. Cephalopods nervous system is highly developed, and has a central brain far larger than other molluscs. The sense organs, especially the well-organized eyes, are elaborate and complex. A funnel expels water from the mantle cavity providing propulsion and expelling waste products. Coloration is variable depending on group and habitat; most forms are provided with numerous chromatophores (pigment sacs) and iridocytes (shiny, reflective platelets) in the skin, so rapid changes in colour and colour patterns are an integral part of their behaviour (Hanlon and Messenger, 1996).

The size of adults' mantle length (ML) ranges from about 8 mm in the family Idiosepididae to over 2.5 m in the giant squid *Architeuthis*. Cephalopods are the most active among molluscs and some squids rival fishes in their swimming speed. Locomotion is achieved by drawing water into the mantle cavity followed by its jet-like expulsion through the funnel and also by crawling along the bottom on the arms (mostly sepioids and octopods). Fins on the mantle provide balance, steering and minor locomotion. Many species of deep water squids adopt a passive life-style using accumulate ammonium salts and reduced musculature to achieve neutral buoyancy.

Two groups of cephalopods exist today: the Nautiloidea, which includes a few species of pearly nautilus restricted to the Indo-Pacific, and the Coleoidea, which includes all other living cephalopods (cuttlefishes, squids, octopods and vampires). No general consensus exists at present on the higher classification of Recent Cephalopods, which is generally accepted and recognized as unstable (see Boletzky, 1999; Young *et al.*, 2010 *ToL*). Various honorable and respected authors have suggested varying arrangements (see Jereb and Roper, 2005); however, it looks like there is a questionable phylogenetic basis for accepting any of these or other schemes (Young *et al.*, 2010). Consequently, rather than accept and promote any particular scheme of classification before consensus and stability are achieved, we will use an operational breakdown that is entirely satisfactory for the objectives of this Guide. For practical purposes we separate the cephalopods into the following groups: Nautiluses, Cuttlefishes, Bobtail squids, Bottletail squids, Pygmy squids, Ram's Horn squid, Myopsid squids, Oegopsid squids, Vampires, Cirrate octopods, and Incirrate octopods. However, research has increased significantly in the past decades and detailed studies on taxonomy are undergoing, currently; genetic analysis and molecular studies also are undergoing. Therefore, a better understanding of the systematic of the group should be achieved in the next future. Cephalopods are exclusively marine animals. Although cephalopods are generally stenohaline, the cuttlefish, *Sepia officinalis* and the squid, *Lolliguncula brevis* are two of the few species known that tolerate low seawater salinity (<16). Over 700 species of living cephalopods are known; about 150 species in 35 families occur in the eastern central Atlantic. Cephalopods occur in all marine habitats: benthic on coral reefs, grass flats, sand, mud and rocks; pelagic and epipelagic in bays, seas and the open ocean. The range of depths extends from 0 to over 5 000 m. Some species, like the vent octopus, *Vulcanoctopus hydrothermalis* are adapted to inhabit areas close to deep hydrothermal vents. Abundance of cephalopods varies (depending on group, habitat and season) from isolated territorial individuals through small schools with a few dozen individuals to huge schools of oceanic species with millions of specimens.

Cuttlefishes and bobtail squids are characteristic of littoral waters. Instead of hiding among stones and rocks, sepioids and sepiolids are able to bury themselves partially or completely to conceal themselves and avoid predation or maximize their efficiency to capture prey. In order to bury themselves, the sediment is blown up using the funnel jet to excavate a depression and using the lateral fins to flick sand over their dorsal surface. They are active, bottom-dwelling predators. The best known genus is *Sepia*, some species of which support important commercial fisheries all over the world, except in the Americas where they are not present. In many members of this genus, the internal chambered shell functions as a buoyancy device.

True squids (Myopsid and Oegopsid squids) consist of a very large and diverse assemblage of families which differ widely in habitat and distribution and include species of great importance to commercial fisheries. Myopsid squids, whose eyes are covered by a translucent membrane and generally have long fins, are typified by squids of the genus *Loligo*. They are coastal animals, sometimes of great seasonal abundance.

They attach spawned egg masses to various substrates on the sea bottom and complete their life cycle in coastal waters. Oegopsid squids, or "opened eyes" squids, include a great number of families, ranging from obscure deep-water species to the short-fin ommastrephid squids of the genera *Illex*, *Todarodes* and *Ommastrephes*, which comprise some of the most important commercial fisheries in the world. Their life-cycle is related to the main oceanic currents systems and areas of nutrient-rich upwellings over the continental shelves. Many ommastrephid squids migrate over large distances, and are able to swim at high velocity. They apparently release large, neutrally buoyant egg masses, and complete their entire life cycle in open waters.

Octopods comprise 2 different forms: the cirrate or finned octopods and the incirrate octopods. The main characteristics of the first group, mainly deep-sea species, are the presence of fins attached to the end of the body and supported by an internal shell, and the presence of cirri alternating with suckers along the arms. Incirrates are about 85% of all octopod species. The Octopodidae, the family with the highest number of species, are benthic and include those species used for most studies in captivity, as well as the most important species from a commercial point of view. The other incirrate families comprise pelagic species. Benthic incirrate octopods live from the intertidal zone to at least 4 000 m depth. Coastal octopuses are widely distributed and epibenthic, living on or close to the bottom. Normally, they are associated with stony or rocky habitats where they can both shelter and find a wide range of invertebrate preys. The octopodids exhibit sophisticated behaviour; the brain of benthic octopuses, with particular reference to the common octopus, *Octopus vulgaris*, has become a model for relating brain structure to function (Nixon and Young, 2003).

The vampire squid is a rather small-sized species, reaching a maximum of 130 mm mantle length, with a very gelatinous body; its consistency is that of a jellyfish. It occupies meso- to bathypelagic depths throughout the tropical and temperate regions of the world's oceans. The second pair of arms is modified into retractile filaments that can extend to lengths well in excess of the total length of the animal and can be retracted into pockets within the web. These filaments, presumably, have a sensory function.

All cephalopods have separate sexes and many, though not all, exhibit external sexual dimorphism, differing either morphologically or in size. Females are generally larger than males (Mangold, 1989). Males of many forms possess 1 or 2 modified arms (hectocotylia) for mating. The hectocotylus may consist of modified suckers, papillae, membranes, ridges and grooves, flaps, etc., but in any case it functions to transfer the sperm packets, or spermatophores, from the male's mantle cavity to a site of implantation on the female; this may be located inside the mantle cavity, around the mantle opening on the neck, in a pocket under the eye, around the mouth, etc. Fertilization takes place not always "in" (i.e. "inside") the female as the eggs are laid. Cuttlefishes lay relatively few, large grape-like eggs that are attached to hard substances and are often coloured in black by a covering of ink deposited by the female at egg-laying. Eggs of squids are generally encased in a gelatinous matrix secreted by the nidamental glands and are deposited as multiple finger-like capsules attached to rocks, shells or other hard substrate on the bottom, in shallow waters, or are extruded as large, singular, sausage-shaped masses that drift in the open sea. These capsules may contain a few to several hundred eggs each, while the sausage-shaped masses contain tens or even hundreds or thousands of eggs. The mode of reproduction and egg-laying is unknown for many cephalopod forms, especially oceanic and deep-sea species. Benthic octopuses lay their eggs in grape-like clusters and strands in lairs, under rocks and in abandoned mollusc shells, where they brood them until they hatch. The eggs are attached to each other but they are not encased in a gelatinous matrix. Females of the pelagic octopod *Argonauta* constructs a thin, shell-like egg case in which they reside and lay festoons of eggs; fertilization occurs from sperm contained in the highly modified hectocotylus that is autotomized by males and deposited in the egg case. Reproductive strategies of cephalopods are very complex (Rocha *et al.*, 2001). Accordingly, depending on the type of ovulation, spawning pattern and growth between egg batches or spawning periods, the following classification is proposed: (a) spawning once (semelparity), consisting of simultaneous terminal spawning, with synchronous ovulation, monocyclic spawning and absence of growth between egg batches, as in *Loligo opalescens*, for example; (b) spawning more than once (iteroparity), including: (i) polycyclic spawning, in which egg-laying occurs in separate batches during the spawning season and growth occurs between production of egg batches and spawning seasons, as in *Nautilus* spp.; (ii) multiple spawning, in which group-synchronous ovulation, monocyclic spawning and growth between egg batches occurs as in *Ommastrephes bartramii*, for example; (iii) intermittent terminal spawning, in which group synchronous ovulation, monocyclic spawning and no growth between egg batches occur, e.g. as in *Sepia officinalis*; (iv) continuous spawning, in which asynchronous ovulation, monocyclic spawning and growth between egg batches occurs, as in many species of the genera *Opisthoteuthis*, *Cirroteuthis* and *Argonauta*. Sexual maturation is under the control of hormones released from small bodies called optic glands, located in the optic tracts (the structures connecting optic lobes to the brain). The onset of sexual maturity is related to environmental factors, mainly to photoperiod and light intensity. In most of the coastal and epipelagic cephalopods, reproduction is seasonal and both males and females die afterwards. Variation of this

monocyclic reproduction and short life span are found or suspected in deep-water benthic octopuses and a range of other species.

Cephalopods have fast growth rates, between 3 and 15% body weight per day. Since protein is used mainly to produce energy, protein assimilation efficiency is high, with protein digestibility apparently greater than 85 to 90%. The life expectancy is about 1 to 2 years in most forms, but larger species of squids and octopuses, for example, the giant squid (*Architeuthis*) and the giant octopus (*Enteroctopus dofleini*), may live for several years. Ageing of cephalopods can be achieved by using different techniques (see Jereb et al., 1991; Loporati et al., 2008; Perales-Raya et al., 2010), but the use of growth increments deposited in statoliths is one of the most suitable. Statoliths are calcareous structures located within the statocysts and are highly evolved structures, responsible for much of the information necessary to monitor and control balance and orientation in a three-dimensional space.

Cephalopod eggs are very yolky, thus cleavage is incomplete and the typical molluscan spiral cleavage is absent. Development is direct and hatchlings are often miniatures of the adult. Thus, no discrete larval stages or metamorphoses occur. Cephalopod mature eggs may vary in size from 0.8 mm in *Argonauta* to about 29 mm long in some *Sepia* species. Time of embryonic development also varies widely, from a few weeks to several months, depending on the species and temperature conditions. Hatching may occur rapidly from a single clutch or be extended over 60% of the life span in continuous spawning species. At hatching, young animals often inhabit different habitats than the adults. For example, the young of many species of benthic octopuses spend periods of time as planktonic organisms before settling to their bottom habitat; these pelagic forms of the first post hatching growth stage, that have a distinctively different mode of life from that of older conspecific individuals, are named "paralarvae". Paralarvae of many species inhabit the upper 100 m of the open ocean, then exhibit an ontogenetic descent, gradually moving to deeper depths with increasing size.

Cephalopods prey actively mainly upon shrimps, crabs, fishes, other cephalopods and polychaetes and, in the case of octopuses, on bivalve molluscs. In turn, cephalopods are major food items in the diets of many large marine predators: toothed whales, dolphins, seals, pelagic birds (penguins, petrels, albatrosses, etc.) and both benthic and pelagic fishes (e.g. sharks, sea basses, lancetfishes, tunas and swordfishes).

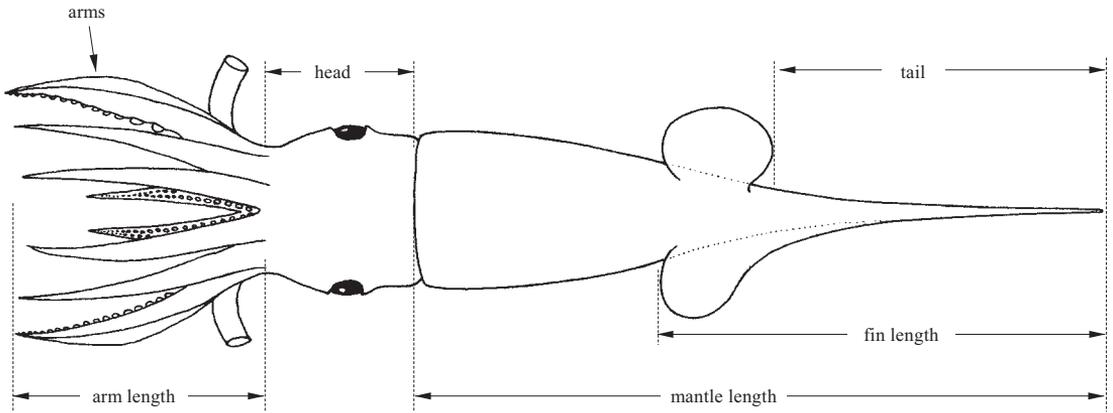
Many species of oceanic cephalopods undergo diel vertical migrations, wherein they occur at depths of about 400 to 800 m during the day, then ascend into the uppermost 200 m or so during the night. While shallow-living cephalopods are able to conceal themselves by chromatophore-produced colour patterns and chameleon-like colour changes, many deep-sea forms camouflage themselves by producing bioluminescent light from light organs (photophores), which conceals their silhouettes against the downwelling light in the dimly-lit mid-depths. Coleoids have an ink sac, which is absent in the majority of deep-sea species. Discharge of ink (almost pure melanine) typically occurs when the animal is startled into an escape reaction or during active pursuit by a predator.

Cephalopods are extremely important as food for human consumption, and well over 3.2 million metric tonnes are caught each year. The fisheries are especially intense in the western Pacific, southwestern Atlantic and in the Mediterranean Sea, to the eastern Atlantic waters. Cephalopods are also important experimental animals in biomedical research with direct application to human. Due to their highly developed brain and sensory organs, cephalopods have a great capacity to learn and remember, which makes them valuable in behavioural and comparative neuroanatomical studies. In addition, cephalopods possess the largest single nerve axons in the animal kingdom; these axons extend to the mantle, and are used extensively in many branches/subjects of neurophysiological research.

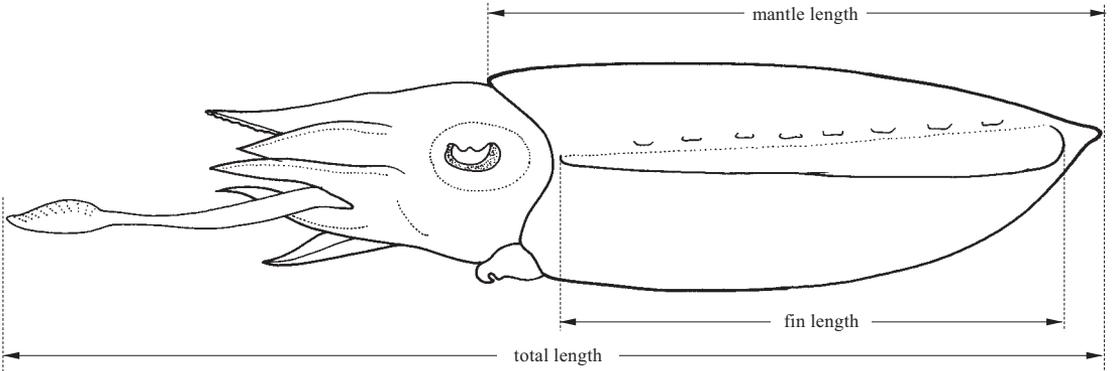
Fishing techniques include small traps, pots, wiers, lures, spears and jigs, gill and seine or lampara nets and midwater and otter trawls. Several species of squids are attracted to light, then jigged or seined. Occasionally, cuttlefishes and octopods are caught in hand-nets or are speared, but it is nearly impossible to capture free-swimming squid in this manner. The bites of some cephalopods, especially octopuses, can be painful at the least and become secondarily infected, but may also be poisonous or, occasionally, lethal (several human deaths have been recorded in Australia due to blue-ringed octopus, *Hapalochlaena*). The poison is secreted by the paired posterior salivary glands, which are a cocktail of enzymes and other secretions injected into the prey via the salivary papilla. Therefore, cephalopods must be handled carefully.

The total commercial catch of cephalopods in the eastern central Atlantic is estimated at around 200 000 tonnes, but the potential for major fisheries for several species is high. Therefore, it is likely that an increasing fishing effort will be focused toward the exploitation of cephalopod resources in this area (e.g. Boyle and Rodhouse, 2005). This, in turn, supports the need to increase our efforts to monitor cephalopod catches and to improve our scientific knowledge on this group. Present understanding of the marine system indicates that removal of cephalopods through fisheries would have a dramatic impact on the environment.

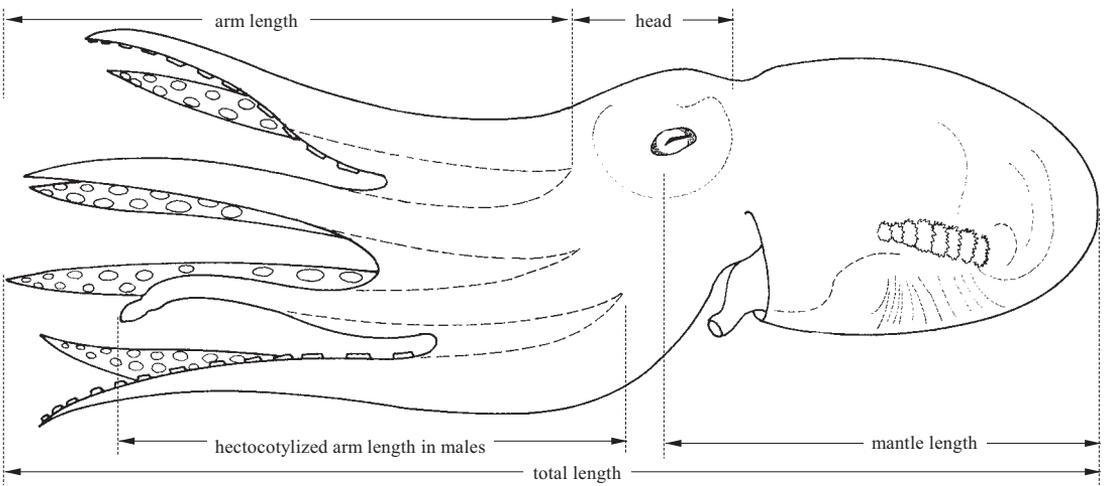
TECHNICAL TERMS AND MEASUREMENTS



a) schematic illustration of a squid



b) schematic illustration of a cuttlefish



c) schematic illustration of an octopus

Fig. 1

ILLUSTRATED GLOSSARY OF TECHNICAL TERMS^{1/}

Abdominal septum – Median septum traversing the posterior mantle cavity parallel to the body axis. It extends from the posterior visceral mass to the ventral mantle wall. The ventral mantle artery runs along the dorsal edge of this septum.

Aboral – Away from or opposite to the mouth.

Abysal – The greatest depths of the ocean: from 2 000 to 6 000 m.

Accessory nidamental glands – Glands consisting of tubules containing symbiotic bacteria. Found in sepioids and loliginid squids (Fig. 25).

Afferent blood vessel – Artery vessel carrying blood toward an organ.

Anal flaps – A pair of fleshy papillae on the lateral sides of the anus involved in directing releases of ink (Fig. 2).

Anal pads – Ovoid pads of unknown function, apparently glandular, located on both sides of the anus in some bobtail squids (sepioids).

Anterior – Toward the head-end or the arm tips.

Antitragus – Knob that projects inward from the posterior surface of the central depression in the funnel locking cartilage of some squids (Fig. 3).

Arm – One of the circumoral appendages of cephalopods. In Decapodiformes (10 circumoral appendages) each member of the fourth pair of arms is modified to form a tentacle. Arms are designated by the numbers I to IV, starting with I as the dorsal (or upper) pair.

Armature – The grappling structures of the arms and tentacles, including both suckers and/or hooks.

Bathypelagic – The deep midwater region of the ocean.

Beak – One of the 2 chitinous jaws of cephalopods. The dorsal beak is the "upper" beak and inserts within the ventral "lower" beak to tear tissue with a scissors-like cutting action.

Benthopelagic – A free-swimming animal that lives just above the ocean floor but rarely rests on the ocean floor.

Brachial – Pertaining to the arms.

Brachial crown – The combination of arms and tentacles that surround the mouth.

Brain – Medial portion of the central nervous system. It includes the subesophageal and supraesophageal masses but generally does not include the large optic lobes.

Branchial – Pertaining to the gills.

Brooding – Incubation of eggs by the parent. A characteristic feature of incirrate octopods but also found in some squid (e.g. **Gonatidae**).

Buccal – Pertaining to the mouth.

Buccal connective – Thin muscular membrane that runs from the buccal support to the base of the adjacent arm (Fig. 4). The position of the attachment of the connective on the fourth (IV) arms is an important character in interpreting phylogenetic relationships among decapodiforms.

Buccal crown – Umbrella-like structure that surrounds the mouth and in turn is enveloped by the brachial crown. It consists of buccal supports and the buccal membrane. The buccal crown is present in most decapodiforms but it is missing in all octopodiforms.

Buccal lappet – see **Buccal support**.

^{1/} According to cephalopod scientific terminology standards (see Roper and Voss; Norman and Hochberg, 2005; Vecchione *et al.* Tol, in progress).

Buccal mass – Muscular bulb at the beginning of the digestive system that contains the mouth, beaks, radula, muscles and pair of salivary glands.

Buccal membrane – The muscular membrane that encircles the mouth like an umbrella. It connects the buccal supports and together with the supports, forms the buccal crown. The pigmentation of the buccal membrane often differs from that of the adjacent oral surfaces of the arms (Fig. 4).

Buccal suckers – Small but normal suckers on the oral surface of the buccal supports in some decapodiforms (Fig. 4).

Buccal support (= Buccal lappet) – One of 6 to 8, large muscular flaps on the buccal crown that surround the mouth. The supports are connected by the buccal membrane. The buccal supports are thought to be homologous with the inner ring of tentacles that surround the mouth of *Nautilus*. May bear suckers (Fig. 4).

Bursa copulatrix – The wrinkled area present in some sepiolids near the female genital opening, for the attachment of the spermatophores; it is more differentiated in members of the subfamily Sepiolinae where it forms a characteristic structure called 'bursa' (Fig. 5).

Caecum – Region of the digestive tract of all cephalopods between the stomach and intestine. It is the primary site of food absorption.

Calcareous (= Calcified) – Composed of calcium carbonate (CaCO_3).

Calamus – The conical papilla at the base of the ligula in the hectocotylus in many incirrate octopods. It is located at the distal termination of the sperm groove and usually lies adjacent to the last arm sucker (Fig. 6).

Carpal-fixing apparatus – see **Carpal-locking apparatus**.

Carpal knobs – Small, rounded, hemispherical, muscular protuberances on the carpus to which carpal suckers from the opposite club adhere during the locking of the clubs (Fig. 7).

Carpal-locking apparatus (= Carpal-fixing apparatus) – Arrangement of suckers and matching knobs on the carpal region of the tentacle club that permits the 2 clubs to be locked together (Fig. 7).

Carpal suckers – Small suckers on the carpus of the club that adhere to the carpal knobs on the opposite carpus during the locking of the clubs (Fig. 7).

Carpus – The "wrist" of the club. Area at the base of tentacular club in some families where small suckers and knobs are located (Fig. 7).

Cartilaginous scales – See **Cartilaginous structures**.

Cartilaginous structures (= Cartilaginous scales and/or Cartilaginous tubercles) – Rigid cartilage-like structures with 1 to several cusps, in the skin of certain oegopsid squids and a few octopods (Fig. 8). They may be overlapping and scale-like, or multifaceted platelets, knobs or papillae in certain oegopsid squid families.

Cartilaginous tubercles – See **Cartilaginous structures**.

Cement body – Structure within spermatophores that draws the sperm cord into a bulb during spermatophore eversion (Fig. 16). Ultimately, it allows adhesion of the discharged spermatophore to a female.

Cephalic cartilage – Cartilage-like tissue that envelop the posterior part of the brain of cephalopods and encompasses the statocysts.

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

Chorion – A tough secreted membrane that surrounds the egg.

Chromatophore – A pigment cell. In cephalopods each chromatophore comprises an elastic sac containing pigment granules that is surrounded by many radial muscles. Under nervous control, the muscles rapidly expand and flatten the pigment sac which spreads the pigment over a relatively broad area.

Cirri – Elongate, fleshy, finger-like papillae occurring along the lateral edges of the sucker row in cirrate octopods and vampires (Fig. 9). Terms formerly used with reference to erected papillae on the skin of incirrate octopods, usually over the eyes (Fig. 10).

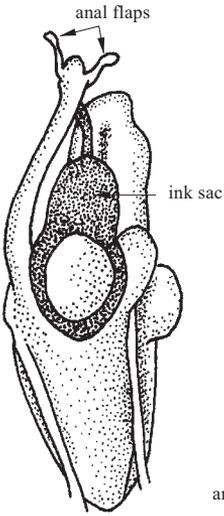


Fig. 2 terminal portion of digestive tract

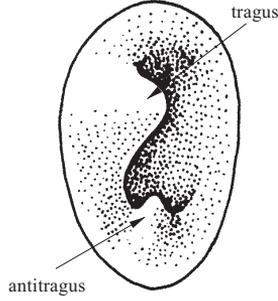


Fig. 3 funnel locking cartilage

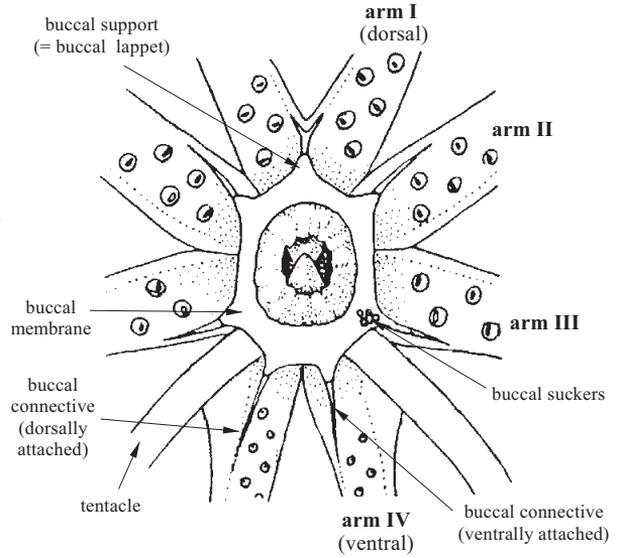


Fig. 4 buccal anatomy of decapods

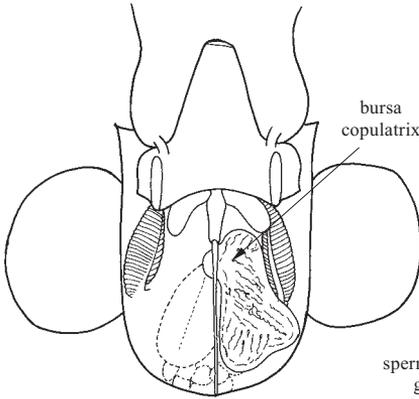


Fig. 5 mantle cavity of female *Sepiola rondeletii* showing the bursa copulatrix

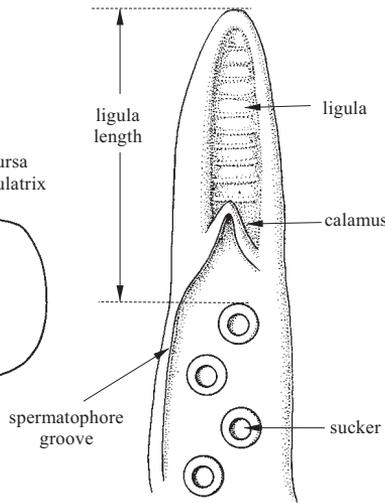


Fig. 6 distal tip of hectocotylus of cirrate and incirrate octopods

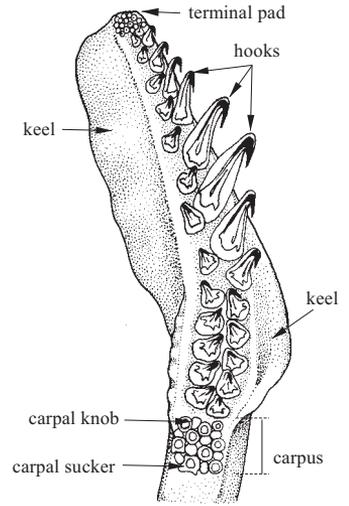


Fig. 7 tentacular club of squid

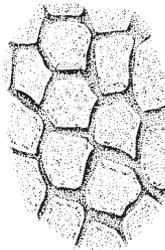
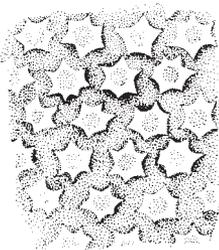


Fig. 8 two types of cartilaginous structures or 'scales'

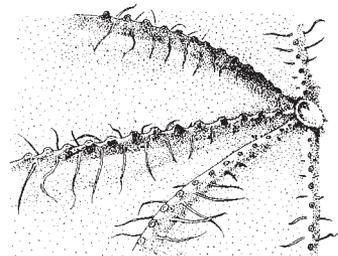


Fig. 9 cirri on arms of cirrate octopods

Coelom – An internal body cavity of mesodermal origin that is lined by an epithelium. Cephalopods have 2 coeloms, the visceropericardial coelom and the nephridial coelom.

Collar – Muscular structure extending from the nuchal cartilage to the funnel that forms a one-way valve that lets water enter the mantle cavity but closes as the mantle contracts thereby forcing exhalent water out through the funnel.

Cone – Term used to refer to the hollow end of the inner structures in cuttlebones and gladius or pen (Fig. 11).

Conus (= primary conus) - The cup or cone-shaped posterior end of the gladius of some cephalopods. It is not formed by the infolding of the vanes.

Conus field – The sides of the conus that continue along the vanes of the gladius.

Cornea – Smooth, thin, turgid, transparent skin without muscles that covers the eyes to protect the eye lenses of incirrate octopods and some decapodiforms (sepioids and myosid squids) (Fig. 12).

Counterillumination – The production of bioluminescent light by an animal to conceal its silhouette against the downwelling light.

Crop – Expansion (i.e. a broadening or a side pocket) of the oesophagus for storing food. Present in *Nautilus* and most octopodiforms (Fig. 14).

Cuttlebone (= **Sepion**). The calcareous (chalky) oblong supporting protective and buoyancy shield in the dorsal part of the mantle of cuttlefishes (Fig. 13).

Dactylus – The distal section of the tentacular club of most decapodiforms, often characterized by suckers of reduced size (Fig. 12).

Decapodiformes (= **Decabrachia** = **Decapods**) – Higher-level taxon (superorder) including ram's horn squid, cuttlefish, bobtail squid, myopsid and oegopsid squids. Even though the term 'decapods' was preoccupied by crabs (crustaceans), there is a long tradition of referring to these cephalopods by the common name 'decapods'; therefore this is maintained as a common name for **Decapodiformes**.

Demersal – Organisms that live close to the ocean floor.

Diel vertical migration – Vertical migration of animals in response to changes in downwelling light.

Digestive gland – Primary organ in cephalopods that secretes digestive enzymes. It is also important in absorption and excretion (Fig. 14).

Distal – Situated away from the point of origin or attachment. For example, the arm tip is the distal end of arm.

Dorsal – Toward the uppermost surface of a cephalopod, opposite the ventral surface where the funnel is located (Fig. 15).

Efferent vein – A vein carrying blood away from an organ.

Egg mass – A large number of eggs encapsulated in a gelatinous matrix or a large number of such structures that are attached together. The egg mass of an oceanic squid can be a large, fragile gelatinous ball or tube carrying many thousands of eggs. In contrast, the egg mass of a neritic squid (lolliginid) can be composed of very tough capsules each carrying several hundred eggs with many capsules attached together at their bases and to the substrate to form an egg mass.

Ejaculatory apparatus – Portion of the spermatophore involved in the vigorous extrusion of the sperm mass (Fig. 16).

Epipelagic zone – The uppermost pelagic zone of the ocean.

Epithelial pigmentation – The pigmentation that is contained in epithelial cells which are unable to change their shape. Colour in most cephalopods, however, is due to pigment granules that are contained in specialized organs, the chromatophores, which can change shape rapidly under nervous control. (See **Chromatophore**).

Eye pore (= **Orbital pore**) – Minute pore in the anterior edge of the transparent membrane (cornea) that covers the eyes of most myosid squids (Fig. 12). The pore is the remnant of the large eye opening of oegopsids and allows fluid exchange between the lens and the exterior environment.

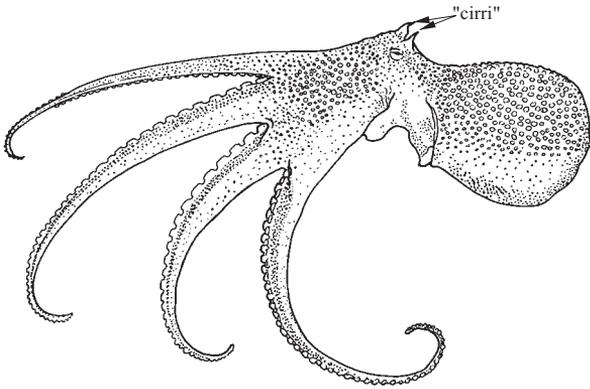


Fig. 10 former use of terms in incirrate octopods

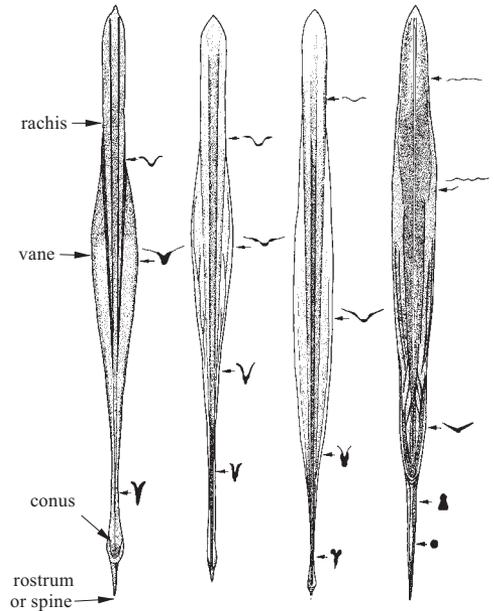
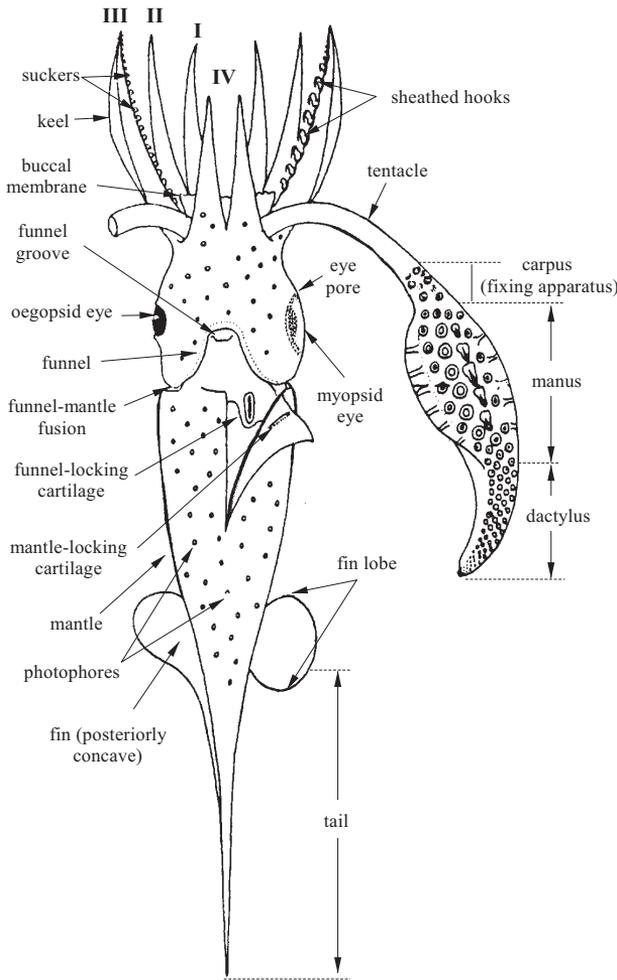
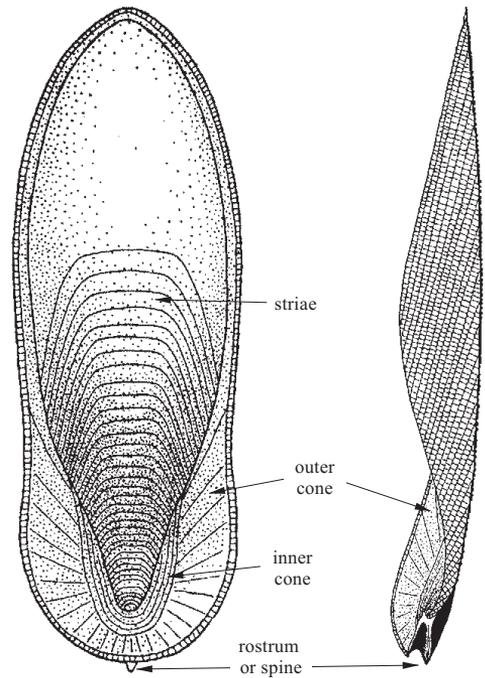


Fig. 11 gladii of some squids



ventral view

Fig. 12 a composite diagram illustrating basic squid features



ventral view

lateral view

Fig. 13 cuttlebone

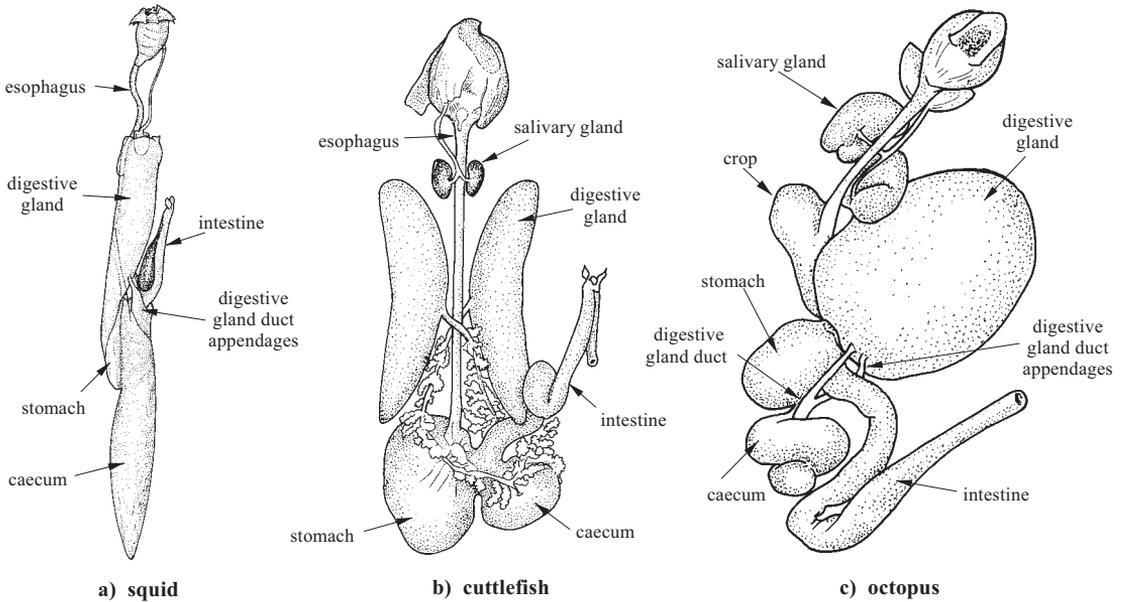


Fig. 14 digestive system

(after Bidder, 1966)

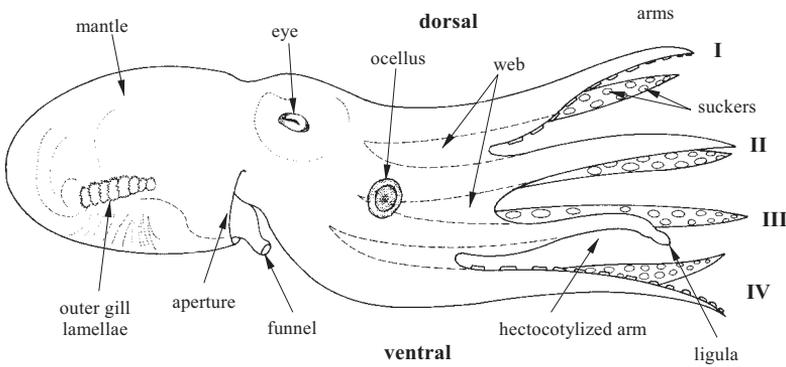


Fig. 15 schematic lateral view of octopus features

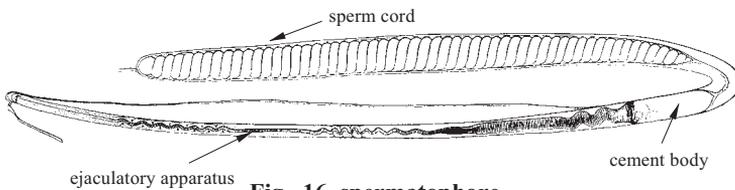


Fig. 16 spermiphore

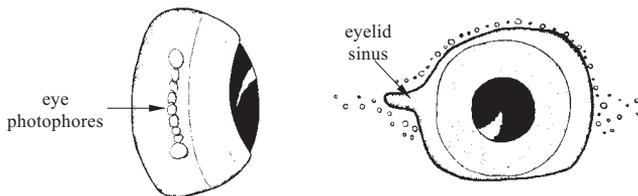


Fig. 17 light organs (photophores) on ventral surface of squid eyeball; eyelid or orbital sinus

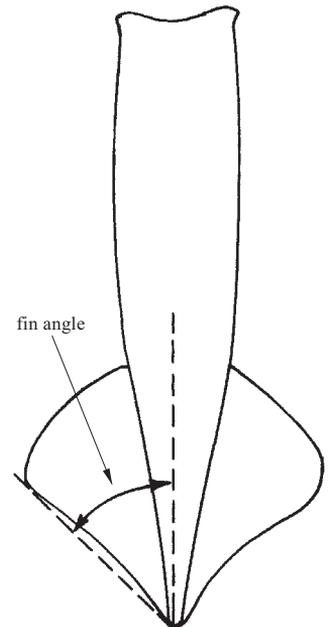


Fig. 18 fin angle on squid

Eyelid sinus (= **Optic sinus** = **Orbital sinus**). Indentation, often complex, of the anterior margin of the eyelid (Fig. 17).

Filamentous appendages – A pair of modified arms in pouches between bases of arms I and II in *Vampyroteuthis*.

Fin(s) – The pair of muscular flaps located along the dorsolateral surface of the mantle, usually in its posterior half; used for locomotion, steering and stabilization (Fig. 12).

Fin angle – The angle between the longitudinal axis of the mantle and the posterior border of the fin (Fig. 18).

Fin lobe – The portion of a fin that extends anteriorly from the fin's anterior point of attachment and/or posteriorly from the fin's posterior point of attachment. This is often called the “free” lobe.

Fin support – Cartilage associated with the fins of all fin-bearing cephalopods. In *Vampyroteuthis* and Cirroctopoda this cartilage is a conspicuous internal shell that has different forms.

Foveola – Transverse membranous fold of skin that forms a pocket in the funnel groove of some oegopsid squids (Fig. 20) (see **Side pockets**).

Funnel – The ventral, subconical muscular tube through which water is expelled from the mantle cavity during locomotion and respiration. The reproductive, waste products and the ink also pass through the funnel (Fig. 12). Archaic term: **siphon**.

Funnel groove – The depression in the ventral surface of the head into which the funnel fits (Fig. 12).

Funnel-locking cartilage – The cartilaginous groove, pit, pocked or depression on each ventrolateral side of the posterior part of the funnel that joins with the mantle component to lock the funnel and mantle together during locomotion and respiration, so that water is expelled only through the funnel and not around the mantle opening (Figs 20 and 21) (see **Mantle-locking cartilage**).

Funnel-mantle locking apparatus – The locking mechanism composed by the funnel-locking cartilage and the mantle-locking cartilage.

Funnel organ – The glandular structures on the internal dorsal and ventral surfaces of the funnel (Fig. 21).

Funnel valve – Semicircular muscular flap in the dorsal inner surface near the distal opening of the funnels in some species (Fig. 21).

Gill(s) – Paired organs for the exchange of respiratory gasses with sea water (Fig. 25a, b, c).

Gill lamella (= **Primary lamella**) – Gill leaflet that extends perpendicular to the axis of the gill and contains the respiratory epithelium (Fig. 22). The lamella contains further subdivisions, the secondary and tertiary lamellae.

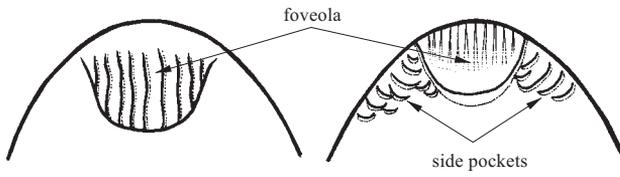
Gladius (= **Pen**) – The chitinous remnant of the shell in many decapodiforms and *Vampyroteuthis*. It is generally feather-shaped and lies in the dorsal midline of the body along the full length of the mantle. The gladius lies within the shell sac which secretes it (Fig. 11).

Gonoduct(s) – Tubular structure of the reproductive system which serves to transport reproductive products from the gonads to the exterior (see **Oviducts**, **Sperm duct**, **Spermatophoric duct**).

Hatchling – Young cephalopod that has just hatched from the egg.

Hectocotylus – One or more modified arm in male cephalopods used for transferring spermatophores to the female; modifications may involve suckers, sucker stalks, protective membranes, trabeculae (Figs 6, 15, 23) (see **Calamus**, **Ligula**).

Hook – Horny structure that looks like a single claw and is derived from the inner sucker ring in some decapodiforms. Hooks may be found on the arms and/or tentacular clubs of squid (Fig. 7).



a) *Todarodinae*

b) *Ommastrephinae*

Fig. 19 funnel groove

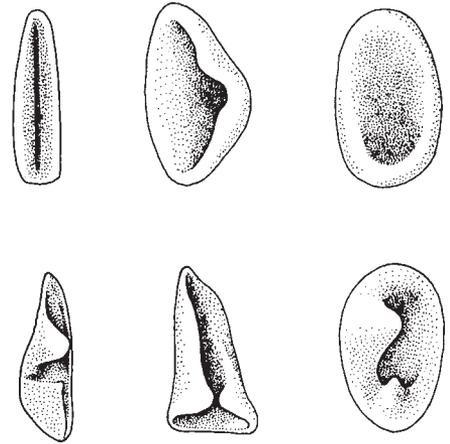


Fig. 20 funnel locking cartilage
(examples of shapes and structures)

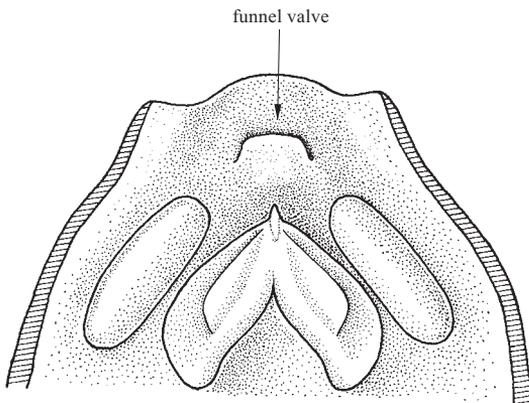


Fig. 21 funnel organ and funnel valve components on inner surface of funnel of squids

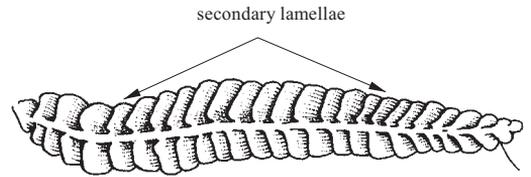


Fig. 22 gill lamella
(primary lamella)

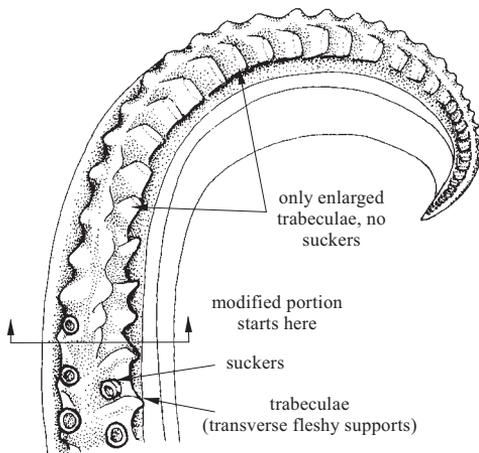


Fig. 23 hectocotylized arm
(*Illex oxygonius*)

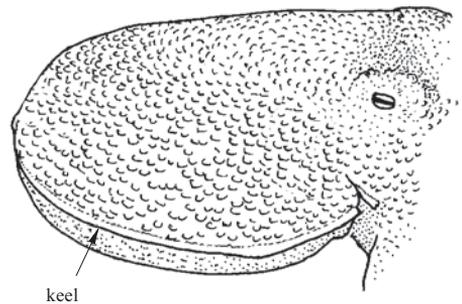


Fig. 24 incirrate octopod
(lateral view of the mantle)

Ink sac – Organ composed of a gland that secretes ink, a sac that stores ink and a duct that connects it to the intestine (Fig. 25). The ink sac generally appears black from the outside although it may be covered by silvery tissue in some species.

Juvenile – Life history stage between the hatchling and the nearly-mature subadult stages.

Keel – (1) A flattened, muscular extension along the aboral region of some arms to render them more hydrodynamic (= **swimming membrane**) (Fig. 12); (2) 1 or 2 expanded membranes along the tentacular clubs of some groups (Fig. 7); and (3) lateral ridge of skin around the lateral margin in incirrate octopods (Fig. 4).

Lateral – Away from the midline.

Lateral ridge – Muscular structure along the lateral region of the mantle of some octopods (see **Keel**).

Light organ – See **Photophore** (Fig. 17).

Ligula – The spatulate to spoon-shaped, terminal structure of the hectocotylus of many incirrate octopods, that contains the calamus basally (proximally) and usually a series of transverse ridges and grooves of the oral surface (Fig. 6) (see **Calamus**, **Hectocotylus**).

Mantle – The fleshy, usually muscular, tube-like or sac-like body wall that covers the visceral region and encloses a space called the mantle cavity.

Mantle cavity – Space enclosed by the mantle. In cephalopods the mantle cavity contains the visceral sac, gills, anus, openings of the gonoducts, nephridial pores and various muscles and septa (Fig. 25).

Mantle length (ML) – The standard measure of length in coleoid cephalopods. In decapodiforms mantle length is measured along the dorsal midline from the mantle margin to the posterior tip of the body (Fig. 1a, b). In octopods mantle length is measured from a line joining the midpoint of the eyes (rather than the anterior mantle margin since the latter is obscured by the head/mantle fusion) to the posteriormost area of the mantle (Fig. 1c).

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 locking apparatus during locomotion (see **Funnel-locking cartilage**) (Fig. 20).

Manus – The central, usually expanded, region of the tentacular club (Fig. 12).

Mature – In cephalopods this term refers to sexual maturity which is determined for females by the presence of ova (mature eggs) free in the coelom or oviducts, and for males by the presence of spermatophores in Needham's sac (Fig. 25).

Medial – Toward the midline.

Mesopelagic zone – The middle-depth zone of the pelagic realm of the ocean.

Myopsid squids – Members of the families Australiteuthidae and Loliginidae. This term refers to the character consisting in the presence of a cornea covering the eye lens. Myopsid eyes also are present in cuttlefishes, bobtail squids and relatives.

Neck – The region separating the posterior end of the cephalic cartilage and the head musculature (collar). Only those cephalopods with elongate heads (e.g. Chiroteuthidae) have distinct necks.

Needham's sac (= Spermatophoric sac) – The large storage sac for spermatophores that is an expanded region of the genital duct at the base of the terminal organ or penis in males (Fig. 26).

Neritic – The region of the ocean that overlies the continental shelf.

Nidamental glands – Large glandular structures found in most female decapodiforms and nautilids that lie in and open directly into the mantle cavity (Fig. 25). The glands are composed of numerous lamellae that are involved in secretion of egg cases or the jelly of egg masses.

Nominal species – A species that is based on a morphological type. A properly named species but not necessarily a valid species.

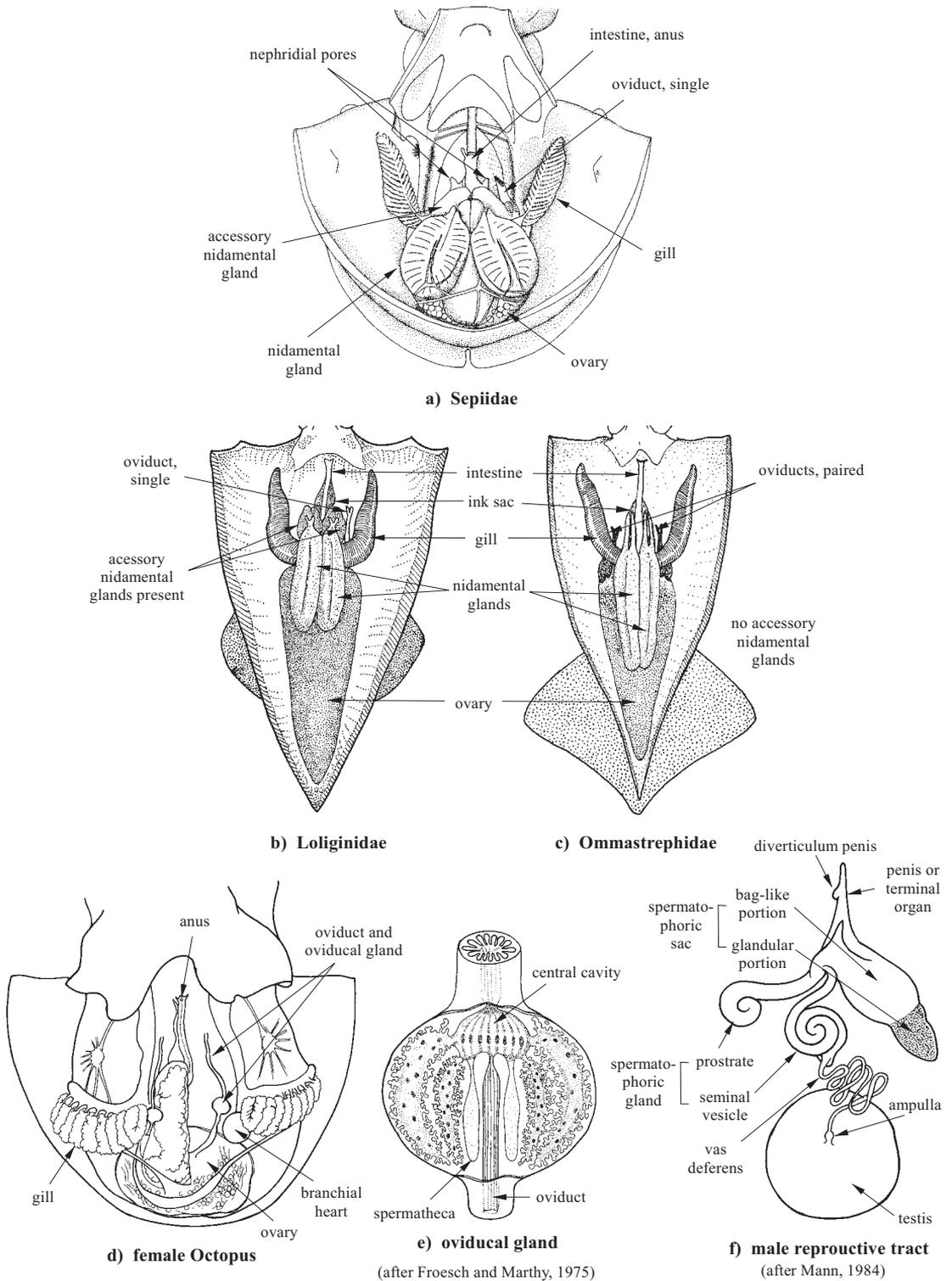


Fig. 25 internal organs
 (a, b and c – Decapodiformes; d, e and f – Octopodiformes)

(after Froesch and Marthy, 1975)

(after Mann, 1984)

Nuchal cartilage – See **Nuchal-locking apparatus**.

Nuchal crest (= **Occipital crest**) – Prominent transverse ridge in most decapodiforms that extends across the dorsal and along the lateral surfaces of the head at its posterior end (Fig. 27).

Nuchal folds (= **Occipital folds**) – Fixed folds of the head integument that adjoin the nuchal crest posteriorly and are perpendicular to it (Fig. 27). The function of the folds is uncertain.

Nuchal-locking apparatus – A cartilaginous locking structure in decapodiforms located mid-dorsally just posterior to the head. It is composed of the nuchal cartilage, which forms an attachment site for collar and head retractor muscles, and a cartilage on the mantle that underlies the gladius. The apparatus keeps the head and mantle aligned dorsally during mantle contractions (Fig. 27).

Nuchal membrane (= **Occipital membrane**). A thin membrane that connects the main nuchal folds at their posterior ends (Fig. 27).

Ocellus – A pigmented spot or patch that usually consists of a dark, ovoid locus of concentrate chromatophores but may possess additional outer concentric rings of chromatophores. Ocelli occur on some octopods. May enclose an iridescent ring. Also called '**false eyespot**' (Fig. 15).

Ocular photophore – Photophore that lies on the eyeball (Fig. 17).

Oegopsid squids – Members of all squid families except Australiteuthidae and Loliginidae. This term refers to the character consisting in absence of a cornea covering the eye lens.

Oesophagus – The portion of the digestive tract between the buccal mass and the stomach. In *Nautilus* and most octopodiforms a portion of the oesophagus is expanded to form a crop for food storage (Fig. 14).

Olfactory papilla – A pit or bump-like to finger-like organ on the posterolateral surface of each side of the head. It has olfactory function.

Optic lobe(s) of brain – Large lobes of the brain associate with the eyes. In octopods and some squids the optic lobes may be separated from the rest of the brain by an optic stalk of varying length. The optic lobes are connected to the brain by the **optic nerves**.

Optic sinus – See **Eyelid sinus**.

Oral – Toward or on the side of the mouth.

Orbital pore – See **Eye pore** (Fig. 12).

Orbital sinus – See **Eyelid sinus**.

Outer cone – Rim that surrounds the phragmocone in cuttlebones (Fig. 13).

Oviduct(s) – Female gonoduct (Fig. 25). The oviduct conducts eggs from the visceropericardial coelom, which holds the ovary, to the exterior and is often used to store eggs. In some argonautoid octopods eggs are fertilized and undergo either partial (*Argonauta*) or complete (*Ocythoe*) embryonic development within the oviduct.

Oviducal gland – Gland surrounding the end of the primary oviduct and responsible for secreting some of the external coatings over spawned eggs (Fig. 25d, e).

Paralarva – First free-living life history stage for those cephalopods found in the plankton that differ in both morphology and vertical distribution from older juveniles.

Pedicle (= **Sucker stalk**) – The structure between the sucker and the arm. In octopods it is a cylindrical structure about the same width as the sucker and in decapodiformes it is constricted into a conical pillar.

Pelagic – (1) Free swimming in open ocean; (2) region of the ocean away from the ocean floor.

Pen – see **Gladius**.

Penis (see also **Terminal organ**) – The long, muscular end of the male gonoduct that assists in transferring spermatophores to the female (Fig. 26). Apparently, in species with a hectocotylus, the penis transfers spermatophores to the hectocotylus which in turn transfers them to the female. In species without a hectocotylus, the penis is often greatly elongate, capable of extending beyond the mantle cavity and can, apparently, transfer spermatophores directly to the female.

Photophore (= **Light organ**) – Organ that produces bioluminescence or 'living light'.

Phragmocone – Chambered portion of the shell in cephalopods.

Posterior – Toward the closed end of the mantle and tail, away from the head and arms.

Primary conus – See **Conus**.

Protective membrane(s) – Membrane(s), generally supported by trabeculae, which forms lateral borders to the oral surfaces of the arms and tentacular clubs in decapodiforms (Fig. 29) (see **Trabeculae**).

Proximal – Situated toward the point of origin or attachment. For example, the proximal end of the arm is the basal end of the arm.

Pseudomorph – A mass of ink and mucous that roughly has the dimensions of the cephalopod that secreted it; a false "body" that fixes the attention of a predator while the cephalopod escapes.

Rachis – The central axis of the gladius which is usually thickened (Fig. 11).

Radula – The chitinous, ribbon-like band in the mouth of cephalopods that contains up to 7 transverse rows of teeth that aid in transport of food into the oesophagus (Fig. 30); it is of a significant higher taxonomic value.

Rhynchoteuthion – Paralarval stage of the Ommastrephidae characterized by the fusion of the tentacles into a trunk-like proboscis.

Rostrum (= **Spine**) – The spike-like posterior projection of the gladius and cuttlebone (Fig. 11).

Secondary web – The narrow membrane that connect each arm to the primary web in some cirrate octopods.

Sepion – See **Cuttlebone**.

Shell sac – The sac that secretes the shell in the Coleoidea.

Side pockets – Pockets formed by small membranous folds of integument lateral to the foveola in the funnel groove (see **Foveola**) (Fig. 19).

Siphuncle – The tube-like extension of the body wall, coelom and an external covering tube that penetrates the phragmocone and regulates gas exchange into the phragmocone chambers.

Sperm duct (= **Vas deferens**) – Male duct that serves the function to transfer the sperm from the testis to the spermatophoric organ (Figs 25f and 26).

Spermatophore – A tubular structure manufactured by male cephalopods for packaging sperm; it is passed to the female during mating. In most coleoids, this structure is very complex and contains a 'rope' of sperm (= sperm mass), an ejaculatory apparatus and a cement body (Fig. 16). Except for the sperm, the entire structure is non-cellular.

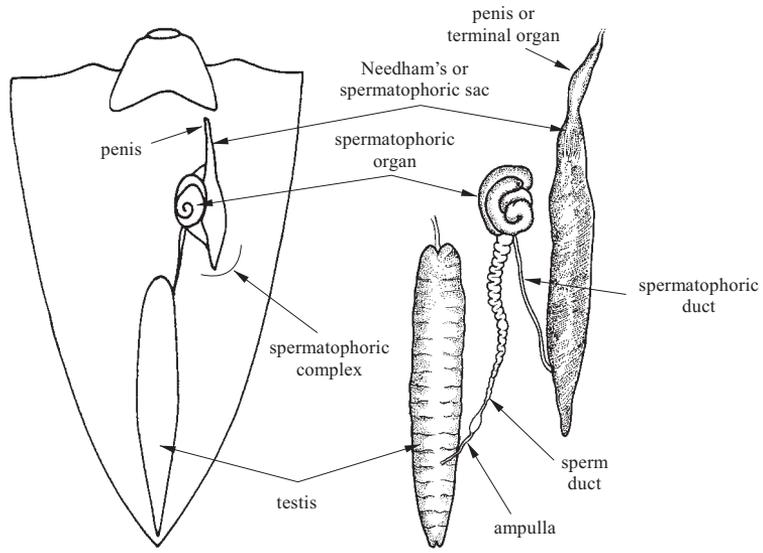
Spermatophoric complex – The unit formed by the sperm duct, the spermatophoric organ, the spermatophoric duct, the spermatophoric sac or Needham's sac, and the penis or terminal organ (Fig. 26).

Spermatophoric duct – Male duct that serves the function to transfer the spermatophores from the spermatophoric organ to the Needham's sac (Fig. 26).

Spermatophoric sac – See **Needham's sac**.

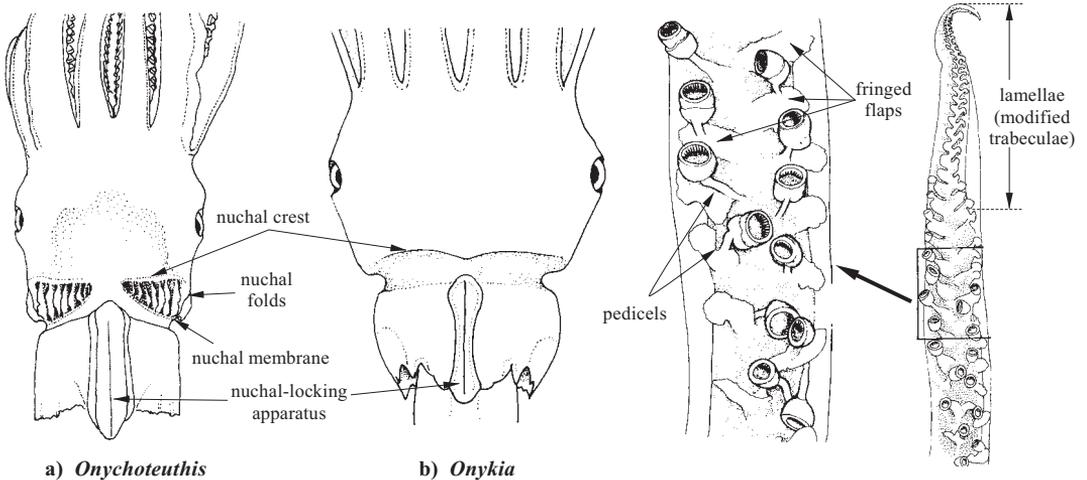
Spine – See **Rostrum**.

Stalk of tentacle – Region of the tentacle proximal to the club.



(after Grieb, 1976)

Fig. 26 male squid reproductive apparatus



a) *Onychoteuthis*

b) *Onykia*

Fig. 27 nuchal folds and nuchal crest

Fig. 28 hectocotyliized arm of males

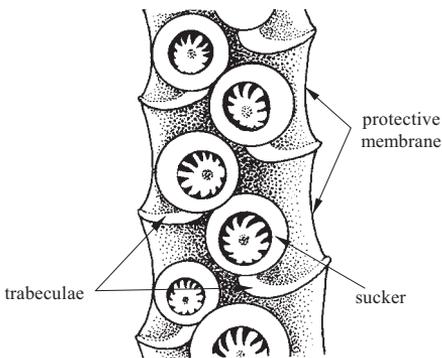


Fig. 29 trabeculae, protective membranes and suckers on arm of squid

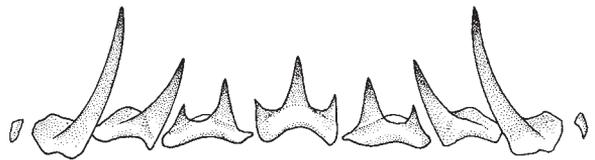


Fig. 30 radula (transverse row of teeth)

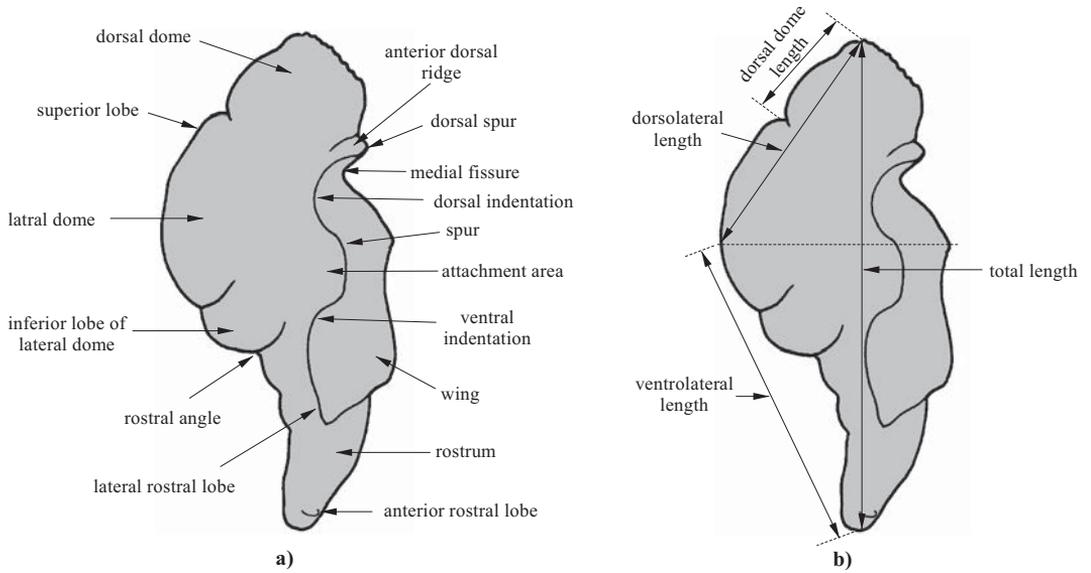


Fig. 31 diagrams of a generalized teuthoid statolith (anterior view) with a) basic terms and b) basic dimensions labelled
(after Clarke, 1978)

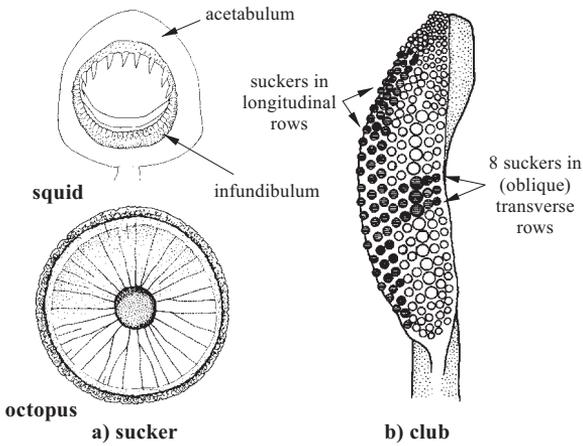


Fig. 32 squid and octopus sucker and squid sucker orientation

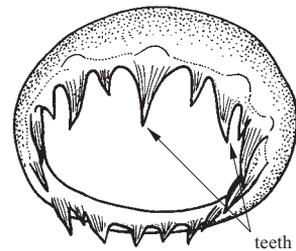


Fig. 33 sucker ring

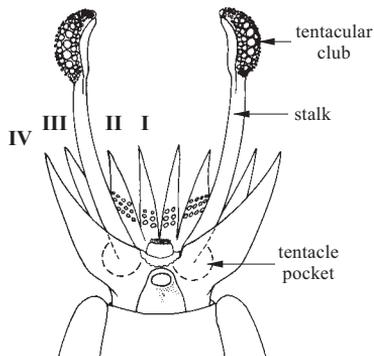


Fig. 34 diagrammatic sketch of arms and tentacles of decapods other than mysoid and oegopsid squids

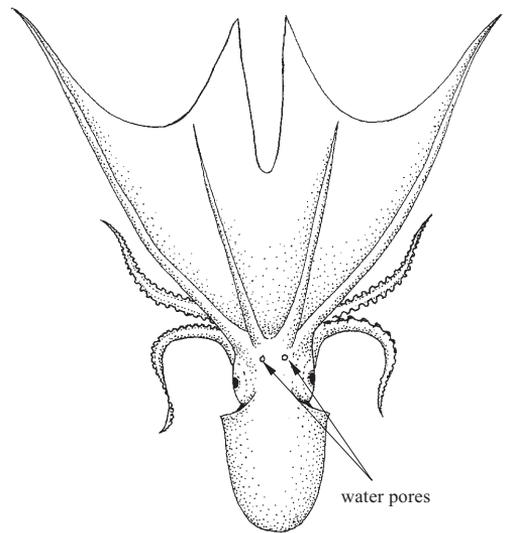


Fig. 35 *Tremoctopus* (dorsal view)

Stalked eyes – Eyes that extend from the head on stalks. Two types exist: (1) stalked eyes in which the optic lobe is adjacent to the eye and separated from the brain by a long optic stalk and (2) stalked eyes in which the optic lobe remains adjacent to the brain and long optic nerves extend from the lobe to the eye. The former type is found exclusively in the Cranchiidae.

Statocyst(s) – A paired sense-organ that detects gravity, angular accelerations and low-frequency sounds. Statocysts are embedded within the cephalic cartilage and contain the statoliths.

Statolith(s) – A calcareous stone within the statocyst (Fig. 31). Statoliths of many species can be used for age determination.

Stellate ganglion – Major ganglion of the peripheral nervous system that controls nerves to the mantle muscles.

Stylet(s) – A pair of rod-like structures considered remains of the molluscan shell in incirrate octopods. Generally in the form of a slender, cartilage-like, pointed rod tightly surrounded by the shell sac and buried in the mantle muscle on either side of the mantle.

Subadult – Stage at which all of the characters that typically define the species are present, but the reproductive system is not mature and functional. It follows the juvenile stage and precedes the adult stage. A subadult stage is defined in cephalopods because the adult phase often is temporally abbreviated.

Subequal – Nearly equal. Generally refers to the length of the arms when these appear to be approximately the same length. Arm lengths cannot be measured very accurately due to variation in their states of contraction. Also used for sucker diameters.

Sucker – Muscular suction-cup on the arms and tentacles and occasionally on the buccal supports. It consists of a cup-shaped portion, the **acetabulum**, and a flat, distal ring, the **infundibulum** that contact the substrate (Fig. 32a). Some are stalked, placed on muscular rods that contract (cuttlefishes and squids); some are sessile, embedded without stalks on the oral surface of the arms (octopuses). Suckers of decapodiforms contain horny rings that often bear teeth (Fig. 33) or sometimes form hooks. They usually are counted either in longitudinal or in transverse (oblique) rows. In octopods suckers are counted in longitudinal rows.

Sucker ring – Chitinous, often serrate or toothed, ring that encircles the opening of suckers of cuttlefishes and squids (Fig. 33).

Sucker series – The longitudinal rows of suckers on cephalopod appendages sometimes are called 'series'. In these cases 'series' (= longitudinal rows) contrast with 'rows' (= transverse rows) in describing suckers arrangement. In octopods, the term 'series' generally is synonymous with 'rows', the 'longitudinal' component of the term being implied.

Sucker stalk – See **Pedicel**.

Sucker teeth – Teeth on the inner, horny sucker rings of some decapodiforms.

Swimming membrane – See **Keel**.

Tail – Posterior narrow extension of the body posterior to the fins. The end of the fins and the beginning of the tail often overlap. An operational definition for point of demarcation for the purposes of measurement is: the point where a hypothetical line, continuous with the broad posterior edge of the fin, crosses the midline of the body (Fig. 1).

Tentacle(s) – Modified fourth pair of arms in Decapodiformes that are capable of considerable extension and contraction. Each tentacle consists of a proximal stalk usually devoid of suckers, and a distal club armed with suckers and occasionally hooks.

Tentacle pocket – A pocket that encompasses the base of each tentacle at its fusion with the head and provides space for complete retraction of the tentacle into the pocket (as in members of the Sepioidea and 'sepoid squids'), or contraction of the tentacular stalk without retraction into the pocket (as in the true squids) (Fig. 34).

Tentacular club – The terminal, usually expanded part of the tentacle which bears suckers and/or hooks (Fig. 7).

Terminal fins – Fins with more than 50% of their length posterior to the muscular mantle. These fins, therefore, are at the “terminal” or posterior end of the body and are generally supported by elongate secondary conus of the gladius.

Terminal organ – Alternative name for penis, as true definition of a penis is ‘organ of insertion’.

Terminal pad (of tentacular club) – A small, distinct pad or circlet of suckers at the tip of the club (Figs 7, 32a).

Trabeculae – Muscular cones or flaps that support the protective membranes on the arms and tentacular clubs in decapodiforms (Fig. 29).

Tragus – Particular inward projecting knob on the medial surface of the central depression in the funnel locking cartilage of some squids (Fig. 3).

Truncate teeth – Teeth on the inner horny of rings of decapodiforms suckers that do not terminate in a point but rather a broad, flat tip.

Vane – Broad, lateral portion of the gladius that arises from the rachis (Fig. 11).

Ventral – Toward the lower surface of the animal (i.e. the side on which the funnel is located) (Fig. 15).

Vesicular tissue – Tissues found in some decapodiforms that contain numerous vesicles filled with water that usually contains ammonium chloride. The vesicles may be concentrated in certain structures (e.g. the ventral arms) or scattered throughout the animal. The light solution in the vesicles provides buoyant lift.

Water pores – One or 2 pairs of pores in the integument of the head that communicate with extensive spaces at the bases of arms on some pelagic octopods (e.g. *Tremoctopus*) (Fig. 35).

Web – A membranous or muscular sheet that extends between the arms of many octopods but is reduced or absent in most decapods.

KEY TO FAMILIES OCCURRING IN THE AREA

- 1a. Suckers stalked with chitinous rings; usually 10 circumoral appendages (8 arms and 2 tentacles; tentacles may be lost in some species) **Cuttlefishes, Bobtail squids, Bottletail squids, Pigmy squids, Ram’s Horn squids, Myopsid squids, Oegopsid squids → 2**
- 1b. Suckers without stalks (but sucker bases may be constricted in cirrate octopods and *Vampyroteuthis*) and without chitinous rings; 8 arms but no tentacles
. **Octopods and Vampires → 26**
- 2a. Internal shell calcified, either straight and laminate, or coiled and chambered → 3
- 2b. Internal shell (gladius) present (rudimentary in Sepiolidae), chitinous → 4
- 3a. Internal shell coiled, chambered **Ram’s Horn squids, Family Spirulidae (Fig. 36)**
- 3b. Internal shell straight, laminate, chalky **Cuttlefishes, Family Sepiidae (Fig. 37)**

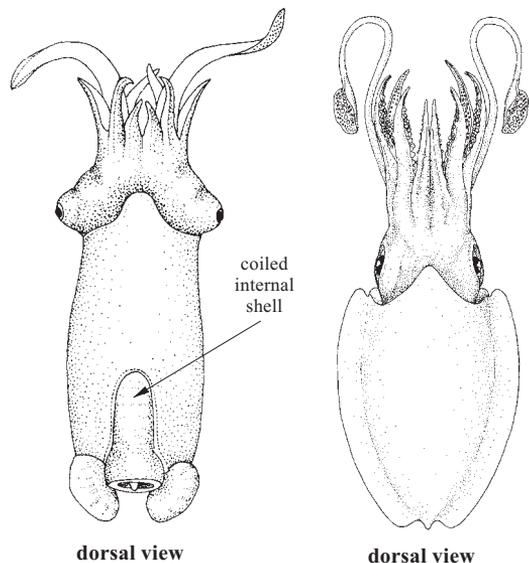


Fig. 36 Spirulidae (*Spirula*) Fig. 37 Sepiidae (*Sepia*)

4a. Internal shell (gladius or pen) chitinous and rudimentary or absent; tentacles retractile into pockets between arms III and IV **Bobtail squids, Family Sepiolidae (Fig. 38)**

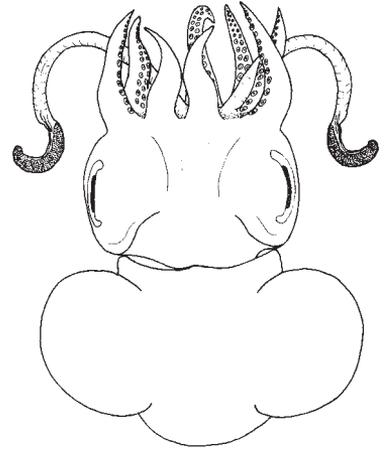
4b. Internal shell straight, feather-shaped or pen-shaped; tentacles contractile, not retractile, into pockets . **Myopsid and Oegopsid squids → 5**

5a. Eye covered by a transparent membrane (cornea) (Fig. 39a) **Myopsid squids, Family Loliginidae (Fig. 40)**

5b. Eye without cornea; lens in open contact with seawater (Fig. 39b) **Oegopsid squids → 6**

6a. Mantle articulates with funnel and head; funnel-mantle locking apparatus and nuchal cartilages present → 7

6b. Mantle fused to funnel ventrally and to head dorsally; funnel-mantle locking apparatus and nuchal cartilages absent^{2/} (Fig. 41) **Cranchiidae**



dorsal view

Fig. 38 Sepiolidae (*Rossia*)

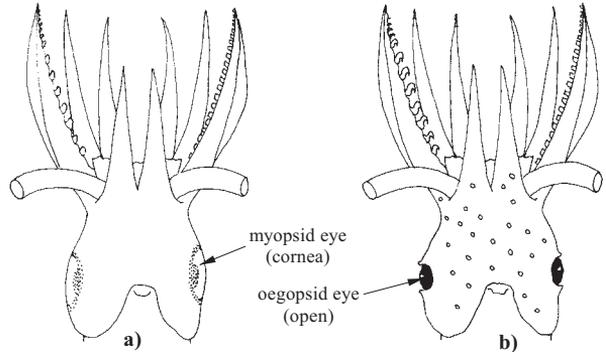


Fig. 39

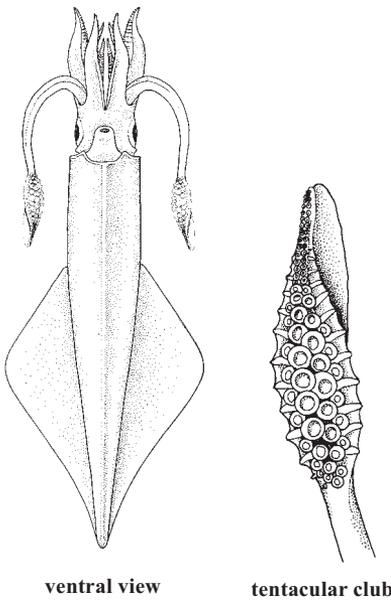


Fig. 40 Loliginidae (*Loligo*)

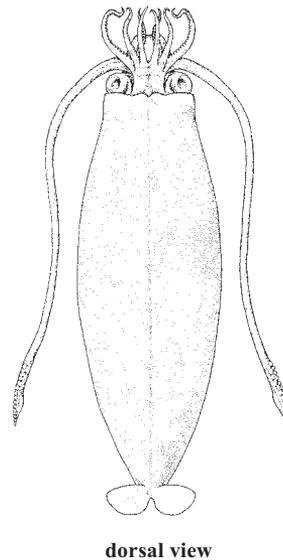


Fig. 41 Cranchiidae (*Helicocranchia*)

^{2/} Mantle fused to funnel ventrally but free from head dorsally in *Grimalditeuthis*.

- 7a. Funnel-mantle locking apparatus a simple, more or less straight groove and ridge (Fig. 42a) → **8**
- 7b. Funnel-mantle locking apparatus not a simple straight groove and ridge (Fig. 42b-f) → **21**

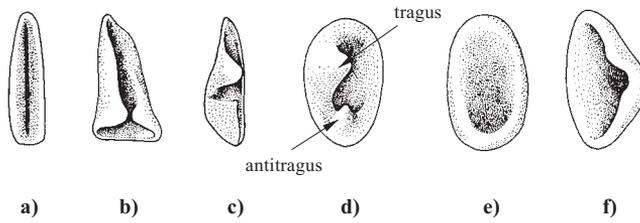


Fig. 42 funnel-locking cartilage

- 8a. Arms with hooks → **9**
- 8b. Arms without hooks → **12**

- 9a. Tentacles and clubs absent in adults; present in paralarvae and occasionally in juveniles (*Taningia*); when present, clubs rudimentary, with few suckers **Octopoteuthidae** (Fig. 43)
- 9b. Tentacles present, with fully developed clubs → **10**

- 10a. Photophores on viscera but not on surface of mantle head or arms . . . **Pyroteuthidae** (Fig. 44)
- 10b. Photophores on surface of mantle, head or arms but not on viscera → **11**

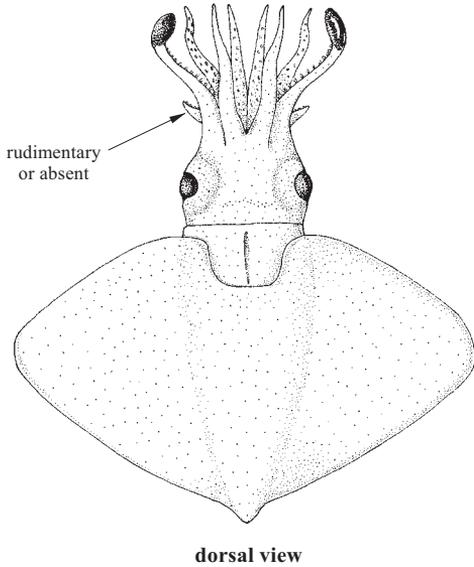


Fig. 43 Octopoteuthidae (*Taningia*)

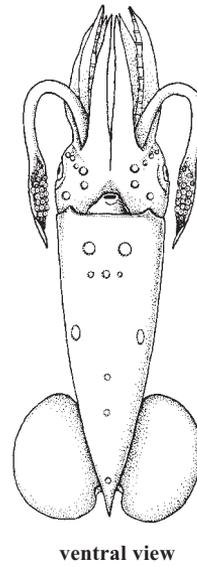
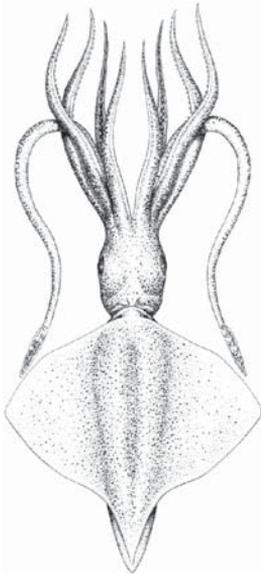


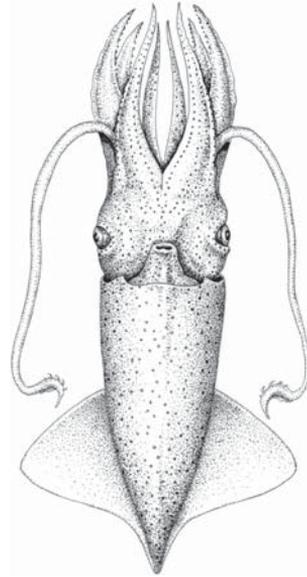
Fig. 44 Pyroteuthidae (*Pterygioteuthis*)

- 11a. Photophores on tentacles but not on eyeballs **Ancistrocheiridae (Fig. 45)**
- 11b. Photophores on ventral eyeballs but not on tentacles **Enoploteuthidae (Fig. 46)**



dorsal view

Fig. 45 Ancistrocheiridae (*Ancistrocheirus*)



dorsal view

Fig. 46 Enoploteuthidae (*Abralia*)

- 12a. Buccal membrane connectives attach to the ventral sides of ventral arms (Fig. 47b). → 13
- 12b. Buccal membrane connectives attach to the dorsal sides of ventral arms (this character may be difficult to detect in some histioteuthids) (Fig. 47a). → 17
- 13a. Hooks present on tentacular clubs (Fig. 48a and b) (tentacles and clubs lost in adults) (Fig. 48c) **Onychoteuthidae**
- 13b. Hooks lacking on tentacular clubs → 14

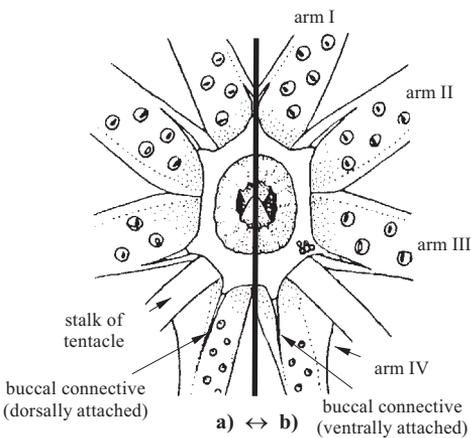


Fig. 47 oral view

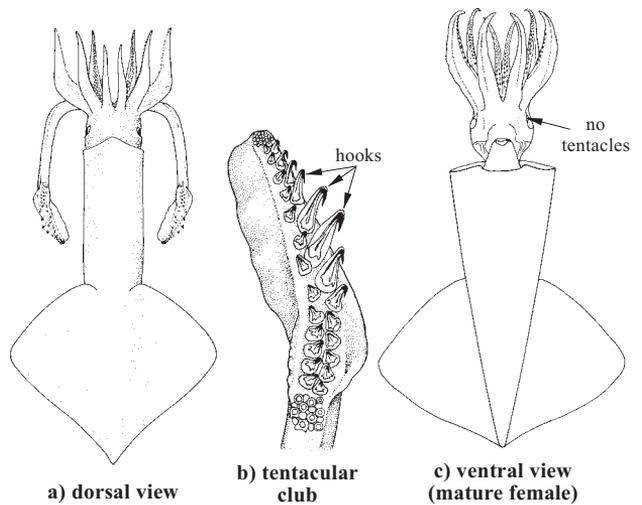


Fig. 48 Onychoteuthidae (*Onychoteuthis*)

- 14a. Cartilaginous scales (sometimes minute) present on mantle; club suckers in 4 longitudinal series → 15
- 14b. Cartilaginous scales lacking; club suckers in more than 4 longitudinal series in some areas → 16

- 15a. Tentacles present, with numerous laterally compressed suckers . . . **Pholidoteuthidae** (Fig. 49)
- 15b. Tentacles lost in adults, small and weak in juveniles, with few (about 6) poorly differentiated suckers **Lepidoteuthidae** (Fig. 50)

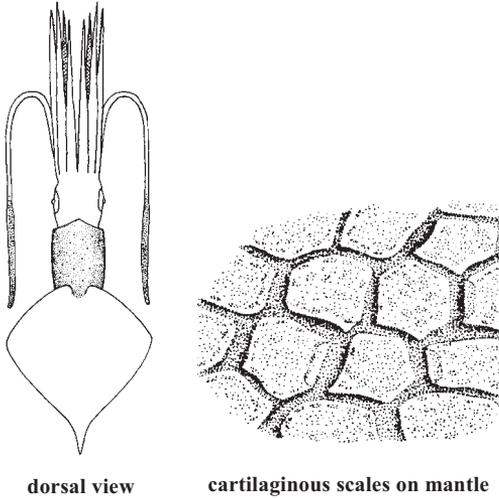


Fig. 49 Pholidoteuthidae (*Pholidoteuthis*)

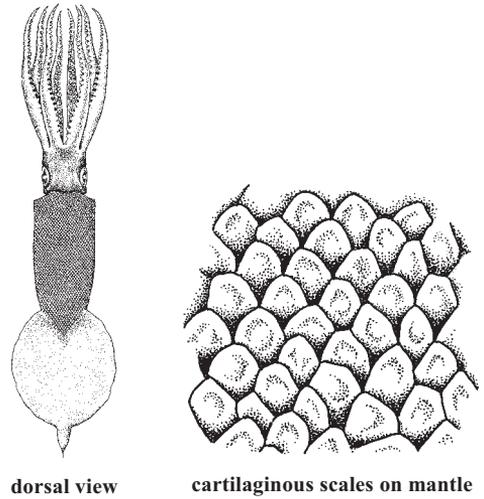


Fig. 50 Lepidoteuthidae (*Lepidoteuthis*)

- 16a. Fins nearly as long as mantle, supported by strong, transverse, muscular ribs; minute suckers present on oral surface of buccal membrane **Ctenopterygidae** (Fig. 51)
- 16b. Fins less than half mantle length, without supporting ribs; no suckers on buccal membrane **Brachioteuthidae** (Fig. 52)

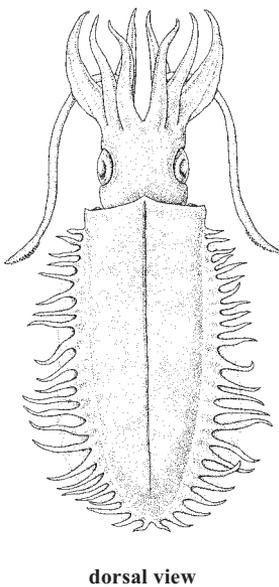


Fig. 51 Ctenopterygidae (*Ctenopteryx*)

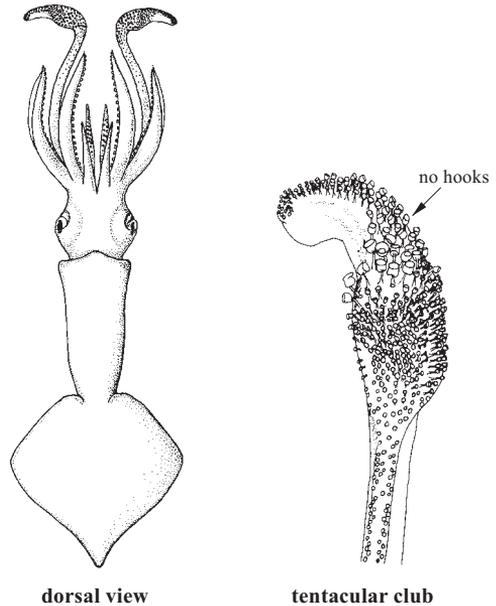


Fig. 52 Brachioteuthidae (*Brachioteuthis*)

17a. Single row of photophores on ventral surface of eye; buccal membrane with 8 lappets . . . **Lycoteuthidae** (Fig. 53)

17b. No photophores on eyes; buccal membrane with 7 lappets or less → 18

18a. Surface of mantle, head and arms covered with numerous photophores, usually large and distinct **Histioteuthidae** (Fig. 54)

18b. Surface of mantle and head without photophores (a few photophores may be present on arms) → 19

19a. Minute suckers present on oral surface of buccal membrane (Fig. 55) **Bathyteuthidae**

19b. No suckers on oral surface of buccal membrane → 20

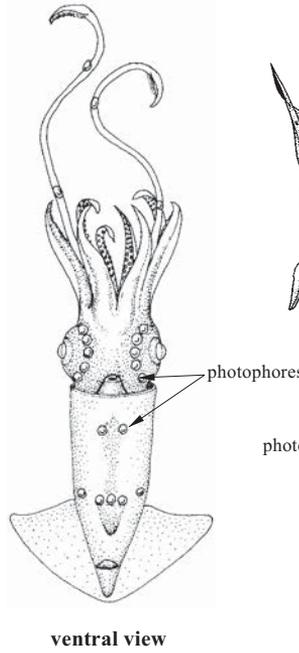


Fig. 53 Lycoteuthidae (*Lycoteuthis*)

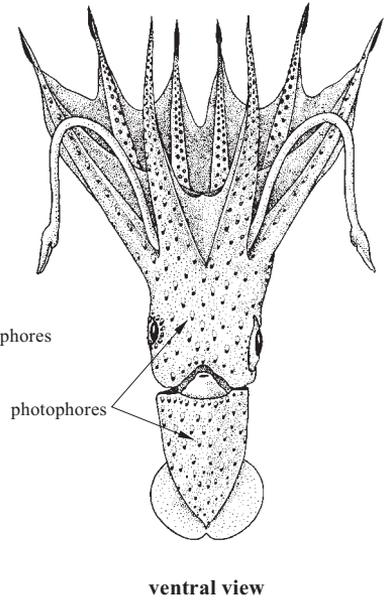


Fig. 54 Histioteuthidae (*Histioteuthis*)

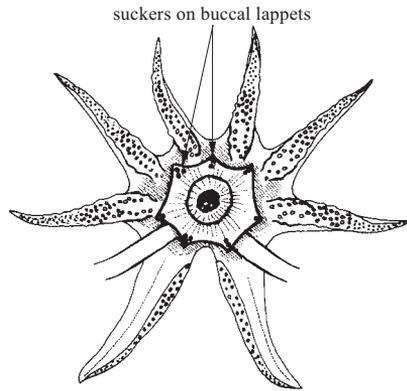
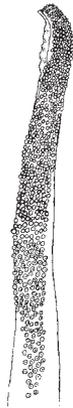
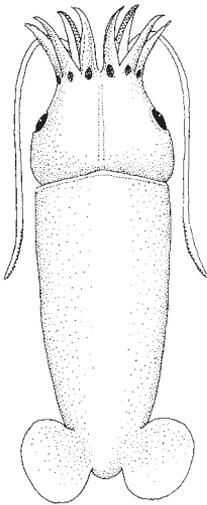
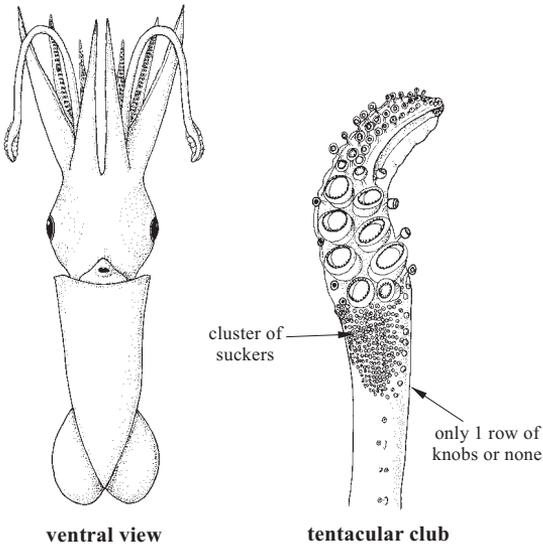
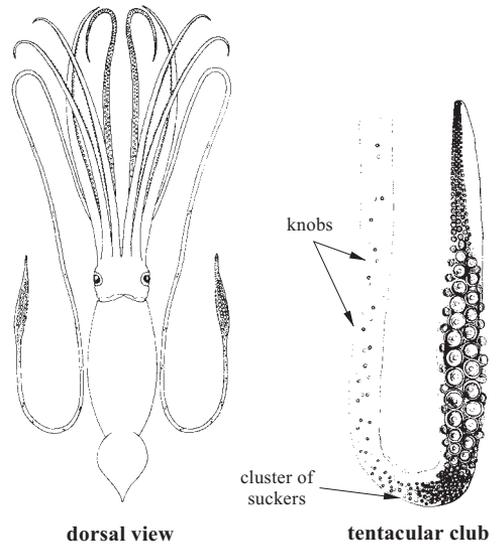


Fig. 55 Bathyteuthidae (*Bathyteuthis*)

- 20a.** Posterior borders of fins convex; carpal knobs in a single dorsal row or absent; adults not gigantic (Fig. 56) **Neoteuthidae**
- 20b.** Posterior borders of fins concave; carpal knobs in a cluster alternating with suckers and extending almost to base of tentacle; attains gigantic size (Fig. 57) **Architeuthidae**

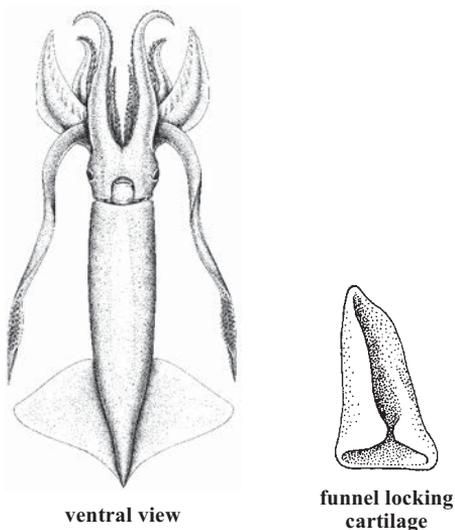


ventral view tentacular club
Fig. 56 Neoteuthidae (*Alluroteuthis*)

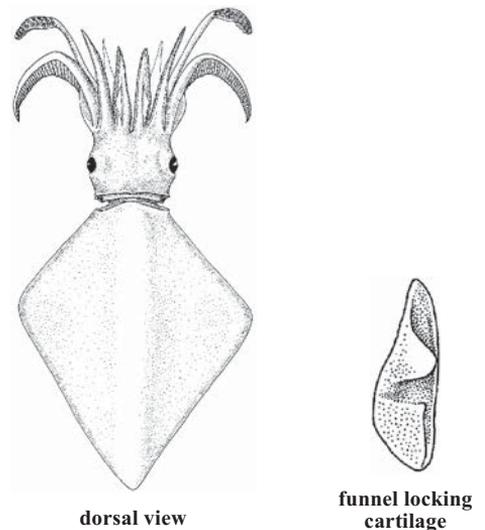


dorsal view tentacular club
Fig. 57 Architeuthidae (*Architeuthis*)

- 21a.** Funnel-locking cartilage with longitudinal and transverse grooves ⊥-shaped or -| shaped (Fig. 42b and c) → **22**
- 21b.** Funnel-locking cartilage triangular or oval, with or without inward projecting knobs → **23**
- 22a.** Funnel-locking cartilage with longitudinal groove crossed by a transverse groove at its posterior end, ⊥-shaped (Fig. 42b); fins less than 60% mantle length (Fig. 58) **Ommastrephidae**
- 22b.** Funnel-locking cartilage with longitudinal groove from which a shorter groove branches medially, -| shaped (Fig. 42c); fins more than 80% mantle length (Fig. 59) **Thysanoteuthidae**



ventral view funnel locking cartilage
Fig. 58 Ommastrephidae (*Ommastrephes*)



dorsal view funnel locking cartilage
Fig. 59 Thysanoteuthidae (*Thysanoteuthis*)

- 23a. Funnel locking apparatus oval with posterior shelf or 1 or 2 knobs projecting inward (Fig. 42d). → 24
- 23b. Funnel locking apparatus oval or subtriangular, without shelf or knobs (Fig. 42e, f). → 25

- 24a. Club suckers in 4 longitudinal rows **Chiroteuthidae** (Fig. 60)
- 24b. Club suckers minute, in more than 15 longitudinal rows **Mastigoteuthidae** (Fig. 61)

- 25a. Arm suckers in 4 to 6 longitudinal rows; tail extremely long, greater than mantle length; arms very long **Joubiniteuthidae** (Fig. 62)
- 25b. Arm suckers in 2 longitudinal rows; tail short, less than half mantle length, or absent **Cycloteuthidae** (Fig. 63)

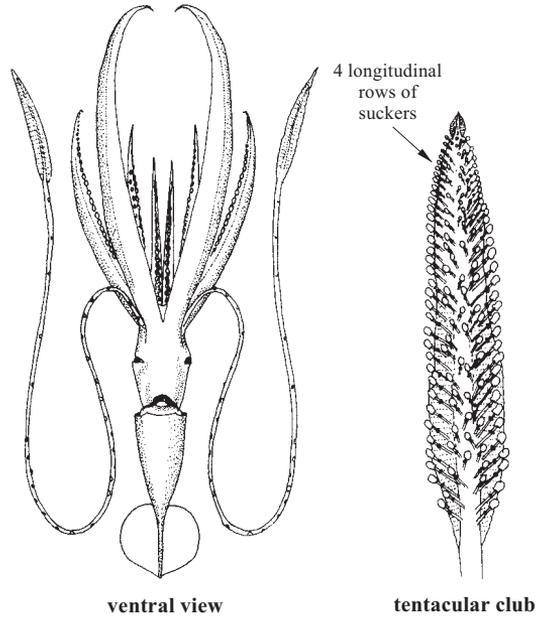


Fig. 60 Chiroteuthidae (*Chiroteuthis*)

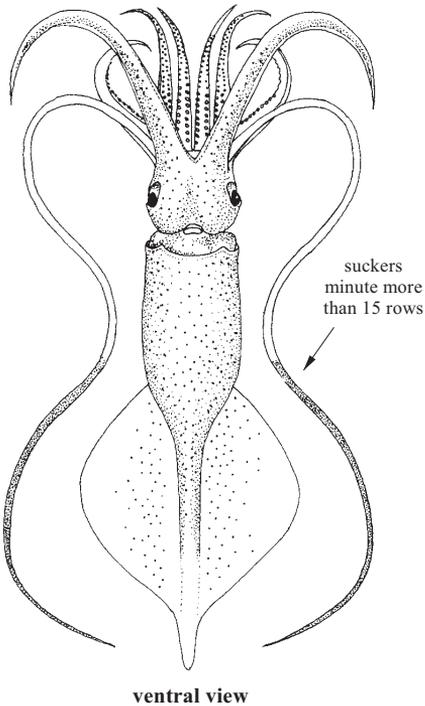


Fig. 61 Mastigoteuthidae (*Mastigoteuthis*)

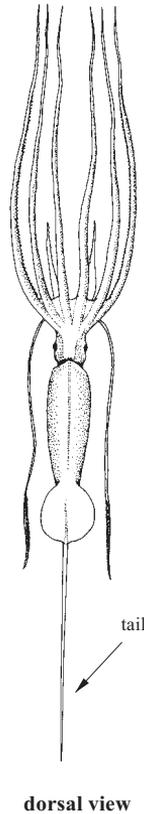


Fig. 62 Joubiniteuthidae (*Joubiniteuthis*)

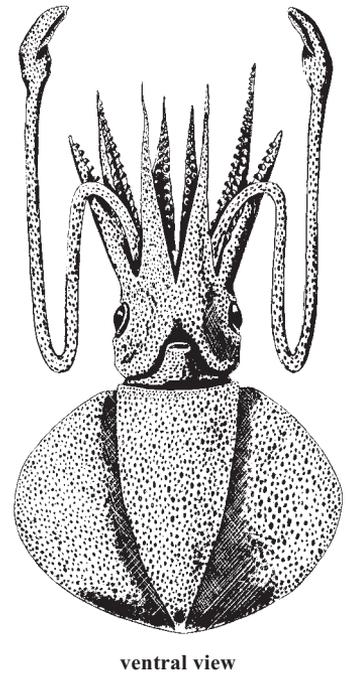


Fig. 63 Cycloteuthidae (*Discoteuthis*)

- 26a. Filamentous appendages present in pouches between bases of dorsal and dorsolateral arms; photophores present at base of each fin; colour dark maroon to black **Vampires (monotypic), Family Vampyroteuthidae (Fig. 64)**
- 26b. Filaments and photophores absent; colour variable to dark maroon, never black **Octopods → 27**
- 27a. Fins present; cirri on arms **Cirrate Octopods → 28**
- 27b. Fins and cirri absent **Incirrate Octopods → 30**

- 28a. Short cirri and no secondary webs, body axis strongly compressed in anteroposterior plane **Opisthoteuthidae (Fig. 65)**
- 28b. Long cirri and secondary webs, body axis not compressed in anteroposterior plane **→ 29**

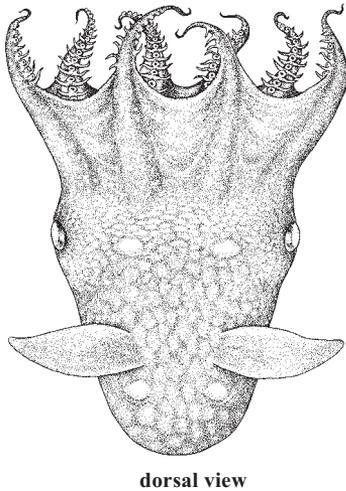


Fig. 64 Vampyroteuthidae (*Vampyroteuthis*)

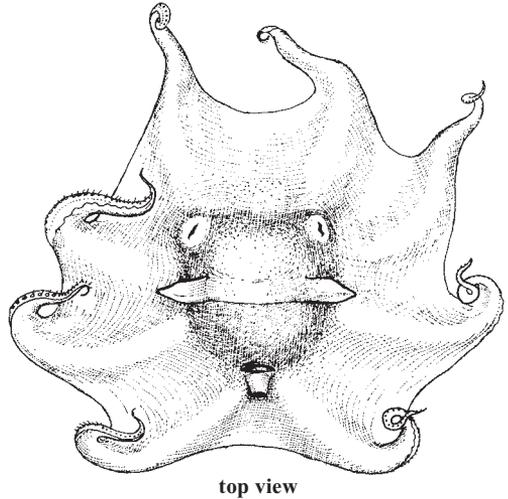


Fig. 65 Opisthoteuthidae (*Opisthoteuthis*)

- 29a. Shell (cartilaginous fin support) U-shaped **Stauroteuthidae (Fig. 66)**
- 29b. Saddle-shaped shell **Cirroteuthidae (Fig. 67)**

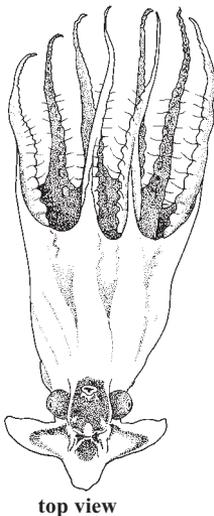


Fig. 66 Stauroteuthidae (*Stauroteuthis*)

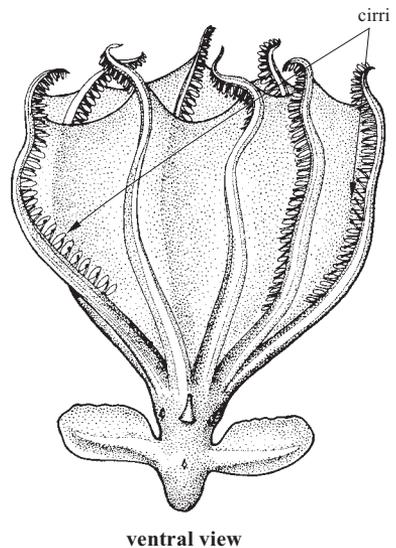


Fig. 67 Cirroteuthidae (*Cirrothauma*)

- 30a. Muscle tissue of body of gelatinous consistency but not transparent or gelatinous and transparent → **31**
- 30b. Muscle tissue of body firm (may be covered by gelatinous subdermal layer) → **34**

- 31a. Shell (internal cartilaginous support U-shaped); suckers biserial distal to edge of web **Alloposidae** (Fig. 68)
- 31b. Without internal shell; suckers uniserial along entire length of arms → **32**

- 32a. Eyes tubular. **Amphitretidae**^{3/} (Fig. 69)
- 32b. Eyes not tubular. → **33**

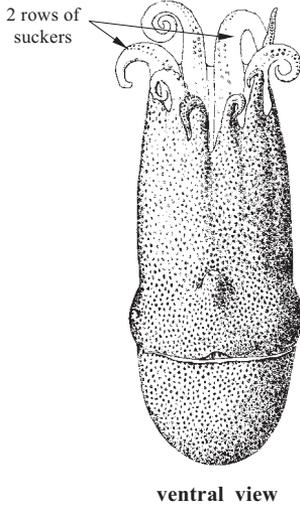


Fig. 68 Alloposidae (*Haliphron*)

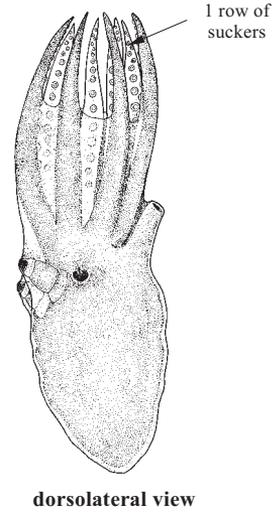


Fig. 69 Amphitretidae (*Amphitretus*)

- 33a. Digestive gland very elongate, spindle-shaped, pointed at one end . . **Vitreledonellidae**^{3/} (Fig. 70)
- 33b. Digestive gland oblong, not pointed at end **Bolitaenidae**^{3/} (Fig. 71)

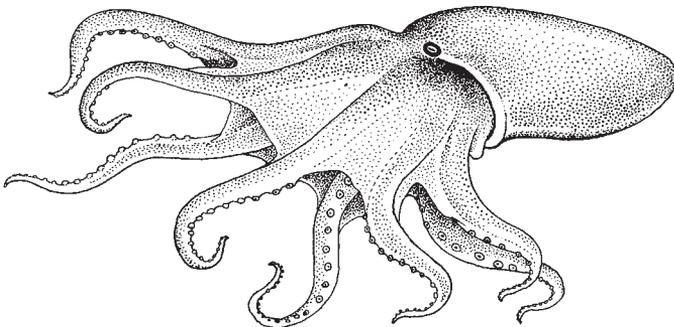


Fig. 70 Vitreledonellidae (*Vitreledonella*)

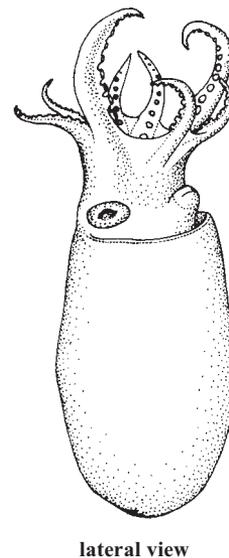


Fig. 71 Bolitaenidae (*Japetella*)

^{3/} At the time of going to press, Strugnell *et al.* (2013) used molecular evidence to merge the families Amphitretinae, Bolitaeninae and Vitreledonellinae into a single family, Amphitretidae.

- 34a. Males and females about the same size; hectocotylized left or right III arm, never in pocket; funnel locking apparatus absent; no water pores on head **Octopodidae**^{4/} (Fig. 72)
- 34b. Dwarf males very much smaller than females; hectocotylized left III arm temporarily coiled in sac below eye, with extremely long filamentous tip; funnel locking apparatus present → 35
- 35a. Water pores present on head at bases of both dorsal and ventral arms; dorsal and dorsolateral arms of female joined by thin, very deep web **Tremoctopodidae** (Fig. 73)
- 35b. Dorsal water pores absent; web, when present, not as above → 36

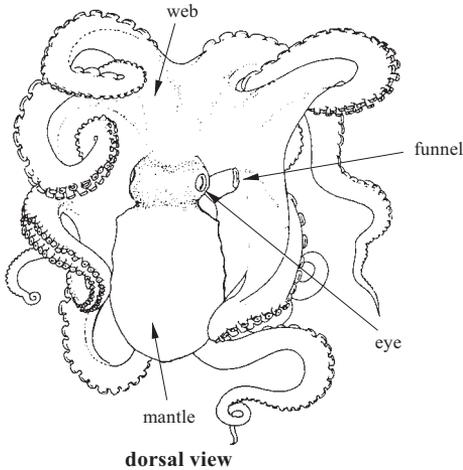


Fig. 72 Octopodidae (*Octopus*)

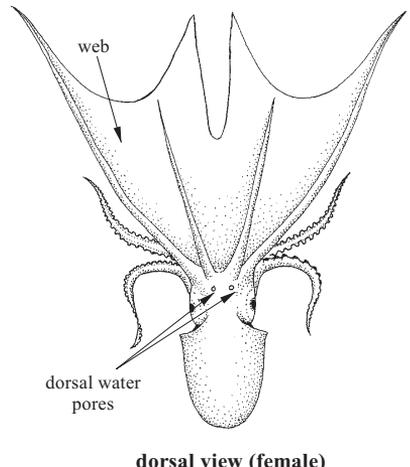


Fig. 73 Tremoctopodidae

- 36a. Females with permanent reticulate sculpturing of ventral mantle; dorsal arms of female normal, without flap; no shell-like egg case; males with hectocotylus in stalked sac beneath eye **Ocythoidae** (Fig. 74)
- 36b. Dorsal arms of females with broad, membranous flap that secretes and holds a thin, shell-like egg case; males with hectocotylus in non-stalked sac beneath eye **Argonautidae** (Fig. 75)

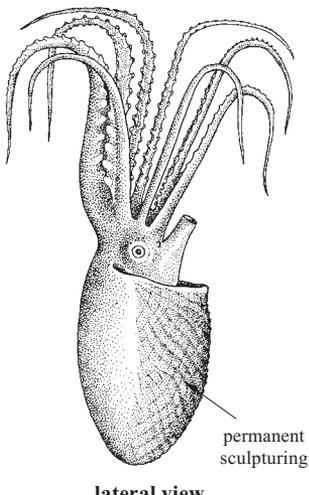


Fig. 74 Ocythoidae (*Ocythoe*)

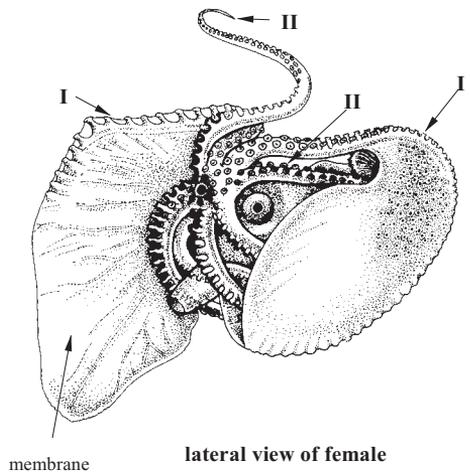


Fig. 75 Argonautidae

^{4/} At the time of going to press, Strugnell *et al.* (2013) published a major revision of the familial level classification of the incirrate octopods. They establish six families: Octopodidae, Bathypolypodidae, Eledonidae, Enteroctopodidae, Megaleledonidae and Amphitretidae.

LIST OF FAMILIES AND SPECIES OCCURRING IN THE AREA

The symbol ♀ is given when species accounts are included.

CUTTLEFISHES, BOBTAIL SQUIDS AND RAM'S HORN SQUID

Family SEPIIDAE

- ♀ *Sepia australis* Quoy and Gaimard, 1832.
- ♀ *Sepia bertheloti* d'Orbigny, 1835.
- ♀ *Sepia elegans* Blainville, 1827.
- ♀ *Sepia elobyana* Adam, 1941.
- ♀ *Sepia hieronis* (Robson, 1924).
- ♀ *Sepia hierredda* Rang, 1835.
- ♀ *Sepia officinalis* Linnaeus, 1758.
- ♀ *Sepia orbignyana* Férussac in d'Orbigny, 1826.
- ♀ *Sepia vermiculata* Quoy and Gaimard, 1832.
- ♀ *Sepiella ornata* (Rang, 1837).

Family SEPIOLIDAE

- ♀ *Austrorossia mastigophora* (Chun, 1915).
- ♀ *Heteroteuthis dispar* (Rüppell, 1844).
- ♀ *Neorossia caroli* (Joubin, 1902).
- ♀ *Rondeletiola minor* (Naef, 1912).
- ♀ *Rossia macrosoma* (Delle Chiaje, 1830).
- ♀ *Sepietta oweniana* (d'Orbigny, 1840).
- ♀ *Sepiola atlantica* d'Orbigny, 1839-1842.
- ♀ *Sepiola aurantiaca* Jatta, 1896.
- ♀ *Sepiola knudseni* Adam, 1984.
- ♀ *Sepiola rondeletii* Leach, 1817.
- ♀ *Stoloteuthis leucoptera* (Verrill, 1878).

Family SPIRULIDAE

- ♀ *Spirula spirula* (Linnaeus, 1758).

SQUIDS

MYOPSID SQUIDS

Family LOLIGINIDAE

- ♀ *Afrololigo mercatoris* (Adam, 1941).
- ♀ *Alloteuthis africana* Adam, 1950.
- ♀ *Alloteuthis media* (Linnaeus, 1758).
- ♀ *Alloteuthis subulata* (Lamarck, 1798).
- ♀ *Loligo forbesii* Steenstrup, 1856.
- ♀ *Loligo reynaudii* d'Orbigny, 1841.
- ♀ *Loligo vulgaris* Lamarck, 1798.

OEGOPSID SQUIDS**Family ANCISTROCHEIRIDAE**

‡ *Ancistrocheirus lesueurii* (d'Orbigny 1842).

Family ARCHITEUTHIDAE

‡ *Architeuthis* Steenstrup, 1857.

Family BATHYTEUTHIDAE

‡ *Bathyteuthis abyssicola* Hoyle, 1885.

Family BRACHIOTEUTHIDAE

‡ *Brachioteuthis picta* Chun, 1910.

‡ *Brachioteuthis riisei* (Steenstrup, 1882).

Family CHIROTEUTHIDAE

‡ *Chiroteuthis veranyi* (Férussac, 1835).

‡ *Grimalditeuthis bonplandi* (Vérany, 1839).

‡ *Planctoteuthis danae* (Joubin, 1931).

‡ *Planctoteuthis exophthalmica* (Chun, 1908).

‡ *Planctoteuthis lippula* (Chun, 1908).

Family CHTENOPTERYGIDAE

‡ *Ctenopteryx canariensis* Salcedo-Vargas and Guerrero-Kommritz, 2000.

‡ *Ctenopteryx sicula* (Vérany, 1851).

Family CRANCHIIDAE

‡ *Bathothauma lyromma* Chun, 1906.

‡ *Cranchia scabra* Leach, 1817.

‡ *Egea inermis* Joubin, 1933.

‡ *Galiteuthis armata* Joubin, 1898.

‡ *Helicocranchia papillata* (Voss, 1960).

‡ *Helicocranchia pfefferi* Massy, 1907.

‡ *Leachia atlantica* (Degner, 1925).

‡ *Liguriella podophtalma* Issel, 1908.

‡ *Liocranchia reinhardtii* (Steenstrup, 1856).

‡ *Megalocranchia oceanica* (Voss, 1960).

‡ *Sandalops melancholicus* Chun, 1906.

‡ *Taonius pavo* (Lesueur, 1821).

‡ *Teuthowenia maculata* (Leach, 1817).

Family CYCLOTEUTHIDAE

‡ *Cycloteuthis sirventi* Joubin, 1919.

‡ *Discoteuthis discus* Young and Roper, 1969.

‡ *Discoteuthis laciniosa* Young and Roper, 1969.

Family ENOPLOTEUTHIDAE

- ‡ *Abralia redfieldi* Voss, 1955.
- ‡ *Abralia veranyi* (Rüppell, 1844).
- ‡ *Abraliopsis atlantica* Nesis, 1982.
- ‡ *Abraliopsis gilchristi* (Robson, 1924).
- ‡ *Abraliopsis morisii* (Vérany, 1839).
- ‡ *Enoplateuthis anapsis* Roper, 1964.
- ‡ *Enoplateuthis leptura leptura* (Leach, 1817).

Family HISTIOTEUTHIDAE

- ‡ *Histioteuthis arcturi* (Robson, 1948).
- ‡ *Histioteuthis bonnellii* (Férussac, 1834).
- ‡ *Histioteuthis celetaria celetaria* (Voss, 1960).
- ‡ *Histioteuthis corona corona* (Voss and Voss, 1962).
- ‡ *Histioteuthis macrohista* Voss, 1969.
- ‡ *Histioteuthis meleagroteuthis* (Chun, 1910).
- ‡ *Histioteuthis reversa* (Verrill, 1880).

Family JOUBINITEUTHIDAE

- ‡ *Joubiniteuthis portieri* (Joubin, 1916).

Family LEPIDOTEUTHIDAE

- ‡ *Lepidoteuthis grimaldii* Joubin, 1895.

Family LYCOTEUTHIDAE

- ‡ *Lampadioteuthis megaleia* Berry, 1916.
- ‡ *Lycoteuthis lorigera* (Steenstrup, 1875).
- ‡ *Selenoteuthis scintillans* Voss, 1959.

Family MAGNAPINNIDAE

- ‡ *Magnapinna talismani* (Fischer and Joubin, 1907).

Family MASTIGOTEUTHIDAE

- ‡ *Mastigoteuthis agassizii* Verrill, 1881.
- ‡ *Mastigoteuthis danae* (Joubin, 1933).
- ‡ *Mastigoteuthis glaukopsis* Chun 1908.
- ‡ *Mastigoteuthis hjorti* Chun, 1913.
- ‡ *Mastigoteuthis inermis* Rancurel, 1972.
- ‡ *Mastigoteuthis magna* Joubin, 1913.

Family NEOTEUTHIDAE

- ‡ *Narrowteuthis nesis* Young and Vecchione, 2005.
- ‡ *Neoteuthis thielei* Naef, 1921.

Family OCTOPOTEUTHIDAE

- ‡ *Octopoteuthis danae* Joubin, 1931.
- ‡ *Octopoteuthis megaptera* (Verrill, 1885).
- ‡ *Octopoteuthis rugosa* Clarke, 1980.
- ‡ *Octopoteuthis sicula* Ruppell, 1844.
- ‡ *Taningia danae* Joubin, 1931.

Family OMMASTREPHIDAE

- ‡ *Eucleoteuthis luminosa* (Sasaki, 1915).
- ‡ *Hyaloteuthis pelagica* (Bosc, 1802)
- ‡ *Illex coindetii* (Vérany, 1839).
- ‡ *Ommastrephes bartramii* (Lesueur, 1821).
- ‡ *Ornithoteuthis antillarum* Adam, 1957.
- ‡ *Sthenoteuthis pteropus* (Steenstrup, 1855).
- ‡ *Todarodes angolensis* Adam, 1962.
- ‡ *Todarodes sagittatus* (Lamarck, 1798).
- ‡ *Todaropsis eblanae* (Ball, 1841).

Family ONYCHOTEUTHIDAE

- ‡ *Ancistroteuthis lichtensteini* (Férussac, 1835).
- ‡ *Onychoteuthis banksii* (Leach, 1817).
- ‡ *Onykia carriboea* Lesueur, 1821.
- ‡ *Onykia robsoni* (Adam, 1962).
- ‡ *Walvisteuthis virilis* Nesis and Nikitina, 1986.

Family PYROTEUTHIDAE

- ‡ *Pterygioteuthis gemmata* Chun, 1908.
- ‡ *Pterygioteuthis giardi* Fischer, 1896.
- ‡ *Pyroteuthis margaritifera* (Rüppell, 1844).

Family THYSANOTEUTHIDAE

- ‡ *Thysanoteuthis rhombus* Troschel, 1857.

VAMPIRES**Family VAMPYROTEUTHIDAE**

- ‡ *Vampyroteuthis infernalis* Chun, 1903.

CIRRATE OCTOPODS**Family CIRROTEUTHIDAE**

- ‡ *Cirroteuthis magna* Hoyle, 1885.

Family OPISTHOTEUTHIDAE

- ‡ *Grimpoteuthis boylei* Collins, 2003.
- ‡ *Grimpoteuthis wuelkeri* (Grimpe, 1920).
- ‡ *Opisthoteuthis calypso* Villanueva, Collins, Sánchez and Voss, 2002.
- ‡ *Opisthoteuthis grimaldii* (Joubin, 1903).
- ‡ *Opisthoteuthis massyae* (Grimpe, 1920).

INCIRRATE OCTOPODS**Family ALLOPOSIDAE**

- ‡ *Haliphron atlanticus* Steenstrup, 1861.

Family AMPHITRETIDAE

- ‡ *Amphitretus pelagicus* Hoyle, 1885.

Family ARGONAUTIDAE

- ‡ *Argonauta argo* Linnaeus, 1758.
- ‡ *Argonauta hians* Lightfoot, 1786
- ‡ *Argonauta nodosus* Lightfoot, 1786.

Family BOLITAENIDAE

- ‡ *Bolitaena pygmaea* (Verrill, 1884).
- ‡ *Japetella diaphana* Hoyle, 1885.

Family OCTOPODIDAE

- ‡ *Amphioctopus burryi* (Voss, 1950).
- ‡ *Aphrodoctopus schultzei* (Hoyle, 1910).
- ‡ *Bathypolypus ergasticus* (P. Fischer and H. Fischer, 1892).
- ‡ *Bathypolypus sponsalis* (P. Fischer and H. Fischer, 1892).
- ‡ *Bathypolypus valdiviae* Thiele in Chun 1915.
- ‡ *Benthoctopus januarii* (Hoyle, 1885).
- ‡ *Callistoctopus macropus* (Risso, 1826).
- ‡ *Eledone caparti* Adam, 1950.
- ‡ *Eledone cirrhosa* (Lamarck, 1798).
- ‡ *Eledone moschata* (Lamarck, 1798).
- ‡ *Graneledone verrucosa* (Verrill, 1881).
- ‡ *Macrotritopus defilippi* (Vérany, 1851).
- ‡ *Octopus vulgaris* Cuvier, 1797.
- ‡ *Pteroctopus tetracirrhus* (Delle Chiaje, 1830).
- ‡ *Scaergus unicirrhus* (Delle Chiaje, 1841).

Family OCYTHOIDAE

- ‡ *Ocythoe tuberculata* Rafinesque, 1814.

Family TREMOCTOPODIDAE

 *Tremoctopus violaceus* Delle Chiaje, 1830.

Family VITRELEDONELLIDIDAE

 *Vitreledonella richardi* Joubin, 1918.

References

- Boletzky, S.v.** 1999. A brief outline of the classification of recent cephalopods. *Bulletin de la Societe Zoologique de France*, 124 (3); 271–278.
- Boyle, P.R. & Rodhouse, P.G.** 2005. *Cephalopods: Ecology and Fisheries*. Blackwell Science Ltd. Oxford, UK, 452 pp.
- Clarke, M.R.** 1978. The cephalopod statolith. An introduction to its form. *Journal of the Marine Biological Association of the United Kingdom*, 58: 701–712.
- Hanlon, R.T. & Messenger, J.B.** 1996. *Cephalopod Behaviour*. Cambridge University Press, 232 p.
- Jereb, P. & Roper, C.F.E eds.** 2005. Cephalopods of the World. An annotated and illustrated catalogue of cephalopod species known to date. Volume 1. Chambered nautilus and sepioids (Nautilidae, Sepiidae, Sepiolidae, Sepiadariidae, Idiosepiidae and Spirulidae). *FAO Species Catalogue for Fishery Purposes*, 4(1): 262., 9 colour plates.
- Jereb, P. Ragonese, S. & Boletzky, S. von, eds.** 1991. Squid age determination using statoliths. Proceedings of the International Workshop held in the Istituto di Tecnologia della Pesca e del Pescato. *NTR-ITPP Special Publications*, No. 1: 128 pp.
- Leporati, S.C., Semmens, J.M. & Pecl, G.T.** 2008. Determining the age and growth of wild octopus using stylet increment analysis. *Marine Ecology Progresses Series*, 367: 213–222.
- Mangold, K.** 1989. Céphalopodes. In P.P. Grassé, ed. *Traité de Zoologie*. volume V, fascicule 4, Masson, Paris, 804 pp.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Nielsen, J., ed.** 2007. Cephalopod life-cycles, biology, management. *Reviews in Fish Biology and Fisheries*, 17(2–3): 499 pp.
- Nixon, M. & Young, J.Z.** 2003. *The brains and lives of Cephalopods*. Oxford University Press, 392 pp.
- Perales-Raya, C., Bartolome, A., García-Santamaría, M.T., Pascual-Alayón, P. & Almansa, E.** 2010. Age estimation obtained from analysis of octopus (*Octopus vulgaris* Cuvier, 1797) beaks improvements and comparisons. *Fisheries Research*, 106: 171–176.
- Pierce, G.J., Allcock, L., Bruno, I., Bustamante, P., González, A., Guerra, Á. Jereb, P., Lefkaditou, E., Malham, S., Moreno, A., Pereira, J., Piatkowski, U., Rasero, M., Sánchez, P., Begoña Santos, M., Santurtún, M., Seixas, S., Sobrino, I. & Villanueva, R.** 2010. *Cephalopod biology and fisheries in Europe*. ICES Cooperative Research Report No. 303, 175 pp.
- Rocha, F., Guerra, A. & González, A.F.** 2001. A review of the reproductive strategies in cephalopods. *Biological Reviews*, 76: 291–304.
- Young, R.E., Vecchione, M. & Mangold, K.M.** 2012. Tree of Life Cephalopoda Cuvier 1797. Octopods, squids, nautilus, etc. Version 10 November 2012 (under construction). <http://tolweb.org/Cephalopoda/19386/2012.11.10> in The Tree of Life Web Project, <http://tolweb.org/>

SEPIIDAE

Cuttlefishes

Diagnostic characters: Mantle robust, slightly flattened dorsoventrally, may be broad or slender; oval 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. Head robust, slightly narrower than mantle; eyes prominent, covered by a transparent corneal 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. Males with hectocotylized left ventral arm(s) IV for holding spermatophores; hectocotylus consists of a modified region of reduced suckers on either side of a swollen region, crenulated by transverse folds. Tentacular clubs with 4 or more suckers in transverse rows; **tentacles retractile into pockets on the ventrolateral sides of the head**. Arm and club suckers with chitinous rings. **Internal calcareous shell (cuttlebone) located dorsally under the skin**; cuttlebone shape ranges from lanceolate to oval; dorsal side a calcareous plate (dorsal shield); ventrally finely laminate, porous and consisting of thin, transverse septa supported by transverse calcareous rods. Buccal membrane present, with or without suckers; each radula tooth unicuspid (with a single projection). The colour is variable due to the great complex of chromatophores; browns, blacks, yellows and reds are the dominating colours.

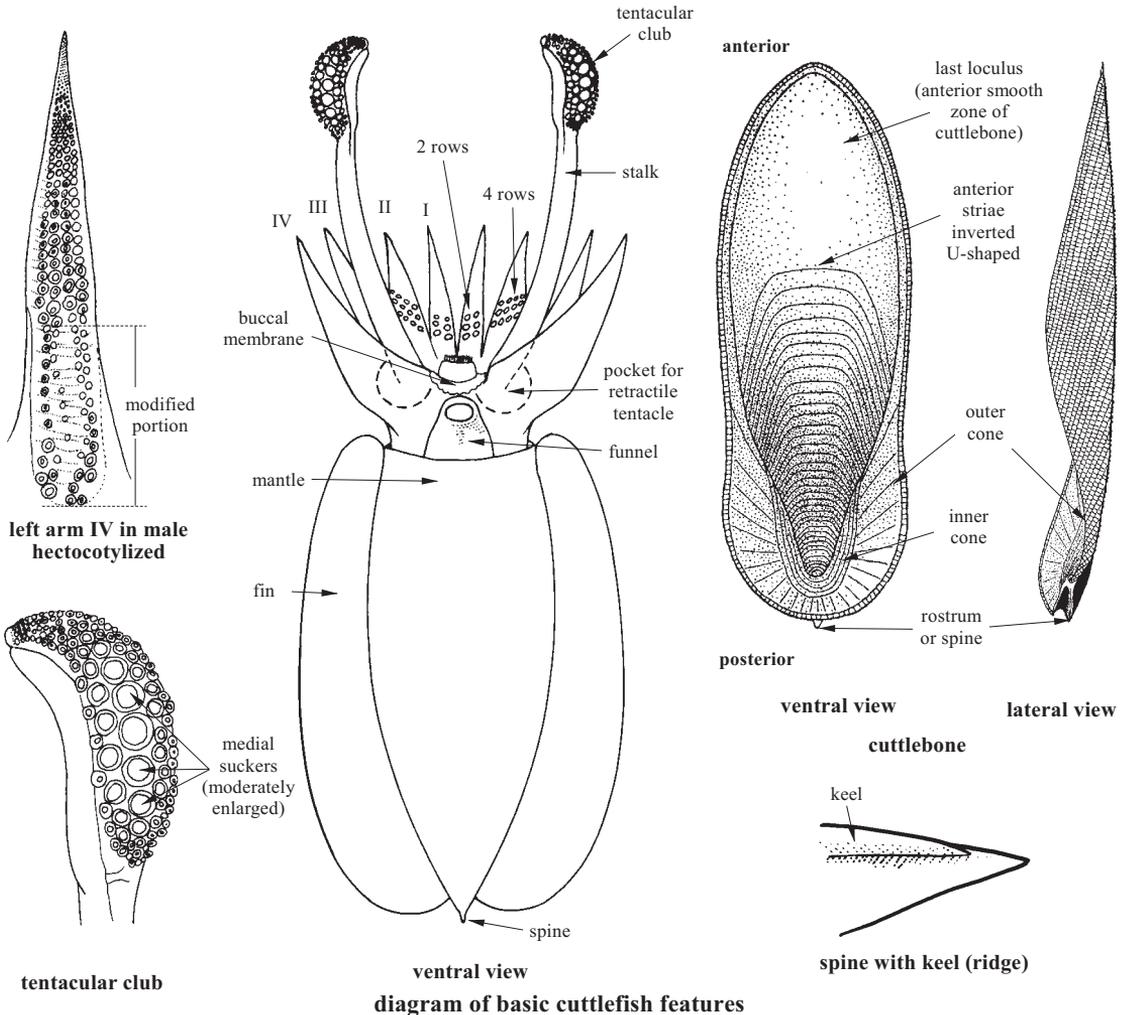


diagram of basic cuttlefish features

Size: Up to 500 mm mantle length and 12 kg in weight.

Habitat, biology, and fisheries: On the continental shelf and upper slope to a maximum depth of approximately 1 100 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 stabilizers. 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.

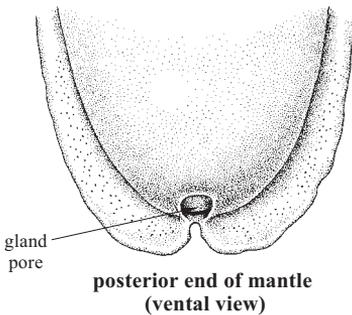
Similar families occurring in the area

The presence of a straight, laminate, calcified cuttlebone easily distinguishes the Sepiidae from the other families.

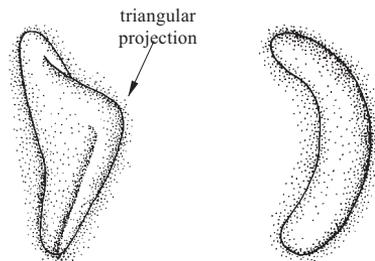
Remarks: There are still unresolved problems in the systematics of the genus *Sepia*. Khromov *et al.* (1998) placed *S. elegans* in the species complex *Rhombosepion*. However, Sanjuan *et al.* (1996), using allozyme electrophoresis on 3 species of *Sepia*, showed that *S. officinalis* and *S. elegans* belong to different genera: the first to the genus *Sepia sensu strictu* and the second to *Rhombosepion*. Resolution of this systematic problem has implications for a large number of other *Sepia* species and requires a larger study.

Key to the species of Sepiidae occurring in the area

- 1a. Posterior gland present on the ventral side of the posterior end of the mantle (Fig. 1), opening between fins; mantle-locking cartilage with triangular projection (Fig. 2a); cuttlebone without spine; outer cone wide posteriorly, with uncalcified edge; inner cone reduced, wide, flat, with short limbs ***Sepiella ornata***
- 1b. Posterior gland absent; mantle-locking cartilage semicircular without triangular projection (Fig. 2b); cuttlebone not as above **(genus *Sepia*) → 2**



posterior end of mantle (ventral view)
Fig. 1 *Sepiella*



a) *Sepiella* b) *Sepia*
Fig. 2 mantle-locking apparatus

- 2a. Cuttlebone broadly to narrowly oval or rhomboidal anteriorly and oval posteriorly; inner cone with moderately wide limbs → **4**
- 2b. Cuttlebone shape not as above; inner cone with narrow limbs → **3**
- 3a. Cuttlebone narrowly drop-shaped; outer cone narrow, not forming posterior wings; spine long, with dorsal and ventral keels ***Sepia australis***
- 3b. Cuttlebone oval, subrhomboidal, or tongue-shaped; outer cone well developed, usually with wide wings; spine present or absent, when present, usually without keels; cuttlebone posterior wings of outer cone absent or indistinct, not separated by deep notch from anterior part of cuttlebone; inner cone U- to V- shaped, with thick, sharply pointed limbs; arms of male subequal → **8**

- 4a. Club suckers subequal, in 5 to 8 longitudinal series; cuttlebone ovally rhomboidal anteriorly, with slightly curved margins; spine of cuttlebone represented by blunt knob ***Sepia elobyana***
- 4b. Club suckers distinctly unequal in size, in 7 or 8 longitudinal series; cuttlebone acuminate anteriorly; cuttlebone spine distinct and sharply pointed → 5
- 5a. Medial club suckers 1.5 to 2.0 times larger than marginal suckers; cuttlebone width <33% length; posterior dorsal shield without excrescence ***Sepia bertheloti***
- 5b. Medial club suckers 2 or 3 times larger than marginal suckers; cuttlebone width usually >33% cuttlebone length → 6
- 6a. Medial club suckers 2.0 to 2.5 times larger than marginal suckers; adult mantle length usually about 150 mm; posterior spine surrounded by smooth, flat, chitinous excrescence ***Sepia vermiculata***
- 6b. Medial club suckers 2.5 to 3.0 times larger than marginal suckers; adult mantle length usually more than 200 mm → 7
- 7a. Cuttlebone very acuminate anteriorly, spine not covered with chitin in adults; hectocotylus usually with 8 to 14 rows of reduced suckers ***Sepia hierredda***
- 7b. Cuttlebone slightly acuminate anteriorly, spine covered with chitin in adults; hectocotylus usually with 4 to 8 rows of reduced suckers ***Sepia officinalis***
- 8a. Tentacular club suckers distinctly different in size → 9
- 8b. Tentacular club suckers small and subequal ***Sepia hieronis***
- 9a. Cuttlebone spine replaced by short, rugose, calcareous keel; 5 pairs of suckers at the base of I, II and III arms in females, 4 rows of suckers at the remaining parts of the arms, suckers on arms IV always quadriserial ***Sepia elegans***
- 9b. Cuttlebone with long, distally prominent spine; arm suckers quadriserial along entire length ***Sepia orbignyana***

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Sepia australis* Quoy and Gaimard, 1832.
-  *Sepia bertheloti* d'Orbigny, 1835.
-  *Sepia elegans* Blainville, 1827.
-  *Sepia elobyana* Adam, 1941.
-  *Sepia hieronis* (Robson, 1924).
-  *Sepia hierredda* Rang, 1837.
-  *Sepia officinalis* Linnaeus, 1758.
-  *Sepia orbignyana* Férussac in d'Orbigny, 1826.
-  *Sepia vermiculata* Quoy and Gaimard, 1832 .

 *Sepiella ornata* (Rang, 1837).

References

- Adam, W. 1951. Les Céphalopodes de l'Institut Français d'Afrique Noire. *Bulletin de l'Institut français d'Afrique Noire*, 13(3): 771–787.
- Adam, W. 1960. Les cephalopodes de l'Institut Français d'Afrique Noire. *Bulletin de l'Institut français d'Afrique Noire*, 22(2): 456–511.
- Adam, W. & Rees, W.J. 1966. A review of the cephalopod family Sepiidae. *Scientific Reports of the John Murray Expedition*, 11(1): 165 p.

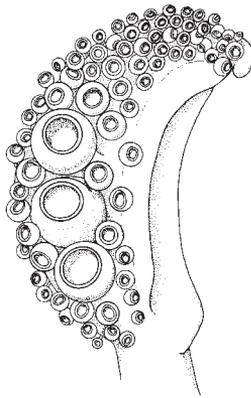
- Delgado de Molina Acevedo, A., Santana Fernandez, J.C., Ariz Telleria, J. & Goni Beltran de Garizurieta, R.** 1993. Parametros biológico-pesqueros de algunas especies de la familia Sepiidae Keferstein, 1866, obtenidos en las campanas IBNSINA (1980–1982). *Boletín del Instituto de Español de Oceanografía*, 9(1): 41–56.
- Guerra A.** 1992. Mollusca: Cephalopoda. In M.A. Ramos *et al.*, eds. *Fauna Ibérica* Vol. 1. Museo Nacional de Ciencias Naturales CSIC Madrid, 327 pp.
- Guerra, A., Pérez-Losada, M., Rocha, F. & Sanjuan, A.** 2001. Species differentiation of *Sepia officinalis* and *Sepia hierredda* (Cephalopoda: Sepiidae) based on morphological and allozyme analyses. *Journal of the Marine Biological Association of the United Kingdom*, 81: 271–281.
- Guerra, A., Robin, J-P., Sykes, A., Koutsoubas, D., Jereb, P., Lefkaditou, E. & Allcock, L.** In press. *Sepia officinalis*. In Jereb, P., Allcock, A.L., Lefkaditou, E., Piatkowski, U., Pierce, G.J. eds, In press. Cephalopod biology and fisheries in European waters: species accounts. *Cooperative Research Report, International Council for the Exploration of the Sea*.
- Ikeda, I.** 1972. Rapport sur les recherches japonaises. *FAO Fisheries Report*, 158: 41–45.
- Jereb, P., Allcock, A.L., Lefkaditou, E., Piatkowski, U. & Pierce, G.J., eds.** In press. Cephalopod biology and fisheries in European waters: species accounts. *Cooperative Research Report, International Council for the Exploration of the Sea*.
- Khromov, D.N., Lu, C.C., Guerra, A., Dong, Z. & Boletzky, S.v.** 1998. A synopsis of Sepiidae outside Australian waters. In N.A. Voss, M. Vecchione, R.B. Toll. & M.J. Sweeney, eds. Systematics and Biogeography of Cephalopods. Volume 1. *Smithsonian Contributions to Zoology*, Washington DC, 586: 77–157.
- Mqoqi, M., Lipinski, M.R. & Salvanes, A.G.V.** 2007. The ecology of *Sepia australis* (Cephalopoda: Sepiidae) along the south coast of South Africa. *ICES Journal of Marine Science*, 64: 945–955.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Okutani, T.** 1995. *Cuttlefish and squids of the world in color*. National Cooperative Association of Squid Processors. Okomura Printing C. Ltd, Tokio, Japan, 185 p.
- Reid, A.L., Jereb, P. & Roper C.F.E.** 2005. Sepiidae. In P. Jereb & C.F.E. Roper, eds. An annotated and illustrated catalogue of cephalopods species known to date. Chambered nautilus and sepioids (Nautilidae, Sepiidae, Sepiolidae, Sepiadariidae, Idiosepiidae and Spirulidae). *FAO Species Catalogue for Fishery Purposes*, 4(1): 57–152.
- Roeleveld, M.A.C.** 1972. A review of the Sepiidae (Cephalopoda) of Southern Africa. *Annals of the South African Museum*, 59(10): 193–313.
- Sánchez, P.** 1988. Systematics and distribution of the cephalopods of Namibia. *Monografías de Zoología Marina, Barcelona*, 3: 205–266.
- Sánchez, P. & Villanueva, R.** 1989. Distribution and abundance of three species of cephalopods sepiids in Namibian waters. *Collection of Scientific Papers. International Commission for the Southeast Atlantic Fisheries*, 16(2): 151–160.
- Sanjuan, A., Pérez-Losada, M. & Guerra, A.** 1996. Intra and interespecific genetic differentiation in 3 species of *Sepia* (Mollusca: Cephalopoda) from Galician waters (NW of the Iberian Peninsula). *Marine Biology*, 126: 253–259.

***Sepia australis* Quoy and Gaimard, 1832**

Frequent synonyms / misidentifications: *Sepia capensis* Orbigny, 1845; *S. sinope* Gray, 1849 / None.

FAO names: **En** – Southern cuttlefish; **Fr** – Seiche australe; **Sp** – *Sepia australis*.

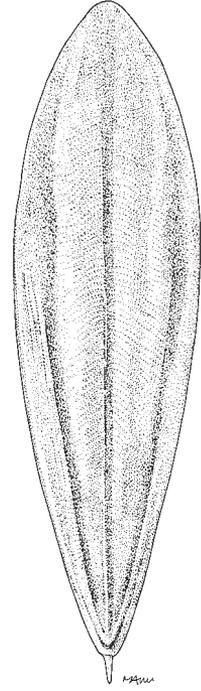
Diagnostic characters: Body elongate, oval, narrow and tapering anteriorly and posteriorly. Fins separated posteriorly. Arm suckers in 4 rows, the 2 median series much larger than the lateral ones. Left ventral arm of male hectocotyized over proximal two-thirds: 5 or 6 normal suckers at base, followed by 6 or 7 rows of minute suckers, the 2 dorsal series in normal position but 2 ventral series merged into a single series of 12 to 14 minute suckers on ventral protective membrane. Tentacular club short, slightly recurved, with suckers in transverse rows of 5, reducing to 4 proximally; **median 3 suckers greatly enlarged**, 1 or 2 others less so. Cuttlebone broadly lanceolate, somewhat oval anteriorly, sharply pointed posteriorly, **without posterior wings**. Striated zone with 3 deep, narrow longitudinal grooves. **Spine with dorsal keel** (barely discernible in juveniles) that extends for a short distance on the posterior part of the cuttlebone. **Intestinal light organ present**. **Colour:** brownish purple dorsally, with a narrow orange band along bases of fins; body equally heavily pigmented dorsally and ventrally.



tentacular club



dorsal view



ventral view

cuttlebone

Size: Maximum mantle length 85 mm, weight 50 g; females are larger and heavier than males.

Habitat, biology, and fisheries: A demersal species, abundant inside the 200 m isobath but recorded from 0 to 496 m. The most common sepiid off the west coast of Namibia and South Africa. *S. australis* apparently thrives in areas where O₂ concentrations are as low as 1.5 ml/l, which allows it to take advantage of oxygen-depleted shallow northern waters of the South African west coast, and to feed on one of its key prey species, the mantis shrimp. On the Agulhas Bank the higher bottom temperatures result in smaller mean size, affecting fecundity and abundance. In the wild this species feeds on crustaceans and euphausiids, fishes, and its own kind (*S. australis*); the incidence of cannibalism was low in summer off the west coast. *S. australis* continues to feed when sexually mature. This species is preyed upon by many species of fish, fur seals and also white-chinned petrels, probably by scavenging at the sea surface. Males may produce up to 360 spermatophores. *S. australis* prefers to spawn in deeper water of about 100 to 150 m. Not currently exploited commercially but important in the foodweb of the Benguela ecosystem.

Distribution: Northern Namibia, (17°30'S) to Rame Head, South Africa (31°47'S, 29°20'E).

Remarks: The record of 2 specimens from the Red Sea is erroneous.

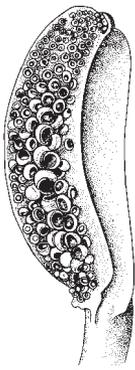


Sepia bertheloti d'Orbigny, 1835

Frequent synonyms/ misidentifications: *Sepia verrucosa* Lönberg, 1896; *S. mercatoris* Adam, 1937 / None.

FAO names: En – African cuttlefish; Fr – Seiche africaine; Sp – Sepia africana.

Diagnostic characters: Mantle more than 2 times longer than wide, its dorsal margin projecting strongly as a long, sharp angle. **Arms IV elongate.** **Left ventral arm hectocotylized with 2 to 5 normal suckers at base and 9 to 13 rows of minute, spaced-out suckers on its proximal third; dorsal protective membrane very broad.** Tentacular club slender, swimming keel not extended beyond base; protective membranes not united proximally and not extended onto stalk; suckers arranged in 8 oblique transverse rows, third in series slightly enlarged. Cuttlebone long oval, limbs of inner cone flat, narrow. **Spine present.** This species has **elongate tubercles along bases of fins with small, light-coloured patches laterally; males with a reddish stripe near lateral border of fins.** **Colour:** purplish brown.



tentacular club

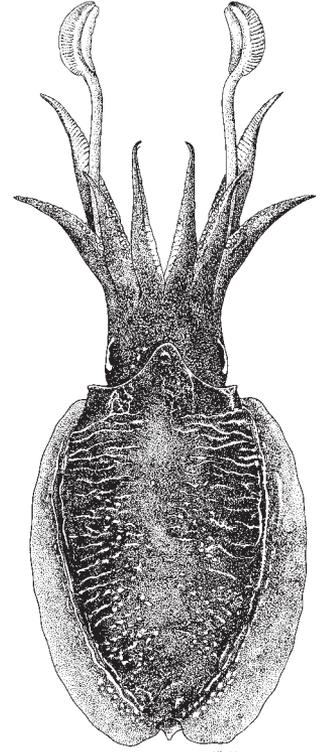


hectocotylus



cuttlebone

(after Adam, 1952)



(after Adam, 1952)

dorsal view

Size: Maximum mantle length 180 mm in males and 130 mm in females.

Habitat, biology, and fisheries: A neritic, demersal species occurring predominantly on sandy to muddy bottoms on the continental shelf. From 20 to 160 m, mostly abundant between 25 and 65 m. The spawning season extends through summer and autumn. The species migrates to shallow waters during the spawning season. Females deposit about 50 to 100 eggs. This species preys upon molluscs (including other cephalopods), crustacean and small fishes. Its maximum lifespan is 2 years. It is a species well represented on the continental shelf along its entire geographical range of distribution but it never showed high abundant concentrations. In the northern part of its geographic distribution it is caught by otter trawlers in *Sepia officinalis* fishery off the Canary Islands and Morocco waters. It is also taken by trawlers in the *S. hierredda* fishery in more southern African waters: off Senegal represents only a minor portion (1 to 2%) of the total cuttlefish catches taken by trawlers and pirogues; it is also caught off Sierra Leone, Liberia, Côte d'Ivoire and Ghana by trawlers and in small-scale fisheries. Marketed fresh or deep-frozen for export. Separate statistics are not reported for this species.



Distribution: Eastern Atlantic from the Canary Islands and Western Sahara to Cape Santa Maria, Angola (14°S).

***Sepia elegans* Blainville, 1827**

Frequent synonyms / misidentifications: *Sepia rubens* Philippi, 1844; *S. ruppellaria* Férussac and d'Orbigny, 1848; *S. biserialis* Vérany, 1851; *S. italica* Risso, 1854, *Rhombosepion ruppellarium* (Férussac and d'Orbigny): Rochebrune, 1884 / *Sepia bertheloti* d'Orbigny, 1835.

FAO names: En – Elegant cuttlefish; Fr – Sieche élégant; Sp – Choquito sin punta.

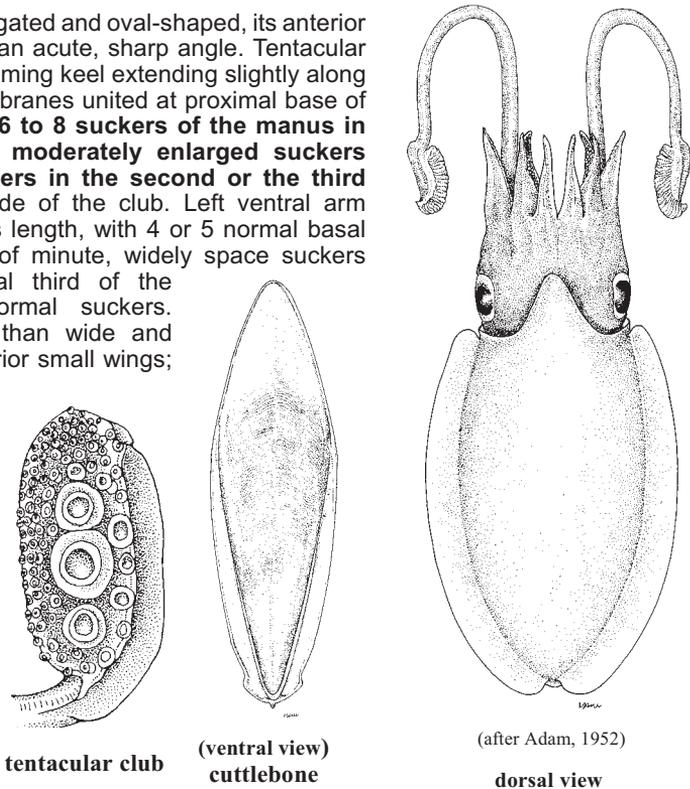
Diagnostic characters: Mantle elongated and oval-shaped, its anterior dorsal margin projecting strongly in an acute, sharp angle. Tentacular club short, broad, blunt distally; swimming keel extending slightly along the stalk; dorsal and protective membranes united at proximal base of club, extending slightly along stalk; **6 to 8 suckers of the manus in oblique, transverse rows; a few moderately enlarged suckers dorsally; 3 greatly enlarged suckers in the second or the third series**, counted from the dorsal side of the club. Left ventral arm hectocotylized in for two-thirds of its length, with 4 or 5 normal basal suckers followed by 9 to 11 rows of minute, widely space suckers arranged in zig-zag pattern; distal third of the hectocotylus with 4 rows of normal suckers. Cuttlebone about 2 times longer than wide and delicate; its outer cone with 2 posterior small wings; spine replaced by a small crest; dorsal surface smooth. **Colour:** reddish brown.

Size: Maximum dorsal mantle length in females and males are 90 and 72 mm, respectively.

Habitat, biology, and fisheries: A nektobenthic species. From 5 to 500 m, mainly abundant between 50 and 150 m depth. Sexual maturity may be attained at different sizes in both sexes. Males are, however, more precocious than females; males of 25 mm mantle length were observed totally mature whereas the first mature female measured 40 mm in mantle length. The spawning season extends almost throughout the year in Galicia (northwest Spain) and off West Africa, while it extends from March to October in the western Mediterranean. Spawning grounds are located in shallow waters between 15 and 70 m depth. *Sepia elegans* is known to migrate from deep to shallow waters for reproduction. Its spatial distribution and abundance changes seasonally, largely as a consequence of changes in depth distribution and resultant migration from neighbouring areas. The eggs are laid in clusters of 12 to 35 (diameter 4.2 to 4.6 mm) attached to alcyonarians (sea fans), red sea-whip, cuttlebones, etc. on muddy bottoms. Hatchlings measure about 4 mm mantle length. This species preys upon small crustaceans, bony fish and polychaeta. Females have longer tentacle clubs and ingest more food than males at any given size. Females grow faster and attain larger sizes than males. Average growth rate estimated ranges from 1.5 to 2.0 mm mantle length per month. Seasonal variations in growth rate do exist. Growth rate is faster during the initial period of its life cycle. The life span of this species is about 16 to 18 months. Its range of salinity tolerance in wild conditions varies from 33 to 35.5‰. The species is not tolerant to high salinity variations. Temperature limits of this species ranged from 10 to 18°C. It is caught as bycatch in trawl fisheries throughout its area of distribution. Separate statistics are not reported.

The spawning season extends almost throughout the year in Galicia (northwest Spain) and off West Africa, while it extends from March to October in the western Mediterranean. Spawning grounds are located in shallow waters between 15 and 70 m depth. *Sepia elegans* is known to migrate from deep to shallow waters for reproduction. Its spatial distribution and abundance changes seasonally, largely as a consequence of changes in depth distribution and resultant migration from neighbouring areas. The eggs are laid in clusters of 12 to 35 (diameter 4.2 to 4.6 mm) attached to alcyonarians (sea fans), red sea-whip, cuttlebones, etc. on muddy bottoms. Hatchlings measure about 4 mm mantle length. This species preys upon small crustaceans, bony fish and polychaeta. Females have longer tentacle clubs and ingest more food than males at any given size. Females grow faster and attain larger sizes than males. Average growth rate estimated ranges from 1.5 to 2.0 mm mantle length per month. Seasonal variations in growth rate do exist. Growth rate is faster during the initial period of its life cycle. The life span of this species is about 16 to 18 months. Its range of salinity tolerance in wild conditions varies from 33 to 35.5‰. The species is not tolerant to high salinity variations. Temperature limits of this species ranged from 10 to 18°C. It is caught as bycatch in trawl fisheries throughout its area of distribution. Separate statistics are not reported.

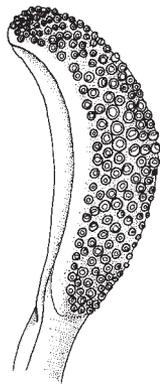
Distribution: The entire Mediterranean Sea and in the eastern Atlantic from 55°N to 15°S.



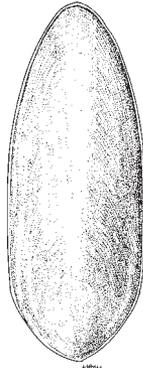
***Sepia elobyana* Adam, 1941**

Frequent synonyms / misidentifications: None / None.

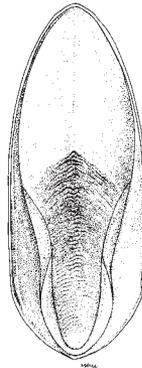
FAO names: En – Guinean cuttlefish; Fr – Seiche de Guinée; Sp – Sepia guineana.



tentacular club

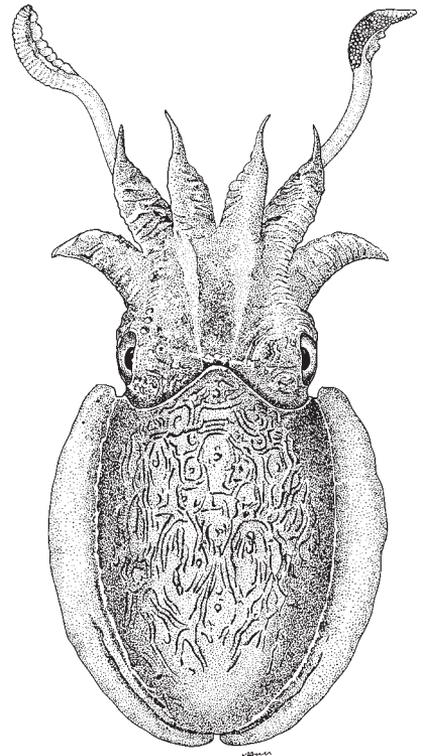


dorsal view



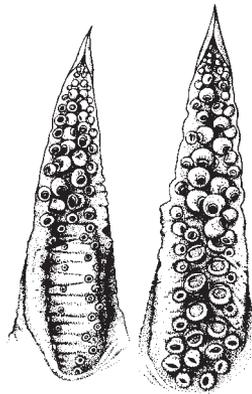
ventral view

cuttlebone



(after Adam, 1952)
dorsal view

Diagnostic characters: Mantle broad, length less than 2 times width; **its dorsal surface with scattered tubercles and peculiar reticulate pattern of ridges.** Fins broad. **Tentacular club with small subequal suckers** in about 8 longitudinal rows. All arms attenuate. Suckers on arms I and II of females biserial distally and quadriserial proximally and quadriserial throughout in arms III. Suckers in males quadriserial for most of the arms, but biserial at tips. Both ventral (IV) arms in males modified. Left ventral arm with 7 or 8 rows in proximal half with minute suckers, widely spaced suckers on fleshy ridges. Spine a blunt knob.



hectocotylus

Size: It is a small species, maximum mantle length about 55 mm.

Habitat, biology, and fisheries: Unknown. None interest to fisheries. However, it is possible that this species was caught as bycatch in the trawl fisheries along the West African coast.

Distribution: Eastern Atlantic along West African coast from Senegal to Elobey Islands, Equatorial Guinea. Its southern limits are undetermined.

Remarks: The species is known from very few animals (1 male from the Gulf of Guinea, holotype, and 4 males and 1 female from Senegal). The tentacular club suckers in the holotype differ from the material caught in Senegalese waters by having some enlarged suckers and were thought by Adam (1952) to be anomalous. The differences in the relative width of the cuttlebone in the holotype and in a male specimen from Senegal strongly suggest different species. If the combined specimens constitute more than 1 species, the name must remain with the holotype, which clearly has some enlarged club suckers. This species was included in the *Sepia sensu stricto* species complex.



***Sepia hieronis* (Robson, 1924)**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Bullet cuttlefish; **Fr** – Seiche arrondie; **Sp** – Sepia redondeada.

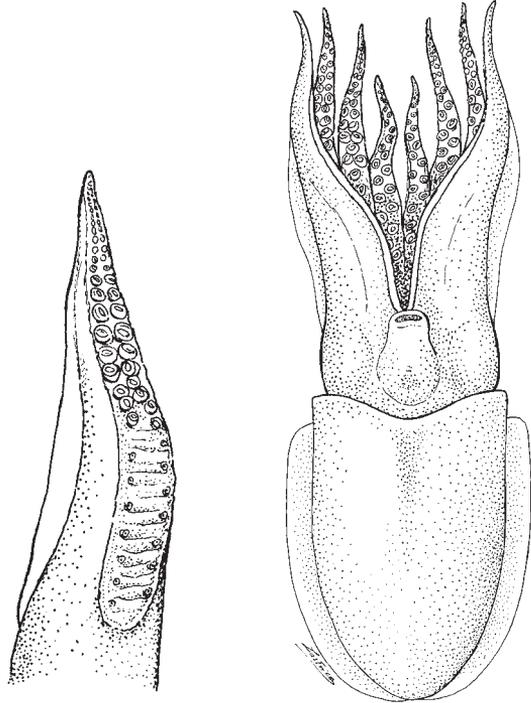
Diagnostic characters: Arm suckers biserial or quadriserial but variable. Lateral arms with several medial suckers enlarged, especially in males. **Arms of females attenuated distally.** Left ventral arm of males hectocotylized over proximal half, with transversely wrinkled area separating 7 pairs of dorsal suckers and 14 ventral suckers in a single series. Tentacular clubs with subequal suckers in 5 to 8 longitudinal series. **Cuttlebone form rhomboid, frequently pink dorsally, with blunt posterior knob, spine absent.** Anterior striae with 3 rounded peaks.

Size: Maximum mantle length 70 mm.

Habitat, biology, and fisheries: Biology virtually unknown. Inhabits waters from 30 to 460 m depth. Maximum biomass off the South African west coast was 1 074 tonnes in August 1988. Biomass greatest in 130 to 220 m depth, at temperatures of 8.5 to 10°C.

Distribution: Off Kunene River, Namibia, to Kenya.

Remarks: Second most abundant sepiid off southern African west coast. Specimens from Mozambique show some morphological differences.



hectocotylus

ventral view



***Sepia hierredda* Rang, 1835**

Frequent synonyms / misidentifications: *Acanthosepion oculifera* Rochebrune, 1884, *A. goreense* Rochebrune, 1884 / *Sepia officinalis* Linnaeus, 1758.

FAO names: **En** – Giant African cuttlefish; **Fr** – Seiche géante africaine; **Sp** – *Sepia gigante africana*.

Diagnostic characters: Anterior dorsal margin of the mantle projecting in an obtuse, blunt angle. **Tentacular club** long with 5 or 6 suckers in transverse rows; **suckers differ in size: 5 or 6 median suckers of proximal rows twice diameter of rest.** **Left ventral arm (IV) hectocotylized, with 8 to 14 transverse rows of reduced suckers distally.** **Cuttlebone anteriorly very acuminate;** its striated zone extends over 47% of its length; cuttlebone width is 35% of mantle length and its thickness 12% of mantle length; its spine is never covered by chitin. **Colour:** pattern very similar to *Sepia officinalis*.

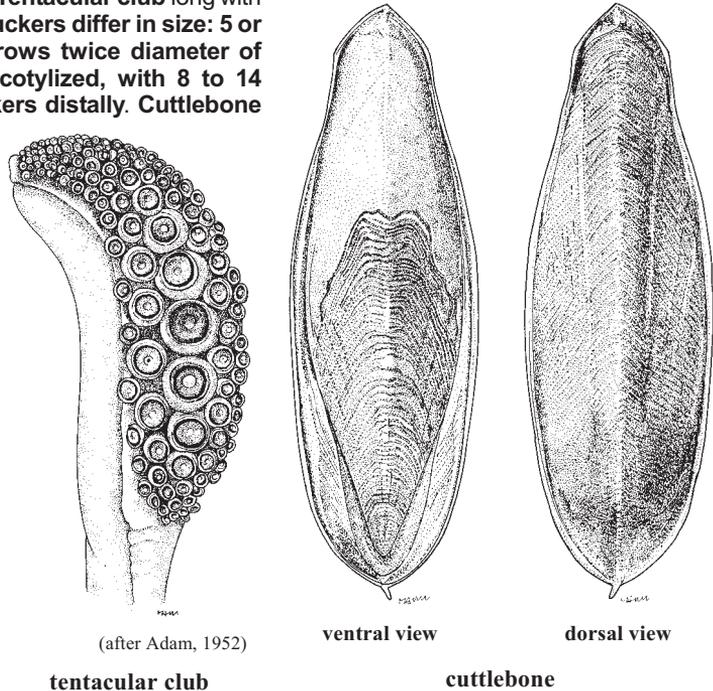
Size: Maximum dorsal mantle length (mantle length) 500 mm.

Habitat, biology, and fisheries:

A nektonic, neritic species. From coastal waters (7 m) to the slope of the continental shelf (about 200 m). Females mature at 13 cm mantle length. Spawning take place from January to September in shallow waters. Total individual fecundity ranges from 250 eggs at 13 cm mantle length to 1 400 eggs at 35 cm mantle length. Spawning migrations towards the coast have been observed. Growth rates of 26 mm per month up to a length of 10 cm, slowing down to 21 mm per month between 10 and 35 cm mantle length were observed. Life span around 2 years. It is a species of commercial importance. Catches of unidentified cuttlefishes are taken in West Africa. However, the main fraction of the total catches in that area can be attributed to *Sepia hierredda*, which is mainly fished by Moroccan in the south, Mauritanian and Senegalese boats, as well as by trawlers from China and Korea. Along the coast of Senegal, the cuttlefish is mainly caught at depths of 7 to 16 m by canoes using jigs and traps and from 10 to 150 m depth by trawlers. The species is usually marketed fresh and frozen.

Distribution: Western Africa, from Cape Blanc, Mauritania, 21°N to Baía dos Tigres, Angola, 16°30'S.

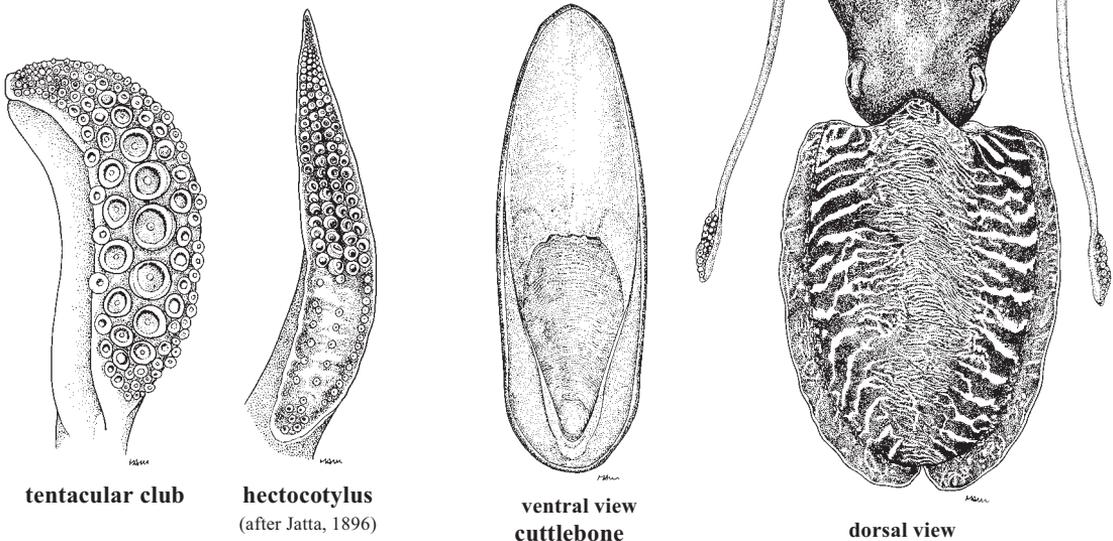
Remarks: This species has been long considered as a subspecies of *Sepia officinalis*. Based on morphological and genetic analysis it has been shown that *S. officinalis* and *S. hierredda* are clearly different species of the same genus.



***Sepia officinalis* Linnaeus, 1758**

Frequent synonyms / misidentifications: *Sepia filliouxii* Lafont, 1869; *S. fischeri* Lafont, 1871; *S. mediterranea* Ninni, 1885 / *Sepia hierredda* Rang, 1835.

FAO names: **En** – Common cuttlefish; **Fr** – Seiche commune; **Sp** – Sepia común.



Diagnostic characters: Tentacular club with 5 or 6 suckers in each transverse row, the medial one twice diameter of rest; swimming keel not extending proximally beyond the base of club. Left arm IV hectocotylized by reduction of the size of suckers in proximal 4 to 8 horizontal rows; dorsal protective membrane of normal width; cuttlebone anteriorly and posteriorly rounded with parallel sides a weak spine visible in juveniles, but embedded in chitin in adults.

Size: Maximum mantle length (ML) 40 cm, though possibly a record of 45 cm exists for this species. Common sizes in the English Channel range from 10 to 22 cm mantle length and between 15 and 25 cm mantle length in the northwestern coasts of Africa.

Habitat, biology, and fisheries: A nektonic, neritic species occurring predominantly on sandy and muddy bottoms mainly covered by algae and marine grasses (*Zostera* and *Posidonia*). From the coastal line to about 200 m depth, but most abundant in the upper 100 m. Generally lays its eggs in shallow waters, at depths rarely greater 30 to 40 m. Eggs, normally black, are attached in grape-like clusters to different substrata fixed on the bottom. The greatest length of the eggs ranged from 2.5 to 3.0 mm. The hatchling has a mantle length ranging from 6 to 9 mm. The highest growth rates of about 0.6 to 0.9 mm increase in mantle length per day were observed at temperatures about 20°C. The lowest growth rate of about 0.2 to 0.3 mm per day was at temperatures between 10° and 13°C. This species has a short lifespan (up to 2 years). Food mainly consists of small crabs, shrimps, demersal fishes, cephalopods and polychaeta. Common cuttlefish attain sexual maturity at very different sizes. Length at first maturity is about 13 cm mantle length in females, and between 12 and 14 cm in males in northwestern African waters. Males may carry up to 1 400 spermatophores, females between 150 to 4 000 eggs, depending on their size. Predators of common cuttlefish included cephalopods, sharks, sparids and other large demersal fish, marine mammals and birds at different stages of its life history. However, the impact of predation in populations is unknown. Although various parasites are known in juvenile and adult *Sepia officinalis*, most of them (except the coccidian *Aggregata eberthi*) do not appear to be very important as mortality factors at prereproductive stages. The species is known to be relatively tolerant to salinity variations. Its range of salinity in wild conditions varies from

25 to 40‰, but it can survive for some time at salinities around 18‰ if slowly acclimatized, although normal embryonic development requires salinities above 25‰. Temperature limits of this species ranged from 10 to 30°C. *S. officinalis* is an important species for the commercial fisheries of many countries. In large-scale fisheries is primarily caught by otter and beam trawlers, either as a target species or as bycatch to demersal finfish. In small-scale fisheries it is caught by gillnets and trammel nets as well as a great variety of highly selective gears, such as spears, pots, traps, lures, jigs and luring the males with a live female attached to a thin line. The species has been successfully reared in aquaculture experiments of medium scale.

Distribution: The species is distributed from the eastern Atlantic to the southwest Baltic Sea (only occasional incursions) and from the North Sea to the northwestern coast of Africa. *Sepia officinalis* and *S. hierredda* are sympatric species. The southern geographic limit of *S. officinalis* coincides approximately with the border between Mauritania and Senegal (approximately 16°N) and the northern limit of *S. hierredda* is at the latitude of Cape Blanc (21°N).

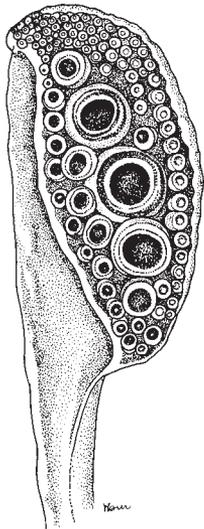


Remarks: Off the northwest African coasts, the distribution ranges of *S. officinalis* and *S. hierredda* Rang 1837 overlap. Recent data and information seem to agree on the southern limit of *S. officinalis* (16°-17°N) and the northern limit of *S. hierredda* (Cape Blanc, 21°N), thus framing the area of overlap (between 16° and 21° N; e.g., Guerra *et al.*, 2001; Reid *et al.*, 2005). However, broader areas of overlap were reported in earlier times (see Ikeda, 1972 and Delgado de Molina Acevedo *et al.*, 1993 for additional details). This resulted in confusion about the maximum size for the species, since disagreement occurred about the identity of the (then) sub-species examined. According to recently given range distribution limits, the maximum size ever recorded for *S. officinalis* would be 45 cm ML (Delgado de Molina Acevedo *et al.*, 1993; African waters between 21° and 26°N, off Sahara). From Guerra *et al.* (In press).

Sepia orbignyana Férussac in d'Orbigny, 1826

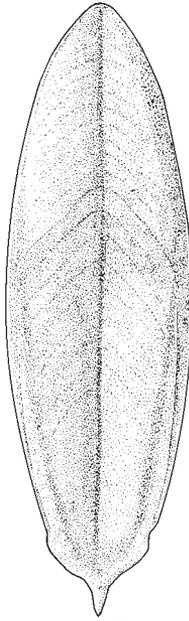
Frequent synonyms / misidentifications: None / None.

FAO names: En – Pink cuttlefish; Fr – Sieche rosée;
Sp – Sepia con punta.



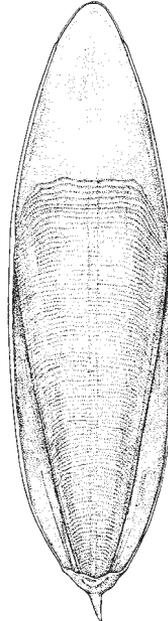
(after Adam, 1952)

tentacular club

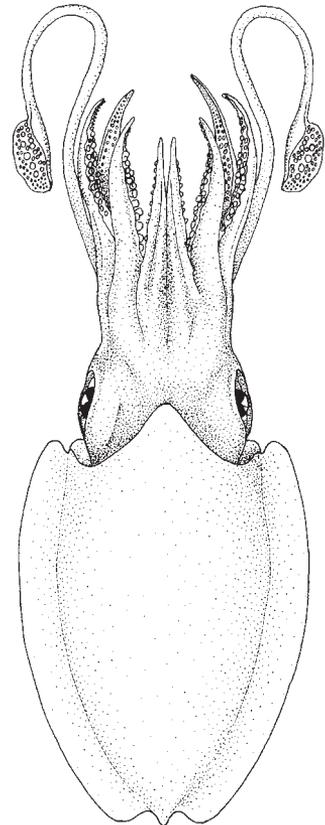


dorsal view

cuttlebone



ventral view



dorsal view

Diagnostic characters: Mantle oval-shaped, its anterior dorsal margin projecting in an acute, sharp angle. Four transverse rows of suckers on the arms. Tentacular club short, broad, blunt distally; swimming keel extends proximally beyond base of club; **5 or 6 suckers of the manus in oblique, transverse rows; the medial longitudinal row with 3 greatly and 2 moderate enlarged suckers.** Left ventral arm hectocotylized in two-thirds to three-fourths of its length, with 3 normal basal suckers followed by rows of minute, widely space suckers arranged in zig-zag pattern; **distal third of the hectocotylus with a dozen of transverse rows of 4 minute and normal suckers to tip of the arm.** Cuttlebone relatively robust; its width is one-third of its length; **posterior spine very pronounced and projecting out of the posterior part of the mantle; dorsal surface rose or orange coloured to one-third of its length with a faint medial groove.** **Colour:** reddish brown mottled.

Size: Maximum dorsal mantle length (ML) 120 mm.

Habitat, biology, and fisheries: A nektobenthic species occurring over muddy and detritus-rich continental shelf and slope areas. From 30 to 512 m, it is mainly abundant from 80 to 200 m depths. Sexual maturity may be attained at different sizes in both sexes. Males are, however, more precocious than females. In the western Mediterranean length at first maturity is 50 mm in males and 78 mm in females, whereas in West Africa populations males reach sexual maturity at about 40 to 50 mm mantle length and females at 70 mm mantle length. The spawning season extends almost throughout the year with a period of higher intensity from early summer to autumn. Spawning occurs at temperatures from 13° to 16°C. No inshore spawning migrations

have been reported. Its spatial distribution and abundance changes seasonally, largely as a consequence of changes in depth distribution. The eggs are laid in clusters of 30 to 40 (diameter 7 to 9 mm) attached to sponges on muddy bottoms. Hatchlings measure 6 to 7 mm mantle length; specimens of 36 to 40 mm mantle length are 9 month old at 10° to 20°C. Females have longer tentacle clubs and ingest more food than females at any given size. Its diet is mostly composed by crustaceans (Alpheidae, Processidae, Cangronidae and Portunidae) and bony fish (Gobiidae). Females grow faster than males. The life span of this species is about 16 to 18 months. This species is caught as bycatch in trawl fisheries throughout its area of distribution. Separate statistics are not reported for this species, which is sold together with other sepiids and sepiolids species, mainly together with small *Sepia officinalis* and *S. hierredda*. It is marketed fresh and frozen.

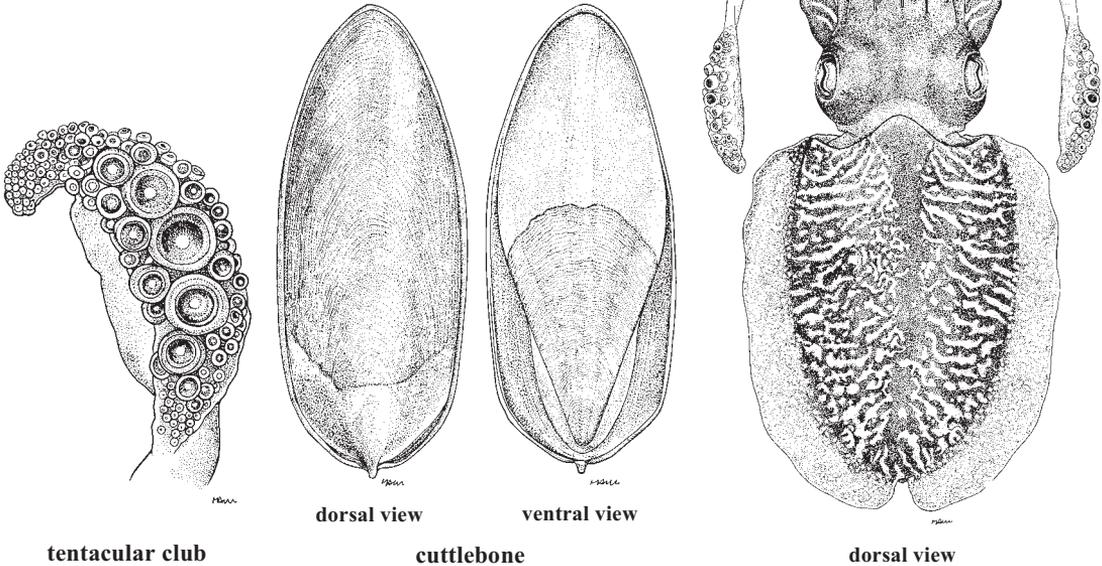
Distribution: The entire Mediterranean Sea and in the eastern Atlantic from 55°N to 17°S.



***Sepia vermiculata* Quoy and Gaimard, 1832**

Frequent synonyms / misidentifications: *Sepia officinalis vermiculata* Quoy and Gaimard, 1832 / *Sepia officinalis* Linnaeus, 1758.

FAO names: **En** – Patchwork cuttlefish; **Fr** – Seiche reticulée; **Sp** – *Sepia reticulada*.



tentacular club

dorsal view

ventral view

dorsal view

Diagnostic characters: Arms with quadriserial suckers. Left arm IV hectocotylized in males. About 6 normal suckers at base of arm, followed by 8–9 to 12–13 rows of modified suckers. **Tentacular club** bearing small distal suckers in oblique rows of 8; **median suckers of proximal part moderately enlarged, 2.0 to 2.5 times as large as marginals**; tentacular club length 24 to 38% mantle length. Cuttlebone broadly oval, dorsal surface tuberculate; striated zone with median longitudinal ridge, its length 41 to 75%, mean 50% cuttlebone length, anterior striae rounded-M-shaped; **cuttlebone width 33 to 42% cuttlebone length**; thickness 9 to 15% cuttlebone length; **spine present, surrounded by chitinous covering**. Mottled, banded, striped patterns, primarily dark (blacks, browns) on light background (yellow, beige); distinct transverse zebra stripes dorsally and small white spots on the fins in mature animals.

Size: Up to 287 mm mantle length.

Habitat, biology, and fisheries: A nekto-benthic species of the litoral, shallow bays and continental shelf, in depths of 0 to 290 m, most abundant at depths less than 100 m, on sandy to muddy bottoms; the only *Sepia* species in southern Africa that enters lagoons and river mouths, for at least part of the year. Biology little known; feeds on molluscs, crabs, shrimps, other cuttlefishes and juvenile fishes; preyed upon by sharks, sparids and other demersal fishes; cannibalism is common. Mature from 150 mm mantle length, spawns in shallow waters. Life span is about 2 years. Caught with seine nets and bottom trawls; not exploited at present, but has potential, for both fisheries and aquaculture. No information is available at present, but this species is believed to have potential to fisheries due to its size and distribution.

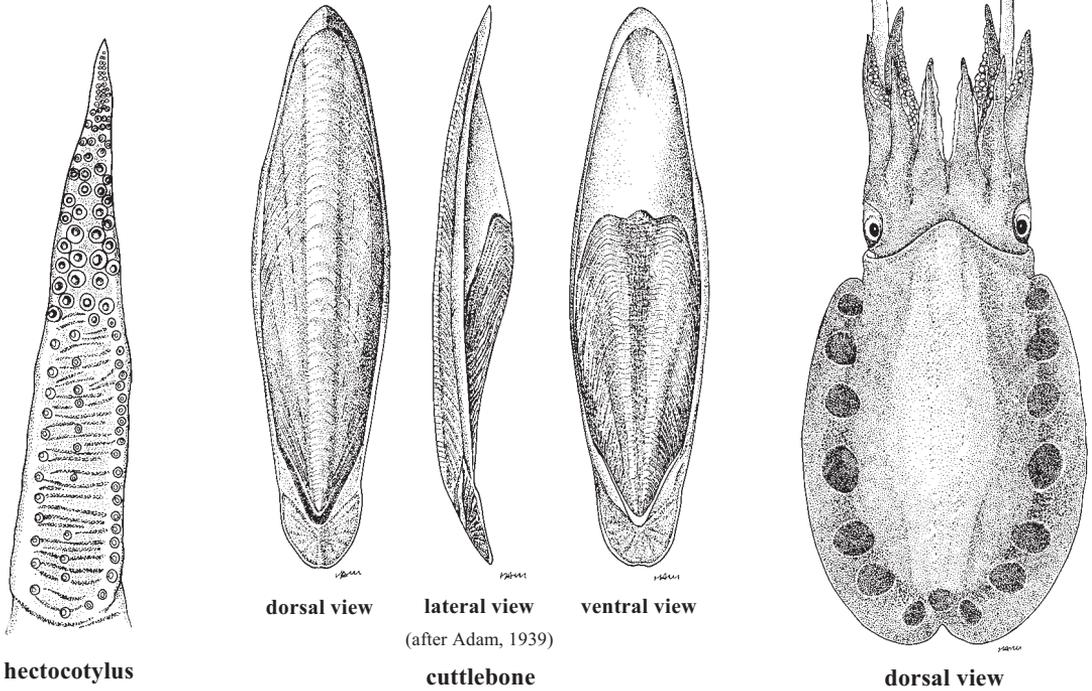
Distribution: Namibia to Mozambique and Saya-de-Malha Bank.



***Sepiella ornata* (Rang, 1837)**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Ornate cuttlefish; **Fr** – Seiche ornée; **Sp** – Sepia orlada.



Diagnostic characters: Mantle elongate, ovoid; a large subcutaneous gland present that opens by a **pore between posterior ends of fins**. Arm suckers quadriserial and subequal in size. Left arm IV of male hectocotylized on proximal half with fleshy transverse ridges and about 40 minute suckers in 4 series, the 2 dorsal series widely separated, the 2 ventral series close-set in a zig-zag pattern. **Tentacular clubs narrow, with 10 to 14 series of minute, subequal suckers** (10 to 12 series in males, 12 to 14 in females). **Cuttlebone elongate with broad, wing-like outer cone**, longer in male than female, and angle of inner cone is smaller in the male; **its width 24 to 30% of length** (24 to 27 in males, 27 to 30 in females). **Spine absent. Adults have a series of 7 reddish large patches along dorsal-fin bases.**

Size: Maximum mantle length 100 mm.

Habitat, biology, and fisheries: A demersal species on muddy or sandy mud bottoms, 13 to 16 km from shore, depth range 0 to 150 m, usually deeper than 30 m. It is taken mostly as bycatch in bottom trawls mixed with *Sepia* species, the highest yields coming from waters deeper than 50 m.

Distribution: Eastern Atlantic from Mauritania (Cape Blanco) to Cape Frio, Namibia.

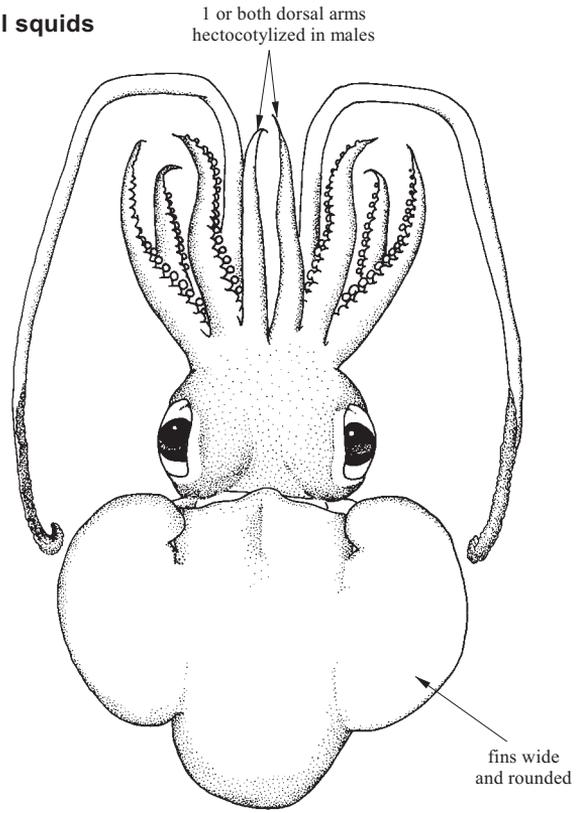


SEPIOLIDAE

Bobtail squids

Diagnostic characters: Small and broad cephalopods with a rounded posterior mantle. Dorsal mantle margin fused to head in some species, ventral mantle margin extends beneath the head in others. Fins broadly separated posteriorly, ear-like, with free anterior and posterior lobes. Large eyes with cornea and ventral eyelid. Lateral funnel adductor present between head and funnel at funnel locking apparatus, which is simple and linear. Median mantle cavity divided by septum. Strong adductor muscles present. Protective membranes of arms generally absent. One or both dorsal arms (I) hectocotylized; 1 arm of pair II (dorsolateral) may also be modified. Tentacles retractable with well defined club. Pen chitinous, rudimentary or absent. Frequently with light organs on ink sac; light organs fused into a single large organ in some species.

Habitat and biology: Benthic or neritic. There are some mesopelagic species living in midwater over or near the continental slope.



dorsal view

Key to the species of Sepiolidae occurring in the area

- 1a. All arms except ventral pair (IV) united by a broad web; anterior edge of ventral mantle extended into extensive ventral shield anteriorly, covering the funnel and sometimes reaching the eye level (Fig. 1)
..... **Subfamily Heteroteuthinae → 3**
- 1b. Arms not united by a broad web, or only ventrolateral pair (III) or ventral pair united by a broad web; anterior edge of the ventral mantle not forming a ventral shield → 2

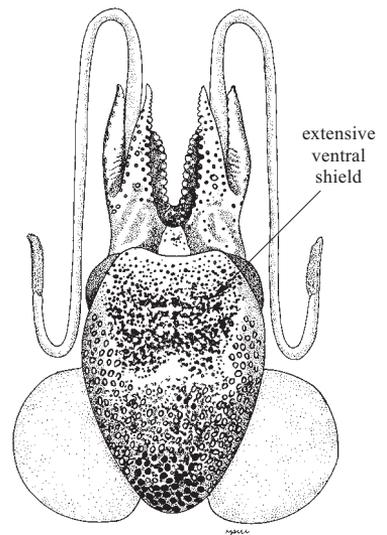


Fig. 1 Heteroteuthinae (Heteroteuthis)

- 2a. Dorsal mantle fused to head by cutaneous occipital band (Fig. 2) . . . **Subfamily Sepiolinae** → 4
- 2b. Dorsal mantle not fused to head by cutaneous occipital band (Fig. 3) . . . **Subfamily Rossiinae** → 6

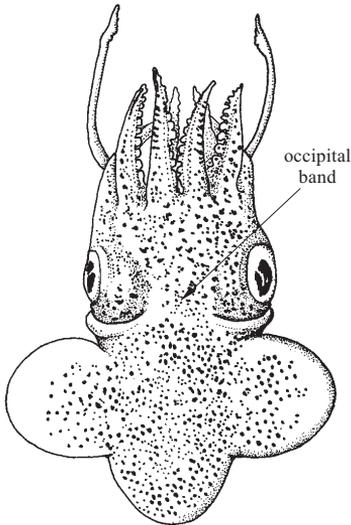


Fig. 2 Sepiolinae

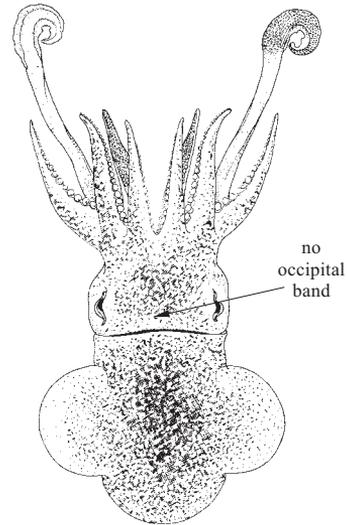


Fig. 3 Rossiinae

- 3a. Occipital band joining mantle to head from 40 to 50% head width; ventral shield extending only to level of eyes ***Stoloteuthis leucoptera***
- 3b. Occipital band almost equal to head width; ventral shield exceeds level of anterior margin of eye, reaching proximal end of arms ***Heteroteuthis dispar***

- 4a. Light organs present on the ink sac → 5
- 4b. Without light organs present on the ink sac ***Sepietta oweniana***

- 5a. A pair of kidney-shaped light organs on anterior surface of ink sac (Fig. 4a) ***Sepiolo***
- 5b. Unpaired round light organ deeply embedded in tissue on ventral side of ink sac (Fig. 4b) ***Rondeletiola minor***

- 6a. Anal flaps present, well developed (Fig. 5a); ink sac well developed → 7
- 6b. Anal flaps reduced or absent (Fig. 5b); ink sac greatly reduced ***Neorossia caroli***

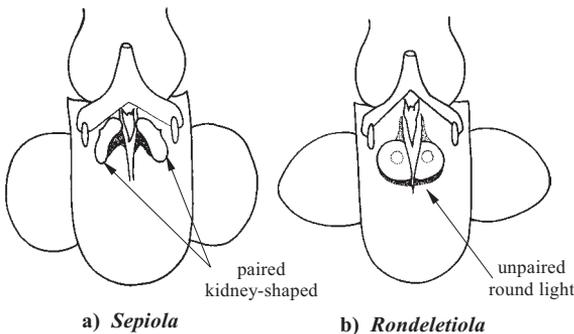


Fig. 4 mantle cavity

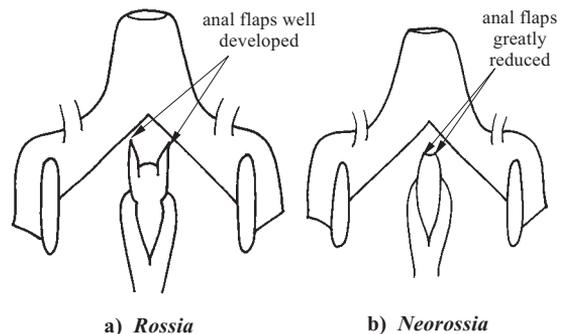


Fig. 5 mantle cavity

- 7a. Tentacle club expanded with 5 to 16 transverse rows of medium-sized suckers . . . ***Rossia macrosoma***
 7b. Tentacle club not expanded with 24 to 40 transverse rows of minute suckers
 ***Austrorossia mastigophora***

List of species occurring in the area

The symbol 🦑 is given when species accounts are included.

- 🦑 *Austrorossia mastigophora* (Chun, 1915).
- 🦑 *Heteroteuthis dispar* (Rüppell, 1845).
- 🦑 *Neorossia caroli* (Joubin, 1902).
- 🦑 *Rondeletiola minor* (Naef, 1912).
- 🦑 *Rossia macrosoma* (Delle Chiaje, 1830).
- 🦑 *Sepietta oweniana* (Orbigny, 1840).
- 🦑 *Sepiolo atlantica* d'Orbigny, 1839–1842.
- 🦑 *Sepiolo aurantiaca* Jatta, 1896.
- 🦑 *Sepiolo knudseni* Adam, 1984.
- 🦑 *Sepiolo rondeletii* Leach, 1817.
- 🦑 *Stoloteuthis leucoptera* (Verrill, 1878).

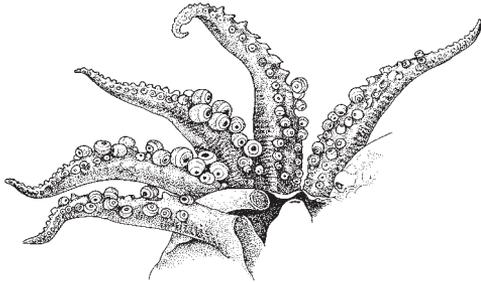
References

- Boletzky, S.v., ed.** 1995. Mediterranean Sepiolidae. *Bull. Inst. Oceanogr. Monaco*, 16: 104 p.
- Fioroni, P.** 1981. Die Sonderstellung der Sepioliden, ein Vergleich der Ordnungen der rezenten Cephalopoden. *Zoologische*, 108: 178–228.
- Guerra, A.** 1992. Mollusca: Cephalopoda. In: Ramos, M.A. et al., eds. *Fauna Ibérica* Vol. 1. Museo Nacional de Ciencias Naturales CSIC Madrid, 327 pp.
- Guerra, A.** 2012. *Sepiolo atlantica* Orbigny, 1840 publication sometime between 1839–1842. Atlantic bobtail squid. Version 06 March 2012 (under construction). http://tolweb.org/Sepiolo_atlantica/24019/2012.03.06 in The Tree of Life Web Project, <http://tolweb.org/>
- Naef, A.** 1921/23. Cephalopoda. Fauna e Flora del Golfo di Napoli. Monograph, no. 35. English translation: A. Mercado (1972). Israel Program for Scientific Translations Ltd. IPST Cat. No. 5110/1,2.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Reid, A.L. & Jereb, P.** 2005. Family Sepiolidae. In P. Jereb & C.F.E. Roper, eds. *An annotated and illustrated catalogue of cephalopods species known to date. Chambered nautilus and sepioids (Nautilidae, Sepiidae, Sepiolidae, Sepiadariidae, Idiosepiidae and Spirulidae)*. FAO Species Catalogue for Fishery Purposes. No 4, Volume 1. Rome, FAO, pp. 153–210.
- Rodrigues, M.G.** 2012. Bioecology of *Sepiolo atlantica* (Mollusca, Cephalopoda) in Galician waters. European doctoral dissertation. University of Vigo (Spain), 150 pp.
- Villanueva, R. & Sánchez, P.** 1993. Cephalopods of the Benguela Current off Namibia: new additions and considerations on the genus *Lycoteuthis*. *Journal of Natural History*, 27(1): 15–46.

***Austrorossia mastigophora* (Chun, 1915)**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Whip-bearing bobtail; **Fr** – Sépiole fouet; **Sp** – Globito látigo.



arms of male

(after Chun, 1915)

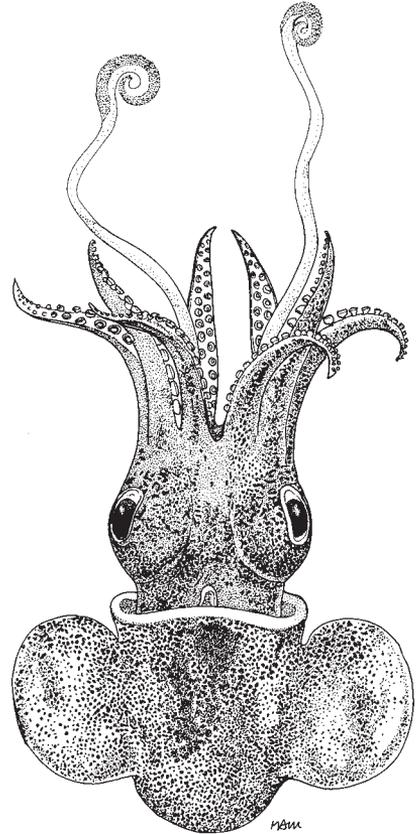
Diagnostic characters: Mantle sac-shaped and rounded posteriorly without tubercles or papillae. **Margin slightly retracted, especially on the dorsal side without projecting corners.** Fins occupying two-thirds of the length of the mantle. Arms suckers biserial; **in males, 8 pairs of enlarged suckers on ventral (IV) and ventrolateral (III), and 6 on dorsolateral arms (II).** A shallow, grey groove is present in the inner side of the stalk of the tentacle. **Club dorsally curved like a horn** with very small suckers (30 to 40 in each row).

Size: Males to approximate 31 mm and females up to 46 mm mantle length.

Habitat, biology, and fisheries: This species extends up to 640 m depth. Its biology is poorly known due to the few records available. No current interest to fisheries.

Distribution: Western, southern and eastern Africa from Guinea and Somalia to the Cape of Good Hope.

Remarks: This species is closely allied and probably identical to *Austrorossia enigmatica* (Robson, 1924).



dorsal view

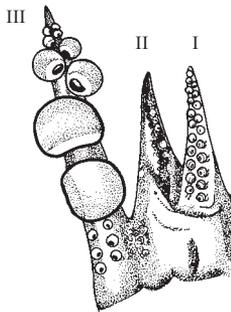
(after Chun, 1915)



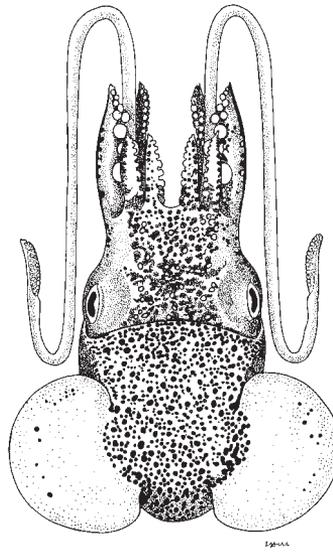
***Heteroteuthis dispar* (Rüppell, 1844)**

Frequent synonyms / misidentifications: None / None.

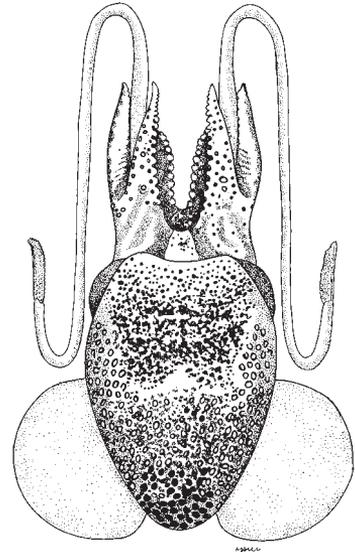
FAO names: En – Odd bobtail;
Fr – Sépiole différente; Sp – Globito aberrante.



arms of male



dorsal view



ventral view

Diagnostic characters: Dorsal mantle not fused to head. Ventral mantle strongly produced anteriorly, nearly covers funnel. Fins long; positioned posterior to the dorsal midpoint. Anterior edge of fin at middle of ventral mantle length. **Mature males:** arms I-II much shorter than III-IV; arms III with 2 enormous suckers and 3 more enlarged suckers. Right arms I-II connected by deep web up to half their length. **Mature females:** tips of arms I-II without suckers, tip of arm II slightly thickened, with oral keel. Tentacles very long with more than 8 transverse rows of club suckers. Rounded light organ present inside the mantle cavity on the ink sac.

Size: Up to 25 mm mantle length.

Habitat, biology, and fisheries: Tropical and subtropical Atlantic. In depths of 110 to 1 680 m. Spawns on the bottom at the slope; larvae meso- and bathypelagic, adults in lower epibenthic and mesopelagic zones but also collected on the bottom. Known predators are black scabbardfish, longnose lancetfish, swordfish, tunas, sharks and dolphins. No interest to fisheries.

Distribution: Madeira and Canaries to Cape Verd and off Guinea Bissau; Ireland to Azores, Mediterranean and western Atlantic, as well as Gibraltar.

Remarks: After Nesis (1982/87), *Heteroteuthis atlantis* Voss, 1955 is a synonymous of *H. dispar*. However, the differences between both species are clear and do not seem to justify the decision of Nesis. Therefore, until the taxonomy the genus is studied in detail, the validity of *H. atlantis* remains questionable.

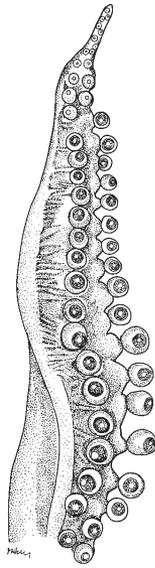


***Neorossia caroli* (Joubin, 1902)**

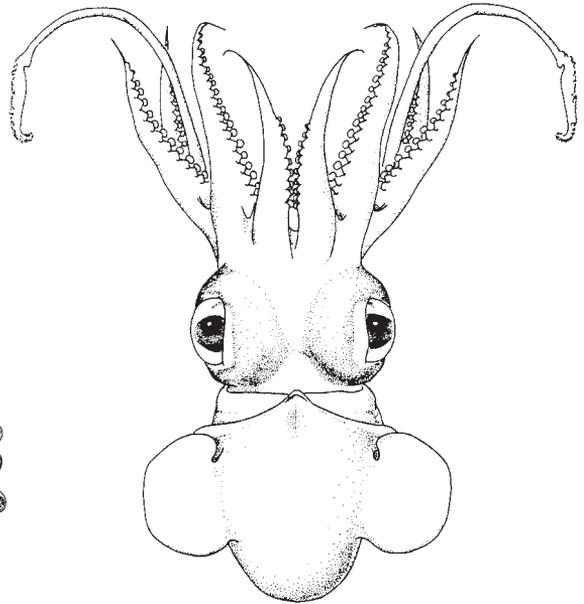
Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Carol bobtail squid; **Fr** – Sépiole de Carol; **Sp** – Globito de Carol.

Diagnostic characters: Dorsal mantle border not fused to head. **Ink sac and anal flaps on the anus greatly reduced and non-functional.** Mantle short and very broad. Median anterodorsal edge of mantle with low V-shaped projection. Anteroventral edge of mantle with shallow crescentic emargination. Dorsal edge of mantle margin projects beyond ventral mantle edge. **Nuchal cartilage oval.** Fins large and moderately broad rounded. Head broader than long. Eyes very large and bulbous. Arms short, robust and broad at bases with 2 rows of spherical suckers. Dorsal pair of arms of males hectocotylized, proximal ventral edge of these arms bordered by a furrow and crest on oral surface extending from sucker rows 3 to 18, minute suckers at tips. Tentacles relatively long and slender with naked stalks, their length ranging from approximately 1 to 4 times the mantle length. Club suckers in 8 to 11 oblique rows.



hectocotylus



dorsal view

Size: Males up to 51 mm and females up to 83 mm mantle length.

Habitat, biology, and fisheries: A bathybenthic species inhabiting waters between 200 and 1 744 m, most abundant between 400 and 700 m in muddy bottoms. Mature individuals present throughout the year suggesting an extend spawning season. The smallest male with spermatophores was 30 mm mantle length. The smaller mature female was 50 mm mantle length. Large round, translucent eggs with a mean diameter 9.9 mm. Spermatophores between 36.5 and 41.2% mantle length. Large mature animals have a thick gelatinous consistency. The life span is probably between 12 and 24 months. A species of minor commercial importance, taken only as bycatch in trawls. Separate statistics are not reported for this species.

Distribution: Eastern Atlantic and Mediterranean Sea: from southwestern Iceland and Ireland southward to the Gulf of Guinea and Namibian coast of southern Africa.

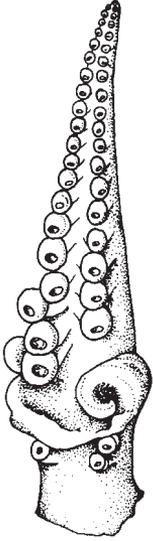
Remarks: Two subspecies has been described: *Neorossia caroli caroli* (Joubin, 1902) and *Neorossia caroli jeannae* (Nesis *et al.*, 2001) described from specimens collected on the Patagonian slope, north of Falkland Islands. The main difference between both subspecies is the size and shape of fins and the nuchal cartilage. However, further studies are necessary to determine the status of these subspecies.



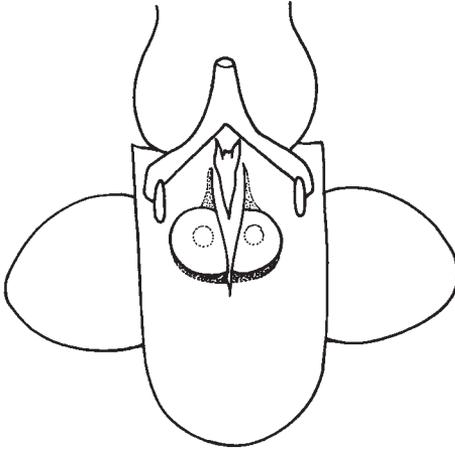
Rondeletiola minor (Naef, 1912)

Frequent synonyms / misidentifications: *Sepietta minor* Naef, 1912 / None.

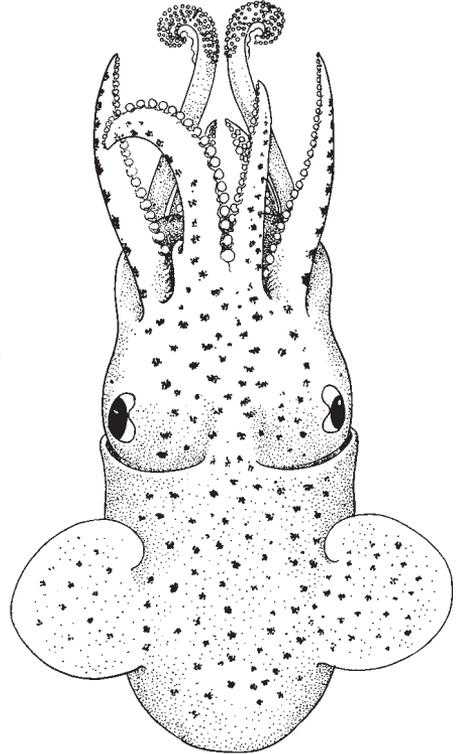
FAO names: En – Lentil bobtail squid; Fr – Sépiole bobie; Sp – Globito pequeño.



hectocotylus



mantle cavity of mature female



dorsal view

Diagnostic characters: Mantle blunt, bullet-shaped. Fins small, round, with blunt lateral angles. Tentacular clubs with about 16 small uniform suckers in each transverse row. **Unpaired round light organ** (as result from the lateral fusion of 2 lentil-shaped light organs) **present on ink sac**. Ventral arms with normal biserial suckers to apex; left arm I hectocotylized, with 3 small suckers at base of a **copulatory apparatus, which is large, swollen, transverse, hood-shaped horn with small accessory papilla**; suckers distal to the papilla greatly enlarged in the dorsal row to the tip of the arm, in the ventral row only about the proximal half of the suckers are enlarged; the 2 rows not widely separated.

Size: Maximum mantle length (ML) 25 mm.

Habitat, biology, and fisheries: A nectobenthic species inhabiting sand and mud bottoms. Between 35 and 600 m. It performs vertical diurnal migrations. Both sexes mature from 12 to 15 mm mantle length. Juveniles found near inshore waters, and adults in deep waters. This species is not of interest to fisheries.

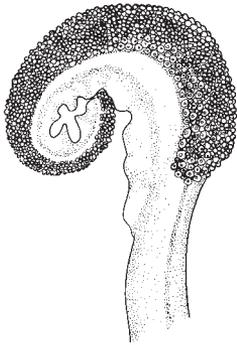
Distribution: Mediterranean Sea and eastern Atlantic from Northwest Iberian Peninsula to South Africa.



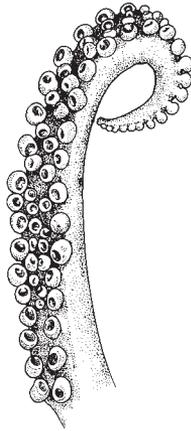
***Rossia macrosoma* (Delle Chiaie, 1830)**

Frequent synonyms / misidentifications: *Sepiola macrosoma* Delle Chiaie, 1829 / None.

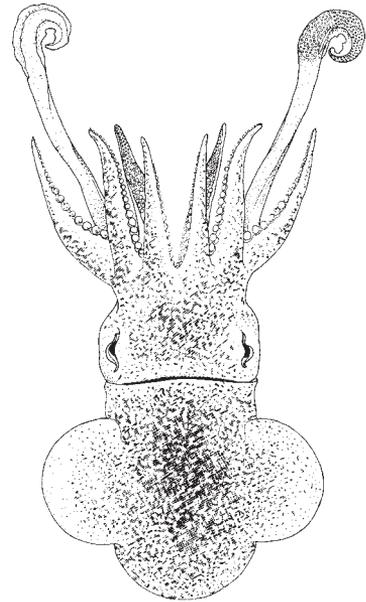
FAO names: En – Stout bobtail squid; Fr – Sépiole melon; Sp – Globito robusto.



tentacular club



arm



dorsal view

Diagnostic characters: Dorsal mantle border not fused to head. Well developed, functional ink sac with regular anal flaps. Nuchal cartilage oval, broad. Arms with 4 rows of suckers medially and distally. Tentacular club with 8 to 12 subequal suckers all much smaller than arm suckers and arranged in transverse rows. Swimming keel equal to club length. Arms III and IV united by a broad web. Both dorsal arms hectocotylized by decrease in size of the 2 rows of large basal suckers to smaller suckers, which are arranged in 4 rows in a rounded zigzag pattern; a deep ridge and groove is present between each transverse rows of suckers. **Colour:** Light yellowish brown with greenish reflection to dark reddish brown.

Size: Maximum mantle length (ML) 85 mm.

Habitat, biology, and fisheries: *Nectobenthic* species inhabiting sandy and detritic but mainly muddy bottoms between 30 and 900 m depth. It undertakes seasonal migrations between deeper offshore waters in winter and shallower coastal areas during the rest of the year, but partitioned by size in such a wide than larges individuals arrive first in spring, followed by smaller individuals in summer. The spawning season of this species extent from spring to autumn. Eggs are deposited in clusters of 30 to 40 (egg diameter 6 to 8 mm) on shells or other bottom substrata. Egg's cover is hard and bluish violet in colour. Mature males (40 mm mantle length, aged 7 or 8 months) carry 85 to 100 spermatophores. Females (57 mm mantle length upward, aged 8 to 11 months) have about 120 to 150 oocytes in the ovary. Embryonic development last 45 days at 16°C. Females grow larger than males. Life span ranging from 12 to 16 months. Its preys are constituted by small bottom organisms. It is predated by several species of small sharks and rays. A species of minor commercial importance, taken as bycatch in bottom trawls, mostly between 100 and 250 m depth. The flesh is tasty but difficult to preserve. Separate statistics are not reported for this species.

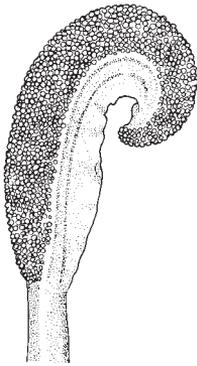
Distribution: Mediterranean Sea, from the 70°N to the Gulf of Guinea in the eastern Atlantic.



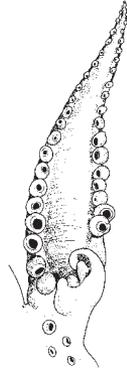
***Sepietta oweniana* (d'Orbigny, 1840)**

Frequent synonyms / misidentifications: None / None.

FAO names: En – Common bobtail squid; Fr – Sépiole commune; Sp – Sepieta común.

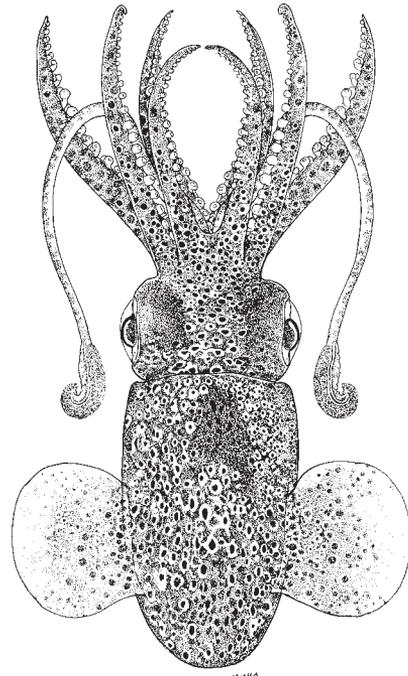


tentacular club



hectocotylus

(after Naef, 1921–23)



dorsal view

Diagnostic characters: Mantle blunt, bullet-shaped. No web or shallow web joint arms. Fins short, not exceeding the mantle with a slight lateral angle and pronounced anterior lobes or “earlets”. Dorsal edge of the mantle fused to the head. **No light organs (photophores) inside mantle cavity.** Dorsolateral arms (II) with 6 enlarged suckers in the ventral row being the opposite ones lower in size. **Tentacular club with 26 to 32 minute subequal suckers in transverse rows.** Left arm I in males hectocotylized by 4 small normal sucker at base followed by a **flesh transverse swelling with a long hook-like inward-curved lateral papilla (copulatory organ)**, a deep cleft medial to papilla, a flask-like rugose bulb and a swelling at the dorsal edge; first 2 suckers in dorsal row distal 2 swelling greatly enlarged, followed by 3 smaller suckers, than 2 enlarged, the gradually decreasing suckers to tip; ventral rows with moderately enlarged suckers; at broad scoop-like depressed area lies between the suckers rows. **Female bursa copulatrix large, extending beyond gill insertion and covering the renal papilla in mature specimens.**

Size: Maximum mantle length (ML) 50 mm.

Habitat, biology, and fisheries: Nekto-benthic species inhabiting soft bottoms, mainly outer shelf and upper bathyal. Up to 1 000 m depth. Most common from 50 to 100 m in the Atlantic. Males and females mature between 6 and 8 month of age. The spawning period extends from March to November with a peak from spring to early summer in the Mediterranean, but it extends throughout the year in the North Atlantic. It spawns mainly in relatively shallow coastal waters (8 to 45 m), but egg masses have been found from 8 to 200 m. Smaller size of this species ascends later in the year and do not spawn before autumn. Its overall fecundity was estimated in 1 000 oocytes per female. The species has a multiple spawning strategy. The mean number of mature oocytes released at each spawning act was 54. The eggs (spherical to lemon-shaped and greyish white in colour) are deposited on ascidians (*Microcosmos* spp.), seaweed, cinder debris and other substrates in cluster of 30 to 160, most commonly between 30 and 60. Newly spawned eggs measured 2.5 mm, but 5.0 x 4.5 mm after embryonic development. At 20°C they take about 20 days to hatch. The newly hatched measure between 3 and 5 mm of mantle length. The diet of newly hatched is composed by free swimming crustaceans like mysids, amphipods, euphausiids and copepods, but adults feed mainly on large mysid and decapod shrimps. The females have longer tentacle clubs and digest more food than males at any given size. Females grow faster than females. Growth rates of 5.3 and 4.2 mm mantle length per month

for males and females respectively in the Atlantic, but between 1.2 and 1.6 mm per month for males and from 2.0 to 2.3 mm per month for females in the Mediterranean, their lower values occurring during winter and early spring and the higher ones during summer months. Total life cycle duration of 6 to 9 months. Post-spawning mortality has been observed. Its range of salinity tolerance is low (34 to 35.5). Temperature limits of this species ranged from 4 to 12°C. This species has some commercial importance and it is caught as bycatch in trawl fisheries.

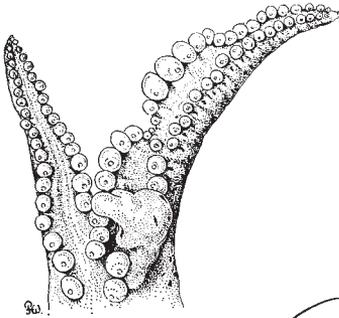
Distribution: Mediterranean Sea and from western Norway and the Faeroe Islands to Senegal (14°N) and Madeira.



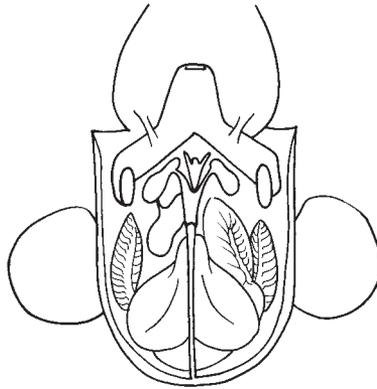
Sepiola atlantica d'Orbigny, 1839–1842

Frequent synonyms / misidentifications: None / None.

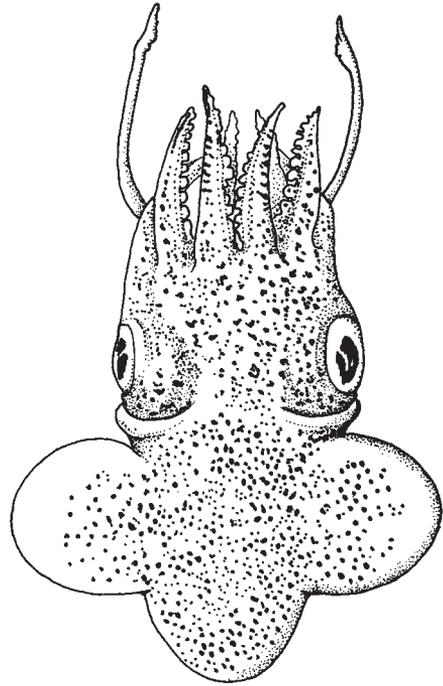
FAO names: **En** – Atlantic bobtail squid; **Fr** – Sépiole grandes oreilles; **Sp** – Sepiola atlántica.



hectocotylus



mantle cavity of mature female



dorsal view

Diagnostic characters: A pair of kidney-shaped light organs on anterior surface of ink sac. Tentacular clubs with 8 suckers in transverse rows. Suckers of the ventral arms (IV) in 2 transverse rows along almost all its length, the abruptly change into minute suckers arranged in 4 to 6 transverse rows on the apices, which are long and finger-like. Left dorsal arm hectocotylyzed by a large swollen bulb, with secondary lobes basally (copulatory organ); suckers of the dorsal row swollen basally, followed by 3 or 4 greatly reduced suckers, then by 4 or 5 greatly swollen suckers in midportion.

Size: Maximum mantle length (ML) 25 mm.

Habitat, biology, and fisheries: Nectobenthic species on muddy sandy and detritus-rich bottoms mainly covered by algae. From sublittoral (4 to 6 m) to about 100 m depth. Males reach gonadal maturity slightly early and at slightly smaller sizes (12 mm ML) than females (16 mm ML). Spawning period extends throughout the year with a peak of reproduction in spring and summer. The number of oocytes in mature females ranged from 64 to 71 (>0.2 mm diameter). In the males, the spermatophores length varies from 6.5 to 10.0 mm. The number of spermatophores per mature males was estimated to range from 59 to 338. Bimodal distribution of sizes in the population of a bay in Scotland waters in the months of May, June and July could represent 2 cohorts. In aquarium conditions, this species fed on small live crustaceans. Its luminous organs have symbiotic bacteria (*Photobacterium fischeri*). Very narrow limits of salinity tolerance, from 34 to 35.5. Temperature limits of this species ranging from 6° to 20°C. This species has not interest to fisheries.

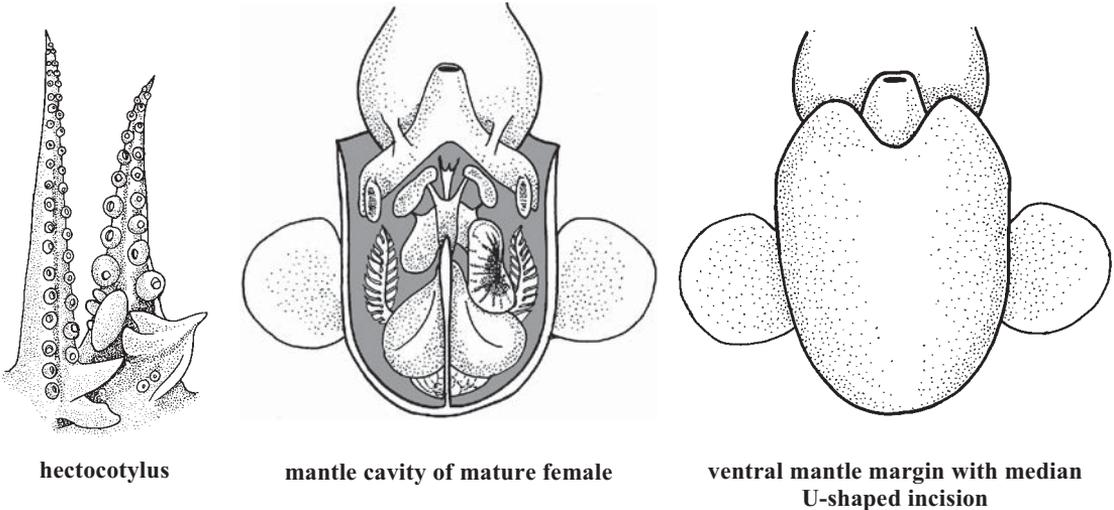
Distribution: Northeast Atlantic Ocean, from Iceland and Norway to northwest Africa (Morocco). The southern limits of its distribution is unknown.



Sepiola aurantiaca Jatta, 1896

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Golden bobtail; **Fr** – Sépiole dorée; **Sp** – Globito dorado.



Diagnostic characters: Ear-shaped light organs attached laterally to ink sac. Ventral mantle margin strongly produced anteriorly, with median U-shaped incision. Tentacular club with 8 rows of minute subequal suckers. Left dorsal arm of male hectocotylized (hectocotylus), with 2 small proximal suckers; stalks of third and fourth ventral suckers form large, inward-projecting processes that are connected basally with a **tooth-like structure at the end of a muscular ridge beginning lateral to the basal suckers; a rugose tubercle develops from the stalks of the second and third dorsal suckers and extends anteriorly towards the oral surface of the arm in the form of an oval pad between the first distal suckers;** about 3 pairs of enlarged suckers distal to the modification. Right dorsal arm of male with additional copulatory apparatus, consisting of 2 small tongue-like outgrowths on basal part of arm. **Bursa copulatrix in females displaces the left renal papilla and covers the genital opening.**

Size: Maximum mantle length 20 mm.

Habitat, biology, and fisheries: Biology poorly known. Outer shelf and upper bathyal. Located between 28 and 200 m and probably to 400 m depth. Not of interest to fisheries.

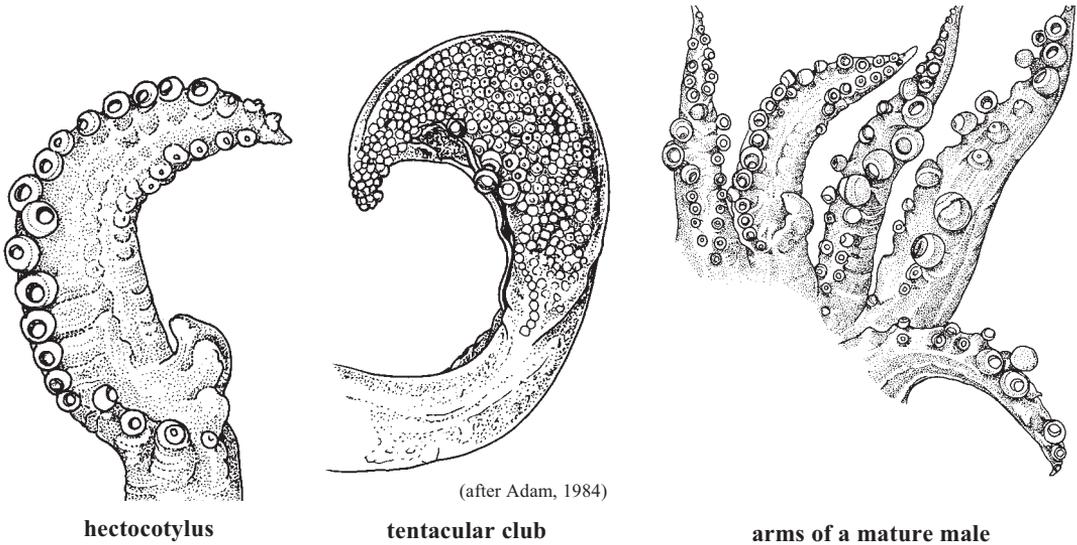
Distribution: Western Mediterranean, southern Norway to North Africa south to Western Sahara and Madeira.



Sepiola knudseni Adam, 1984

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Knudsen's bobtail squid; **Fr** – Sépiole de Knudsen; **Sp** – Globito de Knudsen.



Diagnostic characters: Ear-shaped light organs attached laterally to ink sac. Sucker of fourth arm in 2 rows over the entire length arm. Anterior edge of the mantle on ventral side undulates without deep incision. Left dorsal arm of male (hectocotylus) not or only slightly widened. **Copulatory apparatus of one complexly twisted lobe.** Dorsal lobe of suckers in distal part of the hectocotylized arm in males with 4 large proximal and some smaller distal suckers; in the ventral row, after the big ventral lobe with 3 lappets, there are not suckers in proximal two-thirds of the arm and some very small suckers in distal third.

Size: Maximum mantle length 10 mm in males, 18 mm in females.

Habitat, biology, and fisheries: A poorly known species from the inner shelf in 5 to 90 m. The only known predator is *Trigla lyra* (piper gurnard). Not of interest to fisheries.

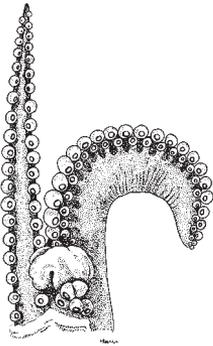
Distribution: Canary Islands, Senegal, Guinea, Nigeria.



***Sepiola rondeletii* Leach, 1817**

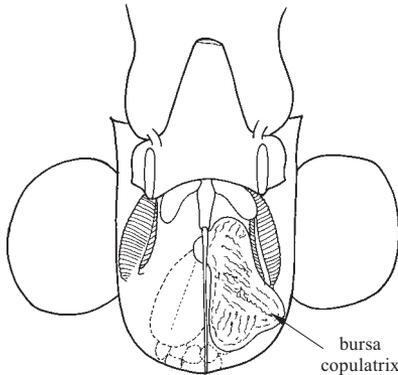
Frequent synonyms / misidentifications: None / None.

FAO names: En – Dwarf bobtail squid; Fr – Sépiole naine; Sp – Globito enano.

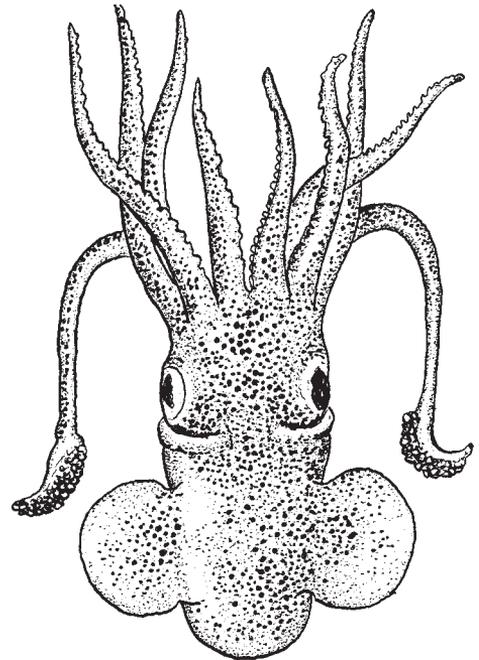


(after Naef, 1912)

dorsal arms of male (hectocotylus)



mantle cavity of mature female



dorsal view of female

Diagnostic characters: Light organs ear-shaped, attached laterally to ink sac. Ventral mantle margin projects markedly anteriorly. Tentacular clubs with 8 suckers in transverse rows, well developed, markedly enlarged in proximal part of dorsal longitudinal rows. Left dorsal arm hectocotylized in males; there is not a groove on inner side of the hectocotylus; base of the hectocotylus with 3 equal sized suckers, **the copulatory apparatus forms an eyelet**. Mature females without mantle constrictor in the posterior left part of the mantle; **bursa copulatrix large in size, with a small caecum, just protruding into the right half of mantle cavity**.

Size: In the Mediterranean males up to 25 mm mantle length; females up to 35 mm mantle length. It seems that in cold Atlantic waters this species reach up to 60 mm mantle length.

Habitat, biology, and fisheries: Nectobenthic species on muddy sandy and detritus-rich bottoms mainly covered by algae and *Posidonia* seaweed. From sublittoral (4 to 6 m) to about 400 m depth. The spawning season extends from March though November in the western Mediterranean. All females above 30 mm mantle length are mature. Diameter of mature eggs about 6 mm. Hatchling size (ML) ranging from 3.5 to 4.2 mm. It feeds on crustaceans and small fishes. Growth rate in aquarium under 12 to 18°C was 2.5 mm mantle length per month. Longevity is estimated at about 9 to 12 months. This species has no interest to fisheries and statistics are not reported separately, it is, however, caught as bycatch in trawl fisheries as well as with purse seines and drift nets.

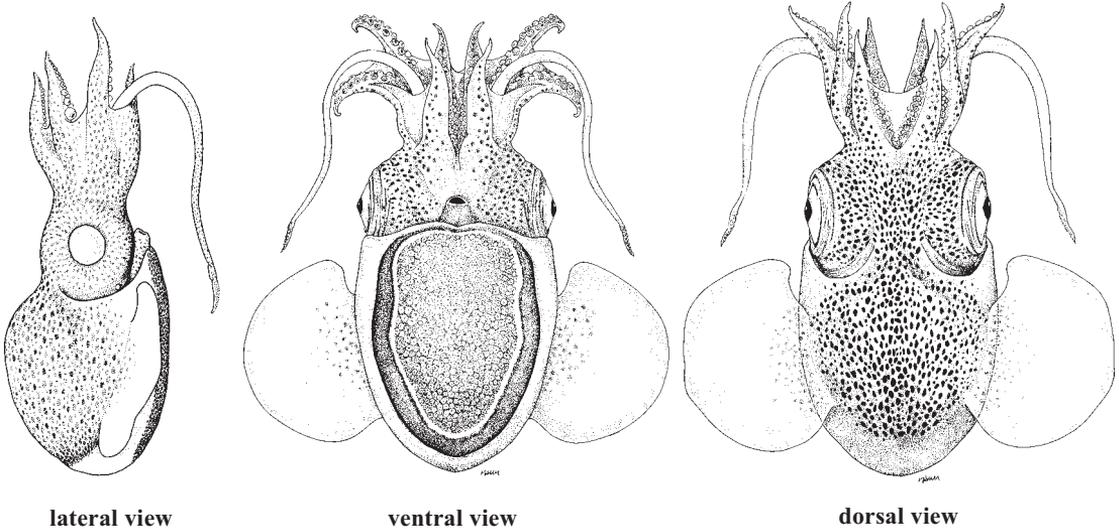
Distribution: Throughout the Mediterranean Sea. In the northeast Atlantic Ocean, from the North Sea to Senegal. The southern limit of its distribution is unknown.



***Stoloteuthis leucoptera* (Verrill, 1878)**

Frequent synonyms / misidentifications: None / None.

FAO names: En – Leucoptera bobtail squid; Fr – Sépiole leucoptère; Sp – Globito leucoptero.

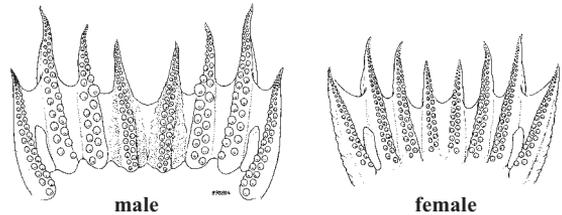


lateral view

ventral view

dorsal view

Diagnostic characters: Mantle developed ventrally to form a shield extending anteriorly, but not beyond anterior level of eyes, and a marked mid-dorsal bulge. Nuchal commissure narrower than head width. Posterior edges of fins rounded, do not extend beyond mantle. **Extensive web present between all arms except between ventral pair.** Arm suckers biserial except distally on arms IV, where suckers are in 3 or 4 rows in males. Arm II in males with 1 to 3 enlarged suckers at level of the fifth and sixth sucker rows. Tentacular club with aboral keel proximal to club. Large light organ on ink sac. Proximal two-thirds of arms I in males with thickened lateral membranes, containing finger-like structures and spherical bodies of unknown function.



male

female

oral view of arms

Size: Maximum mantle length 18 mm.

Habitat, biology, and fisheries: Lower sublittoral and upper bathyal; at or near the bottom in 362 to 712 m; 14 to 489 m by day and by night in midwater in 0 to 447 m. Colour pattern is cryptic for the pelagic environment and the species is probably diurnal in upper mesopelagic water. Spermatangia are attached to females on dorsal and ventral sides of head, base of web and eyelids. Not of interest to fisheries.

Distribution: Mediterranean, Bay of Biscay, Namibia south of 27°S and probably also further north; South African west coast, Gulf of St Lawrence to Straits of Florida. Kerguelen, Prince Edward Islands and Discovery Bank and probably off eastern Tasmania.

Remarks: All recorded specimens need to be investigated to check whether or not they are conspecific.



SPIRULIDAE

Ram's horn squid

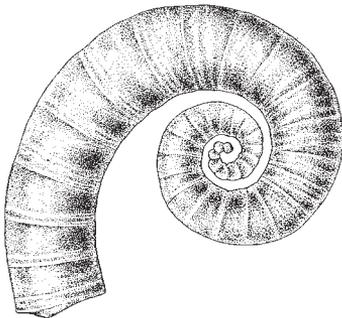
A single species in the family.

Spirula spirula (Linnaeus, 1758)

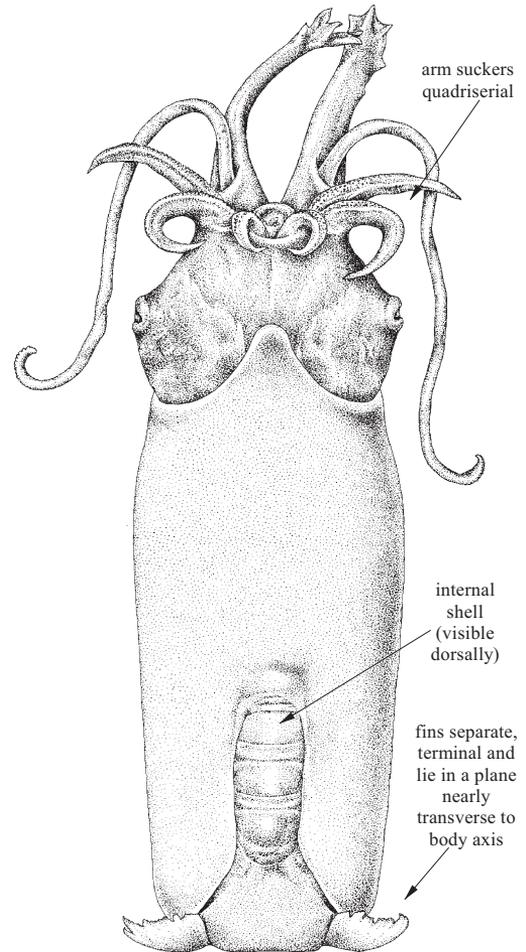
Frequent synonyms / misidentifications: None / None.

FAO names: En – Ram's horn squid; Fr – Spirule; Sp – Espirula.

Diagnostic characters: A small, muscular species. **Internal chambered shell spirally coiled**, located in posterior end of mantle. **Small round fins separate, terminal, nearly transverse to body axis.** Large photophore located between fins. Funnel-mantle locking cartilage a simple, straight groove and ridge. Eyes large, without cornea but with muscular eyelids. Arm lengths increase from dorsal to ventral, each arm with 4 to 6 longitudinal series of small suckers. Both ventral arms hectocotylized in males. Tentacular clubs with subequal suckers in 16 series, not divided into manus and dactylus. **Colour:** dark reddish brown. Skin smooth but mantle under skin covered with regularly aligned collagen fibrils that produce a silvery sheen.



internal shell



dorsal view of male

(illustration: K. Hollis/ABRS)

Similar families occurring in the area

None, no other family has a shell curved ventrally in an open coil.

Size: Maximum mantle length 45 mm.

Habitat, biology, and fisheries: This is a mesopelagic species living above continental slope at depths of 0 to 2 000 m, timed depths of 500 to 1 000 m by day, mainly in 100 to 300 m at night. The calcareous shell is used as a buoyancy device; migrates vertically; normal swimming position is head-down. Known predators include short-finned squids, splendid alfonso, swordfish and grey-faced petrels. Attains sexual maturity at about 30 mm mantle length. Eggs small, possibly laid on the bottom on the continental slope. Juveniles have been collected at about 1 000 to 1 750 m; smallest known juveniles had 2 shell chambers at mantle length ± 1.5 mm. No direct interest to fishery exists. Stranded shells sold in shell trade.

Distribution: Tropical and subtropical oceanic waters worldwide, in water masses where temperature is over 10°C at 400 m; empty shells are carried by currents extremely far from the natural habitat.



References

- Bruun, A.F.** 1943. The biology of *Spirula spirula* (L). *Dana Report, Carlsberg Foundation*, 24: 44 p.
- Bruun, A.F.** 1955. New light on the biology of *Spirula*, a mesopelagic cephalopod. *In Essays in the Natural Sciences in Honour of Capt. Allan Hancock*. Los Angeles: University of Southern California Press, pp. 61–72.
- Clarke, M.R.** 1970. Growth and development of *Spirula spirula*. *Journal of the Marine Biological Association of the United Kingdom*, 50: 53–64.
- Degner, E.** 1925. Cephalopoda. *Rep. Dan. oceanogr. Exped. Mediterr.*, 2(C.1): 1–94.
- Denton, E.J & Gilpin-Brown, J.B.** 1971. Further observations on the buoyancy of *Spirula*. *Journal of the Marine Biological Association of the United Kingdom*, 51: 363–373.
- Lu, C.C., Guerra, A., Palumbo, F. & Summers, W.B.** 1992. Order Sepioidea Naef, 1916. *In* M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.V. Boletzky, eds. "Larval" and Juvenile Cephalopods: A manual for their identification. *Smithsonian Contributions to Zoology*, 513: 21–26.
- Reid, A.** 2005. Family Spirulidae. *In* P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 1. Chambered nautilus and sepioids (Nautilidae, Sepiidae, Sepiolidae, Sepiadariidae, Idiosepiidae and Spirulidae)*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 1. Rome, FAO. pp. 211–212.

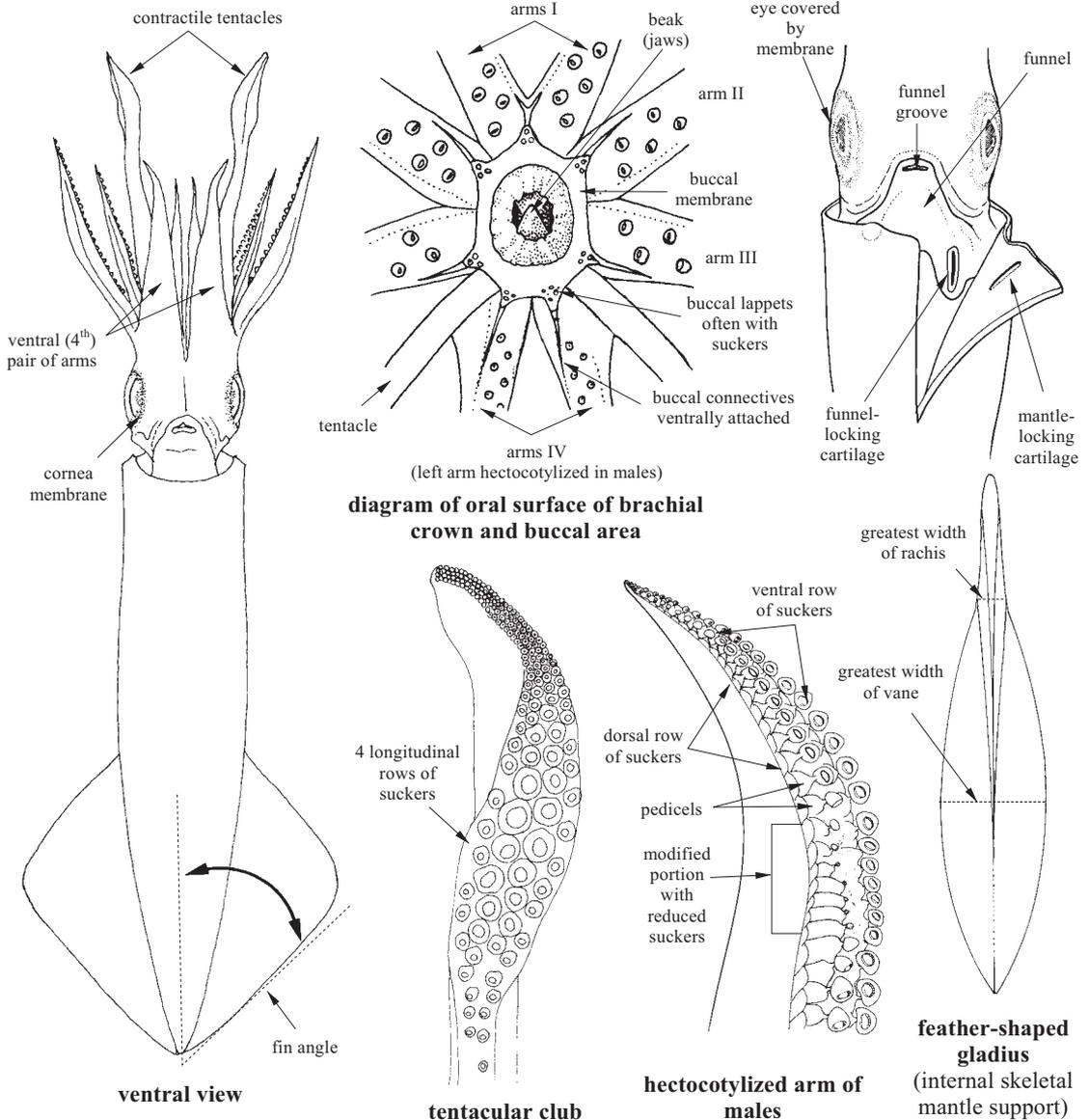
SQUIDS

Myopsid Squids

LOLIGINIDAE

Inshore squids

D **Diagnostic characters:** Transparent skin (corneal membrane) covers eye lens. Funnel-locking apparatus a simple, straight groove and ridge. Fins attached to lateral regions of mantle. Arms with suckers in 2 series. Tentacular club with suckers in 4 longitudinal rows. **Hooks never present.** Buccal connectives attach to ventral margins of ventral arms. **Seven buccal lappets usually possess small suckers** (absent in *Afrololigo* and *Alloteuthis*). The left ventral arm is hectocotylized in males. Eggs spawned in finger-like egg capsules attached to substrate. **Colour:** usually reddish brown, darker dorsally but quite variable, depending on behaviour.



Habitat and biology: Loliginids are small to large squids occurring along the coastal margins and continental shelf, primarily in warm to temperate waters worldwide. Various species occur from very shallow water in bays and estuaries, over grass flats and coral reefs, to water as deep as over 700 m (during seasonal offshore migrations). Eggs are usually attached to hard surfaces in clusters of finger-like capsules; paralarvae resemble the adults. Typically, they undertake diel migrations, aggregating near the bottom during the day but dispersing into the water column during the night.

Remarks: The history of nomenclature and the systematics of this family have long been problematic at least in part because of its worldwide distribution, the diversity of the group, the lack of comprehensive collections, and the scattered and often isolated literature dating from the eighteenth and nineteenth centuries (Vecchione *et al.*, 1998b). A workshop on loliginid systematics was convened during the 2003 meeting of the Cephalopod International Advisory Council held in Phuket, Thailand (Vecchione *et al.*, 2005). One goal of the workshop was to resolve conflicting generic-level classifications of the family in light of recent observations and cladistic analyses on morphological and molecular characters. The assembled taxonomic experts reached consensus on a classification which includes 10 genera and 47 species (Vecchione *et al.*, 2005). This classification is followed in this Guide.

Similar families occurring in the area

Other squid families including commercial-sized species that present potential interest to fisheries (Ommastrephidae, Thysanoteuthidae, Onychoteuthidae) all lack suckers on the buccal lappets and have eye lenses open to the sea, not covered by a transparent corneal membrane. The funnel locking apparatus is not straight in Ommastrephidae, Thysanoteuthidae and Cycloteuthidae. Hooks are found on the arms or tentacular clubs in Onychoteuthidae, Enploteuthidae, Pyroteuthidae, Ancistrocheiridae and Octopoteuthidae. The mantle in Lepidoteuthidae and Pholidoteuthidae is covered with small integumentary scales. Brachioteuthidae, Architeuthidae, Neoteuthidae and Joubiniteuthidae can all be distinguished by more than 4 rows of suckers on the proximal part of the tentacular club. Chiroteuthidae and Mastigoteuthidae generally have greatly enlarged ventral arms, modified to hold the long, thin tentacles. The mantle is fused to the funnel and head in Cranchiidae. Non-commercial squid families differ as follows: Ctenopterygidae have comb-like fins extending nearly the full length of the mantle. Lycoteuthidae have light organs on the eyeball, viscera and tentacles. Histioteuthidae have numerous light organs on the ventral surfaces of the mantle, head and arms. Bathyteuthidae are small, deep-sea squids with very short arms joined by a low, fleshy web.

Key to the species of Loliginidae occurring in the area

- 1a. Fins transversely oval, rounded posteriorly, without tail; very small squids, maturing at 20 mm mantle length; light organs only in female; buccal lappets without suckers ***Afrololigo mercatoris***
- 1b. Fins rhomboidal or heart-shaped, longer than wide, tail present or absent; medium- to large-sized squids; light organs absent; buccal lappets with or without suckers → 2
- 2a. Fins drawn out into a long tail^{1/}; buccal lappets without suckers ***Alloteuthis* → 3**
- 2b. Fins not drawn out into a long tail; buccal lappets with suckers ***Loligo* → 5**
- 3a. Mature squids with relatively short tail; tail length less than half fin length; fin length (with tail) not more than half mantle length ***Alloteuthis media***
- 3b. Mature squids with long tail; tail length not less than half fin width; fin length (with tail) more than half mantle length → 4
- 4a. Fin length (with tail) in males not more than 3 times their width; in females not more than 2 times their width; club narrow, pairs of median suckers set oblique to longitudinal club axis, at an angle of about 45° ***Alloteuthis subulata***
- 4b. Fin length (with tail) in males not less than 4 times their width; in females not less than 2 times their width; club wide, pairs of median suckers set almost perpendicular to longitudinal club axis ***Alloteuthis africana***

^{1/} Recent data provide evidence that this character can be misleading (Anderson *et al.*, 2008). However, until additional information is provided and the taxonomic status of the 3 nominal species is resolved, it is maintained here.

- 5a.** Median suckers of tentacular clubs about 1.5 times as large as lateral club suckers; elongate flame-like blotches present on ventrolateral mantle in males ***Loligo forbesii***
- 5b.** Median suckers of tentacular clubs about 3 to 4 times as large as lateral club suckers; elongate flame-like blotches only seldom present on ventrolateral mantle in males → **6**
- 6a.** In males, horny rings of largest club suckers smooth (a few teeth may occur in rings of small animals) ***Loligo reynaudii***
- 6b.** In males, horny rings of largest club suckers bear several groups of sharp teeth, not arranged in any distinct sequence (only a few teeth may remain in rings of large males) ***Loligo vulgaris***

Remarks: In spite of the low level of species diversity, *Alloteuthis* taxonomy and systematics are confused and assignment of specimens to species may be difficult. Recent analyses of populations of *A. media* and *A. subulata* from the eastern Mediterranean and the northwestern African waters indicate that a species complex probably exists that requires realignment of previous concepts of these 2 nominal species. Subsequent molecular phylogenetic studies reveal clades that do not correspond to the traditionally recognized *Alloteuthis* species. More recent data provide evidence that the character often used to distinguish *Alloteuthis* species (relative fin length) can be misleading. Clearly, further studies are required to help define the whole species complex. Until the taxonomic situation is resolved, we retain the three nominal species here as separate entities.

List of species occurring in the area

The symbol  is given when species are included.

-  *Afrololigo mercatoris* (Adam, 1941).
-  *Alloteuthis africana* Adam, 1950.
-  *Alloteuthis media* (Linnaeus, 1758).
-  *Alloteuthis subulata* (Lamarck, 1798).
-  *Loligo forbesii* Steenstrup, 1856.
-  *Loligo reynaudii* d'Orbigny, 1941.
-  *Loligo vulgaris* Lamarck, 1798.

References

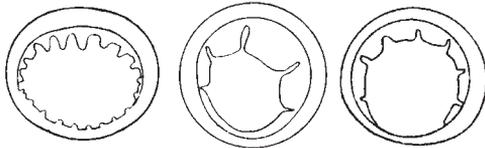
- Adam, W.** 1952. Céphalopodes. *Résultats Scientifiques. Expédition Océanographique Belge dans les Eaux Côtières Africaines de l'Atlantique Sud (1948–1949)*, 3(3): 1–142.
- Allué, C., Lloris, D., Rucabado, J., Guerra, A. & Morales, E.** 1977. Fichas de identificación de especies. Atlántico oriental. Estrecho Gibraltar-Cabo Verde. ZONA CECAF (3-4). Clase Cephalopoda. *Datos informativos. Instituto de Investigaciones Pesqueras*, 3(2): 1–14.
- Anderson F.E.** 2000. Phylogenetic relationships among loliginid squids (Cephalopoda: Myopsida) based on analyses of multiple data sets. *Zoological Journal of the Linnean Society*, 130(4): 603–633.
- Anderson, F.E., Laptikhovsky, V., Pilsits, A. & Bello, G.** 2006. Phylogeny and population genetics of *Alloteuthis* (Loliginidae) and discovery of cryptic species. In *Cephalopod Life Cycles*, Cephalopod International Advisory Council 2006, Hobart, Tasmania. Abstract: p. 34.
- Anderson, F.E., Pilsits, A., Clutts, S., Laptikhovsky, V., Bello, G., Balguerías, E., Lipinski, M., Nigmatulin, C., Pereira, J.M.F., Piatkowski, U., Robin, J.P., Salman, A. & Tasende, M.G.** 2008. Systematics of *Alloteuthis* (Cephalopoda: Loliginidae) based on molecular and morphometric data. *Journal of Experimental Marine Biology and Ecology*, 364: 99–109.
- Augustyn, C.J. & Grant, W.S.** 1988. Biochemical and morphological systematics of *Loligo vulgaris vulgaris* Lamarck and *Loligo vulgaris reynaudii* d'Orbigny nov. comb. (Cephalopoda: Myopsida). *Malacologia*, 29(1): 215–233.
- Brakonieccki, T.F.** 1986. A generic revision of the family Loliginidae (Cephalopoda; Myopsida) based primarily on the comparative morphology of the hectocotylus. Doctoral dissertation, Univ. Miami, FL, 173 pp.

- Brierley, A.S., Thorpe, J.P., Pierce, G.J., Clarke, M.R. & Boyle, P.R.** 1995. Genetic variation in the neritic squid *Loligo forbesi* (Myopsida: Loliginidae) in the northeast Atlantic Ocean. *Marine Biology*, 122: 79–86.
- Chen, C.S., Pierce, G.J., Wang, J., Robin, J.-P., Poulard, J.C., Pereira, J., Zuur, A.F., Boyle, P.R., Bailey, N., Beare, D.J., Jereb, P., Ragonese, S., Mannini, A. & Orsi-Relini, L.** 2006. The apparent disappearance of *Loligo forbesi* from the south of its range in the 1990s: Trends in *Loligo* spp. abundance in the northeast Atlantic and possible environmental influences. *Fisheries Research*, 78: 44–54.
- Guerra, A.** 1992. Mollusca, Cephalopoda. In M.A. Ramos, *et al.*, eds. *Fauna Ibérica*. Museo Nacional de Ciencias Naturales. CSIC. Madrid. 327 pp.
- Hastie, L.C., Nyegaard, M., Collins, M.A., Moreno, A., Pereira, J.M.F., Piatkowski, U. & Pierce, G.J.** 2009. Reproductive biology of the loliginid squid, *Alloteuthis subulata*, in the north-east Atlantic and adjacent waters. *Aquatic Living Resources*, 22: 35–44.
- Jereb, P., Vecchione, M. & Roper, C.F.E.** 2010. Family Loliginidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 38–117.
- Laptikhovskiy, V.V., Salman, A. & Moustahfid, H.** 2005. Morphological changes at maturation and systematics in the squid genus *Alloteuthis*. *Phuket Marine Biological Center Research Bulletin*, 66: 187–193.
- Laptikhovskiy, V., Salman, A., Önsoy, B. & Katagan, T.** 2002. Systematic position and reproduction of squid of the genus *Alloteuthis* (Cephalopoda: Loliginidae) in the eastern Mediterranean. *Journal of the Marine Biological Association of the United Kingdom*, 82(6): 983–985.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Pierce, G.J., Hastie, L.C., Guerra, A., Thorpe, R.S., Howard, F.G., Boyle, P.R.** 1994. Morphometric variation in *Loligo forbesi* and *Loligo vulgaris*: regional, seasonal, sex, maturity and worker differences. *Fisheries Research*, 21: 127–148.
- Sweeney, M.J. & Vecchione, M.** 1998. Generic and specific names introduced in the squid family Loliginidae (Cephalopoda: Myopsida). In N.A. Voss, M. Vecchione, R.B. Toll & M. Sweeney, eds. *Systematics and biogeography of cephalopods*. *Smithsonian Contributions to Zoology*, 586: 223–237.
- Vecchione, M. & Lipinski, M.R.** 1995. Description of the paralarvae of two loliginid squids in southern African waters. *South African Journal of Marine Science*, 15: 1–7.
- Vecchione, M. & Young, R.E.** 2010a. *Afrololigo mercatoris* (Adam, 1941). Guinean thumbstall squid. Version 02 September 2010 (under construction) http://tolweb.org/Afrololigo_mercatoris/23875/2010.09.02 in The Tree of Life Web Project, <http://tolweb.org/>
- Vecchione, M. & Young, R.E.** 2010b. *Alloteuthis* Wülker, 1920. Version 02 September 2010 (under construction) <http://tolweb.org/Alloteuthis/23876/2010.09.02> in The Tree of Life Web Project, <http://tolweb.org/>
- Vecchione, M. & Young, R.E.** 2010c. *Loligo* Lamarck, 1798. Inshore squid. Version 02 September 2010 (under construction) <http://tolweb.org/Loligo/19858/2010.09.02> in The Tree of Life Web Project, <http://tolweb.org/>
- Vecchione, M., Brakoniecki, T.F., Natsukari, Y. & Hanlon, R.T.** 1998. A provisional generic classification of the Family Loliginidae. In N.A. Voss, M. Vecchione, R.B. Toll & M. Sweeney, eds. *Systematics and biogeography of cephalopods*. *Smithsonian Contributions to Zoology*, 586: 215–222.
- Vecchione, M., Shea, E., Bussarawit, S., Anderson, F., Alexeyev, D., Lu, C.C., Okutani, T., Roeleveld, M., Chotiyaputta, C., Roper, C.F.E., Jorgensen, E. & Sukramongkol, N.** 2005. Systematics of Indo-West Pacific Loliginids. *Phuket Marine Biological Center Research Bulletin*, 66: 23–26.

***Afrololigo mercatoris* (Adam, 1941)**

Frequent synonyms / misidentifications: *Lolliguncula mercatoris* Adam, 1941, Roper *et al.* (1984) / None.

FAO names: En – Guinean thumbstall squid; Fr – Calmar doigtier de Guinée; Sp – Calamar dedal de Guinea.



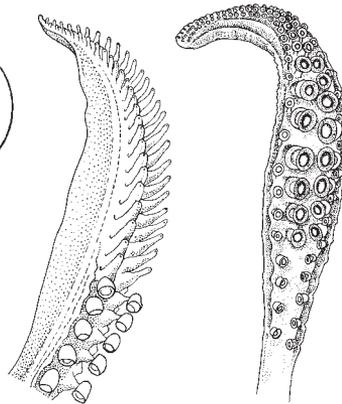
tentacular club
sucker ring

male

arm III sucker rings

female

arm III sucker rings



left ventral arm

(IV) of male
hectocotylized

tentacular club

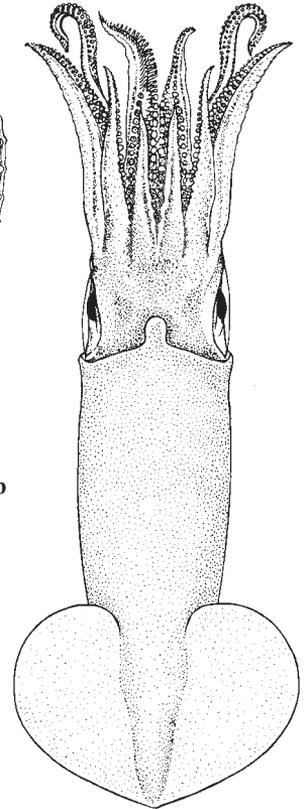
Diagnostic characters: Mantle broad (its width about 35% of dorsal ML) and bluntly rounded posteriorly. **Fins rounded, short** (their length 30 to 52% of dorsal ML), broad (width across both fins 47 to 78% of dorsal ML) with convex posterior margins. Head short; buccal lappets without suckers. Tentacular **clubs narrow, small, with quadriserial suckers, 4 or 5 pairs of median manus suckers much larger than the laterals**, though not nearly as large as the lateral arm suckers in males; club sucker rings with 15 to 25 more or less sharp teeth that are larger and more pointed distally. Dorsal arms (I) extremely short in comparison to the others; ventral suckers on the lateral arms (II and III) much larger than dorsal suckers, especially in males. Horny rings of arm suckers with 1 to 9 large, rectangular teeth distally and laterally, the proximal edge smooth. Left ventral arm (IV) of males hectocotylized, its proximal half with 6 to 12 pairs of normal suckers, the distal half with elongate papillae replacing the suckers, papillae of the dorsal row more strongly developed than the ventral ones. Spermatophore pad of females located in mantle cavity, near gill. **Colour:** reddish to brownish.

Size: Maximum mantle length in females is 50 mm and in males 35 mm.

Habitat, biology, and fisheries: Neritic, nearshore species, most abundant in water shallower than 50 m on mud and sandy mud bottoms but found from the surface down to 252 m. Very little is known about the biology of this species. Known predators are butterfly ray, shallow-water and deep-water Cape hakes and snoek. Currently not exploited, taken incidentally as bycatch in large numbers by research midwater trawls off the South African west coast in summer, but body size probably too small to support a fishery; also captured at night when they concentrate at the 'lumiere des lamparos'; and caught in plankton nets, midwater trawls, bottom and shrimp trawls and even a large dredge.

Distribution: Angra de Cintra (Golfe de Cintra, $\pm 23^{\circ}\text{N}$), Western Sahara, to Port Alfred ($33^{\circ}38'\text{S}$, $26^{\circ}56'\text{E}$), South Africa.

Remarks: Juveniles are very difficult to distinguish from early stages of *Loligo reynaudii* and *L. vulgaris* and, consequently, studies of early life history are complicated, but paralarvae can now be differentiated.



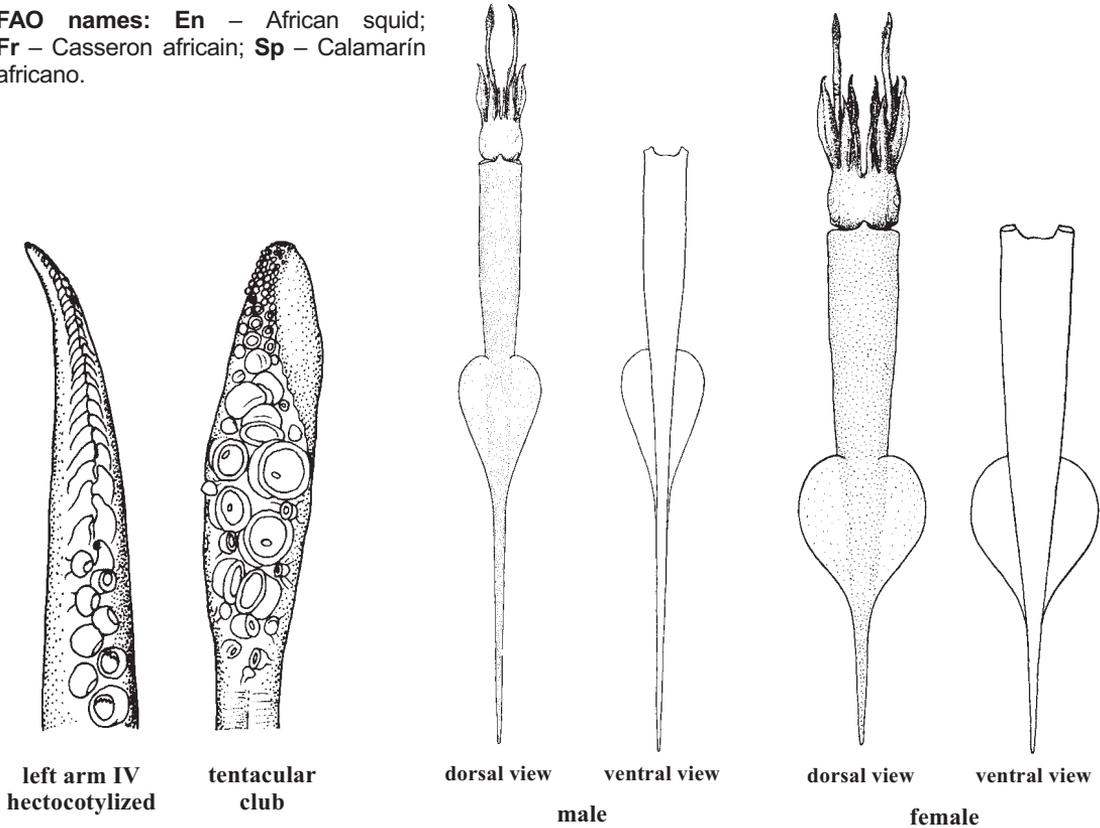
dorsal view



Alloteuthis africana Adam, 1950

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – African squid;
Fr – Casseron africain; **Sp** – Calamarín africano.



Diagnostic characters: Mantle long and narrow. Mantle width ranging from 20 to 25% of dorsal mantle length in juveniles, 15% in adult females and 5% in adult males. Anterior ventral mantle margin squarish in outline. **Tail** (posterior projection of fins and mantle) **very long and pointed in females** (37% ML in juveniles and 58% ML in adults) **and extremely long and spike-like in males** (35% ML in juveniles, 73% ML in adults). Fins oval in outline, with concave posterior borders. Fin width index 23% in adult females and 10% mantle length in adult males. **Tentacles short**, less than mantle length plus head length. **Tentacular club small and narrow, provided with 4 longitudinal rows of suckers, club sucker diameter of 2 median rows 3 times greater than lateral suckers**; rings of largest sucker with 20 to 30 blunt teeth. Left ventral arm (IV) hectocotylized by modification of two-fifths of length, with 8 to 11 pairs of normal suckers proximally followed by 2 longitudinal rows of more or less elongate papillae very thin on the apex. Arm suckers with 6 to 10 square teeth on distal half and smooth on proximal one. **Buccal lappets without suckers.**

Size: Maximum mantle length 205 mm in males and 175 mm in females.

Habitat, biology, and fisheries: A nectobenthic neritic species inhabiting from the surface to about 500 m. It feed on small fishes. Daily growth rate in mantle length in this species increased from 1.2 mm per day at age 90 days to 1.8 mm per day at age 150 days, and then decreased slightly. Daily growth rate in body weight increased at age 90 to 120 days and gradually falling in older animals. Specimens of 120 days have 4 g BW, and those 180 days old 7 g body weight. The maximum ages were 208 days (205 mm ML) for males and 187 days (155 mm ML) for females. This suggests that males may live longer than females and that the life cycle of this squid in west Sahara waters does not significantly exceed 6 months for animals hatching between January and May. Some animals (mostly large males) lived 7 to 8 months. The species mature over a wide

range of sizes and ages (from 120 to 180 days) on the West African shelf. Hatching period extends from January to July, with a peak in March–May in that region. *Alloteuthis africana* is caught as bycatch in local trawl fisheries. Separate statistics are not reported for this species.

Distribution: Eastern Atlantic from 25°N (Western Sahara) to 20°S (Namibia).

Remarks: Analyses of morphometric data suggest that head width can be used to separate *A. africana* from the other 2 species (Anderson *et al.*, 2008).



Alloteuthis media (Linnaeus, 1758)

Frequent synonyms / misidentifications: None / *Alloteuthis subulata* (Lamarck, 1798) (immature males).

FAO names: En – Midsize squid; Fr – Casseron bambou; Sp – Calamarín menor.

Diagnostic characters: Mantle long and relatively narrow, its posterior end drawn out into a pointed tail, up to 6 mm in adults. Fins heart-shaped and with their lateral angles rounded, their posterior borders concave and extending along tail. **Fin length from 45 to 52% mantle length in specimens up to 30 mm mantle length.** Left ventral arm (arm IV) hectocotylized provided with 10 to 12 normal suckers in median row and 2 longitudinal rows of coarse papillae. Tentacles very long, longer than mantle length plus head length in life (tentacular stalks contract after preservation). Tentacular club large and expanded, with 4 longitudinal rows of suckers; sucker diameter 9 to 14% of head width. **The suckers on the manus of the club disposed in transverse rows perpendicular to longitudinal club axis. Buccal lappets without suckers.**

Size: Maximum mantle length 132 mm in females and 88 mm in males.

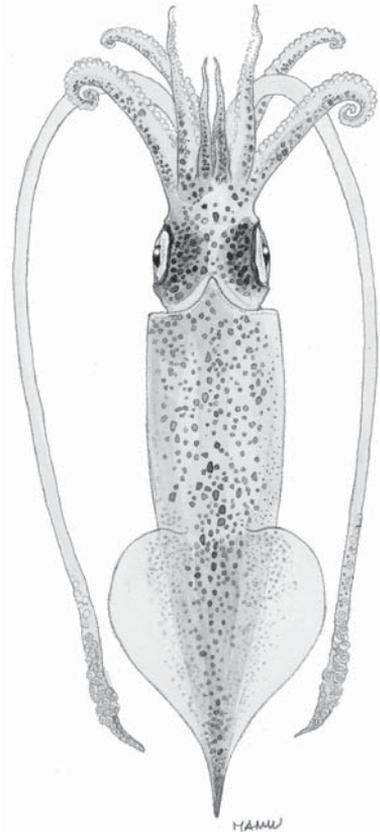
Habitat, biology, and fisheries: Nektobenthic and neritic species inhabiting over sandy detritic and muddy bottoms from the surface to 350 m, but mainly occurring from 20 to 200 m depth. The species undertakes seasonal migrations between offshore and inshore waters. The spawning season extends throughout the year, with 2 peaks in spring and autumn. The species has an intermittent terminal spawning reproductive strategy. Population structure shows successive cohorts recruited at different periods of the year. Length at first maturity in females is about 95 mm mantle length, but males are more precocious (55 mm ML). Eggs (1.5 x 1.1 mm) are encapsulated in short gelatinous strings, which are attached to various hard objects on the substrate. The species fed on crustaceans and small fishes. Newly hatched are planktonic. Longevity is about 1 year. Post-spawning mortality has been observed. This species is captured as bycatch in local trawl fisheries. It is frequently mistaken for juveniles of *Loligo vulgaris* and *L. forbesii*. Separate statistics are not reported.

Distribution: Relatively common in the eastern Atlantic from 60°N to 21°N (Cape Blanc), rare in the North Sea; common in the Mediterranean Sea.

Remarks: Morphometric analyses indicate that central club sucker size is a reliable character to separate *A. media* from *A. subulata* (Anderson *et al.*, 2008).



tentacular club



dorsal view



***Alloteuthis subulata* (Lamarck, 1798)**

Frequent synonyms / misidentifications: None / *Alloteuthis media* (Linnaeus, 1758); *A. africana* Adam, 1959.

FAO names: **En** – European common squid; **Fr** – Casseron commun; **Sp** – Calamarín picudo.

Diagnostic characters: Mantle long and narrow. **Tail long and pointed in adult females** (always longer than 6 mm), **very long** (20 to 60 mm) **and spike-like in adult males**. Fins heart-shaped, with pointed lateral angles, their posterior borders concave and extending along tail. **Fin length 52 to 70% mantle length in specimens up to 30 mm mantle length**. Left ventral arm (arm IV) hectocotylized with 13 to 16 normal suckers proximally and 2 longitudinal rows of fine, thin papillae distally. Tentacles short, less than mantle length plus head length. Tentacular club small and narrow, provided with 4 longitudinal rows of suckers; sucker diameter greater than 6 to 8% head width. **The suckers on the manus of the club disposed in oblique rows respect its longitudinal axis**. Buccal lappets without suckers.

Size: Maximum mantle length 215 mm in males and 150 mm in females.

Habitat, biology, and fisheries: Nekto-benthic and neritic species inhabiting over sandy detritic and muddy bottoms, occurring from the surface to 500 m, mainly from 20 to 200–350 m depth. The species undertakes reproductive migrations towards inshore waters. In the West African shelf, the species show a major spawning period between March and May, with a second spawning peak in autumn. The species has an intermittent terminal spawning reproductive strategy. Eggs (size from 1.5 to 2.3 mm) are encapsulated in gelatinous strings of 20 to 40 mm length, which are attached to various hard objects on the substrate. The duration of the embryonic development at 15° to 18°C is of 3 weeks. Growth rate varies between 0.3 and 1 mm mantle length per day in both sexes, its longevity ranging between 1 and 2 years in cold and temperate waters. Age of adult mature males does not exceed 8 months, that of females 6 months. Population structure shows successive cohorts recruited at different periods of the year. The species mature over a wide range of sizes and ages (from 120 to 180 days). Hatching between January and May is about 6 months, much shorter than that of this species in east northern temperate range. Longevity in the waters off west Sahara is 1 year. Post-spawning mortality has been observed. This species shows a schooling pattern similar to that described in fish. This species is captured as bycatch in local trawl fisheries. The seasonal catch rate patterns from the whole. It is frequently mistaken for juveniles of *Loligo vulgaris* and *L. forbeisi*. Separate statistics are not reported.

Distribution: Relatively common in the eastern Atlantic from 60° to 10°N (Guinea), frequent in the Baltic and North Sea; rare in the Mediterranean Sea.

Remarks: Morphometric analyses indicate that central club sucker size is a reliable character to separate *A. media* from *A. subulata* (Anderson *et al.*, 2008).



tentacular club

(after Guerra, 1992)



male

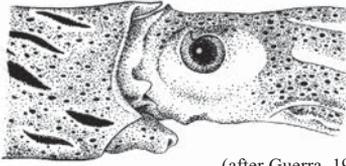
dorsal view



***Loligo forbesii* Steenstrup, 1856**

Frequent synonyms / misidentifications: None / *Loligo vulgaris* Lamarck, 1798.

FAO names: En – Veined squid; Fr – Encomet veiné; Sp – Calamar veteado.



(after Guerra, 1992)

eye detail

Diagnostic characters: Mantle long and cylindrical. **Fins rhomboid, length in adults about 75% mantle length.** Locking cartilages simple. **Eyes larger than in *Loligo vulgaris*.** Arm sucker rings with 20 to 30 sharp conical subequal teeth over the entire ring. Hectocotylus present in males, one-third of left ventral arm modified.

Tentacles not retractile, **tentacular club with 4 longitudinal rows of suckers, of which the suckers in the medial rows are slightly larger (1.5 times) than in the lateral rows.** Tiny suckers with 12 to 15 obtuse teeth present on lappets of the buccal membrane. **Colour:** long lines of bordeaux red chromatophores present on the anterior and ventrolateral surfaces of the mantle.

Size: Maximum mantle length 937 mm in males and 462 mm in females.

Habitat, biology, and fisheries: A nektonic species inhabiting subtropical and temperate waters (above 8.5°C). It is located in schools from the surface to 400 m depth and is most abundant from 20 to 200 m, grouped near the bottom during the day and dispersed in the water column at lower depths at night. Undertakes vertical and horizontal migrations related to feeding and reproduction throughout its life cycle. Finger-shaped egg-masses are attached to various substrates at depths of 20 to 50 m. The length of the eggs is about 3.3 x 2.4 mm. The main spawning peak is centred in winter-spring. At lower latitudes, spawning occurs earlier (in late autumn–early winter). The estimated number of oocytes in the ovary was $14\,965 \pm 1\,137$. Maximum major axis of mature oocytes in the oviducts was 4.3 mm. This species is considered to be an intermittent terminal spawner. Females mature at a smaller size than males. Both sexes mature at the age of approximately 5 months. Juveniles recruit to the fishery at approximately 4 months of age. The diet was composed of Teleostei, Crustacea and Cephalopoda, in decreasing order of importance. The growth rate ranged from 0.89 and 2.0 mm/day, but varied depending on the month of hatching, while the instantaneous relative growth rate ranged from 0.46 and 0.90. The life span varies from 15 to 18 months. A study of geographic variation suggested that *L. forbesii* in the Azores may reasonably be regarded as a distinct stock, differing from *L. forbesii* on the continental shelf. This species is fished as bycatch in bottom and pelagic trawls and to a lesser extent with gillnets and trammel nets. It is also a target species in the hand-jigging, artisanal, coastal fishery, mainly in the Spain, Portugal, British Isles, Ireland and France. This species is marketed together with *Loligo vulgaris* and, frequently the 2 species are not recorded separately in official statistics. During the last 10 years, *L. forbesii* has gradually disappeared from the Iberian Atlantic waters and apparently also further south, on the northwest African coast.

Distribution: Eastern Atlantic from the North Sea and British Isles (55°N) to Senegal, mainly north of 24°N; Azores; Mediterranean Sea; Red Sea.

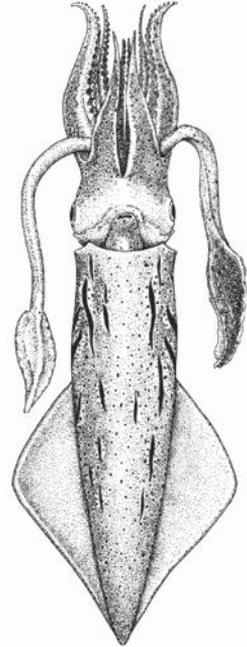


**left arm IV of male
hectocotylized**



**tentacular
club**

(after Guerra, 1992)



ventral view

(after Guerra, 1992)



Loligo reynaudii d'Orbigny, 1839–1841

Frequent synonyms / misidentifications: *Loligo vulgaris reynaudii* Augustyn and Grant, 1988 / None.

FAO names: **En** – Cape Hope squid; **Fr** – Calmar du Cap; **Sp** – Calamar del Cabo.

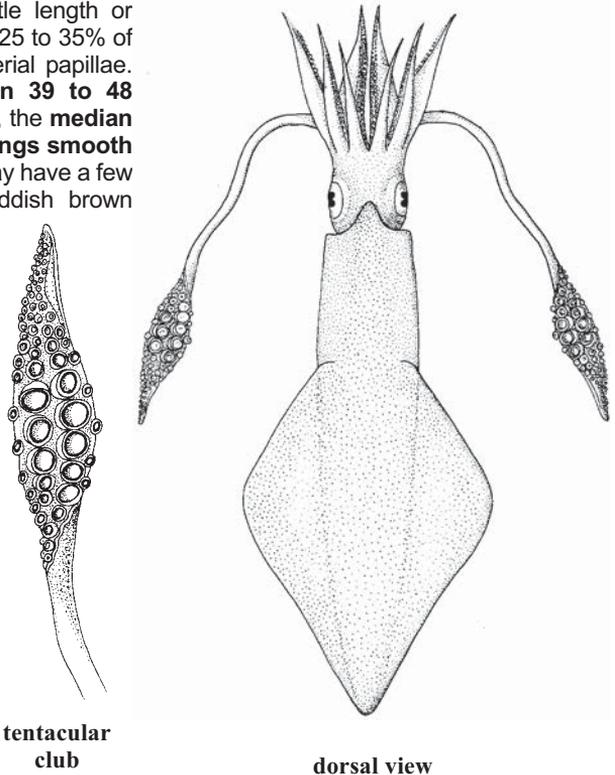
Diagnostic characters: Fins long, 65% mantle length or more. Left ventral arm hectocotylized, the distal 25 to 35% of arm length modified and bearing 44 to 68 biserial papillae. **Tentacular clubs** expanded, **with suckers in 39 to 48 transverse rows** (35 to 37 rows in *L. vulgaris*), the **median manus suckers** greatly enlarged, their **horny rings smooth from 78 mm mantle length** (smaller animals may have a few teeth in the large club suckers). **Colour:** reddish brown chromatophores present on head and mantle; when alive, the colour can change from dark red to almost translucent.

Size: Males larger than females, maximum mantle length 400 mm, females up to 240 mm.

Habitat, biology, and fisheries: A neritic, nekto-benthic species, widely distributed over the continental shelf and slope, at depths of 0 to 384 m (136 to 300 m by day); migrate vertically after dark. The west coast population, found to greater depths than on the south coast, consists mainly of immature and maturing subadults, is continuous with that on the south coast and constitutes a significant but highly variable part of the biomass. It is an opportunistic predator taking a wide size range of prey. Adults feed on polychaetes, crustaceans, cephalopods and teleost fish larvae and juveniles.

Cannibalism is generally low offshore, but increases on the spawning grounds. *L. reynaudii* is preyed upon by a wide variety of opportunistic predators, including skates, rays and sharks, a large number of teleost fishes, seals, dolphins and seabirds. Immature males and females are usually in separate schools on the shelf. Maturation takes place during migration back to the spawning grounds, where the schools mix. Size at maturity is highly variable (males 264 to 346 mm, females 166 to 244 mm ML). Spawning and hatching is mainly from September to December inshore, in less than 40 m; when inshore conditions are unfavourable, the species may spawn offshore, in shelf waters deeper than 100 m. Egg beds range from small clusters of 100 to 1 000 capsules to dense beds several metres in diameter. Egg capsules contain 94 to 126 eggs, attached by stalks usually embedded in the substrate. The fishery is mainly restricted to the southeast coast of South Africa; inshore spawning aggregations support a substantial jigging fishery with night lights in about 15 to 40 m; catches on spawning grounds are usually best at sea surface temperature of 18 to 23°C. The resource has a history of fluctuating abundance. The species is also an important bycatch of demersal trawlers.

Distribution: Southeastern Atlantic, from northern Namibia to the Ntlonyane River, Eastern Cape (32.25°S, 28.98°E), South Africa; possibly also southern Angola.



***Loligo vulgaris* Lamarck, 1798**

Frequent synonyms / misidentifications: None / *Loligo forbesii* (formerly, multiple authors).

FAO names: En – European squid; Fr – Calmar commun; Sp – Calamar común.

Diagnostic characters: Fin length exceeds 50% mantle length. Left ventral arm of male hectocotylized, the distal 25 to 33% of arm length modified and bearing 50 to 62 biserial papillae. Tentacular club with **35 to 37 transverse rows of suckers, of which the median manus suckers are larger than the marginal ones; median manus sucker rings bear teeth, varying from small teeth around most of the ring in some smaller specimens, to a few distal teeth in some larger specimens.** A greenish blue iridescence present in the posterior part of the mantle in live or fresh specimens.

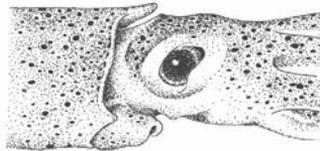
Size: Maximum mantle length 640 mm in males and 485 mm in females.

Habitat, biology, and fisheries: A nektonic species inhabiting temperate waters. Located in schools from the surface to 550 m depth and most abundant from 20 to 200 m. This species undertakes vertical and horizontal migrations related to feeding and reproduction throughout its life cycle. Its potential fecundity ranges from 780 to 74 000 oocytes. Finger-like egg capsules are attached to several substrates below 200 m depth. Full maturity occurred at smaller sizes in Portuguese waters than in the remaining Atlantic waters. This species is considered to be an intermittent terminal spawner. Males mature earlier than females. Juveniles recruit to the fishery at about 3 to 4 months of age. The diet is composed of Teleostei, Cephalopoda, Crustacea and Polychaeta, in decreasing order of importance; cannibalism has also been observed. There are 2 hatching peaks: in winter–spring, eventually resulting in larger sized animals, and in summer–autumn. The life span is about 1 year for males and females. The age at first maturity is variable among areas, and is frequently more than 150 mm mantle length in both sexes. The biological variability of *L. vulgaris* between areas is considered to be related to plasticity of response to large-scale geographic environmental conditions. This species is taken throughout the year as bycatch in bottom trawl, gill and trammel nets and also as target species in the hand-jig artisanal coastal fishery in depths between 20 and 350 m in the Mediterranean, off West Africa and the northeastern Atlantic. *L. vulgaris* is an important secondary target species in the Saharan Bank cephalopod trawl fishery. Frequently, *L. vulgaris* and *L. forbesii* species are not separated in official statistics.

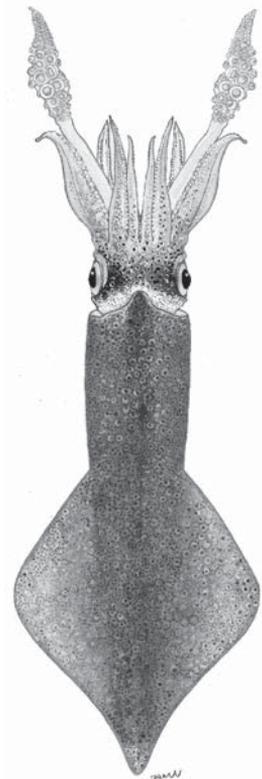
Distribution: Eastern Atlantic from the North Sea and British Isles (55°N) to northern Namibia (20°S); Mediterranean Sea.



tentacular club
(after Guerra, 1992)



eye detail
(after Guerra, 1992)



ventral view



ANCISTROCHEIRIDAE

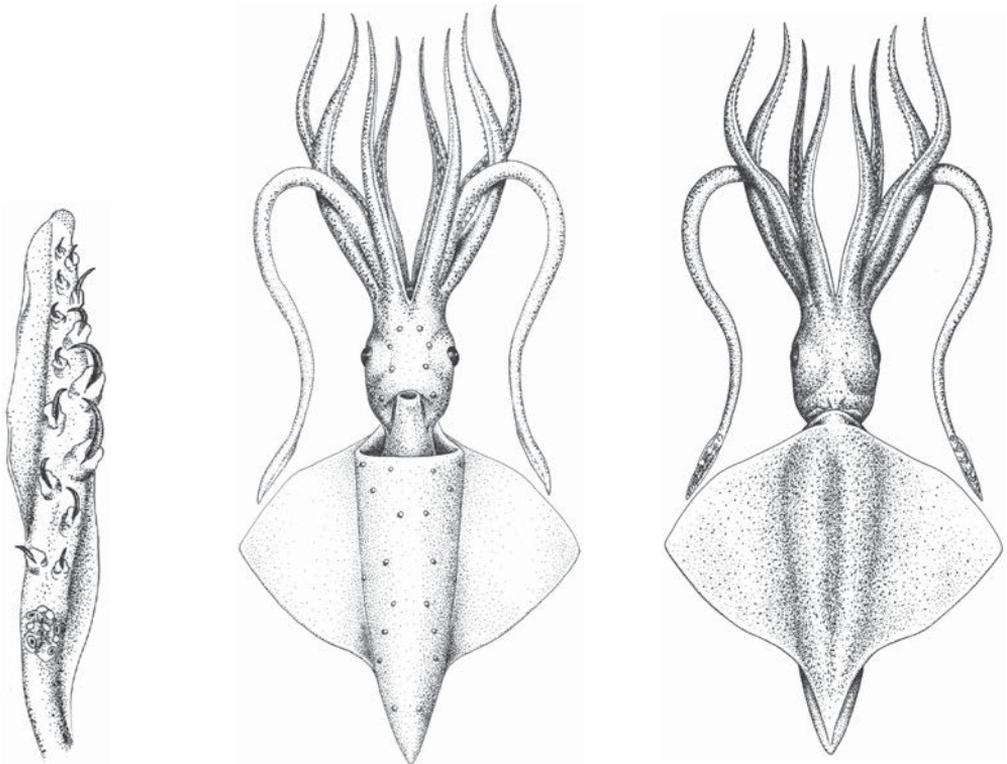
Sharpear enope squids

This monotypic family contains a single species. Consequently, diagnostic characters, habitat, biology and interest to fisheries coincide.

Ancistrocheirus lesueurii (d'Orbigny, 1842)

Frequent synonyms / misidentifications: *Onychoteuthis lesueurii* Orbigny 1839; *Theliodioteuthis alsessandrini* (Vérany, 1851) / None.

FAO names: **En** – Sharpear enope squid; **Fr** – Encornet cachalot; **Sp** – Enoploluria rómbica.



tentacular club

ventral view

dorsal view

(all illustrations from Guerra, 1992)

Diagnostic characters: Funnel locking cartilage simple. **Arms thick with 2 rows of hooks (10 to 15 pairs); small, stalked suckers may be present on arm tips. Tentacles robust with 12 to 28 photophores** along the aboral side of the stalk, clubs narrow, unexpanded, with a distinct carpal cluster. Manus with 2 rows of sharp hooks. **Ventral surface of mantle studded with 20 to 24 relatively large, separated photophores arranged in transverse rows of 2 or 4.** A pair of photophores near the distal end of the funnel groove, 4 ventrolateral pairs in the head, 2 pairs in the dorsal surface of the head and 1 near each eye.

Similar families occurring in the area

Octopoteuthidae lacks tentacles beyond the paralarval stage; has buccal membrane connectives attached ventrally to the vental arms.

Size: Maximum mantle length 400 mm.

Enoploteuthidae has light organs on the ventral surface of the eyeball; lacks distinctive large light organs of this family.

Thysanoteuthidae has a complex funnel-locking apparatus; lacks arm hooks and large light organs on head and mantle.

Cycloteuthidae has buccal membrane connectives attached ventrally to the ventral arms; has a complex funnel-locking apparatus; lacks arm hooks and large light organs on head and mantle.

Habitat, biology, and fisheries: Epi- mesopelagic species inhabiting the water column, at least, up to 700 m. The adults seem to undertake the spawning near the bottom. Planktonic juveniles. This species has nidamental glands and therefore can produce egg mass. Potential fecundity in prespawning specimens varies from 195 000 to 790 000 eggs. Relative fecundity of the maturing squid is about 430 eggs/g, and 230 eggs/g in the mature female. Ripe egg dimensions were 1.91 to 2.6 x 1.5 to 1.6 mm. There are about 7 000 ripe eggs in the oviducts of mature female. In all squid studied no copulation traces were found on the nuchal cartilage, buccal membrane, inside the mantle or on the outer surface of the body. Life span is between 1 and 2 years. It posses a high concentration of ammonium in body tissues, probably related to buoyancy. No interest to fisheries.

Distribution: Cosmopolitan species in tropical and temperate waters.

Remarks: Until recently, this family was considered to be a subfamily of the Enoploteuthidae. Although only a single species is recognized in the family, differences in paralarval morphology between Atlantic and Pacific specimens suggests that more than 1 species exists (Young *et al.*, 1992).



References

- Bello, G.** 1992. On the validity, authorship and publication date of the specific name *Ancistrocheirus lesueurii* (Cephalopoda: Ancistrocheiridae). *Veliger*, 35: 141–145.
- Bello, G., Potoschi, A. & Berdar, A.** 1994. Adult of *Ancistrocheirus lesueurii* caught in the Straits of Messina (Cephalopoda: Ancistrocheiridae). *Bollettino Malacologico*, 29(9–12): 259–266.
- Guerra, A.** 1992. *Mollusca, Cephalopoda*. In M.A. Ramos, *et al.*, eds. *Fauna Ibérica*. Vol. 1. Museo Nacional de Ciencias Naturales. CSIC, Madrid, 327 pp.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Roper, C.F.E. & Jereb, P.** 2010. Family Ancistrocheiridae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO. Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 118–120.
- Villanueva, R. & Sanchez, P.** 1993. Cephalopods of the Benguela Current off Namibia: new additions and considerations on the genus *Lycoteuthis*. *Journal of Natural History*, 27(1): 15–46.
- Young, R.E., Burgess, L.A., Roper, C.F.E., Sweeney, M.J. & Stephen, S.J.** 1998. Classification of the Enoploteuthidae, Pyroteuthidae and Ancistrocheiridae. *Smithsonian Contribution to Zoology*, 586: 239–255.

ARCHITEUTHIDAE

Giant squids

The family is monotypic, consequently diagnostic characters, habitat, biology and interest to fisheries coincide with those of the genus.

Architeuthis Steenstrup, 1857

Frequent synonyms / misidentifications: None / None.

FAO names: En – Giant squid; Fr – Encornet monstre; Sp – Megaluria.

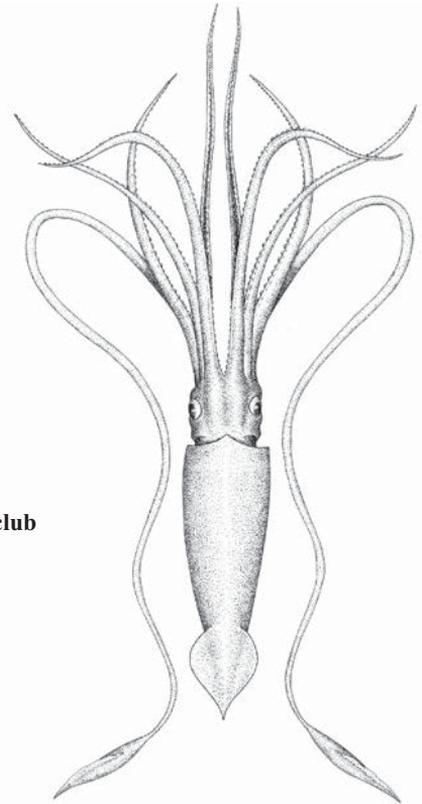
Diagnostic characters: Huge animals, among the largest of all molluscs. Mantle narrow, posteriorly acuminate and attenuated into a short tail. **Arms very long**, about as long as the mantle, with biserial suckers; **tentacles may be extremely long**, reputedly up to 8 times as long as the mantle but more reliably 1 to 3.6 times mantle length. **Tentacular clubs elongate, narrow, with suckers in 4 longitudinal series on the manus, those of the 2 middle series enlarged; carpus with a clump of 15 to 44 irregularly arranged toothed suckers; fixing apparatus with a large cluster of very numerous (34 to 74) small smooth-ringed suckers and knobs, extending proximally in more and more widely spaced pairs along the stalk, almost to the tentacle base; proximal 11 to 28% of the tentacle length bare, with no suckers or knobs.** Locking cartilages simple, straight ridge and groove. Males with a long muscular terminal organ (penis) of about 70% mantle length. **Tips of both ventral arms of male hectocotylized.** **Fins small, ovate, without free anterior or posterior lobes, not reaching the end of the tail;** posterior edges of fins concave. Buccal connectives attach to dorsal borders of ventral arms. **Colour:** skin, when undamaged, brick red; lining of mantle cavity the same colour.



hectocotylus



tentacular club



dorsal view

(all illustrations from Guerra, 1992)

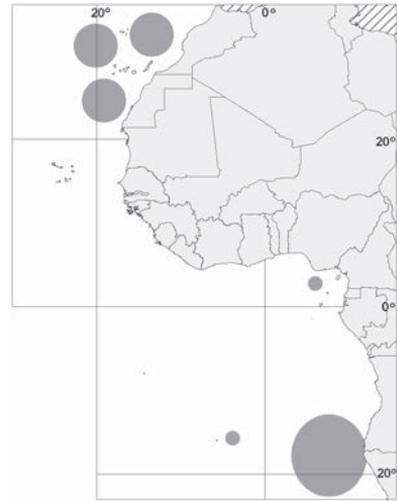
Size: Maximum mantle length up to about 3 m, more often between 1 and 2 m; up to 18 m total length, but more commonly 6 to 12 m.

Habitat, biology, and fisheries: Oceanic species, the young inhabiting midwater (epipelagic and mostly mesopelagic between 200 and 1 000 m.), while adults live in the epipelagic and mesopelagic zones and over the bottom in the bathyal; frequently found over submarine rises and canyons at depths from 125 to 620 m, they occasionally range as deep as 1 000 m. These animals are often stranded near the coast. The diet of these species consists mainly of fish and to a lesser extent of other cephalopods and crustaceans. *Architeuthis* constitutes a major food supply for sperm whales. Other known predators are sharks, large fishes such as lancetfish and tuna, other cetaceans or albatrosses. Sex ratio clearly biased towards females. Males mature at much smaller sizes (at about 1 m ML) than females. A number of mature males have been found with spermatophores embedded in the skin of several arms, the head, mantle and penis. Spawning season unknown. Potential fecundity was estimated to be around 5 to 12 x 10⁶ oocytes. Egg diameter small,

from 1.2 to 1.8 mm. Spermatophores long, from 55 to 204 mm. The maximum estimated age is about 2 to 3 years, although this issue is under discussion. This species has no commercial value due to the low number of specimens collected and mainly, the high ammonium content in the flesh.

Distribution: Cosmopolitan genus. Relatively abundant in waters of the northeastern and northwestern Atlantic, southern Africa, Australia and New Zealand.

Remarks: The systematics of *Architeuthis* is confused and poorly known. Twenty-one nominal species have been described, some of which are clearly invalid. Currently, 3 species are considered valid by some authors, while others regard these 3 entities as subspecies of *Architeuthis dux*: *A. dux dux* in the Atlantic, *A. dux martensii* in the North Pacific and *A. dux sanctipauli* in the southern hemisphere.



References

- Förch, E.C.** 1998. The marine fauna of New Zealand: Cephalopoda: Oegopsida: Architeuthidae (giant squid). *NIWA Biodiversity Memoir*, 110: 1–113.
- González, A.F., Guerra, A., Rocha, F. & Gracia, J.** 2002. Recent findings of the giant squid *Architeuthis* in northern Spanish waters. *Journal of the Marine Biological Association of the United Kingdom*, 82(5): 859–861.
- Guerra, A. & González, A.F.** 2010. Le calmars géants. *Pour la Science*, n° 394: 26–33.
- Guerra, A., González, A.F., Dawe, E.G. & Rocha, F.** 2004. Records of giant squid in the north-eastern Atlantic, and two records of male *Architeuthis* sp. off the Iberian Peninsula. *Journal of the Marine Biological Association of the United Kingdom*, 84(2): 427–431.
- Guerra, A., González, A.F., Rocha, F., Gracia, J. & Laria, L.** 2006. Enigmas de la Ciencia: El Calamar Gigante. In A. Guerra et al., eds. Instituto de Investigaciones Marinas (CSIC), Vigo: 313 pp.
- Hoving, H.-J.T., Roeleveld, M.A.C., Lipinski, M.R. & Melo, Y.** 2004. Reproductive system of the giant squid *Architeuthis* in southern African waters. *J. Zool., London*, 264: 153–169.
- Lordan, C., Collins, M.A. & Perales-Raya, C.** 1998. Observations on morphology, age and diet of three *Architeuthis* caught off the west coast of Ireland in 1995. *Journal of the Marine Biological Association of the United Kingdom*, 78: 903–917.
- Roeleveld, M.A.C.** 2002. Tentacle morphology of the giant squid *Architeuthis* from the North Atlantic and Pacific oceans. *Bulletin of Marine Science*, 71: 725–737.
- Roeleveld, M.A. & Lipinski, M.R.** 1991. The giant squid *Architeuthis* in southern African waters. *Journal of Zoology, London*, 224(3): 431–477.
- Roper, C.F.E. & Boss, K.J.** 1982. The giant squid. *Scientific American*, 246: 2–8.
- Roper, C.F.E. & Jereb, P.** 2010. Family Architeuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 121–123.
- Roper, C.F.E. & Young, R.E.**, 1972. First record of juvenile giant squid, *Architeuthis* (Cephalopoda: Oegopsida). *Proceedings of the Biological Society of Washington*, 85: 205–222.

BATHYTEUTHIDAE

Deepsea squids

The family is monotypic, consequently diagnostic characters, habitat, biology and interest to fisheries coincide with those of the genus.

Bathyteuthis abyssicola Hoyle, 1885

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Bathyal deepsea squid; **Fr** – Loutène abyssale; **Sp** – Batiluria abisal.

Diagnostic characters: Mantle robust and round-shaped posteriorly. **Fins small, round, separate and short.** **Eyes orient slightly anteriorly.** Buccal connectives attached to the dorsal borders of ventral arms, suckers on the buccal lappets. **Clubs unexpanded, short, with 8 to 10 rows of minute suckers.** Arms shorts with suckers arranged in irregular rows (2 rows proximally increasing to 4 rows distally). Protective membranes on arms low, fleshy, without trabeculae. A single photophore is embedded at the base of each arm I and III. Alive animals colour deep maroon.

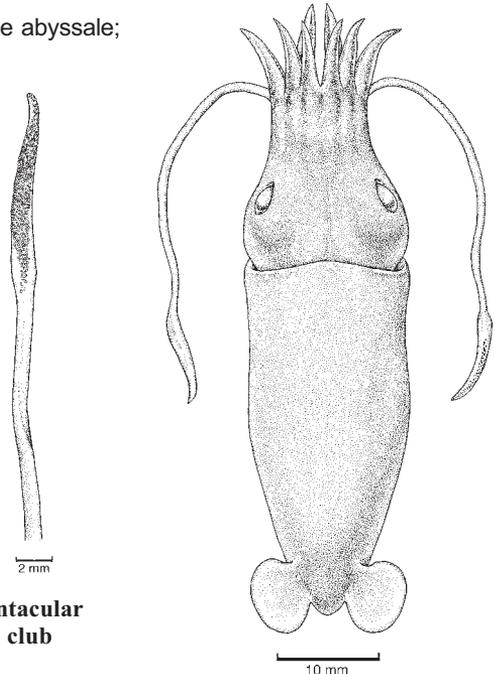
Similar families occurring in the area

None.

Size: Up to 75 mm mantle length.

Habitat, biology, and fisheries: Its biology is poorly known. Oceanic species. Occurring from 100 to 4 200 m, but normally encountered between 700 and 2 000 m. Mantle length at first maturity is about 40 to 50 mm in females and 35 mm in males. Believed to undertake vertical migrations between lesser depths (up to 100 m) at nights and greater depths during the day. The photosensitive vesicles of *Bathyteuthis* appear to function in the detection of bioluminescent light organisms located outside the visual fields. Not of interest to fisheries.

Distribution: Although the exact limit boundary is partially unknown, it can be considered a cosmopolitan species, more frequent in the southern Ocean and productive waters of the eastern Pacific, Atlantic and Indian Oceans. Also cited in the Mediterranean Sea and in the Gulf of Mexico.



dorsal view

(illustrations: K. Hollis/ABRS)



References

- Guerra, A.** 1992. Mollusca, Cephalopoda. In M.A. Ramos et al., eds. Vol. 1. *Fauna Ibérica*. Museo Nacional de Ciencias Naturales. CSIC. Madrid, 327 pp.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Roper, C.F.E.** 1969. Systematics and Zoogeography of the worldwide bathypelagic squid genus *Bathyteuthis* (Cephalopoda: Oegopsida). *United States National Museum Bulletin*, 291: 1–210.
- Roper, C.F.E. & Jereb, P.** 2010. Family Bathyteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 124–126.
- Vecchione, M.** 2002. Cephalopods. In K.E. Carpenter, ed. *The living marine resources of the western central Atlantic. Volume 1: Introduction, molluscs, crustaceans, hagfishes, sharks, batoid fishes and chimaeras*. FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5, Rome, FAO, pp. 149–244.

BRACHIOTEUTHIDAE

Arm squids

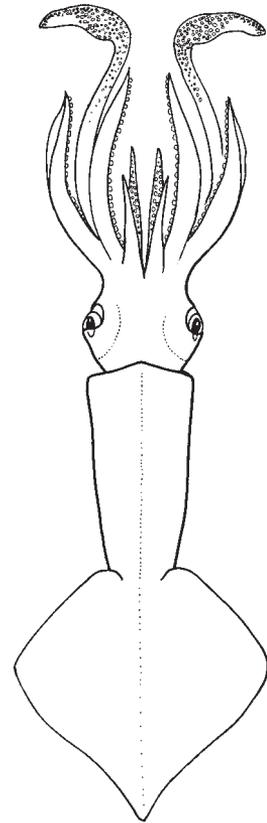
D **Diagnostic characters:** The mantle is muscular but generally thin. **Dactylus of tentacular clubs with quadriseriate sucker but the carpal region is greatly expanded and carries numerous small suckers in many series.** Arm suckers biserial. Fins short, terminal, with free anterior lobes. Simple, straight funnel-locking cartilage. Buccal connectives attach to the ventral margins of ventral arms. Light organs known only on eyes, where a single ventral light organ may be present.

Habitat, biology, and fisheries: Little is known about the biology of brachioteuthid squids although aggregations near the ocean floor, at depth of about 800 m, have been observed from submersibles. Occurs from the surface to 3 000 m.

Remarks: While only 2 genera are presently recognized in this family, many species exist, most of which are not described. The family is in urgent need of revision.

Similar families occurring in the area

Ommastrephidae and Loliginidae: Ommastrephidae has T-shaped funnel locking apparatus; in Loliginidae the eye lens is covered by a cornea; neither of those families have numerous series of suckers in the carpal region of the tentacular clubs, a character shared with the Architeuthidae and the Neoteuthidae; in Neoteuthidae, the posterior edges of the fins are convex whereas in architeuthids the digestive gland abuts the cephalic cartilage.



dorsal view

Key to the *Brachioteuthis* species occurring in the area

- 1a. Mantle very narrow, widening slightly at anterior opening and tapering abruptly in front of fin; fin length and width about 50% mantle length; fin width to length ratio about 0.9 to 1.1; colour purplish brown ***Brachioteuthis picta***
- 1b. Mantle cylindrical, not tapering abruptly in front of fin; fin transversely rhomboidal; fin less than 50% mantle length; fin width to length ratio usually 1.2 to 1.4; colour pale, nearly colourless ***Brachioteuthis riisei***

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Brachioteuthis picta* Chun, 1910.
-  *Brachioteuthis riisei* (Steenstrup, 1882).

References

- Chun, C.** 1910. Die Cephalopoden. 1. Teil: Oegopsida. Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898–1899, 18: 1–401.
- Clarke, M.R.** 1966. A review of the systematics and ecology of oceanic squids. *Advances in Marine Biology*, 4: 91–300.
- Lipinski, M.R.** 2001. Preliminary description of two new species of Cephalopods (Cephalopoda: Brachioteuthidae) from South Atlantic and Antarctic waters. *Bulletin of the Sea Fisheries Institute, Gdynia*, 152: 3–14.
- Lipinski, M.R. & Young, R.E.** 2008. Brachioteuthidae Pfeffer 1908. Version 06 July 2008. <http://tolweb.org/Brachioteuthidae/19409/2008.07.06> in The Tree of Life Web Project, <http://tolweb.org/>
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Roper, C.F.E. & Jereb, P.** 2010. Family Brachioteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 129–134.
- Roper, C.F.E. & Vecchione, M.** 1996. In situ observations on *Brachioteuthis beanii* Verrill: paired behavior, probably mating (Cephalopoda, Oegopsida). *American Malacological Bulletin*, 13(1/2): 55–60.
- Schott, G.** 1902. Oceanographie und maritime Meteorologie. Wiss. Ergebn. dt. Tiefsee-Exped. 'Valdivia' 1: 1–404 + atlas. 45 72 73 74 76 77, Expedition: Deutschen Tiefsee.
- Shea, E.K. & Vecchione, M.** 2002. Quantification of ontogenetic discontinuities in three species of oegopsid squids using model II piecewise linear regression. *Marine Biology*, 140: 971–979.
- Young, R.E., Harman, R.F. & Mangold, K.M.** 1985. The eggs and larvae of *Brachioteuthis* sp. (Cephalopoda: Teuthoidea) from Hawaiian waters. *Vie Milieu*, 35: 203–209.

***Brachioteuthis picta* Chun, 1910**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Ornate arm squid; **Fr** – Encornet bras courts orné; **Sp** – Braquiluria moteada.

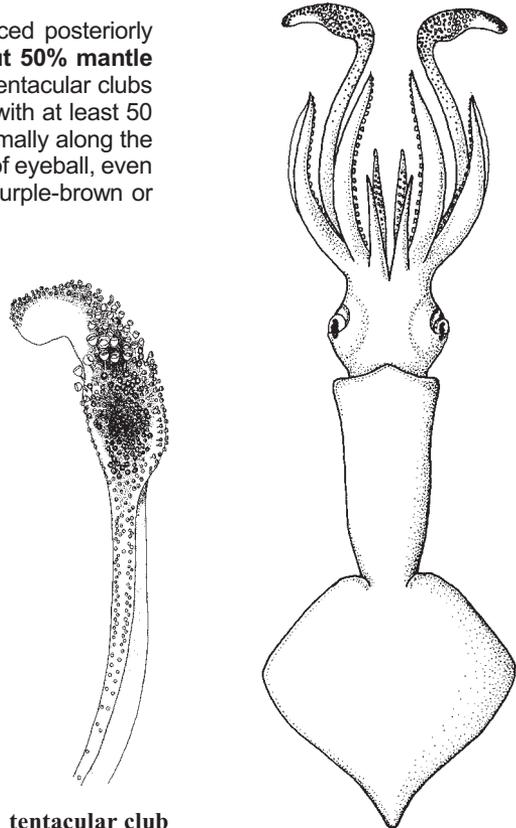
Diagnostic characters: Mantle long, slender, produced posteriorly into a tail. Fins sagittate, **fin length and width about 50% mantle length. Fin width to length ratio about 0.9 to 1.1.** Tentacular clubs expanded, parts of the club not clearly differentiated, with at least 50 minute suckers in the carpal region that extends proximally along the club. A single sausage-like light organ on ventral side of eyeball, even in juveniles. Skin of reticular-fibrous structure. Light purple-brown or chocolate.

Size: Maximum mantle length 90 mm.

Habitat, biology, and fisheries: An oceanic mesopelagic and bathypelagic species. Primarily occurring in depths of 50 to 200 m but its depth range extends from 0 to 952 m, 700 to 952 m by day; the juveniles are epipelagic; 46 to 370 km from shore off Namibia. Males mature at 40 mm mantle length and females at 45 to 50 mm. Spermatophores are transferred to the buccal membrane of the female and spawning is in the water column. Not of interest to fisheries.

Distribution: This is a circumglobal, oceanic species, distributed from about 30°N to at least 40°S to 45°S; distribution limits undetermined due to uncertain identifications in the literature. Records of confidence in the waters off Cabinda (Angola), and Namibia.

Remarks: Chun (1910) gives the type locality as Valdivia, but this is apparently an error.



tentacular club

dorsal view



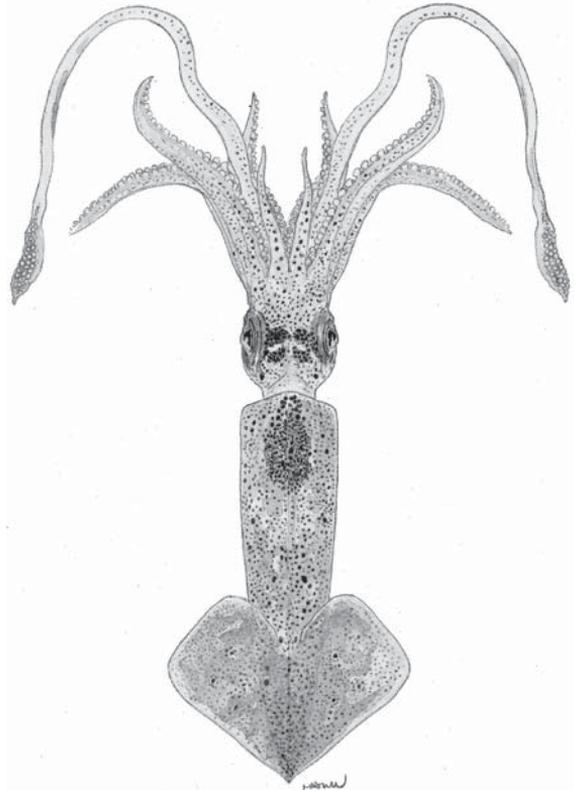
***Brachioteuthis riisei* (Steenstrup, 1882)**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Common arm squid; **Fr** – Encornet bras courts commun; **Sp** – Braquiluria común.



tentacular club
(from Guerra, 1992)



dorsal view

Diagnostic characters: Mantle very elongate, muscular. **Fin less than 50% mantle length**, saggitate; **width to length ratio usually 1.2 to 1.4**. Tentacular clubs narrow with very numerous minute suckers in proximal portion. Ocular light organ present in adults.

Size: Maximum mantle length 170 mm.

Habitat, biology, and fisheries: Epi- mesopelagic species, adults also in bathypelagic habitat. Found from the surface to 3 000 m; about 750 m by day. The spawning season appears to be much extended; hence recently hatched individuals are found throughout the year. Eggs planktonic no forming clusters. Paralarvae have long necks, planktonic and experiencing relatively deep transformations during growth. Found in the stomachs of tuna fish. No interest to fisheries.

Distribution: Cosmopolitan. Mediterranean sea; In the Atlantic from southern Norwegian Sea and Iceland to extreme southern Atlantic, not in tropical western Atlantic, nor Gulf of Mexico and Caribbean; Indian Ocean, except Arabian Sea and North Bay of Bengal; central and southern Pacific; circumglobal in southern Ocean.

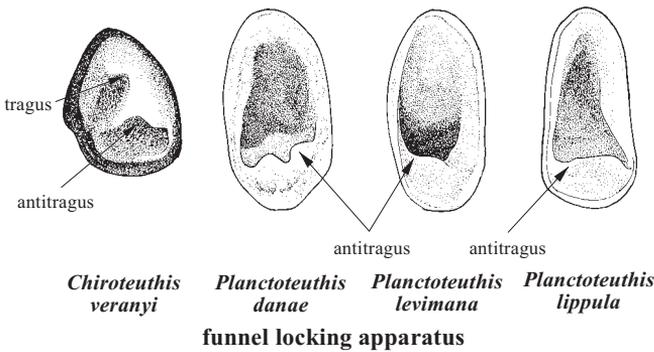
Remarks: It seems to be a species complex.



CHIROTEUTHIDAE

Chiroteuthid squids

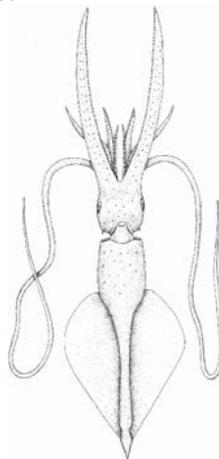
D iagnostic characters: Small to medium in size, gelatinous. **Funnel-locking apparatus oval, generally with 1 or 2 knobs (tragus and antitragus) directed toward the centre of the concavity.** Neck elongate. Ventral arms generally elongate. Arm suckers in 2 series. Most species have extremely long, slender tentacles. Tentacle suckers usually in 4 series, but absent in *Grimalditeuthis*. Club very elongate and divided into 2 or 3 portions by symmetrical protective membranes, except in *Planctoteuthis*. **Very distinctive paralarvae, known as the *Doratopsis* stage, with an elongate neck and brachial pillar.** The presence of a *Doratopsis* paralarva is the only character that is unique to the family.



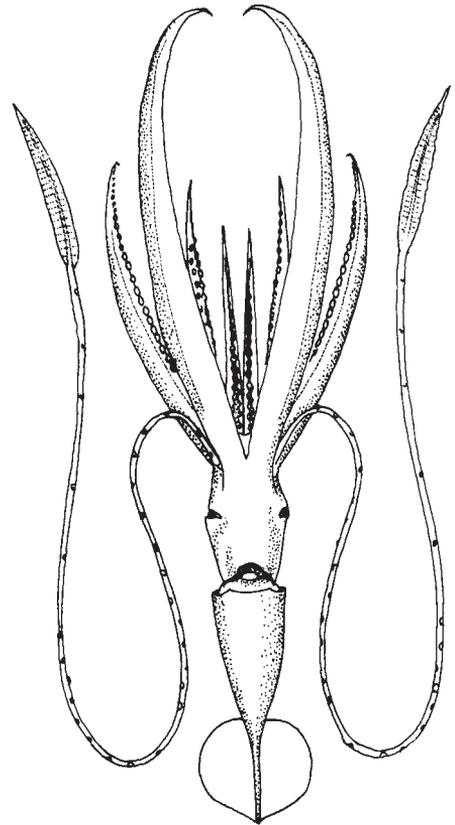
Habitat, biology, and fisheries: Our knowledge on the biology of these slow moving, deepsea oceanic squids, usually with elongate necks and slender bodies, is poor. Found from the surface to 2 500 m. Numerous chambers in the arms, head and mantle filled with a light-weight fluid, ammonium chloride, which provides near-neutral buoyancy for the squids. Not of interest to fisheries.

Similar families occurring in the area

Mastigoteuthidae: tentacles have very numerous minute suckers in more than 6 series; necks are not elongate.



ventral view
Mastigoteuthidae



ventral view

Key to the species of Chiroteuthidae occurring in the area

- 1a. Funnel fused to mantle; tentacle clubs lack suckers ***Grimalditeuthis bonplandi***
 1b. Funnel locks to mantle with cartilaginous apparatus; tentacle clubs with suckers → 2
- 2a. With a compact club not divided into proximal and distal portions by protective membranes; arms subequal in length in adults (ventral arms much longer in young)
 → ***Planctoteuthis****
 2b. Club very elongate and divided into 2 or 3 portions by protective membranes; ventral arms greatly elongate and thickened ***Chiroteuthis veranyi***

**Planctoteuthis*. The species of this genus present in the area are compared in the following table (from Young *et al.*, 2008).

Species	Number of suckers arm IV	Arms (I–III) sucker dentition	Antitragus	Fin length	Club shape	Club keel
<i>P. danae</i>	12–13	7–9 distal truncated teeth	Double. Lobes nearly equal	52% ML	Symmetrical	No
<i>P. exophthalmica</i> = <i>P. levimana</i> ?	10	?	?	Width=36% ML	Symmetrical	No
<i>P. lippula</i>	25	>50 minute teeth, distal larger	Single or slight double. Low, broad	40–45% ML	Short, asymmetrical	Yes

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Chiroteuthis veranyi* (Férussac, 1835).
 *Grimalditeuthis bonplandi* (Vérany, 1839).
 *Planctoteuthis danae* (Joubin, 1931).
 *Planctoteuthis exophthalmica* (Chun, 1908).
 *Planctoteuthis lippula* (Chun, 1908).

Remarks: Considerable morphological differences exist among genera of this family. Species of *Planctoteuthis* are usually rather small and very fragile deepsea squids, but, unlike other chiroteuthids, the subadult retains the peculiar doratopsid paralarval tentacular club. Roper and Young (1967) suggested that *Planctoteuthis* is a neotenic *Doratopsis*.

References

- Adam, W.** 1952. Céphalopodes. *Résultats Scientifiques, Expédition Océanographique Belge dans les Eaux Côtières Africaines de l'Atlantique Sud (1948–1949)*, 3(3): 1–142.
- Chun, C.** 1908. Ueber Cephalopoden der Deutschen Tiefsee-Expedition. *Zoologischer Anzeiger*, 33: 86–89.
- Chun, C.** 1910. Die Cephalopoden. Oegopsida. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition, "Valdivia" 1898–1899*, 18: 1–522 + Atlas.
- Clarke, M.R.** 1992. Family Grimalditeuthidae. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke, & s.v. Boletzky, eds. 'Larval' and juvenile cephalopods: A manual for their identification. *Smithsonian Contributions to Zoology*, 513: 18.
- Glaubrecht, M. & Salcedo-Vargas, M.A.** 2000. Annotated type catalogue of the Cephalopoda (Mollusca) in the Museum für Naturkunde, Humboldt University of Berlin. *Mitteilungen aus dem Museum für Naturkunde in Berlin. Zoologische Reihe*, 76(2): 269–282.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Pfeffer, G.** 1912. Die Cephalopoden der Plankton-Expedition. *Ergebniss der Plankton-Expedition der Humboldt-Stiftung*. 2: 1–815.
- Rodhouse, P.G. & L.U. C.C.** 1998. *Chiroteuthis veranyi* from the Atlantic sector of the Southern Ocean (Cephalopoda: Chiroteuthidae). In A.I.L. Payne, M.R. Lipinski, M.R. Clarke & M.A.C. Roeleveld, eds. *Cephalopod biodiversity, ecology and evolution*. *South African Journal of Marine Science*, 20: 311–322.
- Roper, C.F.E. & Jereb, P.** 2010. Family Chiroteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 135–145.
- Roper, C. F. E. & Young, R. E.** 1967. A review of the Valbyteuthidae and an evaluation of its relationship with the Chiroteuthidae. *Proceeding of the US National Museum*, 123: 1–9.
- Young, R.E.** 1972. The systematics and areal distribution of pelagic cephalopods from the seas off Southern California. *Smithsonian Contribution to Zoology*, 97: 1–159.
- Young, R.E.** 1991. Chiroteuthid and related paralarvae from Hawaiian waters. *Bulletin of Marine Science*, 49: 162–185.
- Young R.E & Roper C.F.E.** 2011. Chiroteuthidae Gray, 1849. Version 22 November 2011 (under construction). <http://tolweb.org/Chiroteuthidae/19451/2011.11.22> in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E., Vecchione, M. & Roper, C.F.E.** 2008. *Planctoteuthis* Pfeffer, 1912. Version 21 April 2008 (under construction). <http://tolweb.org/Planctoteuthis/19464/2008.04.21> in The Tree of Life Web Project, <http://tolweb.org/>.

***Chiroteuthis veranyi* (Férussac, 1835)**

Frequent synonyms / misidentifications: *Chiroteuthis lacertosa* Verrill, 1881; *Leptoteuthis diaphana* Verrill, 1884 / None.

FAO names: **En** – Verany's long-armed squid; **Fr** – Chirocalmar de Vérany; **Sp** – Calamarín volador de Verany.

Diagnostic characters: Head and arms well developed; mantle relatively small and calyx-like in form; round terminal fins. **Ventral arms (IV) greatly elongate and thickened and with well developed keel; club very elongate and divided into 2 or 3 portions by protective membranes.** Club sucker stalks in 2 distinct parts; stalks of lateral sucker series about twice as long as those of medial sucker series. Eyeball light organs disposed in 2 lateral series or stripes; the intermediate stripe with 3 (2 posterior and large light organs and 1 anterior small); **a pair of round light organs on the ink sac; a row of light organs in the arms IV and on the tentacular stalk.**

Size: Mantle length between 100 and 200 mm.

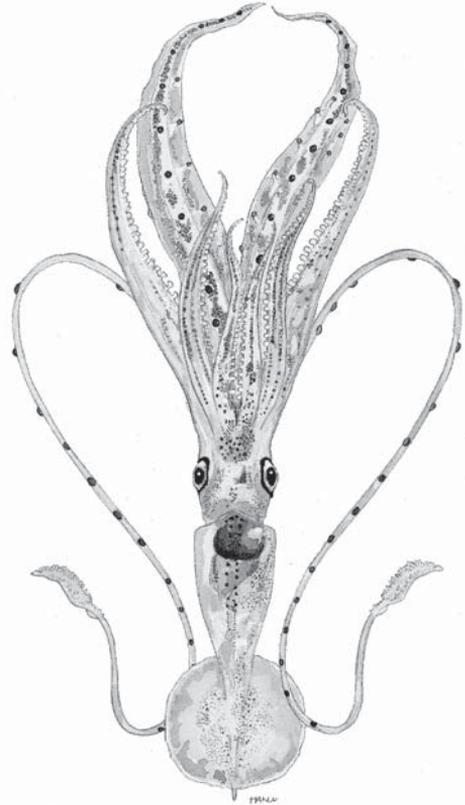
Habitat, biology, and fisheries: Data on the biology of this species are very scarce. Found in the bathyal and in the mesopelagic and upper bathypelagic zones above the continental slope from the surface to depths of 2 130 m by day and 100 to 600 m at night. Known predators are *Dissostichus eginoides* (Patagonian toothfish), *Prionace glauca* (blue shark), *Thunnus alalunga* (albacore), *Diomedea chrysostoma* (grey-headed albatross), *Diomedea exulans* (wandering albatross), *Diomedea melanophrys* (black-browed albatross), *Globicephala malaena* (pilot whale), *Globicephala melas* (long-finned pilot whale), *Hyperoodon planifrons* (bottlenose whale), *Mirounga leonina* (southern elephant seal), *Stenella coeruleoalba* (striped dolphin) and *Physeter catodon* (sperm whales). Not of interest to fisheries. Depth: 0–2130 m, 100–600 m at night.

Distribution: Cosmopolitan, including the Mediterranean Sea. Widely distributed in the Atlantic: from Azores to Namibia; from the Reykjanes Ridge to South Georgia. Indian and Pacific Oceans from Tierra del Fuego to South Africa, Peru and Chile; northeastern Pacific to Oregon.



tentacular club

(from Guerra, 1992)



dorsal view



***Grimalditeuthis bonplandi* (Vérany, 1839)**

Frequent synonyms / misidentifications: *Doratopsis sagitta* Chun, 1908 / None.

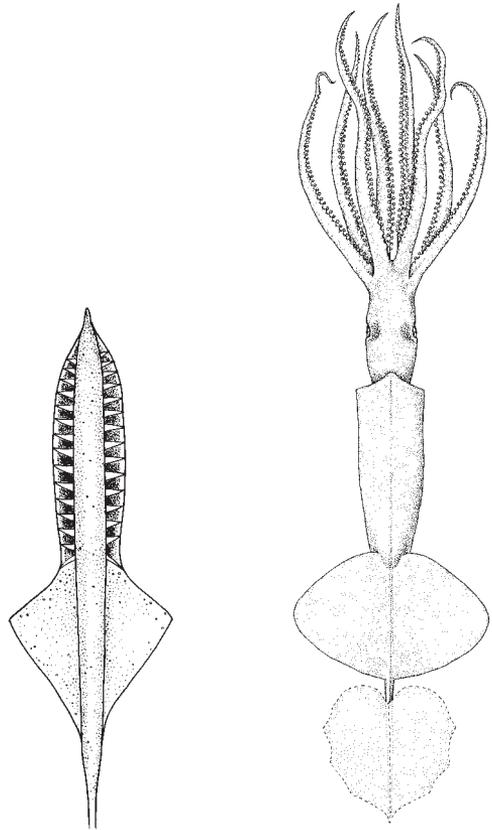
FAO names: **En** – Grimaldi's chiroteuthid squids; **Fr** – Chirocalmar de Grimaldi; **Sp** – Quiroluria de Grimaldi.

Diagnostic characters: Two fin-like “floatation devices” or secondary fins arise from tail. **Funnel fused to mantle at each funnel-mantle locking apparatus. Arms approximately subequal in length, gelatinous; sucker base with 3 conical papillae.** Tentacles club divided into 2 portions by symmetrical protective membranes. **Suckers absent from clubs.** Funnel valve present. Light organs absent, except at the arm tips of mature females. **A very characteristic pattern of chromatophores on the head:** a line of chromatophores passes across the ventral surface of the head between the anterior ends of eyes; another line runs along the neck from each olfactory papilla anteriorly to each eye, then anterior to each eye along the brachial pillar, terminating at the base of the arms.

Size: Maximum mantle length 250 mm.

Habitat, biology, and fisheries: This species is infrequently captured but seems to have a worldwide distribution in tropical to temperate seas, inhabiting in the mesopelagic and bathypelagic zones from the surface to 2 500 m by day and 200 to 1 500 m at night. Known predators are *Alepisaurus ferox* (longnose lancetfish) and *Xiphias gladius* (swordfish). Not of interest to fisheries.

Distribution: North and South Atlantic; Madeira, Cape Verde Islands to Côte d'Ivoire coast; southwestern Indian Ocean and North Pacific Ocean.



tentacular club

(after Young & Roper, 1992)

dorsal view

(illustration: K. Hollis/ABRS)



***Planctoteuthis danae* (Joubin, 1931)**

Frequent synonyms / misidentifications: *Valbyteuthis danae* Joubin, 1931 / None.

FAO names: **En** – Dana's chiroteuthid squid; **Fr** – Chirocalmar de Dana; **Sp** – Quiroluria de Dana.

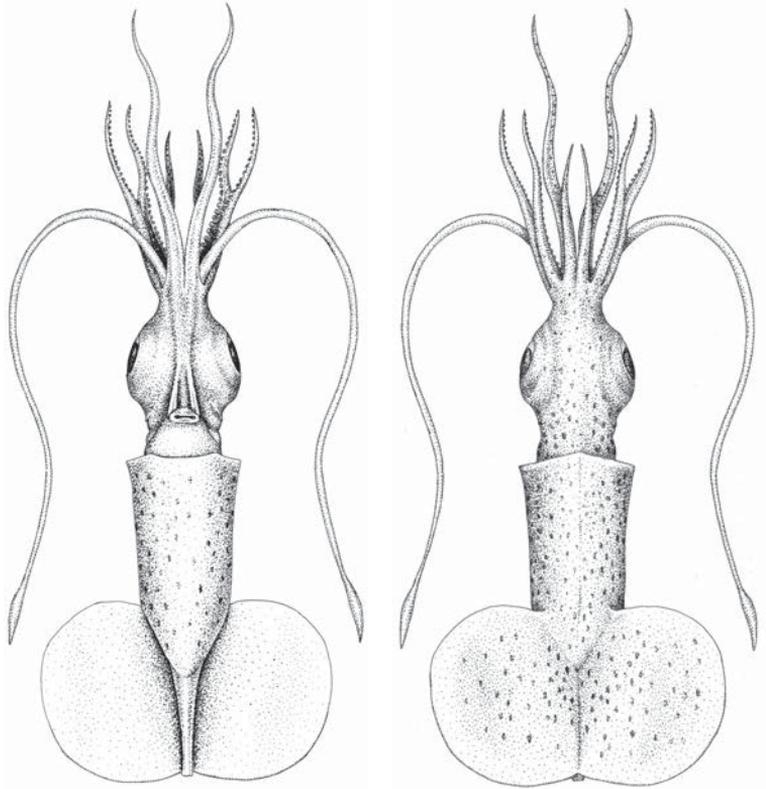
Diagnostic characters: Arms subequal in length in adults; arms IV much the longest in young. **Arms IV with relatively few suckers (12 or 13) usually aligned in virtually single series. Arms I–III with 7 to 9 distal truncated teeth.** Tentacular club small, compact, with low protective membranes along both borders, and not divided into proximal and distal regions by protective membranes and with a keel. Head with elongate neck and brachial pillar. Eyes commonly project ventrally from head. Funnel valve absent. **Funnel locking apparatus oval with posterior bump (antitragus) double and with the lobes nearly equal.** Light organs absent.

Size: Maximum mantle length 55 mm.

Habitat, biology, and fisheries: Occurring at depths of 0 to 2 330 m by day, 50 to 1 250 m at night. Among the deepest living of all pelagic squid, there is a suggestion of ontogenetic vertical spreading but no indication of diel vertical migration. The only known predator is *Alepisaurus ferox* (Lancetfish). Not of interest to fisheries.

Distribution: From Madeira to Guinea Bissau in the Atlantic; eastern Pacific from California to Chile; Hawaii and eastern Polynesian Islands.

Remarks: The type species, *Planctoteuthis danae*, was originally placed in a new genus, *Valbyteuthis*, within a new family, Valbyteuthidae, by Joubin (1931). Roper and Young (1967) placed *Valbyteuthis* in the family Chiroteuthidae noting the similarity of *Valbyteuthis paralarvae* to those of *Chiroteuthis*. Young (1991) recognized that some paralarvae of *Valbyteuthis* had been previously described by Pfeffer (1912) as members of his new genus, *Planctoteuthis*, within the Chiroteuthidae. *Valbyteuthis*, therefore is a junior synonym of *Planctoteuthis*.



ventral view

dorsal view

(illustrations from Guerra, 1992)



***Planctoteuthis exophthalmica* (Chun, 1908)**

Frequent synonyms / misidentifications: *Doratopsis exophthalmica* Chun, 1908; *Chiroteuthis (Planktoteuthis) exophthalmica* (Chun, 1908) / None.

FAO names: **En** – Pop-eye chiroteuthid squid; **Fr** – Chirocalmar exorbité; **Sp** – Quiroluria desorbitada.

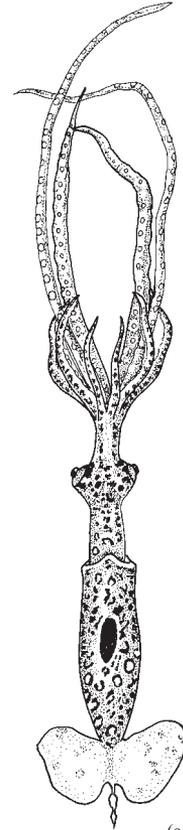
Diagnostic characters: Arms subequal in length in adults; arms IV much the longest in young. **Arms IV with few (6 to 10) suckers usually aligned in virtually single series.** Tentacular club small, compact; with low protective membranes along both borders, and not divided into proximal and distal regions by protective membranes. Head with elongate neck and brachial pillar. Eyes commonly project ventrally from head. Funnel valve absent. Funnel locking apparatus oval with posterior bump (antitragus) Light organs absent.

Size: Maximum mantle length 25 mm.

Habitat, biology, and fisheries: Occurring from the surface to 2 500 m. This species is known only from descriptions of paralarvae. Not of interest to fisheries.

Distribution: Eastern Atlantic Ocean, Irish water, Madeira. Indian Ocean.

Remarks: *Planctoteuthis exophthalmica* could be a junior synonym of *P. levimana*.



(after Chun, 1910)

dorsal view



***Planctoteuthis lippula* (Chun, 1908)**

Frequent synonyms / misidentifications: *Doratopsis lippula* Chun, 1908; ?=*Planctoteuthis levimana* (Lonnberg, 1896) / None.

FAO names: **En** – Chun's chiroteuthid squid; **Fr** – Chirocalmar de Chun; **Sp** – Quiroluria de Chun.

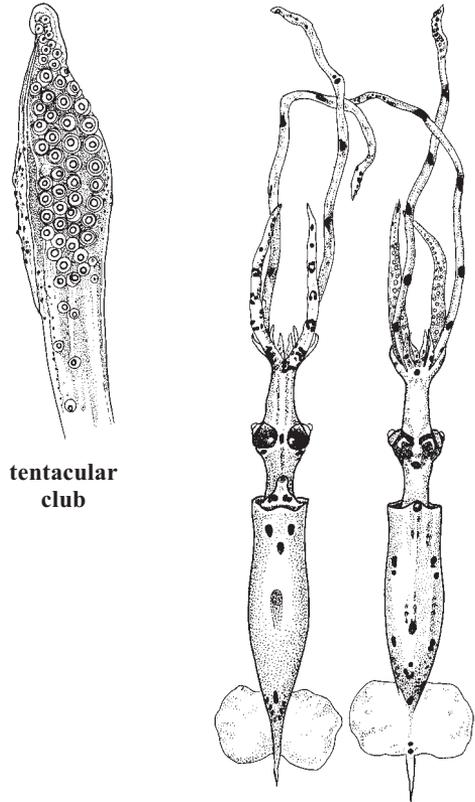
Diagnostic characters: Arms subequal in length in adults; **arms IV much the longest in young. Arms IV with 25 suckers usually aligned in virtually single series. Arms (I–III) sucker dentition with more than 50 minute teeth, distal larger.** Tentacular club small, compact; with low protective membranes along both borders, and not divided into proximal and distal regions by protective membranes. Head with elongate neck and brachial pillar. Eyes commonly project ventrally from head. Funnel valve absent. **Funnel-locking apparatus oval with posterior bump (antitragus) single or slight double, low and broad.** Light organs absent.

Size: Maximum mantle length estimated, 20 mm.

Habitat, biology, and fisheries: This species is known for certain only from the original description, which was based on a 16 mm mantle length specimen and the head of another, from the same haul, estimated to have a mantle length of 20 mm. The only known predator is ?*Delphinus* sp. (common dolphin) (as *Planctoteuthis levimana*, Lonnberg, 1896). Not of interest to fisheries.

Distribution: Eastern Atlantic waters: Benguela Current, central Angola, ?north of Azores. Central Pacific (Hawaii).

Remarks: Nesis (1987) suggested that *P. lippula* may be a synonym of *P. levimana* (Lonnberg, 1896).



ventral view dorsal view
(after Chun, 1910)



CHTENOPTERYGIDAE

Comb-finned squids

Diagnostic characters: Small, muscular. **Fins extend nearly the full length of the mantle in adults; they attach to lateral walls of mantle and are comprised of slender muscle bundles connected by membranes, producing a comb-like appearance.** Funnel-locking cartilages simple, straight. Buccal membrane bears small suckers. Tentacular club suckers in 8 to 20 series. Mature females with an accessory nidamental gland. **Males without hectocotylus.**

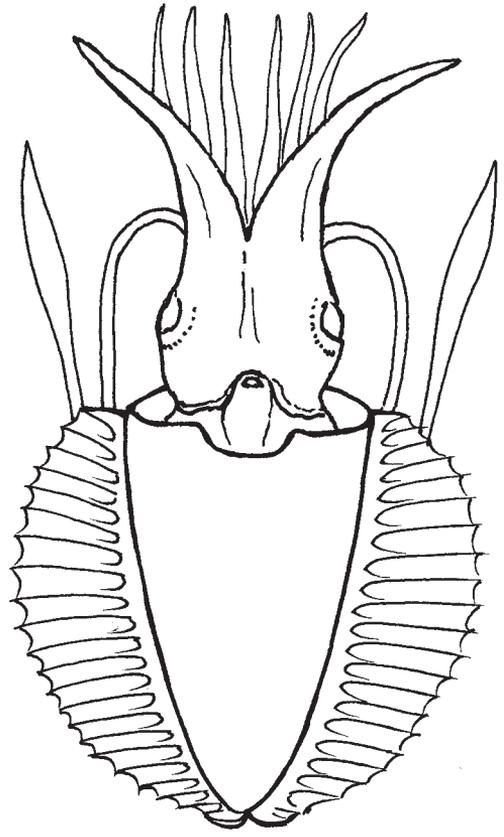
Habitat, biology, and fisheries: Very scarce data. No interest to fisheries. Occurring from the surface to 3 000 m; most abundant at depths from 500 to 1 000 m during the day and migrating into near-surface waters at night.

Similar families occurring in the area

None, no other family has comb-like muscle bundles in fins.

Key to the species of Chtenopterygidae occurring in the area

- 1a. Light organ on eyes and large oval light organ on viscera *Chtenopteryx sicula*
- 1b. No light organ on neither eyes nor viscera . . . *Chtenopteryx canariensis*



ventral view

Remarks: This family, monotypic, is in need of revision, and a number of undescribed species are included in the only recognized genus. The type species, *Chtenopteryx sicula*, was described by Naef as “without visceral photophore”; however, recent observations on specimens from the Mediterranean Sea reported the presence of a visceral photophore (Young and Vecchione, ToL); therefore, a clarification of the species status in the Mediterranean Sea is necessary before the situation of the species in the other oceans can be resolved. Along with *Chtenopteryx sicula* 2 other species are generally recognized at present: *C. sepioloides* Rancurel, 1970 from the Pacific Ocean and *C. canariensis* Salcedo-Vargas and Guerrero-Kommritz, 2000, from the Canary Islands. Both are listed here, pending taxonomic revision. The genus name was formerly spelled *Ctenopteryx*; however, the actual correct spelling is Appellof’s original, “*Chtenopteryx*”.

List of species occurring in the area

The symbol ♪ is given when species accounts are included.

- ♪ *Chtenopteryx canariensis* Salcedo-Vargas and Guerrero-Kommritz, 2000.
- ♪ *Chtenopteryx sicula* (Vérany, 1851).

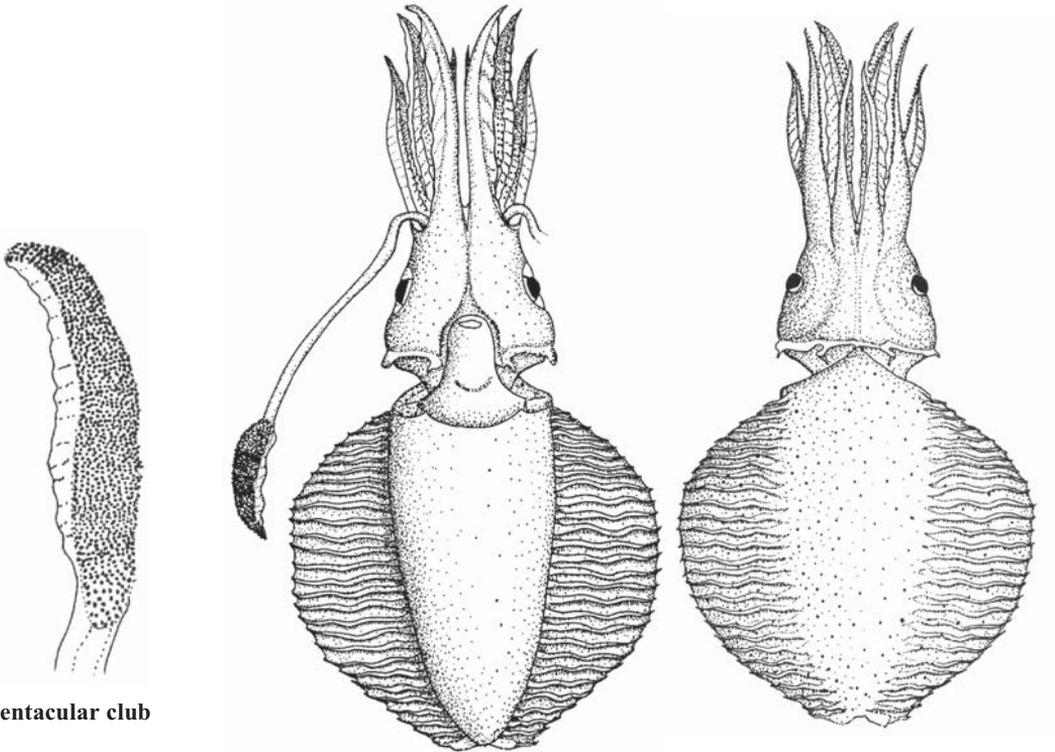
References

- Bello, G. & Giannuzzi-Savelli, R.** 1993. *Chtenopteryx* Appellöf, 1890 (Mollusca, Cephalopoda): proposed confirmation as the correct original spelling. *Bulletin of Zoological Nomenclature*, 50(4): 270–272.
- Guerra, A.** 1992. Mollusca: Cephalopoda. In M.A. Ramos *et al.*, eds. *Fauna Ibérica*, Vol. 1. Museo Nacional de Ciencias Naturales. CSIC. Madrid: 327 p.
- Jefferts, K.** 1992. Family Ctenopterygidae Grimpe, 1922. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. 'Larval' and juvenile cephalopods: A manual for their identification. *Smithsonian Contributions to Zoology*, nº 513: 125–126.
- Naef, A.** 1921–1923. Cephalopoda. Fauna e Flora del Golfo di Napoli. Monograph, no. 35. English translation: A. Mercado (1972). Israel Program for Scientific Translations Ltd. IPST Cat. No. 5110/1,2.
- Okutani, T.** 1974. Epipelagic decapod cephalopods collected by micronekton tows during the EASTROPAC Expeditions, 1967–1968 (systematic part). *Bulletin of the Tokai Regional Fisheries Research Laboratory*, 80: 29–118.
- Salcedo-Vargas, M.A. & Guerrero-Kommritz, J.** 2000. Three new cephalopods from the Atlantic Ocean. *Mitteilungen aus dem Hamburgischen Zoologische Museum und Institut Hamburg*, 97: 31–44.
- Young, R.E. & Vecchione, M.** 2010. Ctenopterygidae Grimpe 1922. *Chtenopteryx* Appellof 1890. Combfin squid. Version 15 August 2010 (under construction). <http://tolweb.org/Chtenopteryx/19430/2010.08.15> in The Tree of Life Web Project, <http://tolweb.org/>

Ctenopteryx canariensis Salcedo-Vargas and Guerrero-Kommritz, 2000

Frequent synonyms / misidentifications: None / None .

FAO names: **En** – Canaries comb-finned squid; **Fr** – Calmar pectiné des Canaries; **Sp** – Calamar pectinado canario.



tentacular club

(after Salcedo-Vargas & Guerrero-Kommritz, 2000)

ventral view

dorsal view

Diagnostic characters: Suckers arranged up to 14 longitudinal rows in arms and 16 to 20 in tentacular club. Absence of ink sac light organs.

Size: Maximum mantle length 65 mm, mature male.

Habitat, biology, and fisheries: Biology unknown. Of no interest to fisheries. Found at 1 000 m depth.

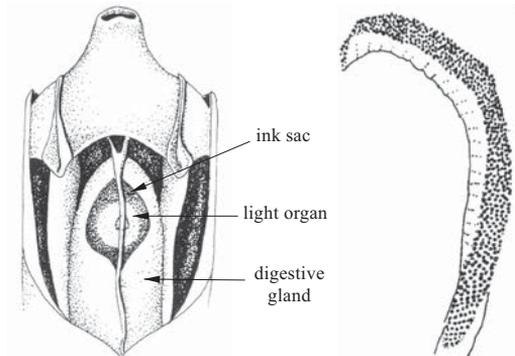
Distribution: Tropical eastern central Atlantic from Canary Islands to the Equator.



***Chtenopteryx sicula* (Vérany, 1851)**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Sicilian comb-finned squid; **Fr** – Calmar pectiné sicilienne; **Sp** – Calamarín pectinado siciliano.

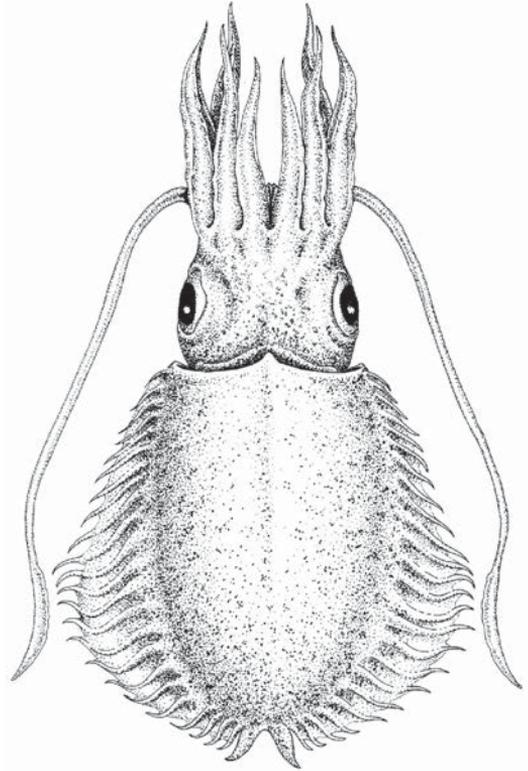


internal organ

(from Guerra, 1992)

tentacular club

(from Saledo-Vargas & Guerrero-Kommritz, 2000)



dorsal view

(from Guerra, 1992)

Diagnostic characters: Large oval light organ on viscera. Suckers on arms I–III biserial proximally, in 4 to 6 series distally. Tentacular club with 8 to 14 series of small suckers.

Size: Maximum mantle length 115 mm.

Habitat, biology, and fisheries: Larvae and juveniles in epipelagic and mesopelagic, adults mainly in bathypelagic zones. Found at depths of 0 to 3 000 m, 20 to 925 m by day, 25 to 990 m at night. Known predators include *Beryx spendens* (splendid alfonso), *Chauliodus* (viperfish), *Synaphobranchus*, (deep-sea eel), *Thunnus alalunga* (albacore), *Xiphias gladius* (swordfish) and a Mediterranean dolphin. Males mature at 35 to 40 mm mantle length, females at about 40 mm mantle length. Not of interest to fisheries.

Distribution: Tropical-subtropical cosmopolitan: Mediterranean Sea; eastern Atlantic from Bay of Biscay to South Africa (36°S); western Atlantic from Nova Scotia to Suriname. Indian and Pacific Oceans.

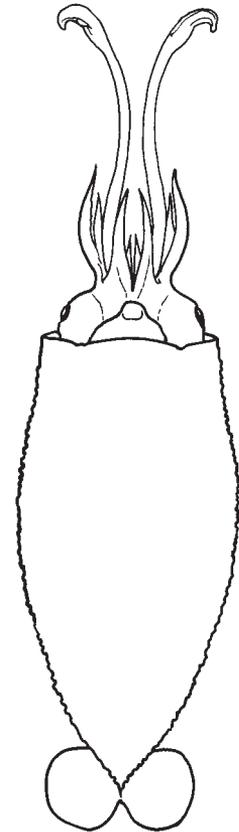


CRANCHIIDAE

Cranch squids

Diagnostic characters: From small (*Helicocranchia* has a maximum mantle length of 100 mm) to very large squids (*Mesonychoteuthis* maximum mantle length is well over 200 cm). In general appearance they often appear to have bloated bodies and short arms. The mantle is generally thin but muscular. **Head fused to mantle at funnel and nuchal locking apparatuses.** With coelom (internal cavity) modified into a large buoyancy chamber. Armature of suckers or hooks in 2 series. Buccal connectives attach to ventral borders of arms IV. Digestive gland generally spindle-shaped and situated well posterior to cephalic cartilage. Most paralarvae with eyes on stalks.

Habitat, biology, and fisheries: Cranch squids occur from the surface to approximately 2 000 m. The biology of the majority of the species of this family is poorly known. They possess a large buoyancy chamber and, hence, the common name 'bathyscaphoid squids'. They seem to be terminal spawners. Several species have been observed in deep water from submersibles to exhibit a peculiar posture (cockatoo posture) with the arms and tentacles folded back over the head. Many species go through marked morphological change with growth and at maturity. These can involve changing eye shape and position, changing fin shape, increased pigmentation and development of light organs on arm tips, various modifications of arm structure and, apparently, loss of tentacles. These changes have led to many developmental stages being named as separate species or genera. Cranchiid paralarvae, which are easily recognized by their long eyestalks, are common in near-surface waters and many remain in this habitat until reaching a rather large size (about 50 to 100 mm ML). Most species occupy progressively deeper waters as they grow larger (ontogenetic descent). Not of interest to fisheries.



ventral view

Similar families occurring in the area

None.

Key to the subfamilies and genera of adult Cranchiidae occurring in the area (from N.A. Voss, 1980)

- 1a. Ventral surface of mantle with 1 or 2 cartilaginous strips extending posteriorly from anterior apex of funnel-mantle fusions; funnel fused to head laterally; eyes with 4 or more small, round to oval photophores **Subfamily Cranchiinae**
- 1b. Ventral surface of mantle without cartilaginous strips extending posteriorly from anterior apex of funnel-mantle fusions; funnel free from head laterally; eyes with 1 usually large photophore, or 2 or 3 markedly dissimilar-sized photophores with the largest usually crescent-shaped **Subfamily Taoninae**
- 2a. Ventral surface of mantle with 2 cartilaginous strips in inverted V-shaped pattern extending posteriorly from anterior apex of funnel-mantle fusions; funnel valve present; dorsal pad of funnel organ with 3 longitudinal, triangular flaps; gladius with short conus → 3
- 2b. Ventral surface of mantle with 1 cartilaginous strip extending posteriorly from anterior apex of funnel-mantle fusions; funnel valve absent; dorsal pad of funnel organ with 3 to 7 narrow papillae; gladius with long slender conus **Leachia**

- 3a.** Mantle covered with cartilaginous tubercles; eyes with 14 photophores; brachial photophores present on all arms in near mature and mature females; suckers in 4 series in midportion of hectocotylyzed right IV in males ***Cranchia***
- 3b.** Mantle without cartilaginous tubercles except on ventral cartilaginous strips and sometimes on dorsal median line; eyes with 4 or 14 photophores; brachial photophores present only on arms III in near-mature and mature females; suckers in 2 series on midportion of hectocotylyzed right or left IV in males ***Liochanchia***
- 4a.** Fins small, paddle-shaped, subterminal; eyes with 1, usually large, photophore → **5**
- 4b.** Fins not paddle-shaped, may be short to long, round to lanceola-shaped, terminal or terminal lateral; eyes with 1 large and 1 or 2 small photophores → **6**
- 5a.** Fins fused distally, inset on short rostrum of gladius which projects dorsally free of end of mantle; eyes small to medium ***Helicocranchia***
- 5b.** Fins widely separated, insert on lateral expanded ends of transverse extensions of posterior end of gladius; eyes proportionally large to huge ***Bathothauma***
- 6a.** Gladial conus short, broad to narrow; fins short (<25% mantle length), oval to round; digestive gland long, narrow, spindle-shaped → **7**
- 6b.** Gladial conus medium to long, narrow, or needle-like to filiform; fins medium to long (30 to 60% mantle length), narrow, lanceolate to ovate; digestive gland stout, spindle-shaped or rounded. → **8**
- 7a.** Posterior fin insertions do not extend to tip of gladius; no tubercles present on funnel-mantle fusion cartilages; dorsal pad of funnel organ with large, triangular lobe on each lateral arm; eyes with small, round, anterior photophore indented into median anterior margin of large, round, posterior photophore ***Sandalops***
- 7b.** Posterior fin insertions extend to tip of gladius; 2 small tubercles present at anterior end of funnel-mantle fusion cartilages; dorsal pad of funnel organ with large, spatulate papilla on each lateral arm; eyes with small, crescent-shaped, anterior photophore lying closely within concavity of large, crescent-shaped, posterior photophore ***Liguriella***
- 8a.** Anterior fin insertions on lateral margins of lanceola of gladius → **9**
- 8b.** Anterior fin insertions on lateral margins of mantle → **11**
- 9a.** Tentacular club with hooded hooks, marginal suckers of manus greatly reduced in size or lost; arms IV the longest in juveniles, approximately coequal to III in adults; gladial conus narrow or needle-like → **10**
- 9b.** Tentacular club without hooded hooks (enlarged suckers with 1 or 2 large, central, hook-like teeth on distal margin), marginal suckers of manus not greatly reduced in size or lost; arms III the longest in juveniles, the longest or approximately coequal to II in adults; gladial conus filiform ***Taonius***
- 10a.** Arms without hooded hooks; fins lanceolate becoming attenuate posteriorly. ***Galiteuthis***
- 10b.** Arms with hooded hoks on midportion; fins stout, ovate (nearly round in combined outline in juvenile), do not become attenuate posteriorly ***Mesonychoteuthis*^{1/}**

^{1/} This genus has no species represented in the area

- 11a.** Funnel valve present; dorsal pad of funnel organ with triangular flap on each lateral arm; eyes with 2 photophores (large, roughly crescent-shaped posterior photophore, and within its concavity, smaller, roughly elongate S-shaped anterior photophore); carpal suckers in 2 series on tentacular stalk → **12**
- 11b.** Funnel valve absent; dorsal pad of funnel organ with long, spatulate papilla on each lateral arm; eyes with 3 photophores (large, crescent-shaped posterior photophore, and within its concavity, a smaller, crescent-shaped anterior photophore and a third small, oval photophore); carpal suckers in 4 series set in zigzag pattern on tentacular stalk **Teuthowenia**
- 12a.** Photophores absent on ventral surface of stout, spindle-shaped, digestive gland; long, single united digestive duct **Egea**
- 12b.** Large compound photophore present on ventral surface of rounded digestive gland; 2 short digestive ducts remain separate **Megalocranchia**

List of species occurring in the area

The symbol 🦑 is given when species accounts are included.

- 🦑 *Bathothauma lyromma* Chun, 1906.
- 🦑 *Cranchia scabra* Leach, 1817.
- 🦑 *Egea inermis* Joubin, 1933.
- 🦑 *Galiteuthis armata* Joubin, 1898.
- 🦑 *Helicocranchia papillata* (Voss, 1960).
- 🦑 *Helicocranchia pfefferi* Massy, 1907.
- 🦑 *Leachia atlantica* (Degner, 1925).
- 🦑 *Liguriella podophtalma* Issel, 1908.
- 🦑 *Liocranchia reinhardtii* (Steenstrup, 1856).
- 🦑 *Megalocranchia oceanica* (Voss, 1960).
- 🦑 *Sandalops melancholicus* Chun, 1906.
- 🦑 *Taonius pavo* (Lesueur, 1821).
- 🦑 *Teuthowenia maculata* (Leach, 1817).

Remarks: This is one of the most specious Oegopsid families, and still there are many undescribed species.

References

- Clarke, M.R.** 1966. A review of the systematics and ecology of oceanic squids. *Advances in Marine Biology*, 4: 91–300.
- Guerra, A.** 1992. Mollusca, Cephalopoda. In M.A. Ramos *et al.*, eds. Vol. 1. *Fauna Ibérica*. Museo Nacional de Ciencias Naturales. CSIC. Madrid, 327 pp.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Okutani, T.** 2005. *Cuttlefishes and squids of the world*. Publication for the 40th Anniversary of the Foundation of National Cooperative Association of Squid Processors, Tokyo, 254 pp.

- Roeleveld, M.A.** 1977. Cephalopoda from the Tropical Eastern Atlantic Ocean. *Galathea Report*, 14: 123–132.
- Roper, C.F.E & Jereb, P.** 2010. Family Cranchiidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 148–178.
- Voss, N.A.** 1974. Studies the cephalopod family Cranchiidae a redescription of *Egea inermis* Joubin, 1933. *Bulletin of Marine Science*, 24(4): 936–956.
- Voss, N.A.** 1980. A generic revision of the Cranchiidae (Cephalopoda; Oegopsida) *Bulletin of Marine Science*, 30(2): 365–412.
- Voss, N.A.** 1985. Systematics, biology and biogeography of the cranchiid cephalopod genus *Teuthowenia* (Oegopsida). *Bulletin of Marine Science*, 36: 1–85.
- Voss, N.A. & Voss, R.S.** 1983. Phylogenetic relationships in the cephalopod family Cranchiidae (Oegopsida). *Malacologia*, 23(2): 397–426.
- Voss, N.A., Stephen, S.J. & Dong, Zh.** 1992. Family Cranchiidae Prosch, 1849. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. "Larval" and Juvenile Cephalopods: A Manual for their Identification. *Smithsonian Contributions to Zoology*, 513: 187–210 pp.
- Young, R.E. & Mangold, K.M.** 1996. *Sandalops* Chun, 1906. *Sandalops melancholicus* Chun, 1906. The sandal-eye squid. Version 01 January 1996 (under construction). http://tolweb.org/Sandalops_melancholicus/19551/1996.01.01 in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Mangold, K.M.** 1999. *Liguriella* Issel, 1908. *Liguriella podophtalma* Issel, 1908. Version 01 January 1999 (under construction). http://tolweb.org/Liguriella_podophtalma/19552/1999.01.01 in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Mangold, K.M.** 2006. *Teuthowenia* Chun, 1910. Version 16 July 2006. <http://tolweb.org/Teuthowenia/19560/2006.07.16> in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Mangold, K.M.** 2007. *Leachia* Lesueur 1821. Version 30 June 2007 (under construction). <http://tolweb.org/Leachia/19544/2007.06.30> in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Mangold, K.M.** 2008a. Cranchiidae Prosch, 1847. Bathyscaphoid squids. Version 22 April 2008. <http://tolweb.org/Cranchiidae/19411/2008.04.22> in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Mangold, K.M.** 2008b. *Helicocranchia* Massy, 1907. Piglet squid. Version 27 October 2008 (under construction). <http://tolweb.org/Helicocranchia/19550/2008.10.27> in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Mangold, K.M.** 2008c. *Helicocranchia pfefferi* Massy 1907. Banded piglet squid. Version 16 October 2008 (under construction). http://tolweb.org/Helicocranchia_pfefferi/19580/2008.10.16 in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Mangold, K.M.** 2009. *Egea* Joubin, 1933. *Egea inermis* Joubin, 1933. Version 17 August 2009 (under construction). http://tolweb.org/Egea_inermis/19563/2009.08.17 in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Mangold, K.M.** 2010. *Megalocranchia* Pfeffer, 1884. Version 15 August 2010 (under construction). <http://tolweb.org/Megalocranchia/19562/2010.08.15> in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Mangold, K.M.** 2011. *Taonius* Steenstrup, 1861. Version 22 November 2011 (under construction). <http://tolweb.org/Taonius/19558/2011.11.22> in The Tree of Life Web Project, <http://tolweb.org/>

***Bathothauma lyromma* Chun, 1906**

Frequent synonyms / misidentifications: *Leucocranchia pfefferi* Joubin, 1912 / None.

FAO names: **En** – Lyre cranch squid; **Fr** – Encornet-outré lyre; **Sp** – Cranquiluria cítara.

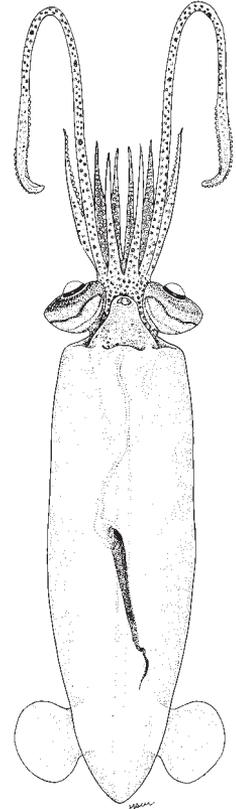
Diagnostic characters: Mantle cylindrical, translucent and widely rounded posteriorly. Fins small, subterminal and paddle-shaped directly attached to the mantle ahead of its posterior end and fairly separated from one other. Eyes large, subspherical and prominent with a semilunar light organ on ventral side of each eyeball; sessile in adults, but with extremely long eye stalks and long slender muzzle in paralarvae. Funnel wide, large and it extends almost to the proximal part of the arms; **funnel valve absent**. The tips of dorsal arms in adult males become thinner, accompanied by a change from 2 rows of arm suckers to 4 rows of much smaller suckers with much reduced aperture. The percentage of the arm that is modified increases with increasing mantle length; in most males it is 64%. Tentacles long and muscular with 4 rows of carpal suckers; manus with 4 rows of suckers and protective membrane with trabeculae on both sides; dactylus with 4 rows of small suckers; swimming keel present.

Size: Up to 200 mm mantle length.

Habitat, biology, and fisheries: A meso-bathypelagic species occurring from 100 to about 2 000 m. It does not seem to undertake vertical migrations. The eye stalks disappear at a mantle length of about 110 mm. Sexual differentiation becomes apparent at a mantle length of approximately 60 mm. First arms of males are modified at a mantle length of about 60 mm. The smaller specimens lives in shallower waters than the larger ones. Of no interest to fisheries.

Distribution: Tropical and subtropical cosmopolitan species up to the sub-Antarctic region.

Remarks: Recent studies indicate that at least 4 closely related species exist.



female
ventral view



Cranchia scabra Leach, 1817

Frequent synonyms / misidentifications: None / None.

FAO names: En – Rough cranch squid; Fr – Encornet-outré rude; Sp – Cranquiluria ruda.

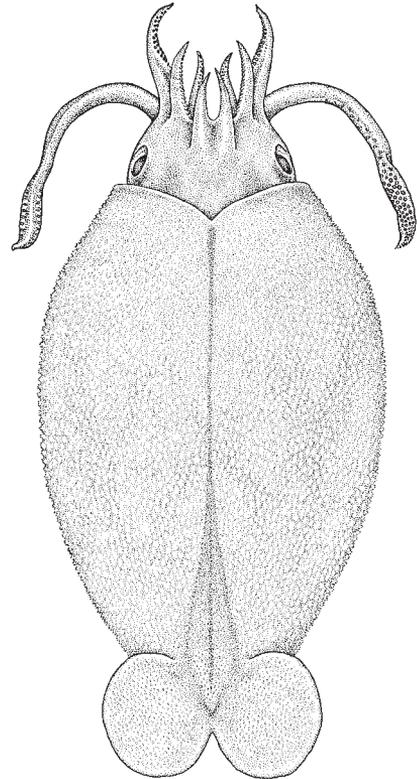
Diagnostic characters: Stout, spindle-shaped mantle tapers posteriorly to broad point. Mantle walls thin. **Entire surface of mantle and dorsal surface of fins is beset by cartilaginous tubercles; whose tops bear 3 to 5 sharp spines.** Head with large, round sessile eyes. Fins small, round, resembling symbol of infinity. **A total of 14 light organs on eyeball:** 6 around the pupil, 7 arched along ventral side of eyeball and 1 between them. Funnel large and broad, extending nearly to base of arms. Funnel valve present. Arms short to medium length, narrow, muscular. A large light organ on ends of all arms in adult females. Right ventral arm hectocotylized with 4 rows of suckers in its medial part. Tentacles with slightly expanded clubs, diagonally set pairs of carpal suckers alternate with pads on distal two-thirds of stalk; carpal group present; suckers of club largest on midmanus, with central suckers only slightly larger than marginals; suckers abruptly reduced in size on dactylus.

Size: Mantle length up to 150 mm.

Habitat, biology, and fisheries: A meso to bathypelagic species. Found from the surface to 2 000 m. This species is among the fast growing squids in the epipelagic waters of the tropical Atlantic. Juveniles present in upper 400 m day and night. There is a tendency for larger juveniles to extend range into deeper water. Adults have been taken in open nets at depths of 1 900 to 2 000 m. The maximum estimated age from the statoliths of animals ranging from 50 to 150 mm mantle length was 170 days. The hatching period in the central-east Atlantic goes from April to June, with a clear peak in May. This species seem to spawn at great depths and it is likely that just after hatching, small paralarvae ascend to epipelagic waters, which was confirmed by captures of paralarvae of 3.3 mm mantle length in the superficial water layer of the open tropical Atlantic. During the first 4 to 5 months of their ontogenesis feed and grow quickly in the epipelagic waters, attain 120 to 130 mm mantle length and then move onto deeper water for maturation and subsequent spawning.

Distribution: Tropical and subtropical cosmopolitan species. Distribution generally described by north and south subtropical convergences.

Remarks: May comprise more than 1 species or subspecies.



dorsal view

(illustration: K. Hollis/ABRS)



Egea inermis Joubin, 1933

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Unarmed cranch squid; **Fr** – Encornet-outré désarmé; **Sp** – Cranquiluria desarmada.

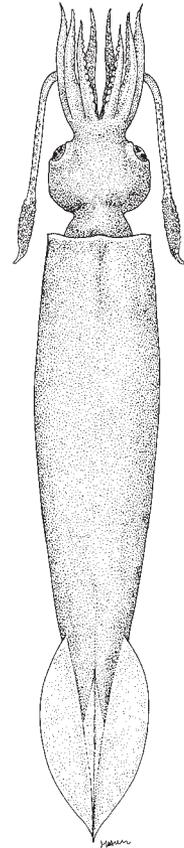
Diagnostic characters: **Mantle fused with head and funnel in the nuchal region.** The mantle is long, narrow, spindle-shape, tapering posteriorly to attenuated tip, and **without hyalines stripes on its ventral side.** In young (7 to 16 mm ML) the funnel-mantle fusion cartilages are elongate and roughly triangular; the fins are small and paddle-shape, inserted on an elongate, diamond-shaped lanceola. In juveniles (> or = 20 mm ML) the head has a short, stout, arm-crown stalk; eyes oval, with short ventral rostrum, on short to medium length stalks. Tentacles long, narrow, with 2 rows of carpal suckers changing to 4 rows about 1 club length proximal to forming club.

Size: Maximum mantle length of subadults 420 mm approximately (mature animals are not available).

Habitat, biology, and fisheries: Epi- mesopelagic species; occurring from the surface to 2 000 m. The paralarvae between 7 and about 35 mm mantle length concentrated day and night in upper 200 m; following morphological changes (at approximately 35 to 40 mm ML), juveniles expand their range to at least 800 m. Night captures of juveniles and large subadults from subsurface to about 300 m indicate that at least part of the population undergoes diel vertical migrations. Maturation occurs in deep water possible 2 000 m. None interest to fisheries.

Distribution: Circumglobal in tropical and equatorial waters, extending in Gulf of Mexico and northwestern Atlantic in Gulf Stream system, and into northwestern Pacific in Kuroshio Current.

Remarks: It seems to comprise at least 2 species.



dorsal view



***Galiteuthis armata* Joubin, 1898**

Frequent synonyms / misidentifications: *Taonidium pfefferi* Russell, 1909; *Galiteuthis shumi* Chun, 1910 / None.

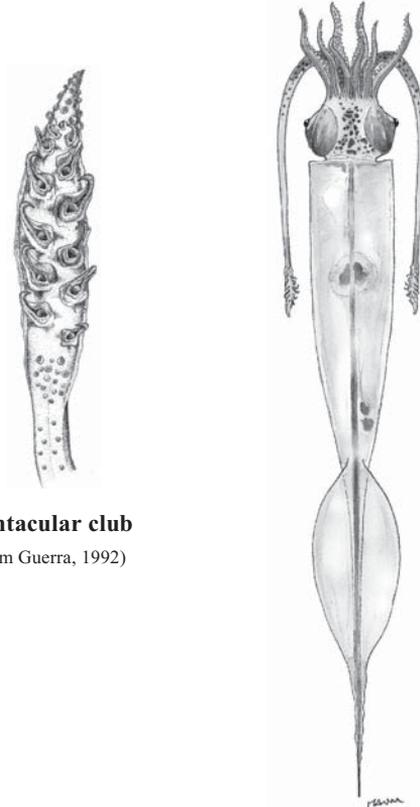
FAO names: **En** – Armed helmet squid; **Fr** – Encornet-outré armé; **Sp** – Cranquiluria armada.

Diagnostic characters: Mantle long, lanceolated, fused with funnel and head in the occipital area. Mantle surface smooth. A total of 2 to 4 small conical tubercles on the mantle-funnel fusion sites (difficult to see in adults, but easily felt by touch). No tubercles on dorsal side of mantle near the mantle-head fusion. **Fins lanceolated reaching the pointed tail of the mantle.** Eyes large, rounded and protuberant, even in adults, but at this stage they are not pedunculated. Two light organs in the ventral side of the eyes. Anterior eye light organ narrow, rod-like. Arms short, suckers in 2 rows with smooth chitinous rings. **Tentacles about 50% of mantle length with 2 rows of carpal suckers set in pairs on distal two-thirds to three-quarters of stalk; manus with well-developed protective membranes and with a total of 6 pairs of suckers modified with growth into hooks.** Few small chromatophores in the mantle, being more frequent in the dorsal part of the fins.

Size: Up to 610 mm mantle length.

Habitat, biology, and fisheries: A bathypelagic species. Occurs in depths of 100 to about 4 000 m but more often at 500 to 2 000 m. Juneniles in epipelagic and mesopelagic waters. Frequently preyed by tunas, dolphins and sperm whales. No interest for fisheries.

Distribution: Western Mediterranean and Adriatic Sea. In the eastern Atlantic from about 50°N to South Africa and in the western Atlantic from Newfoundland up to Bermuda.



tentacular club
(from Guerra, 1992)

dorsal view



***Helicocranchia papillata* (Voss, 1960)**

Frequent synonyms / misidentifications: *Ascocranchia joubini* Voss, 1962 / None.

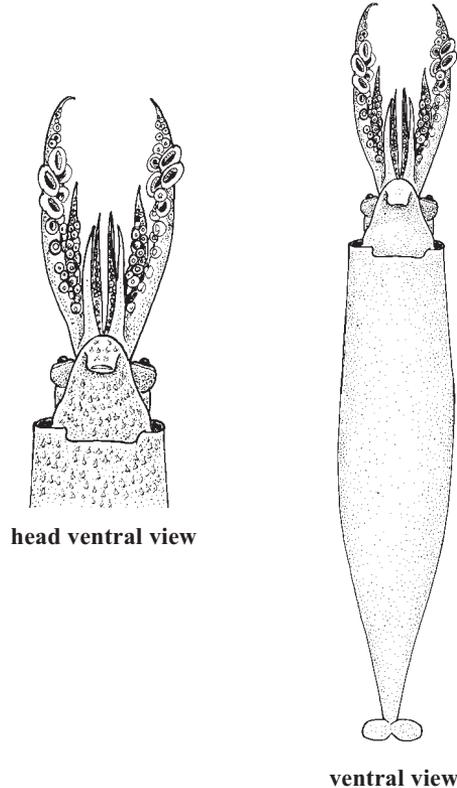
FAO names: **En** – Siphonate cranch squid; **Fr** – Encornet-outré à grand siphon; **Sp** – Cranquiluria sifonada.

Diagnostic characters: Mantle cylindrical, stoutest in midportion, tapering posteriorly to a blunt point. **Mantle thick, coriaceous, muscular.** Surface of mantle (particularly in anterior part) and funnel beset by numerous small, sharp cuticular papillae. **Funnel-mantle fusion area broad with barely discernable narrow cartilage, tubercles absent;** middorsal anterior mantle margin free with medial cleft; nuchal fusion cartilage irregular oval-shaped, tubercles absent. Fins tongue-like, of subequal width at the base and in the middle, set on lanceola of gladius, posterior edges of both fins fused. **Funnel very large, broad, extending beyond base of IV arms.** Head with small to medium size oval to round eyes; eye with single small to large, often poorly defined, oval to triangular light organ on posteroventral surface. Suckers in midpart of III arms in females considerably larger than on other arms, with smooth rings. Sucker rings of other arms with small denticles. Colour reddish brown.

Size: To 60 mm mantle length.

Habitat, biology, and fisheries: Meso and bathypelagic squids. Found from the surface to 2 000 m or more. None interest to fisheries.

Distribution: Western, central and eastern subtropical North Atlantic Ocean; Caribbean Sea and Gulf of Mexico, northeastern African waters.



(illustrations after Nesis, 1987)



***Helicocranchia pfefferi* Massy, 1907**

Frequent synonyms / misidentifications: *Helicocranchia beebei*, Nesis (1982, 1987) / None.

FAO names: **En** – Pfeffer's cranch squid;
Fr – Encornet-oultre de Pfeffer; **Sp** – Cranquiluria de Pfeffer.

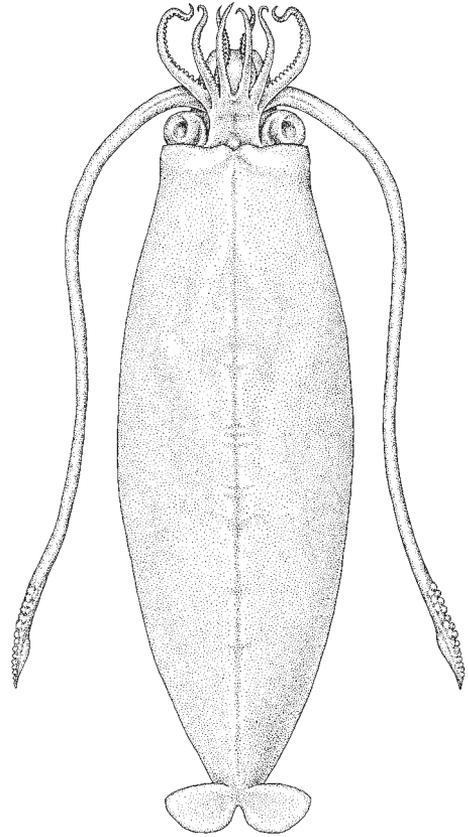
Diagnostic characters: Absence of cartilaginous papillae on the mantle, no enlarged suckers on the arms III of adult females (or on tentacular clubs); tentacular clubs with suckers only. Tentacular stalks with 2 series of suckers and pads nearly to stalk base. Funnel extremely large. Funnel valve absent. **L-shaped ventral pads on funnel organ.** Fins paddle-shaped. Fins insert on short rostrum of gladius which projects dorsally in advance of mantle apex. Presence of bands of orange/brown chromatophores on sides of mantle; moderately long, robust tentacles, less than 100% of the mantle length.

Size: Maximum mantle length from 90 to 100 mm.

Habitat, biology, and fisheries: Paralarvae and juveniles occur in the epipelagic zone, then descend gradually to the upper mesopelagic; finally, adults descend into the lower mesopelagic and the bathypelagic zones to at least 2 000 m. Some diel vertical migration might occur. No interest to fisheries.

Distribution: Species occur throughout the world's tropical and subtropical oceans and, in the Atlantic Ocean, in north temperate waters. In the Atlantic it occurs from 50° to 55°N to 30° to 35°S. Complete distributional pattern as yet undetermined.

Remarks: *Helicocranchia pfefferi* probably is a complex species.



dorsal view

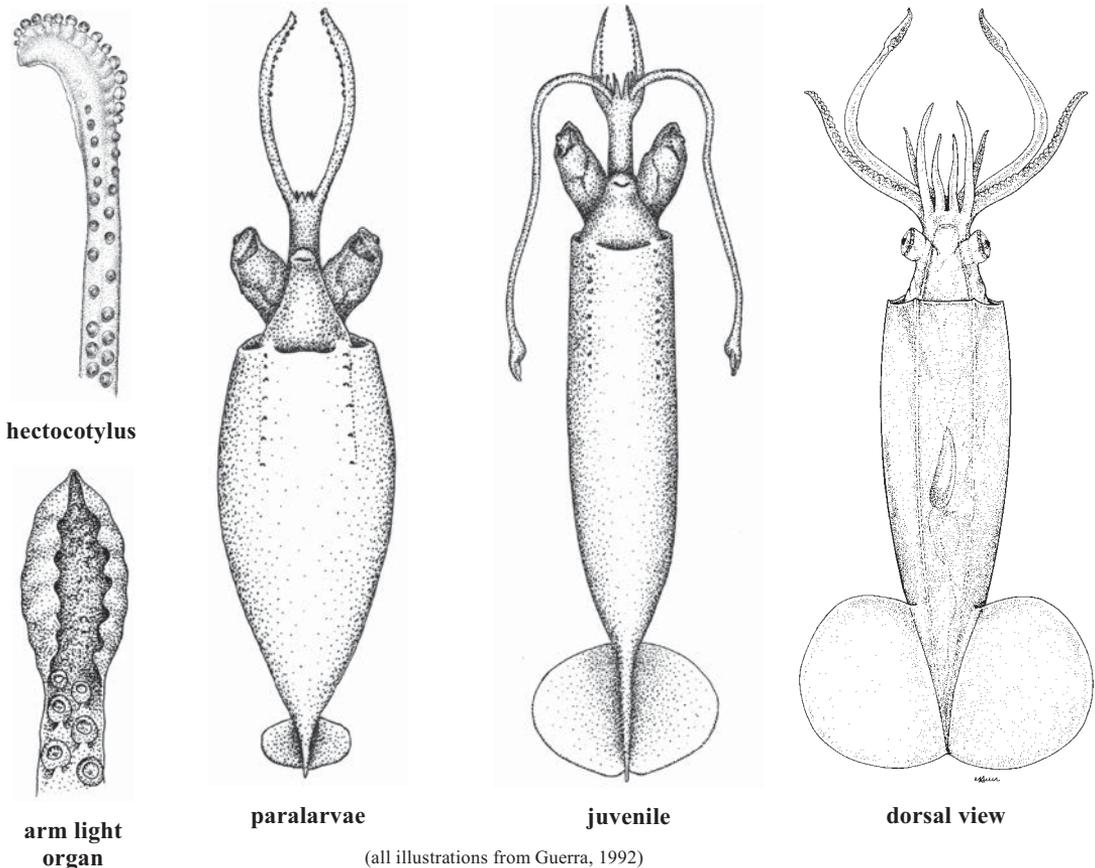
(illustration: K. Hollis/ABRS)



Leachia atlantica (Degner, 1925)

Frequent synonyms / misidentifications: *Pyrgopsis rynchophorus* Rochebrune, 1884 / None.

FAO names: **En** – Atlantic cranch squid; **Fr** – Encornet-outré de l'Atlantique; **Sp** – Cranquiluria atlántica.



Diagnostic characters: Mantle fused with head and funnel in the nuchal region. Mantle elongated, cylindrical or narrowly fusiform. **Two hyalines stripes present on ventral side of mantle starting from the sites of mantle-funnel fusion**, its length extending from 14% mantle length, and bearing cartilaginous tubercles with one of several acute tops. The number of round ocular photophores ranging from 5 to 21, arranged in outer and inner arcs around the pupil. Fins round to transversely elliptical in combined outline; fin length 20 to 30% mantle length. Funnel valve absent. **A large light organ (brachial end-organ) present on the ends of III pair of arms in near-mature or mature females; right IV arm modified into hectocotylus, elongate, curved laterally with distal one-third to one-half modified by enlarged**, reduced-aperture suckers in ventral row on flared ventral margin, suckers in dorsal row reduced and may be lost distally. Eyes in paralarvae and juveniles are stalked at a mantle length up to 50 to 100 mm.

Size: Maximum mantle length (ML) to 100 mm.

Habitat, biology, and fisheries: A meso-bathypelagic species. Occurs from the surface to about 2 000 m. It undergoes relatively important changes during growth. Life history of this species includes early growth in shallow water and ontogenetic descent to deep waters when maturation occurs. There is evidence of diel movements. Spawning seems to occur in surface waters, where numerous mature and spent females were caught at night and early morning. None interest to fisheries.

Distribution: North Atlantic Subtropical Region, northward reaches Newfoundland Bank and the Bay of Biscay and southward Senegalese waters, although its southern limit is not well known; Gulf of Mexico, Strait of Florida and northern Caribbean.

Remarks: Of the 14 nominal species in the genus *Leachia*, at least 6 species are valid, 1 yet to be named. The closely related species show contiguous geographical distributions with considerable overlap. While the genus is easily characterized, the species are not easily recognized, because of incomplete descriptions based principally on paralarvae (Young and Mangold, 2007). Therefore, additional material and observations are deeply needed to help define the situation. Paralarvae of *Leachia* were originally placed in the genus *Pyrgopsis* and are now often referred to as pygopsis paralarvae (Young and Mangold, 2007).



Liguriella podophthalma Issel, 1908

Frequent synonyms / misidentifications: None / None.

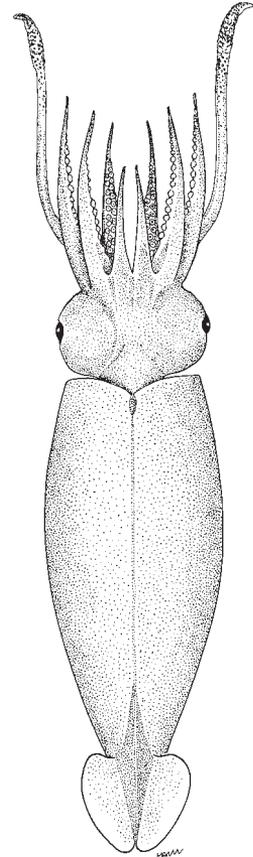
FAO names: **En** – Bigeye cranch squid; **Fr** – Encornet-outré grand-oeil; **Sp** – Cranquiluria ojo-grande.

Diagnostic characters: Mantle without tubercles, but with tubercles at funnel mantle fusion, which have 2 small cartilaginous tubercles at anterior end; funnel valve absent; **dorsal pad of funnel organ with 3 spatulate papillae**; **fins terminal, small, posterior fin insertions extend to tip of gladius and fuse along distal end of vane of gladius**; **eyes with 2 contiguous photophores**, the anterior 1 small, crescent-shaped lies closely within the concavity of the large crescent-shaped posterior photophore; **arm tip photophores absent**; tentacular club with suckers, no hooks, no carpal cluster, 2 series of suckers and knobs along tentacular stalk.

Size: Maximum mantle length known 243 mm.

Habitat, biology, and fisheries: The species overall vertical distribution extends from subsurface waters to depths in excess of 1 000 to 1 500 m. Paralarvae and juveniles up to about 40 mm mantle length occur from subsurface depths to around 400 m, while older animals extend progressively deeper with growth. This ontogenetic descent extends to about 1 500 m where the largest specimen caught to date was a 243 mm mantle length subadult. Not interest to fisheries.

Distribution: This species occurs circumglobally in tropical, subtropical and northern sub-Antarctic waters of the world's oceans.



dorsal view



Liocranchia reinhardtii (Steenstrup, 1856)

Frequent synonyms / misidentifications: *Liocranchia intermedia* Robson, 1924; *Fusocranchia alpha* Joubin, 1920 / None.

FAO names: **En** – Reinhardt's cranch squid; **Fr** – Encornet-outré de Reinhardt; **Sp** – Cranchiluria de Reinhardt.

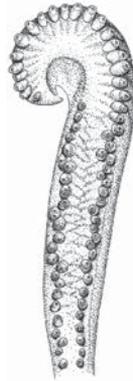
Diagnostic characters: Medium-size animal, mantle elongate and spindle-shaped (larva often inflated to stout, elliptical shape) tapers posteriorly to narrow point. Walls thin and leathery. **Two moderately long cartilaginous strips diverge from apex of funnel-mantle fusions in inverted V-shaped pattern. A row of cartilaginous tubercles reaching the beginning of fin running along the dorsal median line above gladius. Fins 23 to 35% of mantle length, nearly circular in combined outline unite posterior to end of mantle.** Head with medium to large, round, prominent sessile eyes. **A total of 14 light organs on eyeball.** Arms short (longest arm 35% of ML), narrow and muscular. A large light organ on ends of ventrolateral arms in mature females.

Ends of these arms of mature males are attenuated and bear 4 to 8 rows of very small suckers. Left or right ventral arm of mature males hectocotylized. Tentacle length about 60 to 70% of mantle length, with slightly expanded clubs and 20 to 23 small suckers in the dactylus disposed in 4 rows. A total of 10 rows in 4 rows attached by long peduncles and 20 carpal suckers in 2 rows.

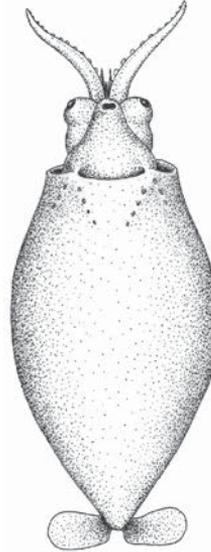
Size: Maximum size up to 250 mm mantle length.

Habitat, biology, and fisheries: A meso-bathypelagic species. Found from 100 to about 1 200 m depth. The paralarvae and juvenile are planktonic, live in shallower waters, and their shape is rather different than adults. This species undertake important changes in shape during its life cycle. Adults undertake vertical migrations. The maximum estimated age from the statoliths of animals ranging from 100 to 205 mm mantle length was 146 days. Males tend to be larger than the same-aged females. The hatching period in the central-east Atlantic goes from April to June, with a clear peak in May. This species seem to spawn at great depths and it is likely that just after hatching, small paralarvae ascend to epipelagic waters, which was confirmed by captures of paralarvae of 2.4 mm mantle length in the superficial water layer of the open tropical Atlantic. During the first 4 to 5 months of their ontogenesis feed and grow quickly in the epipelagic waters, attain 170 to 200 mm mantle length and then move onto deeper water for maturation and subsequent spawning. The tubercles are composed by cartilaginous elastic tissue that could serve as insertion and support of the muscles, helping that way to the displacement of the animal. None interest to fisheries.

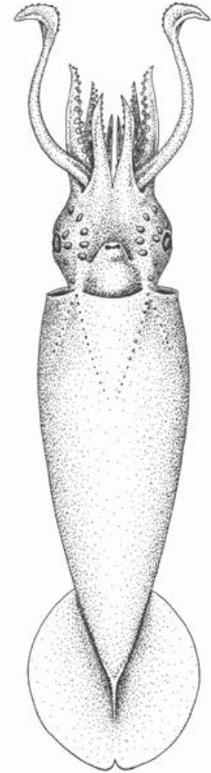
Distribution: Distributed circumglobally in tropical and subtropical waters, recorded from 50°N to about 35°S, generally bounded by the north and south tropical convergences.



hectocotylus



paralarvae



ventral view

(all illustrations from Guerra, 1992)



***Megalocranchia oceanica* (Voss, 1960)**

Frequent synonyms / misidentifications: *Corynomma speculator* Chun, 1910 / *Megalocranchia maxima* Pfeffer, 1884.

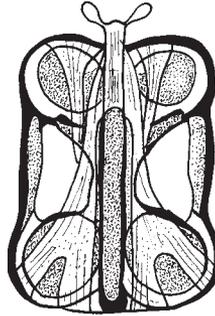
FAO names: En – Oceanic cranch squid; Fr – Encornet-outré océanique; Sp – Cranquiluria oceánica.

Diagnostic characters: Mantle slender, elongate, tapering posteriorly to slender point. No tubercles present on elongate, usually roughly triangular funnel fusion cartilages or on conspicuous spindle-shaped nuchal fusion cartilage. Long, lanceolate, terminal-lateral fins extending from the tip of gladius onto lateral margins of mantle for approximately one-half of the mantle length. Funnel extends to approximately mideye level. Very large and nearly spherical eyes with 2 light organs on ventral surface. Arms short and stout. Tentacles short, strong, without hooks. **Rounded digestive gland with large bilobed light organs covering entire ventral surface.**

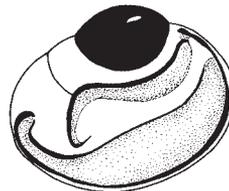
Size: To 810 mm mantle length.

Habitat, biology, and fisheries: Epimesopelagic squids. Inhabits subsurface waters may occurs in depths greater than 1 000 m. Not of interest to fisheries.

Distribution: Atlantic tropical and subtropical waters.

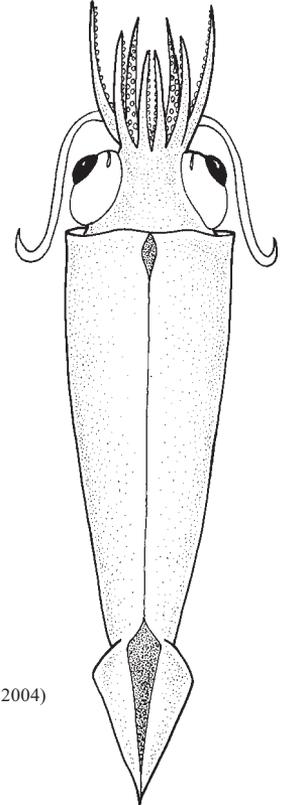


visceral light organ



eye light organ

(all illustrations after Okutani, 2004)



dorsal view



***Sandalops melancholicus* Chun, 1906**

Frequent synonyms / misidentifications: *Uranoteuthis bilucifer* Lu and Clarke, 1974 / None.

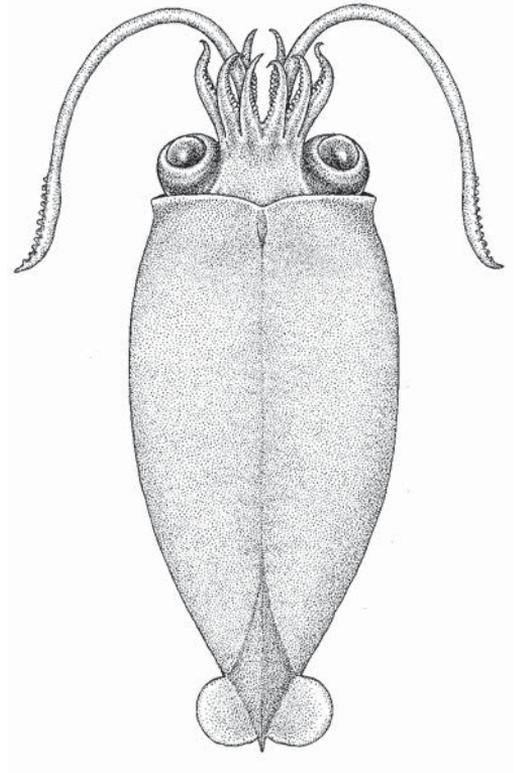
FAO names: **En** – Melancholy cranch squid; **Fr** – Encornet-outré mélancolie; **Sp** – Cranquiluria afligida.

Diagnostic characters: The eyes are long, tubular in paralarvae and particularly in juveniles when they occupy the upper mesopelagic zone; **eyes oriented vertically upward. In subadults the eyes become nearly hemispherical.**

Size: Maximum mantle length to 110 mm.

Habitat, biology, and fisheries: *Sandalops melancholicus* lives in epipelagic, mesopelagic and bathypelagic zones, following the general cranchiid pattern of ontogenetic descent. By full growth, animals have descended into the bathypelagic zone beyond 2 000 m depth, where maturation and mating occur. No evidence currently exists for diel vertical migration.

Distribution: The species is cosmopolitan in tropical and subtropical waters.



dorsal view

(illustration: K. Hollis/ABRS)



***Taonius pavo* (Lesueur, 1821)**

Frequent synonyms / misidentifications: None / None.

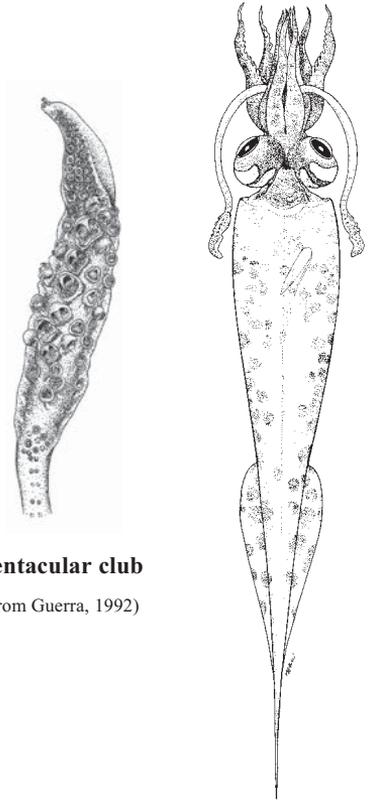
FAO names: **En** – Peacock cranch squid; **Fr** – Encornet-outré paon; **Sp** – Cranquiluria pavo.

Diagnostic characters: **Mantle jelly-like fused with head and funnel in the nuchal region.** The mantle is very long and slender, narrow and cone- shape, and without hyalines stripes on its ventral side. Fins paddle-shaped in paralarvae (< or = 18 mm ML), inserted on elongate, diamond-shape lanceola; fins and posterior end of the gladius elongate early with growth, becoming very attenuate posteriorly; eyes elliptical to oval, on long stalks in paralarvae (< or = 22 mm ML); with growth, eyes become tubular in juvenile, with large tripartite-appearing light organs on posteroventral surface. Midarm suckers on arms II and III with low teeth on distal margins. **Suckers of manus of the tentacular club with 1 or 2 large, central, hook-like teeth** first have seen forming on rings of median suckers in juvenile of about 60 mm mantle length.

Size: Maximum mantle length 660 mm.

Habitat, biology, and fisheries: Epi-mesopelagic oceanic species. Paralarvae with long and stalked eyes (<20 mm ML) epipelagic (from the surface to 200 m depth); juvenile (25 to 30 mm ML) between about 400 and 600 m; large juvenile, with growth, progressively extend range to greater depths up to 700 m. Maturation occurs in deep waters to at least 2 000 m. Captures of mature females at the surface at night indicate that spawning occurs in shallow water. There is not evidence of diel vertical migration, but subadults appear to range widely in water column. It has been found in the stomachs of sperm whales, tuna, big teleosts and marine birds. None interest to fisheries.

Distribution: Widely distributed in the Atlantic Ocean from approximately 45°N to possible the Southern Subtropical Convergence, and may extend into the western Indian Ocean in the area of Agulhas Current.



tentacular club

(from Guerra, 1992)

**adult
dorsal view**



***Teuthowenia maculata* (Leach, 1817)**

Frequent synonyms / misidentifications: *Teuthowenia megalops* (Prosch, 1847) / None.

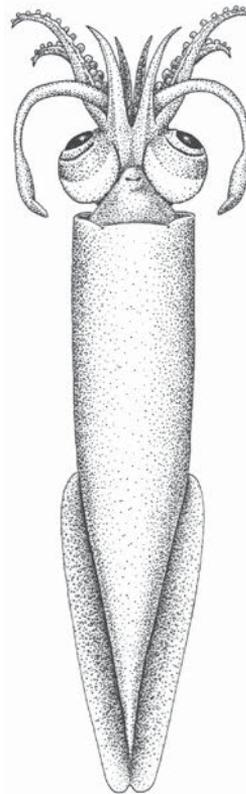
FAO names: **En** – Spotted cranch squid; **Fr** – Encornet-outré tacheté; **Sp** – Cranquiluria maculada.

Diagnostic characters: Conical and coriaceous firm mantle, elongate and tapering posteriorly. Funnel-mantle fusion cartilages with 1 single-point, poorly developed tubercle at mantle margin. Largest arm III suckers 3 times basal suckers in diameter. **Arms I and II of males with 25 to 27 pairs of normal, wide-aperture, suckers prior to modified, slightly swollen, terminal portions which are provided of 3 or 4 series of modified suckers until the tip. Largest club suckers with 22 to 26 teeth.**

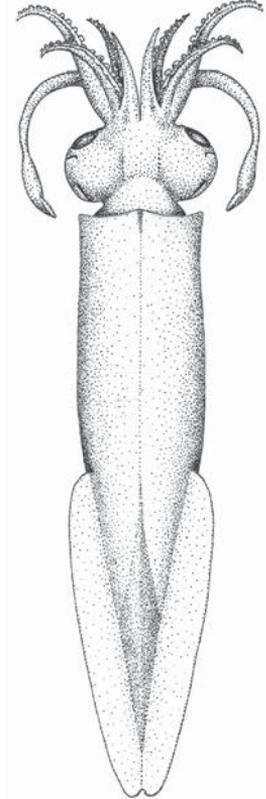
Size: The largest known specimen is an immature male of 143 mm mantle length.

Habitat, biology, and fisheries: Epi- to bathypelagic squid. Caught in open nets from 25 to 2 000 m. Paralarvae (10 to 16 mm ML) near-surface layer, specimens of about 40 mm mantle length descend to depths between 300 and 600 m; juveniles of 50 to 60 mm mantle length were taken during the day and night in depths of 600 to 700 m. There are, however, captures of small and large specimens until 2 000 m depth. The species undertakes vertical migrations and ontogenetic descent. Not of interest to fisheries.

Distribution: Eastern North and South Atlantic Ocean, from about 20°N to around 20°S.



ventral view



dorsal view

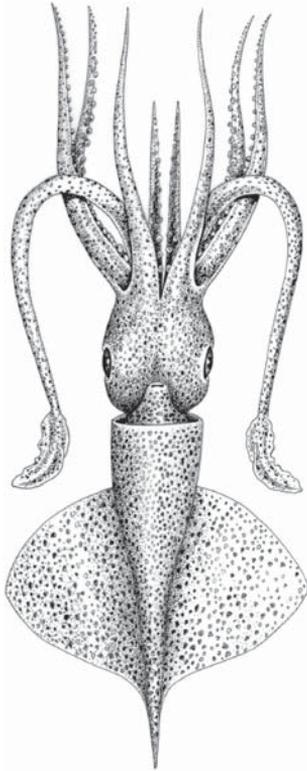
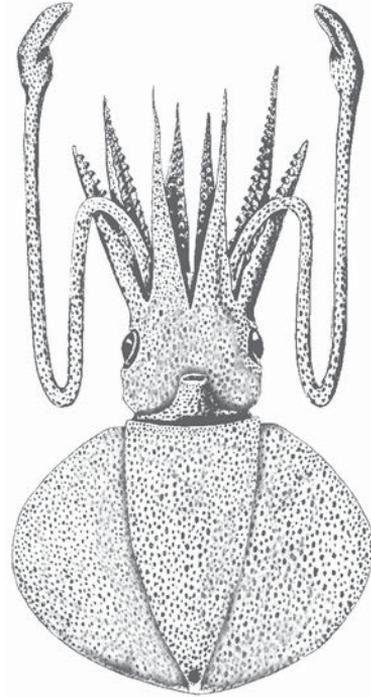
(illustrations from Guerra, 1992)



CYCLOTEUTHIDAE

Disc-fin squids

Diagnostic characters: Fins large in adults (greater than 70% ML), disc-like. Buccal connectives attached to ventral borders of arms IV. **Triangular funnel-locking apparatus.** Arm suckers biserial. Tentacular club with quadraserial suckers. **Light organs** present. **Hectocotylus** absent.

*Cycloteuthis**Discoteuthis*

Habitat, biology, and fisheries: Very little is known about the biology of any species in the family. Mesopelagic squids.

Similar families occurring in the area

None.

Key to the species of Cycloteuthidae occurring in the area

- 1a. Tail and large visceral light organ present ***Cycloteuthis sirventi***
 1b. Tail and visceral light organ absent → 2
- 2a. Four light organs around each eye; a single and prominent light organ located ventrally near the posterior apex of the mantle; no light organ on each side near the edge of the membrane that connects the bases of arms III and IV. ***Discoteuthis discus***
 2b. Two light organs around each eye; no light organ near posterior apex of the mantle; a small, round light organ on each side near the edge of the membrane that connects the bases of arms III and IV. ***Discoteuthis laciniosa***

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Cycloteuthis sirventi* Joubin, 1919.
 *Discoteuthis discus* Young and Roper, 1969.
 *Discoteuthis laciniosa* Young and Roper, 1969

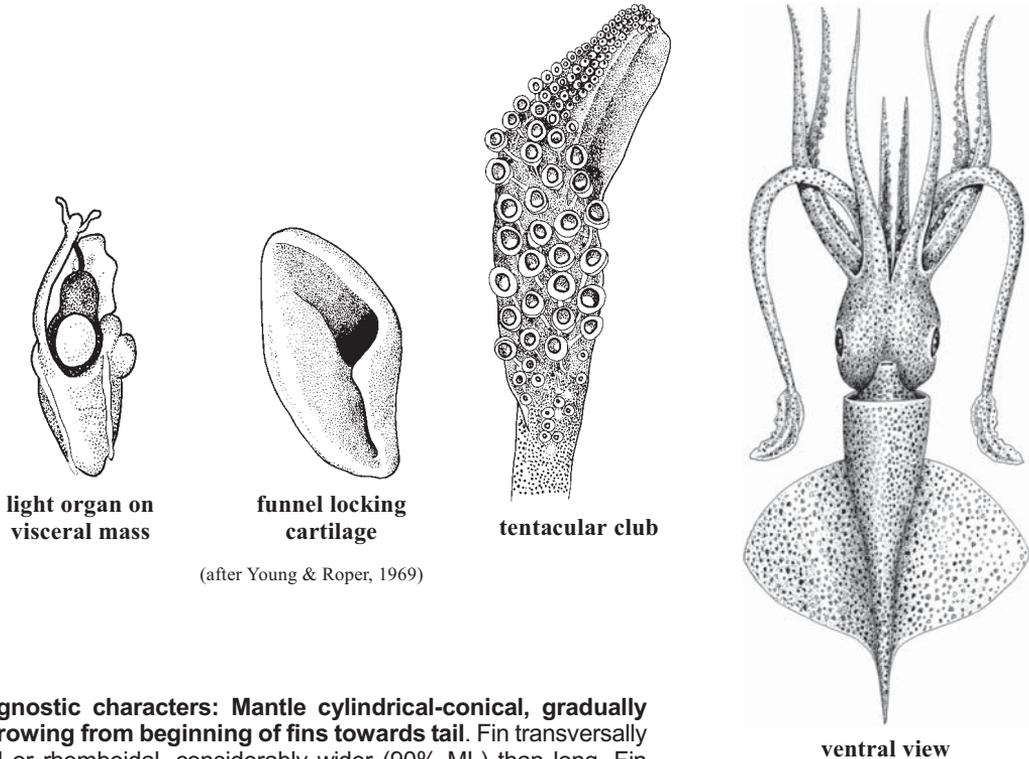
References

- Clarke, M.R. 1980. Cephalopoda in the diet of sperm whales of the Southern Hemisphere and their bearing on sperm whale biology. *Discovery Report*, 37: 1–324.
- Filippova, J.A. 1968. A new species of the genus *Cycloteuthis* (Cephalopoda: Oegopsida). *Malacological Review*, 1: 119–124.
- Guerra, A. 1992. Mollusca, Cephalopoda. In M.A. Ramos *et al.*, eds. Vol. 1. Fauna Ibérica. Museo Nacional de Ciencias Naturales. CSIC. Madrid, 327 pp.
- Jefferts, K. & Roper, C.F.E. 1992. Family Cycloteuthidae Naef, 1923. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. “Larval” and Juvenile Cephalopods: A manual for their identification. *Smithsonian Contributions to Zoology*, 513: 161–163 pp.
- Nesis, K.N. 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Roper, C.F.E. & Jereb, P. 2010. Family Cycloteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 179–182.
- Young, R.E. 2012. Tree of Life. Cycloteuthidae Naef, 1923. Version 10 November 2012 (under construction). <http://tolweb.org/Cycloteuthidae/19412/2012.11.10> in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Roper, C.F.E. 1969. A monograph of the Cephalopoda of the North Atlantic: The family Cycloteuthidae. *Smithsonian Contributions to Zoology*, 5: 1–24.
- Young, R.E., Vecchione, M. & Mangold, K.M. 2012. Decapodiformes Leach, 1817. Squids, cuttlefishes and their relatives. Version 04 July 2012. <http://tolweb.org/Decapodiformes/19404/2012.07.04> in The Tree of Life Web Project, <http://tolweb.org/>

***Cycloteuthis sirventi* Joubin, 1919**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Sirvent's disc-fin squid; **Fr** – Discoloutène de Sirvent; **Sp** – Discoluria de Sirvent.



Diagnostic characters: Mantle cylindrical-conical, gradually narrowing from beginning of fins towards tail. Fin transversally oval or rhomboidal, considerably wider (90% ML) than long. Fin length in adults approximately 80% mantle length. Arms with 2 rows of suckers. Tentacles long and robust. Tentacular clubs with 4 rows of suckers; manus suckers equal in size; carpus ill-defined with 6 or 7 suckers and knobs. Funnel locking cartilage subtriangular. Buccal connective attach to ventral borders of arms IV. **A conspicuous visceral light organ is present;** and between 15 and 30 yellow and small light organs on the eyes in adults.

Size: Maximum mantle length 50 mm.

Habitat, biology, and fisheries: This species is known from few individuals. Collected with open nets between 10 and 790 m. No interest to fisheries.

Distribution: Throughout the Atlantic warm waters, from approximately 37°N and 8°S. Western Mediterranean Sea. Indo-West Pacific.

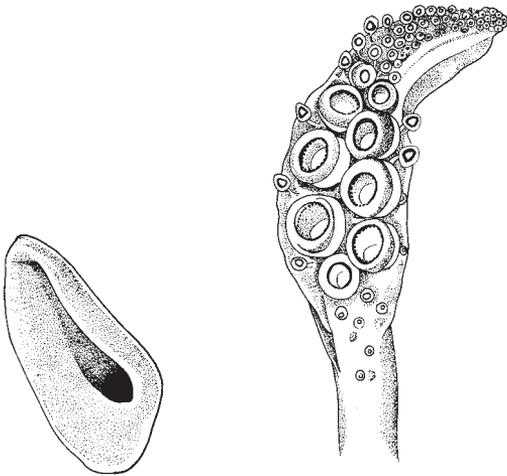
Remarks: The other species of this genus, *Cycloteuthis akimuskini* Filippova, 1968 has been considered a synonymy of *C. sirventi* (Clarke, 1980).



Discoteuthis discus Young and Roper, 1969

Frequent synonyms / misidentifications: None / None.

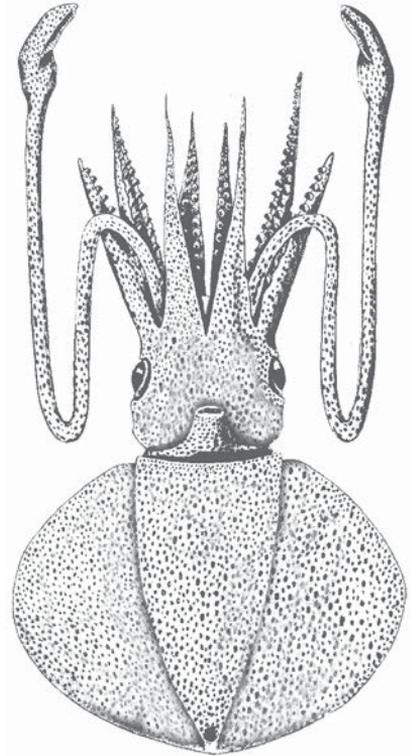
FAO names: **En** – Rounded disc-fin squid; **Fr** – Discoloutène rond; **Sp** – Discoluria rotunda.



funnel locking cartilage

tentacular club

(after Young & Roper, 1969)



ventral view

Diagnostic characters: Mantle nearly conical tapering posteriorly to a slightly rounded point; **a true tail absent**. Mantle width about 50% mantle length, it is free in its anterior end. The fins are huge and broadly oval in outline; they extend nearly the entire length of the mantle (98% ML) and are very broad. Fin width about 40% greater than mantle length. **Funnel locking cartilage subtriangular and encircled by a broad nearly membranous flange**. Arms suckers arranged in 2 rows, the suckers are large, globular and relatively few in number. Tentacles very long (1.5 time in ML). The tentacular clubs expanded and flattened bearing 4 rows of suckers in the manus, the 6 to 9 suckers in 2 medial rows greatly enlarged. **Four light organs around the eye, and a dark, round light organ on the ventral surface of the posterior tip of the mantle. The pen is extremely tick.**

Size: Maximum mantle length 90 mm.

Habitat, biology, and fisheries: This species is known from few individuals. Occurring in depths from 200 to 750 m. Undertakes allometric changes during growth associated with the length of the fins and the pen. None interest to fisheries.

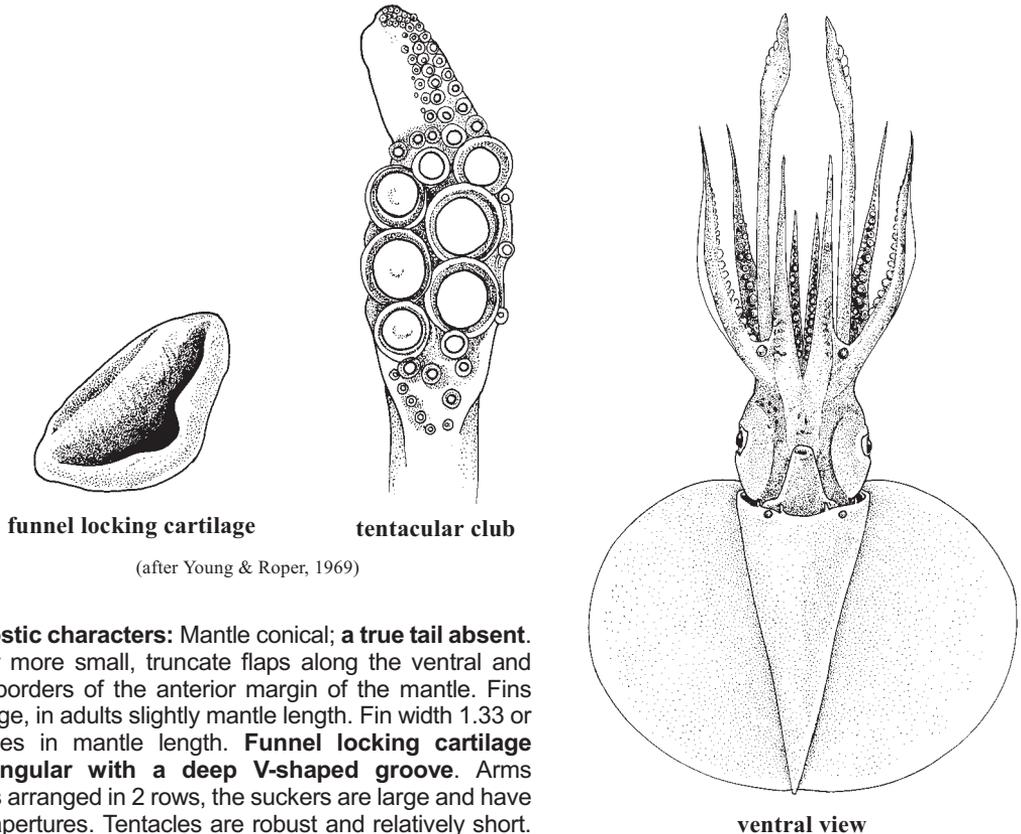
Distribution: Atlantic warm waters: Gulf of Guinea; off northeast coast of South America and Caribbean Sea. Pacific and Indian Oceans.



***Discoteuthis laciniosa* Young and Roper, 1969**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Crenellate disc-fin squid; **Fr** – Discoloutène crénelée; **Sp** – Discoluria crenulada.



Diagnostic characters: Mantle conical; **a true tail absent.** Four or more small, truncate flaps along the ventral and lateral borders of the anterior margin of the mantle. Fins very large, in adults slightly mantle length. Fin width 1.33 or 1.5 times in mantle length. **Funnel locking cartilage subtriangular with a deep V-shaped groove.** Arms suckers arranged in 2 rows, the suckers are large and have broad apertures. Tentacles are robust and relatively short. The tentacular clubs expanded and flattened bearing 4 rows of suckers in the manus, 6 or 7 suckers in 2 medial rows enormously enlarged. A small light organ embedded near the edge of the membrane that passes between the III and IV arms on each side, and 2 small light organs ventrolaterally near the free margin of the mantle. **No light organs around the eye.**

Size: Maximum mantle length 70 mm.

Habitat, biology, and fisheries: This species is known from few individuals. Captured in open nets at depths between 100 and 1 000 m. None interest to fisheries.

Distribution: Tropical, subtropical Atlantic: off west Africa; Madeira; Cape Verde Islands; in the Tongue of the Ocean, Bahama and off Bermuda. Pacific and Indian Oceans.



Oegopsid Squids

ENOPLOTEUTHIDAE

Enope squids

Diagnostic characters: Straight funnel-locking apparatus. Eight buccal lappets and buccal connectives that attach dorsally to the ventral arms. **Hooks present on all arms.** Tentacular clubs with 1 or 2 series of hooks on manus (except *Pterygioteuthis*, which lacks hooks in the tentacular club); armature on manus in 2 or 3 series. **Light organs present on mantle, funnel, head, eyeballs and arms;** on eyeballs in single line; anterior and posteriormost light organs generally largest; light organs absent from tentacles, viscera and most of fins. Tail with vesicles, broad and extends well beyond conus of gladius. **Nidamental glands absent.**

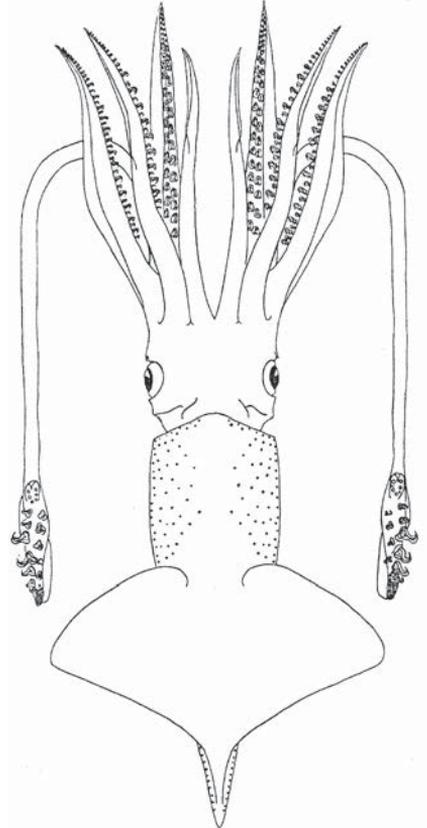
Habitat and biology: All open-ocean species occupy the upper mesopelagic. In the regions where the mesopelagic zone intersects the slopes of land masses (i.e. the mesopelagic boundary zone) some species may occur at shallower depths. Many species are known to undergo extensive daily vertical migrations and this habit may be characteristic of all species in the family.

Similar families occurring in the area

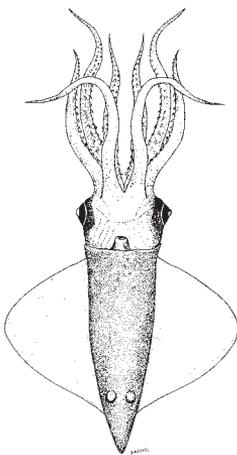
Octopoteuthidae: adult lacks tentacles; together with Pyroteuthidae and Lycoteuthidae, possesses visceral light organs.

Pyroteuthidae: lacks light organs on mantle and surface of head or arms.

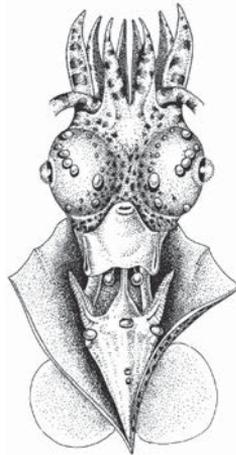
Lycoteuthidae and Onychoteuthidae: have suckers rather than hooks on arms.



dorsal view

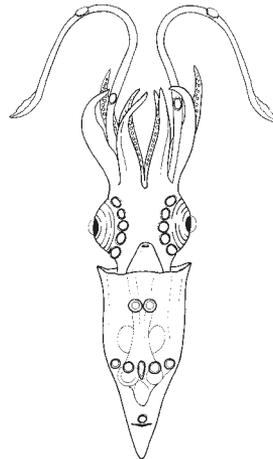


Octopoteuthidae

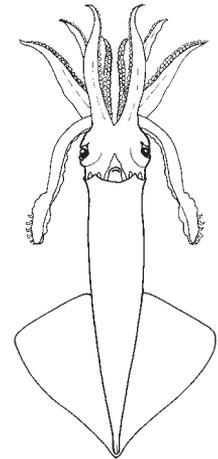


Pyroteuthidae

(from Guerra, 1992)



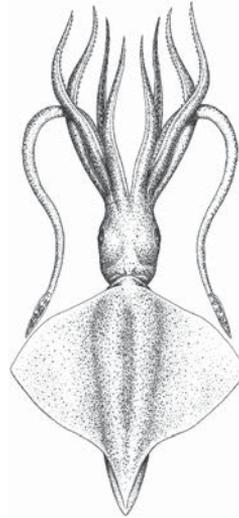
Lycoteuthidae



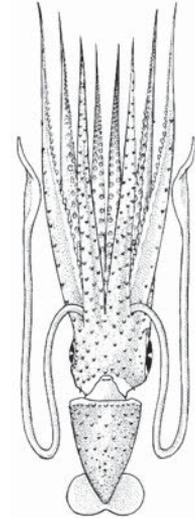
Onychoteuthidae

Ancistrocheiridae: has light organs on tentacles but not on eyeballs.

Histioteuthidae: has normal suckers rather than hooks on arms.



Ancistrocheiridae
(from Guerra, 1992)



Histioteuthidae

Key to the species of Enoploteuthidae occurring in the area

- 1a. Posterior fin insertion anterior to tail ***Enoploteuthis* → 6**
- 1b. Fins extend along lateral sides of tail. → 2

- 2a. Two to 4 large, dark light organs at tips of ventral arms ***Abraliopsis* → 4**
- 2b. No large dark light organs at tips of ventral arms ***Abralia* → 3**

- 3a. Arms with 3 or 4 terminal sucker rows; left arm IV hectocotylized; 3 to 5 tentacular hooks; subocular light organs of 2 types. ***Abralia veranyi***
- 3b. Arms with 2 terminal sucker rows; right arm IV hectocotylized; 2 to 4 tentacular hooks; subocular light organs of 1 type ***Abralia redfieldi***

- 4a. Light organs uniformly scattered on ventral surface of head ***Abraliopsis pfefferi***
- 4b. Light organs on ventral surface of head form distinct longitudinal rows → 5

- 5a. Hooks 2 or 3 times longer than the width of the club; 8 longitudinal rows of photophores on ventral side of head, the median one consisting on 2 parallel rows ***Abraliopsis gilchristi***
- 5b. Hooks 1.5 times longer than the width of the club; 7 longitudinal rows of photophores on ventral side of head ***Abraliopsis atlantica***

- 6a. Tentacles short and weak, with no ventral flap; fixing apparatus elongate; dactylus suckers in 2 longitudinal rows; hectocotylized right arm IV with a single ventral flap; many small papillae present on oral surfaces of arms I to III ***Enoploteuthis leptura leptura***
- 6b. Tentacle long and robust, with a ventral flap and oval fixing carpal apparatus; dactylus suckers in 4 longitudinal rows; hectocotylized right arm IV with 2 prominent, unequal-sized, offset crests, the distal crest dorsal and proximal crest ventral ***Enoploteuthis anapsis***

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Abralia redfieldi* Voss, 1955.
-  *Abralia veranyi* (Rüppell, 1844).
-  *Abraliopsis atlantica* Nesis, 1982.
-  *Abraliopsis gilchristi* (Robson, 1924).
-  *Abraliopsis morisii* (Vérany, 1839).
-  *Enoploteuthis anapsis* Roper, 1964.
-  *Enoploteuthis leptura leptura* (Leach, 1817).

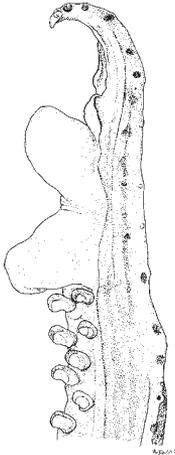
References

- Alexeyev, D.O.** 1994. New data on the distribution and biology of squids from the southern Pacific. *Rutenica*, 4:151–166.
- Arkhipkin, A.I.** 1994. Age, growth and maturation of the squid *Enoploteuthis leptura* (Oegopsida: Enoploteuthidae) from the central-east Atlantic. *Journal of Molluscan Studies*, 60: 1–8.
- Bello, G.** 2005. *Abraliopsis morisii* vs. *Abraliopsis pfefferi* (Cephalopoda: Enoploteuthidae): which is the right name? *Journal of Conchology*, 38(5): 561–565.
- Cairns, S.D.** 1976. Cephalopods collected in the straits of Florida by the R/V Gerda. *Bulletin of Marine Science*, 26(2): 233–272.
- Guerra, A.** 1992. Mollusca, Cephalopoda. In M.A. Ramos *et al.*, eds. *Fauna Ibérica. Museo Nacional de Ciencias Naturales*. CSIC. Madrid. 327 pp.
- Lipinski, M.** 1983. A description of a new species of enoploteuthid cephalopod, *Abralia siedleckyi* spec. nov., with some remarks on *Abralia redfieldi* G. Voss, 1955. *Veliger*, 25(3): 255–265.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Riddell, D.J.** 1985. The Enoploteuthidae (Cephalopoda: Oegopsida) of the New Zealand region. *Fisheries Research Bulletin (NZ)*, 27: 1–52.
- Roper, C.F.E.** 1964. *Enoploteuthis anapsis*, a new species of enoploteuthid squid (Cephalopoda: Oegopsida) from the Atlantic Ocean. *Bulletin of Marine Science of the Gulf and Caribbean*, 14(1): 140–148.
- Roper, C.F.E.** 1966. A study of the genus *Enoploteuthis* (Cephalopoda: Oegopsida) in the Atlantic ocean with a redescription of the type species, *E. leptura* (Leach, 1817). *Dana Report No. 66*: 1–46.
- Sánchez, P.** 1988. Systematics and distribution of the cephalopods of Namibia. *Monografías de Zoología Marina*, 3: 205–266.
- Tsuchiya, K. & Young, R.E.** 2013. Enoploteuthidae Pfeffer 1900. Version 3 November 2013. <http://tolweb.org/Enoploteuthidae/19634/2013.11.03> in The Tree of Life Web Project, <http://tolweb.org/>
- Voss, G.L.** 1967. Some bathypelagic cephalopods from South African waters. *Annals of the South African Museum*, 50(5): 61–88.
- Young, R.E., Burgess, L.A., Roper, C.F.E., Sweeney, M.J. & Stephen, S.J.** 1998. Classification of the Enoploteuthidae, Pyroteuthidae and Ancistrocheiridae. *Smithsonian Contributions to Zoology*, 586: 239–255.

***Abralia redfieldi* Voss, 1955**

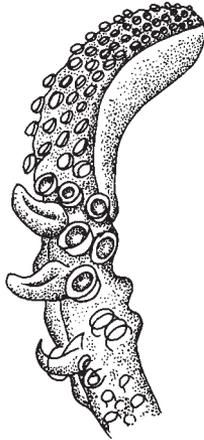
Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Redfield's enope squid; **Fr** – Encornet de Redfield; **Sp** – Enoploluria de Redfield.

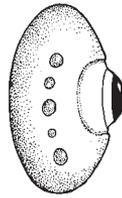


hectocotylus

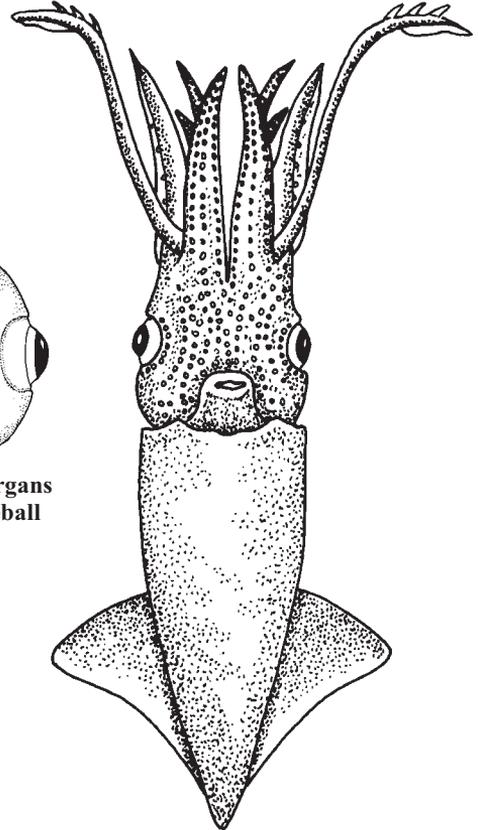
(after Cairns, 1976)



tentacular club



**light organs
in eyeball**



ventral view

Diagnostic characters: Mantle conical, with broad fin. **Arms with 5 to 8 pairs of hooks on proximal two-thirds and biserial suckers distally.** Right ventral arm hectocotylized in males, with 2 large proximal flaps and a smaller distal one. Tentacular club with 2 to 4 hooks. Ventral surface of mantle and head covered with numerous scattered light organs but leaving a bare stripe along the ventral mantle midline. **Five optic light organs, the first, third and fifth larger than second and fourth.**

Size: Maximum mantle length about 30 mm.

Habitat, biology, and fisheries: Inhabits waters of 50 to about 700 m at night, 720 m at dawn and 70 to 300 m by day. The only known predator is *Kogia simus* (dwarf sperm whale). Not of interest to fisheries.

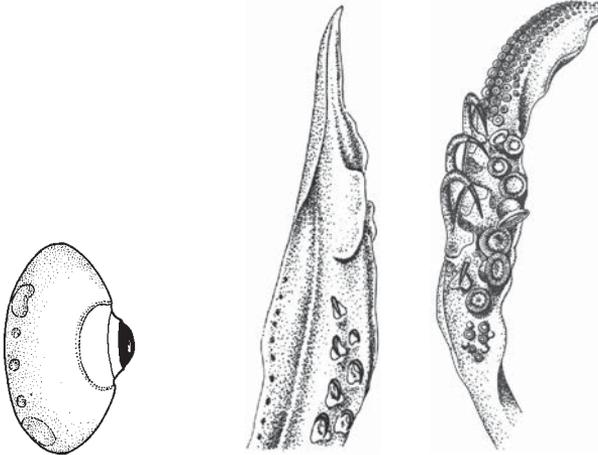
Distribution: Amphi-Atlantic, tropical to temperate and bicentral, mainly in western Atlantic from New England to the Caribbean and Suriname to southern Argentina. Guinea Bissau and South Africa in the eastern Atlantic.



***Abralia veranyi* (Rüppell, 1844)**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Verany's enope squid; **Fr** – Encornet de Verany; **Sp** – Enoploluria de Verany.



light organs on eyeball

hectocotylus

tentacular club

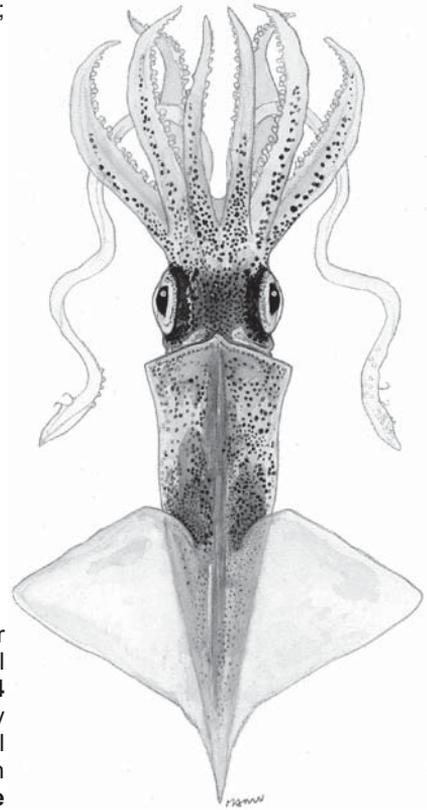
(from Guerra, 1992)

Diagnostic characters: Mantle conical, with sagittate posterior fins. Arms I to III with biserial suckers proximally, of which several may change into hooks proximally; **minute distal suckers in 3 or 4 series**. Left ventral arm hectocotylized in males, with a pair of fleshy distal flaps. Tentacular club with 3 or 4 hooks and a dorsal membrane. Ventral surface of mantle, head and arms covered with numerous scattered light organs. **Five optic light organs, the terminal 2 oval and larger than the middle 3 rounded ones.**

Size: Maximum mantle length 49 mm.

Habitat, biology and fisheries: Mesopelagic and bathypelagic, at the bottom in bathyal and in midwater above slopes, sometimes at the surface; absent in open ocean far from slopes. Inhabits waters around 0 to 200 m at night, 300 to 800 m by day, making diurnal vertical migrations. Forms groups in relatively abundant numbers; at Funchal, Madeira, makes summer migrations, probably for mating or spawning; spermatophores attached to seminal receptacle on nuchal cartilage and spawning is intermittent and prolonged. This species has been recorded from the stomachs of sharks, teleost and dolphins. Not of interest to fisheries.

Distribution: The most widely distributed species of *Abralia* in the Atlantic. Amphi-Atlantic, tropical and subtropical, associated with neritic-oceanic, near-slope waters. Madeira, Mauritania, Guinea Bissau, Côte d'Ivoire, Equatorial Guinea to Angola; Mediterranean Sea; western Atlantic from Georges Bank to southern Brazil.



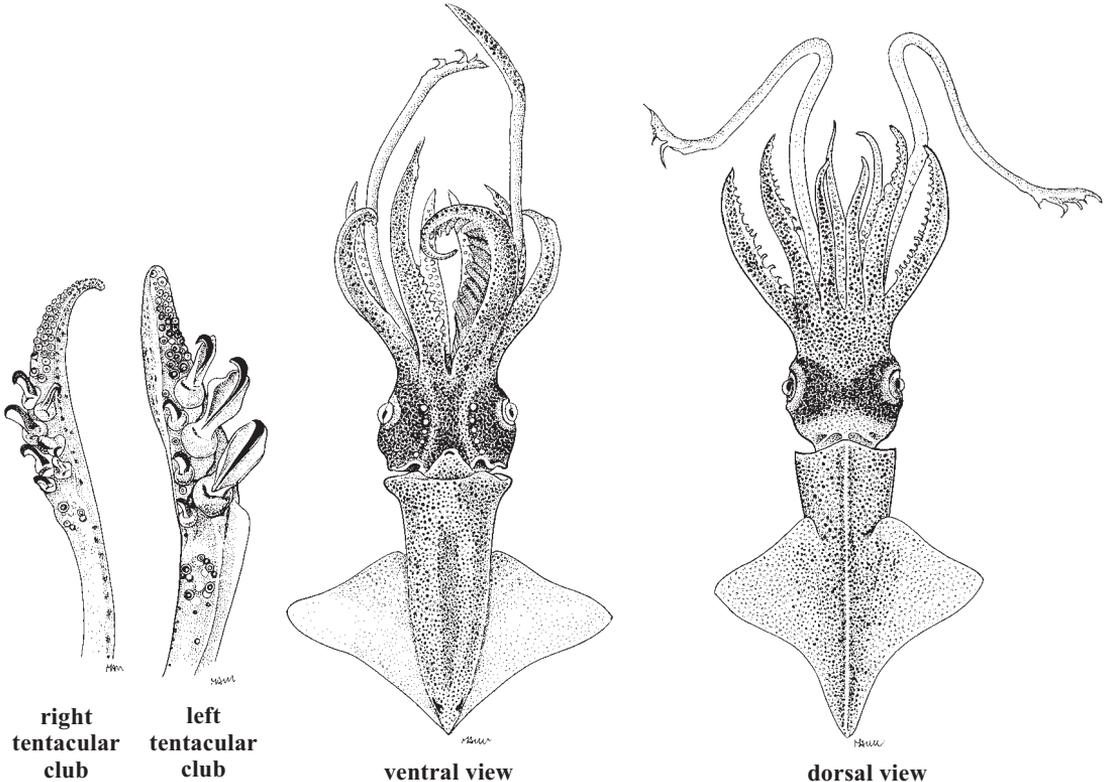
dorsal view



Abrialiopsis atlantica Nesis, 1982

Frequent synonyms / misidentifications: *Abrialiopsis morisii* Chun, 1910 (part) / None.

FAO names: **En** – Atlantic firefly squid; **Fr** – Encornet de l'Atlantique; **Sp** – Enopololuria atlántica.



(all illustrations after Chun, 1910)

Diagnostic characters: The tentacular club lacks of membrane and keel except in the dactylus where a narrow protective membrane is present. Club hooks small, no more than 1.5 times the club width. Left ventral arm of male with widened orange ventral protective membrane. Photophores (light organs) on ventral side of mantle arranged in distinct isolated longitudinal rows. Seven longitudinal rows of photophores on ventral side of head. **No additional photophores between the median row and the lateral ones.**

Size: Maximum mantle length 28 mm in males, 33 mm in females.

Habitat, biology, and fisheries: A little-known species. Depth between 97 and 786 m, larvae and early juveniles in 20 to 50 m, mainly in the thermocline at 25 to 35 m, at least 80 km from shore. Mean daily growth rate 0.076 to 10.4% mantle length and 0.48 to 6.3% body weight, maximum known age 140 days. Not of interest to fisheries.

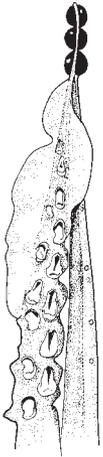
Distribution: Equatorial East Atlantic, Gulf of Guinea, west of Liberia, northern Namibia; South Africa; Caribbean Sea and Gulf of Mexico.



***Abrialiopsis gilchristi* (Robson, 1924)**

Frequent synonyms / misidentifications: *Enoploteuthis neozelandica* Dell, 1959 / None.

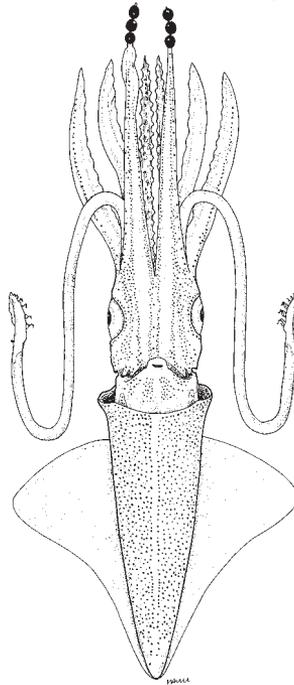
FAO names: **En** – Gilchrist's firefly squid; **Fr** – Encornet de Gilchrist; **Sp** – Enoploluria de Gilchrist.



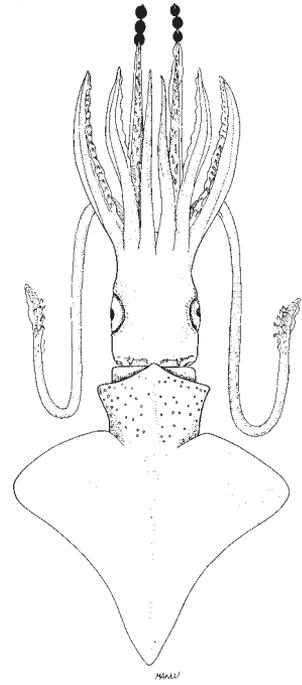
hectocotylus



tentacular club



ventral view



dorsal view

Diagnostic characters: The buccal membranes coloured a dark violet with numerous small papillae on the dorsal surface. Arms with 2 rows of very sharp, slender, strongly curved hooks, which become extremely minute distally and are followed immediately by minute suckers in 2 rows. Trabeculae of protective membrane of

left ventral arm of male elongated and thickened but not joined by a wide membrane. Three large photophores on the tip of each ventral arm. **In central part of tentacular club (manus) there are 3 or 4 small hooks on the dorsal side and 4 large (2 to 3 times longer than the width of the club) hooks on ventral side.** The dactylus of the club is very short and has about 12 transverse rows of suckers in 4 longitudinal rows. **Eight rows of photophores on the ventral side of the head arranged on a linear longitudinal pattern, the median one consisting of 2 parallel rows.** The 5 round and reddish brown in colour photophores on the eyeball are located on the ventral periphery. **The right ventral arm is hectocotylized in males and is composed of 3 subequal-sized offset crest.**

Size: Maximum mantle length 40 mm in females.

Habitat, biology, and fisheries: Mesopelagic and mesobathypelagic species at night ascending into epipelagic zone. One of the most abundant micronektonic mesopelagic squids off southern Namibia. Depth 0 to about 1 200 m, mainly 0 to 200 m, 27 to 162 km from shore. Feeds mainly copepods, and to a lesser extent on euphausiids and hyperiid amphipods. In the central South Pacific, all were immature in April, maturing in July, the majority mature or spent in September. The seminal receptacles in this species are the anterior pockets under collar on sides of nuchal cartilage and in a median pocket on inner mantle. Not of interest to fisheries but possibly an important prey item for larger oceanic species.

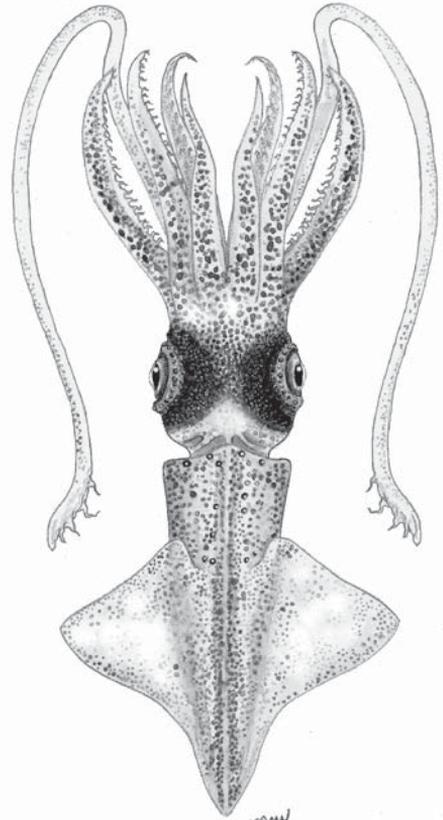
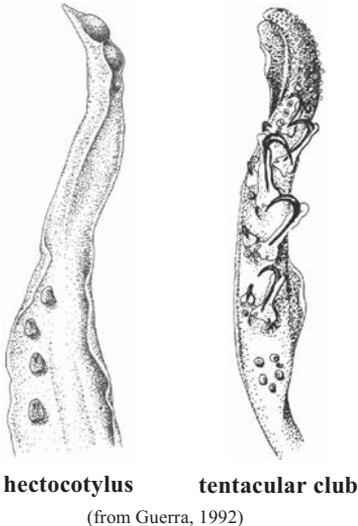
Distribution: Walvis Bay to east London and probably also northern Namibia. Circumglobal, southern subtropical belt of the Atlantic, Indian and Pacific Oceans from 20° to 45°S.



***Abrialiopsis morisii* (Vérany, 1839)**

Frequent synonyms/ misidentifications: *Abrialiopsis pfefferi* Joubin, 1896; *Compsoteuthis lonnbergi* Pfeffer, 1900; *Abrealia (Compsoteuthis) jattai* Pfeffer, 1912 / None.

FAO names: **En** – Pfeffer's firefly squid; **Fr** – Encornet de Pfeffer; **Sp** – Enoploluria de Pfeffer.



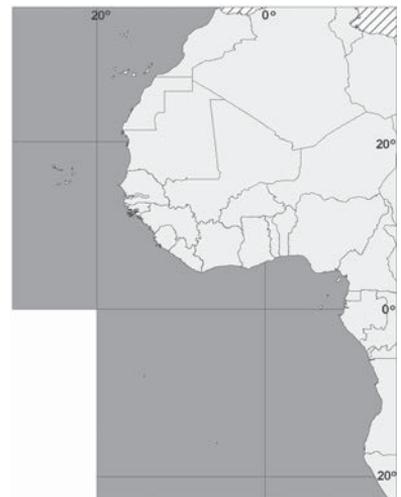
dorsal view

Diagnostic characters: Mantle long, conical and slender, tapering to a sharp point posteriorly. Tentacular clubs with 9 or 10 different-sized hooks in 2 rows on manus, a carpal flap and distinct aboral keel. Arms with 2 rows of very sharp, slender, strongly curved hooks. **Three large photophores on the tip of each ventral arm.** Arms IV relatively long, 94 to 101% mantle length, with 14 to 22 hooks. **Hectocotylus with 2 flaps of different sizes:** a long narrow proximal flap and a short distal one; modified portion of arm with hooks. Numerous scattered photophores on the ventral side of head.

Size: Maximum mantle length of females 42 mm; males 35 mm.

Habitat, biology, and fisheries: A meso- and bathypelagic species, rising to epipelagic zone at night. Depth ranges from 0 to 3 660 m; 0 to 750 m at night, 0 to 1 900 m by day. Found 145 km to more than 463 km from shore. Males mature at 120 to 130 days and females at 150 to 160 days. Minimum mature age is 105 days in males, 127 days in females. Spawns in summer off Delaware Bay and undergoes vertical migration, mainly at 0 to 100 m at night but dispersed throughout a wide depth range, 0 to 1 000 m with apparent concentrations at 500 to 600 m and 800 to 900m, by day. The only known predator is *Stenella coeruleoalba* (striped dolphin). Not of interest to fisheries.

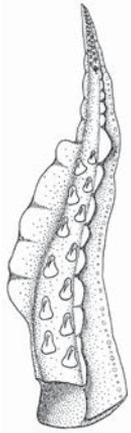
Distribution: Mediterranean Sea. Tropical to warm temperate Atlantic. Eastern Atlantic from Gibraltar to 25°S; western Atlantic from 45°N to subantarctic waters.



Enoploteuthis anapsis Roper, 1964

Frequent synonyms / misidentifications: None / None.

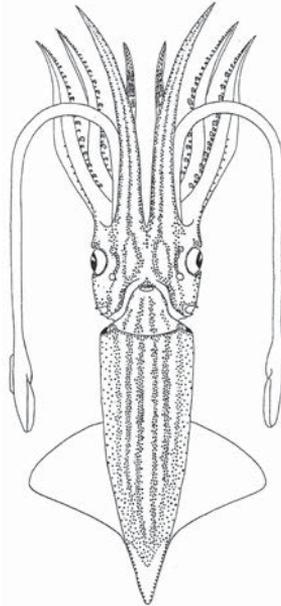
FAO names: **En** – Starlit enope squid; **Fr** – Encornet étoilé; **Sp** – Enoploluria estrellada.



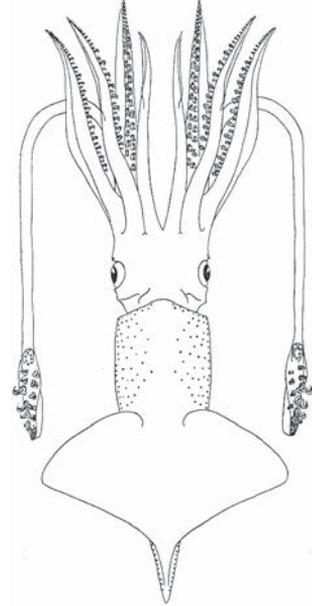
hectocotylus



tentacular club



ventral view



dorsal view

(all illustrations from Roper, 1964)

Diagnostic characters: Mantle elongate and conical, muscular anteriorly but posteriorly to the fins with a tip thin-walled and saccate, occupied by small-filled compartments which give a honey-combed appearance. **Four rows of distinct light organs on ventral side of the mantle, with the medial row free of light organs** (photophores) along its entire length. Tentacles long and robust, 1.3 to 2 times longer than mantle length; tentacular club well developed; the carpal cluster is a raised, ovoid structure consisting of a series of 3 or 4 suckers and knobs each, with interconnecting ridges and grooves; manus with dorsal and ventral membranes, with 2 rows of graded hooks with 5 to 7 hooks in each row, the distal hooks in both rows and, especially, the hooks in the middle-section of the ventral row are considerably larger than the others; **long dactylus with 4 rows of 40 to 50 minute suckers**. Right ventral arm hectocotylized, the ventral protective membrane weakly developed, the dorsal one with an enlarged flap in the zone that bears hooks; 2 rows of hooks on the two-thirds of the arm, **distal part of the arm devoid of hooks and suckers**; tip of the arm with small suckers.

Size: Maximum mantle length 79 mm in males, 77 mm in females.

Habitat, biology, and fisheries: Widely distributed in the tropical to warm temperate Atlantic, 0 to 200 m at night. Probably limited to mesopelagic and upper bathypelagic zones, migrating to the surface at night; depth range from 0 to 2 000 m. Known predators are black scabbardfish and blackfinned tuna. Not of interest to fisheries.

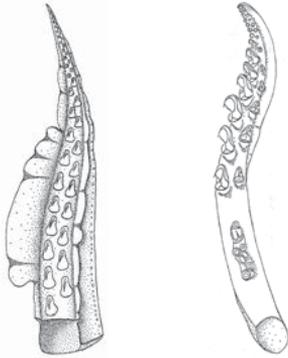
Distribution: Morocco, Madeira, Mauritania, central Atlantic and southeast of St Helena; western Atlantic from Straits of Florida to the Caribbean, Gulf of Mexico and Brazil east of Rio de Janeiro.



***Enoploteuthis leptura leptura* (Leach, 1817)**

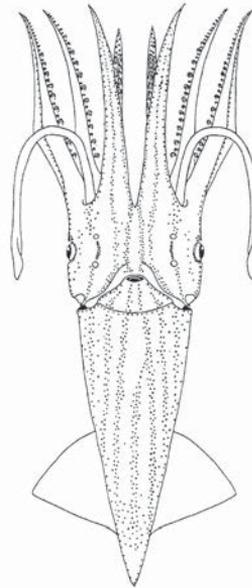
Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Hooked enope squid; **Fr** – Enoploloutène crochu; **Sp** – Enoploluria uncinada.

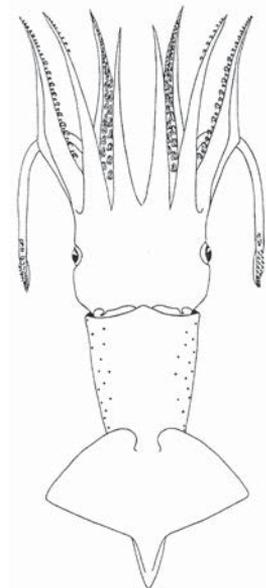


hectocotylus tentacular club

Diagnostic characters: Mantle elongate and conical, muscular anteriorly but posteriorly to the fins with a tip thin-walled and saccate, occupied by small-filled compartments which give a honey-combed appearance. **Seven distinct light organ rows on ventral side of the mantle, single midline row merges with first lateral row on either side well short of anterior mantle margin;** third lateral pair extends shortly posterior to mantle margin. Ten more or less distinct light organ rows on ventral head surface; ventral middle line of head entirely devoid of light organs. Six light organs on funnel. **Tentacles short**, only a little longer than the arms; tentacular club long but not expanded; the carpal cluster is a raised, long structure consisting in a series of 4 or 5 suckers and knobs each with interconnecting ridges and grooves; manus not broad with 6 or 7 large hooks in ventral row and 4 or 5 smaller hooks in the dorsal row; **dactylus with 2 rows of 10 to 15 minute suckers.** Right ventral arm hectocotylized, the ventral protective membrane extremely narrow, the dorsal one with an enlarged flap; 2 rows of hooks extend along the arm; **there is not a zone of the arm devoid of hooks and suckers;** tip of the arm with small suckers.



ventral view



dorsal view

(all illustrations from Roper, 1966)

Size: Maximum mantle length 92 mm (mature female).

Habitat, biology, and fisheries: One of the largest oceanic enoploteuthids. Common in tropical and subtropical Atlantic, depth from 0 to 1 620 m. In the Gulf of Guinea small numbers of larvae were collected, both by day and night, in the upper 20 m in the South Tradewind current, juveniles of 20 to 40 mm near the frontal zone of the South Tradewind current and subtropical waters, adults mainly in subtropical waters. Spawning in the Gulf of Guinea is between January and September. Growth is relatively fast and maturation relatively early, lasting only a short period; males usually mature earlier (at 45 to 60 days) than females (at 80 to 90 days). Size and age at maturity: 50 mm mantle length and 70 days in males, 60 to 70 mm mantle length and 80 to 90 days in females. Maximum age is 153 days in mature males of 72 mm mantle length and 143 days in mature females of 92 mm mantle length. The only recorded predator of this species was yellowfin tuna. Not of interest to fisheries.

Distribution: Madeira, Morocco, Mauritania, Cape Verde Islands, Gulf of Guinea, Ghana and São Tomé and Príncipe, southwestern Africa; western Atlantic from Bermuda and the Caribbean to Brazil.



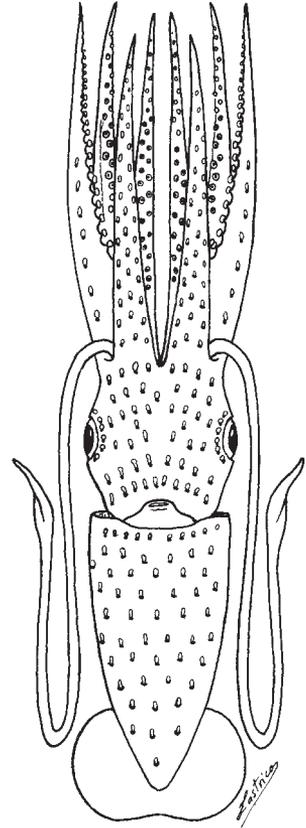
HISTIOTEUTHIDAE

Jewel squids

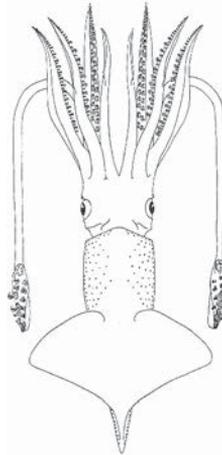
Diagnostic characters: Weakly-muscled species of moderate size. In general they have comparatively long, thick arms and short mantles with small, rounded fins. **Ventral surfaces of mantle, head and arms with anteriorly directed light organs with red colour filters.** Suckers on club in 4 or more irregular series. **Left eye larger than right eye.** Suckers on arms in 2 series. Buccal connectives attach to dorsal borders of ventral arms. A straight or slightly curved and slightly broad, simple, funnel locking cartilage. **Colour:** red, with very distinctive light organs.

Habitat, biology, and fisheries: Oceanic species. Ranges from epipelagic to bathypelagic and from subarctic to subantarctic. From the surface to 2 700 m. Some species appear to be found most frequently near continental slopes and islands. This family represents an important component of the diet of many oceanic toothed whales.

Remarks: The nomenclature and classification used herein is based on Voss *et al.* (1998). Subsequently, different interpretations have been introduced that depart from the earlier classification (see Young and Vecchione, 2000, 2008a, b, c).



ventral view



Enoploteuthidae

Similar families occurring in the area

Enoploteuthidae: have hooks rather than normal suckers on arms.

Key to the species and subspecies of Histiotteuthidae occurring in the area

- 1a. Median row of tubercles on dorsal surface of mantle and basal portions of arms I-III present ***Histiotteuthis meleagroteuthis***
- 1b. Median row of tubercles on mantle and arms absent → 2

- 2a. Single, large, terminal light organ on arms I-III or I-IV present → 3
- 2b. Single, large, terminal light organ on arms absent → 4

- 3a. Buccal membrane with 6 lappets and 1 connective to arms IV ***Histiotteuthis bonnellii***
- 3b. Buccal membrane with 7 lappets and 2 connectives to arms IV ***Histiotteuthis macrohista***

- 4a. Light organs large, arranged in widely to moderately widely spaced pattern on anterior one-third to half of ventral surface of mantle; cirlet around right eye composed of 16 or 17 (rarely 18 or 15) large light organs → 5
- 4b. Light organs intermixed large and small, arranged in moderately dense pattern on ventral surface of mantle; cirlet around right eye composed of 17 large and 1 small light organs. ***Histioteuthis reversa***

- 5a. Light organs in widely spaced pattern on ventral surface of mantle; dorsal pad of funnel organ with 2 lateral flaps; skin conspicuously papillated (except in small juveniles) ***Histioteuthis arcturi***
- 5b. Light organs in moderately widely spaced pattern on ventral surface of mantle; dorsal pad of funnel organ unsculptured; skin not papillated → 6

- 6a. Terminal group of normal light organs on arms I-IV present, except in mature specimens, where terminal groups on arms I-III replaced by single, long, narrow, darkly pigmented light organ; suckers in median 2 or 3 rows of club manus slightly and approximately coequally enlarged ***Histioteuthis celetaria celetaria***
- 6b. Terminal group of light organs on arms absent; suckers in median 2 or 3 rows of club manus larger than the marginal ones ***Histioteuthis corona corona***

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Histioteuthis arcturi* (Robson, 1948).
-  *Histioteuthis bonnellii* (Férussac, 1834).
-  *Histioteuthis celetaria celetaria* (Voss, 1960).
-  *Histioteuthis corona corona* Voss and Voss, 1962.
-  *Histioteuthis macrohista* Voss, 1969.
-  *Histioteuthis meleagroteuthis* (Chun, 1910).
-  *Histioteuthis reversa* (Verrill, 1880).

References

Clarke, M.R. 1980. Cephalopoda in the diet of sperm whales of the Southern Hemisphere and their bearing on sperm whale biology. *Discovery Report*, 37: 1–324

Guerra, A. 1992. *Mollusca, Cephalopoda*. In: M.A. Ramos *et al.*, eds. *Fauna Ibérica*. Vol. 1. Museo Nacional de Ciencias Naturales. CSIC, Madrid, 327 pp.

Lipinski, M.R., Payne, A.I.L. & Rose, B. 1992. The importance of cephalopods as prey for hake and other groundfish in South African waters. In A.I.L. Payne, K.H. Brink, K.H. Mann & R. Hilborn, eds. Benguela trophic functioning. *South African Journal of Marine Science*, 12: 651–662.

Nesis, K.N. 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.

Okutani, T. 2005. *Cuttlefishes and squids of the world*. Publication for the 40th Anniversary of the Foundation of National Cooperative Association of Squid Processors, Tokyo, 253 pp.

Roeleveld, M.A.C. 1977. Cephalopoda from the Tropical Eastern Atlantic Ocean. *Galathea Report*, 14: 123–132.

- Roper, C.F.E. & Jereb, P.** 2010. Family Histioteuthidae. In P. Jereb & C.F.E. Roper, eds. Cephalopods of the world. *An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids.* FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 223–236.
- Voss, N.A.** 1969. A monograph of the Cephalopoda of the North Atlantic. The family Histioteuthidae. *Bulletin of Marine Science*, 19(4): 713–867
- Voss, N.A., Nesis, K.N. & Rodhouse, P.G.** 1998. The cephalopod family Histioteuthidae (Oegopsida): Systematics, Biology, and Biogeography. In N.A. Voss, M. Vecchione, R.B. Toll & M.J. Sweeney, eds. Systematics and Biogeography of Cephalopods. *Smithsonian Contributions to Zoology*, 586: 293–341.
- Voss, N.A., Stephen, S.J. & Dong, Z.** 1992. Family Histioteuthidae Verrill, 1881. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. "Larval" and Juvenile Cephalopods: A Manual for their Identification. *Smithsonian Contributions to Zoology*, 513: 73–91.
- Young, R.E. & Vecchione, M.** 2000. *Stigmatoteuthis dofleini* Pfeffer, 1912. Tree of Life Project, <http://tolweb.org/>
- Young, R.E. & Vecchione, M.** 2008a. *Stigmatoteuthis arcturi* Robson, 1948. Version 29 May 2008 (under construction). http://tolweb.org/Stigmatoteuthis_arcturi/19793/2008.05.29 in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Vecchione, M.** 2008b. *Stigmatoteuthis dofleini* Pfeffer, 1912. Version 29 May 2008 (under construction). http://tolweb.org/Stigmatoteuthis_dofleini/19794/2008.05.29 in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Vecchione, M.** 2008c. *Stigmatoteuthis hoylei* (Goodrich 1896). Version 29 May 2008 (under construction). http://tolweb.org/Stigmatoteuthis_hoylei/19795/2008.05.29 in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Vecchione, M.** 2010. *Histioteuthis bonnellii* (Férussac 1834). Version 15 August 2010 (under construction). http://tolweb.org/Histioteuthis_bonnellii/19786/2010.08.15 in The tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Vecchione, M.** 2013. Histioteuthidae Verrill, 1881. Version 03 November 2013 (under construction). <http://tolweb.org/Histioteuthidae/19782/2013.11.03> in The Tree of Life Web Project, <http://tolweb.org/>

Histioteuthis arcturi (Robson, 1948)

Frequent synonyms / misidentifications: *Histioteuthis dofleini* (Pfeffer, 1912) / None.

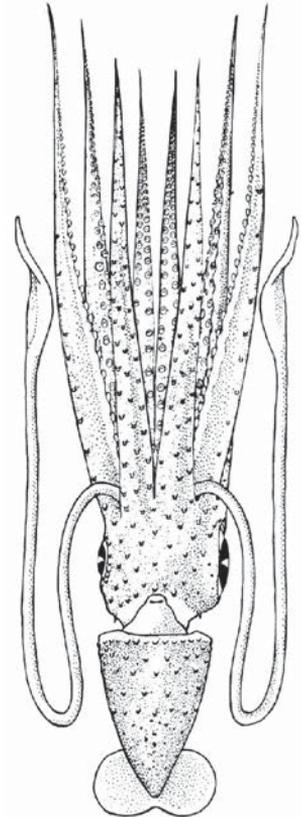
FAO names: **En** – Arcturus jewel squid; **Fr** – Loutène de Arcturus; **Sp** – Joyeluria de Arcturus.

Diagnostic characters: Suckers of the manus of the tentacle in rows of 5 to 7, with strong dissimilarity in size; dorsal pad of funnel organ sculptured with median ridge down each arm; distal portion of median ridge on arms of dorsal pad funnel organ expanded into distinct flap; outer web conspicuously developed up to depth of 14% of length of longest arm; large atypical light organs not present; **light organs on ventral surface of mantle and head mostly large, no densely set**; 17 large light organs in circle around margin of right eyelid. **No distinct terminal light organs present on arms.**

Size: Maximum mantle length 204 mm; mature females 176 to 204 mm, mature males 72 to 125 mm.

Habitat, biology, and fisheries: Its biology is poorly known. Occurring from the surface to more than 1 000 m; early juveniles (4 to 5 mm ML) in 0 to 400 m day and night, larger juveniles in 400 to 750 m by day and 0 to 400 m at night; subadults and mature adults in 600 to 2 700 m, mainly deeper than 1 000 m in both midwater and off the bottom. Known predators are *Thunnus obesus* (bigeye tuna), *Xiphias gladius* (swordfish), *Hyperoodon ampullatus* (northern bottlenose whale), *Physeter macrocephalus* (sperm whale) and *Ziphius cavirostris* (Cuvier's beaked whale). Not of interest to fisheries.

Distribution: Eastern Atlantic from Gibraltar to about 45°S; western Atlantic from Nova Scotia to Gulf of Mexico and Brazil.



ventral view



Histioteuthis bonnellii (Férussac, 1834)

Frequent synonyms / misidentifications: *Histioteuthis bonnellii corpuscula* Clarke, 1880 / None.

FAO common names: **En** – Umbrella squid; **Fr** – Loutène bonnet; **Sp** – Joyeluria membranosa.

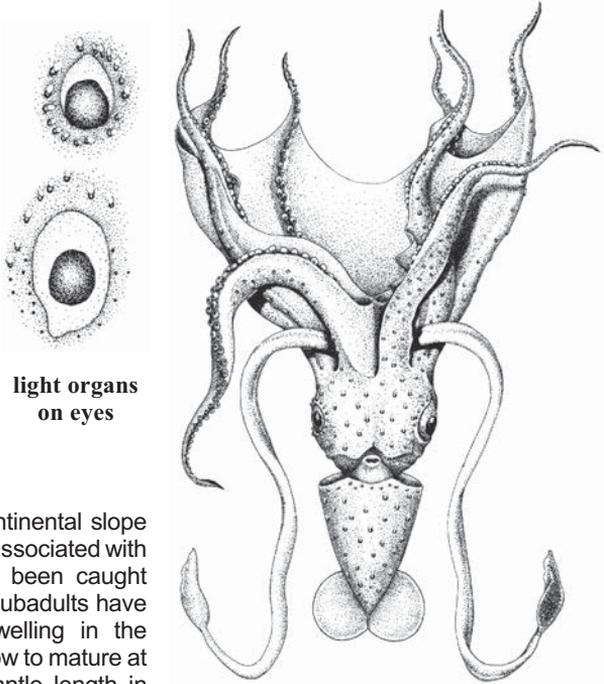
Diagnostic characters: Mantle conical, moderately short and stout covered with 7 or 8 diagonal rows of dark elongated light organs on ventral and lateral surfaces, also present on head and arms. **Arms long, about 130 to 300% mantle length, connected by a very broad, deep, maroon-coloured web.** Tentacular club lacking longitudinal cleft on aboral surface; suckers arranged in 6 rows, with those in medial 2 rows enlarged to 2 times diameter of ventral marginal suckers. **Single, elongate, dark, simple light organs present on ends of arms I-IV; 3 longitudinal rows of light organs on basal portions of all arms; a cirlet of 17 (rarely 16 or 18) large light organs around right eye.**

Size: Maximum mantle length 330 mm. Total length about 1 300 mm.

Habitat, biology, and fisheries: Usually near continental slope and submarine ridges and seamounts, sometimes associated with the bottom. Large juveniles and subadults have been caught between about 200 and 1 000 m depth, but large subadults have been collected at the surface in areas of upwelling in the Mediterranean off Nice and Messina. Males are known to mature at 50 to ± 330 mm mantle length (50 to 75 mm mantle length in Atlantic tropical and southern subtropical waters; 172 mm mantle length in northern Mauritanian upwelling; 76 to ± 330 mm mantle length in temperate and subarctic waters). Females can mature at about 90 mm mantle length in tropical Atlantic and southern subtropical waters. Mature individuals were taken in the Mauritanian upwelling at depths of 1 300 to 2 200 m. Mature egg diameter measured 2.3 mm in a 330 mm mantle length female from northwestern Atlantic. It seems to be a schooling species. Main predators are sperm whale, *Alepisaurus ferox*, *Aphanopus carbo* and different species of tuna fish. To date this species is of no commercial interest.

Distribution: This species is widely, but unevenly, distributed in the Atlantic north of the southern subtropical convergence (SSTC) and extends eastwards across the Indian Ocean and into the Pacific in subtropical waters fringing the convergence of New Zealand and southeastern Australia. Subarctic and north temperate waters, including the Mediterranean Sea. Absent from northern subtropical and western tropical waters and the Gulf of Mexico. Its geographic range in the eastern Atlantic south of temperate waters could be disjunct. In the south Atlantic inhabits in a narrow belt of subtropical waters between 28°S and 40°S that borders the SSTC and extends off Mar del Plata, Argentina eastwards to about 180°.

Remarks: This species was divided into 2 subspecies, *Histioteuthis bonnellii bonnellii* and *H. bonnellii corpuscula* by Clarke (1980). Voss *et al.* (1998), in an extensive study of the species, failed to distinguish these 2 nominal subspecies on the base of the characters used by Clarke. However, they suggested that different populations of the species may exist based on differences in spermatophores structure. If future studies confirm this, they suggest that the Atlantic subtropical population be identified to *H. b. corpuscula*.



light organs
on eyes

ventral view

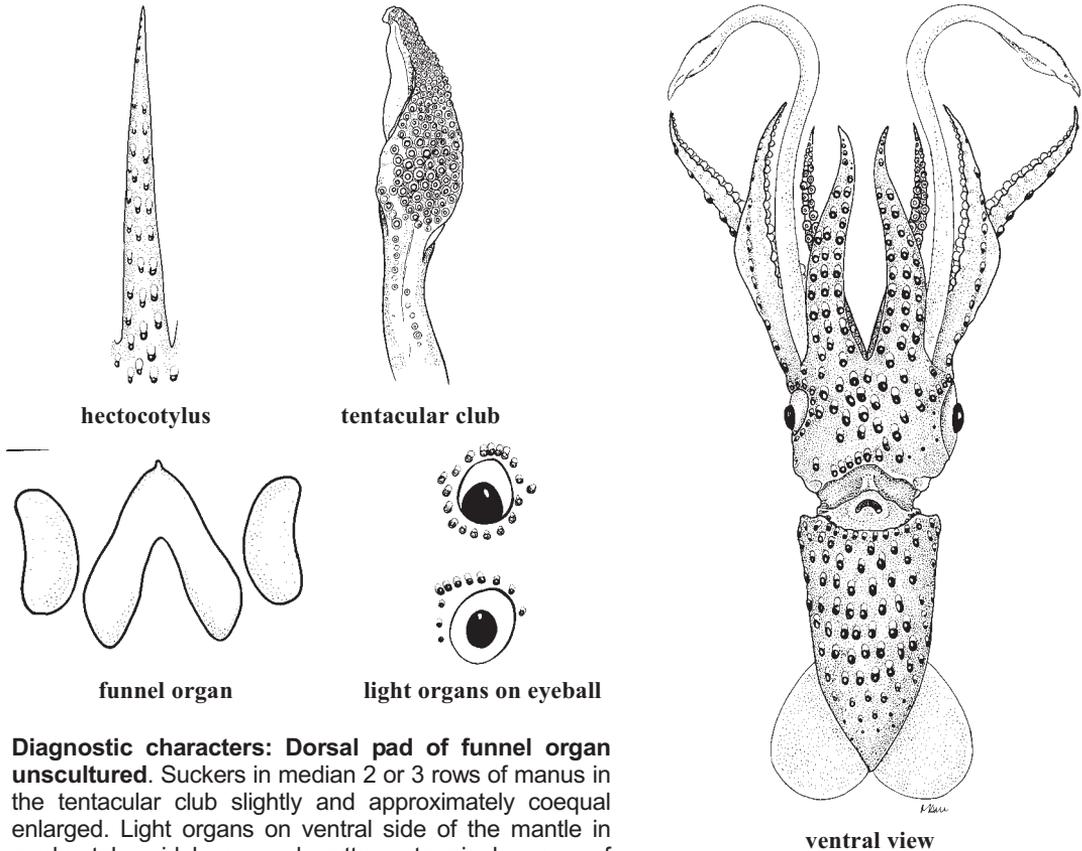
(all illustrations from Guerra, 1992)



Histioteuthis celetaria celetaria (Voss, 1960)

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Elegant jewel squid; **Fr** – Loutène élégante; **Sp** – Joyeluria elegante.



(all illustrations after Voss, 1969)

Diagnostic characters: **Dorsal pad of funnel organ uncultured.** Suckers in median 2 or 3 rows of manus in the tentacular club slightly and approximately coequal enlarged. Light organs on ventral side of the mantle in moderately widely spaced pattern; terminal group of normal light organs on arms I-IV present, except in mature specimens where terminal groups on arms I-III replaced by single, long, narrow, darkly pigmented light organ; **circle around right eye composed of 16 or 17 large light organs; left eye with arch of 7 large light organ over anterior margin, 3 small in ventral margin and a single small on anterodorsal margin.**

Size: Maximum mantle length 258 in females and 87 in males.

Habitat, biology, and fisheries: Biology poorly known. In both open ocean and near land masses and submarine ridges. Small juveniles (to 39 mm ML) in depths from 0 to 800 m; larger juveniles and adults at 750 to 1 010 m at night; mature animals at 750 to 1 010 m. Mating and spawning probably occurs in deep water. Known predators are *Prionace glauca* (blue shark) and *Alepisaurus ferox* (longnose lancetfish). Not of interest to fisheries.

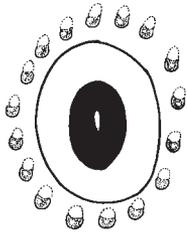
Distribution: From Azores and Madeira to 19°S in the east Atlantic; west Atlantic from Nova Scotia to Brazil; present but poorly known in subtropical South Atlantic



***Histioteuthis corona corona* (Voss and Voss, 1962)**

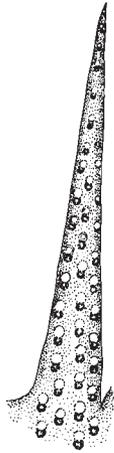
Frequent synonyms / misidentifications: None / None.

FAO names: En – Coronate jewel squid; Fr – Loutène couronnée; Sp – Joyeluria coronada.

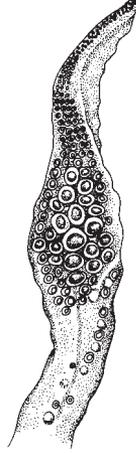


light organs

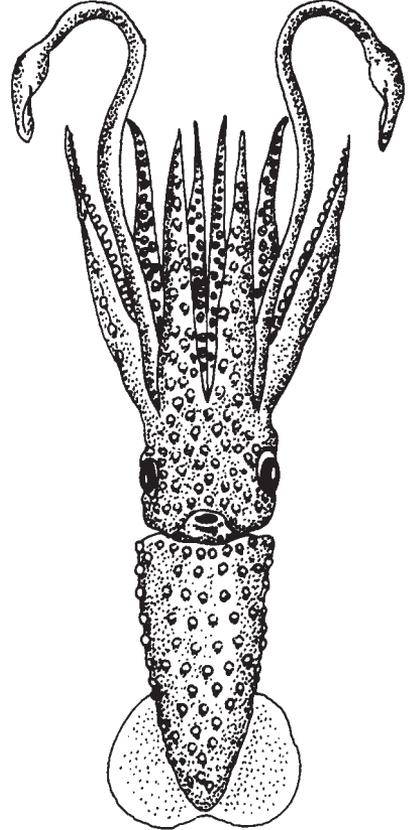
(after Voss, 1969)



hectocotylus



tentacular club



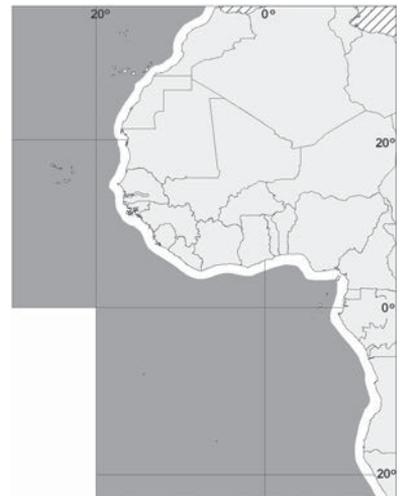
ventral view

Diagnostic characters: Dorsal pad of funnel organ unsculptured. Suckers ring on arms IV with 33 to 38 teeth on rings of large suckers of the manus of tentacular club. Light organs on ventral side of the mantle in moderately widely spaced pattern; terminal group of normal light organs on arms absent; circle around right eye composed of 17 (occasionally 16) large light organs; **7 or 8 large light organs in arc over anterior margin of left eye with 3 small light organs on dorsal margin and 4 small ones on ventral margin of eyelid, 2 smaller additional light organs usually on more immediate posteroventral margin.**

Size: Maximum mantle length in mature males 188 mm. Maximum mantle length of mature females unknown.

Habitat, biology, and fisheries: Data on its biology are very scarce. An oceanic, meso-bathypelagic species. Juveniles (7 to 21 mm ML) in 410 to 700 m by day and 200 to 500 m at night, subadults and adults from 375 to 2 000 m in midwater and at 735 to 750 m near the bottom. Males mature from 110 mm mantle length; female size at maturity unknown. Known predators are *Aphanopus carbo* (black scabbardfish), *Kogia breviceps* (pygmy sperm whale) and *Ziphius cavirostris* (Cuvier's beaked whale). Not of interest to fisheries.

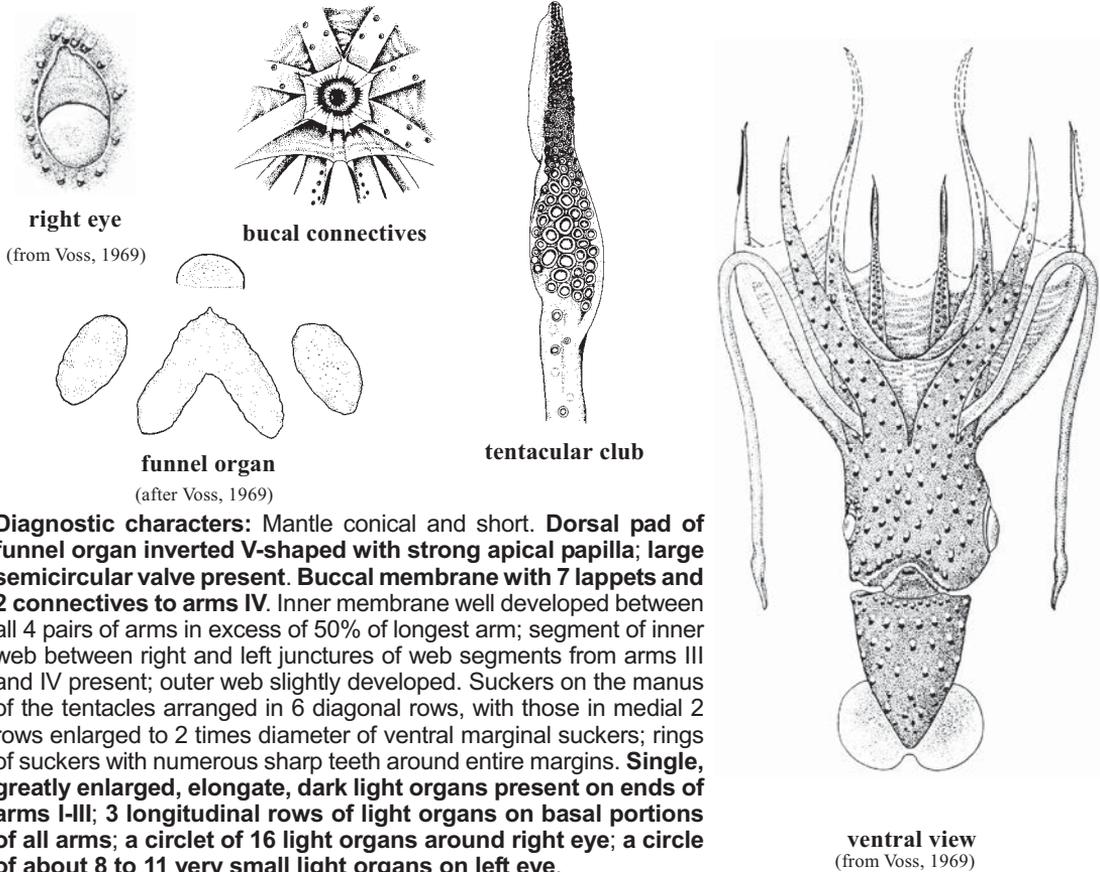
Distribution: In the east Atlantic from 46°N to 27°S; in the west Atlantic from approximately 45°N to Uruguay (36°S); Gulf of Mexico.



***Histioteuthis macrohista* Voss, 1969**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Deep-webbed jewel squid; **Fr** – Loutène ombrelle; **Sp** – Joyeluria umbrelada.



Diagnostic characters: Mantle conical and short. **Dorsal pad of funnel organ inverted V-shaped with strong apical papilla; large semicircular valve present. Buccal membrane with 7 lappets and 2 connectives to arms IV.** Inner membrane well developed between all 4 pairs of arms in excess of 50% of longest arm; segment of inner web between right and left junctures of web segments from arms III and IV present; outer web slightly developed. Suckers on the manus of the tentacles arranged in 6 diagonal rows, with those in medial 2 rows enlarged to 2 times diameter of ventral marginal suckers; rings of suckers with numerous sharp teeth around entire margins. **Single, greatly enlarged, elongate, dark light organs present on ends of arms I-III; 3 longitudinal rows of light organs on basal portions of all arms; a circlet of 16 light organs around right eye; a circle of about 8 to 11 very small light organs on left eye.**

Size: Maximum mantle length 65 mm (female).

Habitat, biology, and fisheries: Its biology is poorly known. An oceanic, mesopelagic and bathypelagic specie. Occurring from surface to 2 500 m; juveniles and subadults in midwater throughout entire vertical range at night; subadults also near the bottom at 700 to 800 m; mature males at 100 to 600 m at night. Males mature at 40 to 53 mm mantle length, females from about 49 to more than 65 mm. Known predators are *Ommastrephes bartramii* (neon flying squid), *Prionace glauca* (blue shark), *Genypterus blacodes* (ling, pink cusk-eel), *Thunnus albacares* (yellowfin tuna), *Thunnus obesus* (bigeye tuna), *Arctocephalus gazella* (Antarctic fur seal), *Physeter catodon* (sperm whale), *Diomedea exulans* (wandering albatross), *Phoebetria fusca* (sooty albatross) and *Puffinus tenuirostris* (short-tailed shearwater). Not of interest to fisheries.

Distribution: Almost circumglobal, primarily in the transitional and fringing waters of the Southern Subtropical Convergence, between about 33° and 47°S, extending northward in the eastern Atlantic to 23°S and probably further north off Namibia. Recorded once in the Gulf of Guinea.



***Histioteuthis meleagroteuthis* (Chun, 1910)**

Frequent synonyms / misidentifications: *Meleagroteuthis separata* Sasaki, 1915; *Histioteuthis bruuni* Voss, 1969 / None.

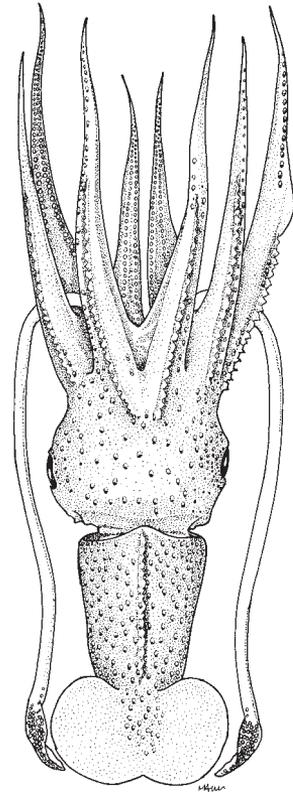
FAO names: En – Pearly jewel squid; Fr – Loutène nacrée; Sp – Joyeluria nacarada.

Diagnostic characters: Midline of dorsal surface of mantle with row of small tubercles fused basally to form strong ridge on anterior two-thirds of mantle and from near base to approximately middle portion of arms I-III; light organs uniformly small, arranged in dense pattern on ventral surfaces of mantle and head, in 8 or 9 longitudinal rows on basal portions of arms IV, in circlet of 19 to 22 around right eye.

Size: Maximum mantle length 114 mm.

Habitat, biology, and fisheries: Its biology is practically unknown. Found from surface to more than 1 000 m; juveniles (<6 mm ML) at 210 to 300 m by day, juvenile (16 mm ML) and subadult (54 mm ML) at 610 to 700 m, juveniles (25 to 35 mm ML) at 100 to 360 m by night; large juveniles and subadults in midwater about 200 to 1 950 m and near the bottom at about 500 to 1 250 m. Females mature at 114 mm mantle length, males at 65 to 102 mm. Large females could undergo diel vertical migration and spawning may occur in deep water. Known predators are *Galeocerdo cuvieri* (tiger shark), *Thunnus obesus* (bigeye tuna), *Globicephala macrorhynchus* (short-finned pilot whale), *Hyperoodon ampullatus* (northern bottlenose whale), *Physeter catodon* (sperm whale), *Ziphius cavirostris* (Cuvier's beaked whale), *Phoebetria fusca* and *P. palpebrata* (sooty albatrosses). Not of interest to fisheries.

Distribution: Madeira, Canarys, Mauritania, Guinea Bissau, Gulf of Guinea, Gabon, off Namibia; western Indian Ocean and western and central Pacific.



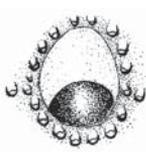
dorsal view
(after Voss, 1969)



Histioteuthis reversa (Verrill, 1880)

Frequent synonyms / misidentifications: *Histioteuthis elongata* (Voss and Voss, 1962) / None.

FAO names: En – Reverse jewel squid; Fr – Loutène retournée; Sp – Joyeluria invertida.



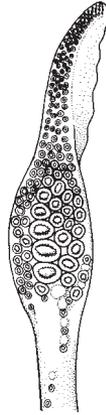
right eye



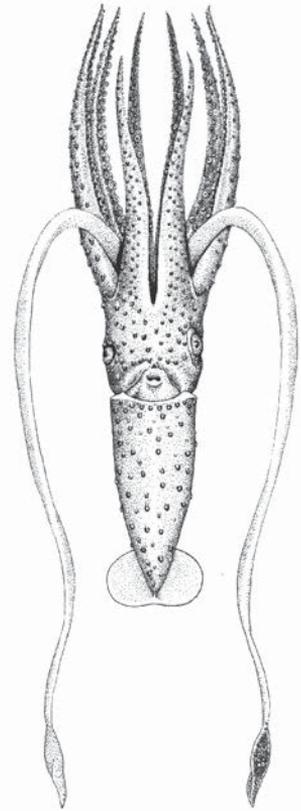
left eye

light organs on eyeball

(from Guerra, 1992)



tentacular club



ventral view

(from Guerra, 1992)

Diagnostic characters: Mantle conical moderately elongated. Inner web low to vestigial between dorsal 3 pairs of arms, outer web not conspicuously developed. Tentacular suckers in about 6 diagonal rows, the medial rows enlarged especially central 4 or 5 of more ventral of 2 rows. **Eighteen light organs, 17 large and 1 small, in closed cirlet around right eye; 7 large light organs in arc over anterior margin of left eye with 10 to 14 small light organs regularly spaced around remaining margin of eyelid.**

Size: Maximum mantle length 200 mm (female).

Habitat, biology, and fisheries: Data on its biology are very scarce. Juveniles at 0 to 630 m by day and 0 to 260 m at night; subadults at 80 to 300 m at night; mature females at 500 to 1 000 m by day; mature males and females in midwater at 800 to 1 000 m by day and in midwater and near the bottom at 600 to 1 300 m at night. Females mature at 114 to 186 mm mantle length and undergo rapid elongation of the mantle shortly before reaching maturity; mature females ascend the water column to spawn and die in shallow water. Males mature at about 49 to 99 mm mantle length. Abundant near slopes and submarine ridges; 46 to 370 km from shore off Namibia; Known predators are *Aristaeomorpha foliacea* (giant red shrimp), *Etmopterus spinax* (velvet belly), *Galeus melastomus* (blackmouth catshark), *Prionace glauca* (blue shark), *Xiphias gladius* (swordfish), *Globicephala melas* (long-finned pilot whale), *Grampus griseus* (Risso's dolphin), *Hyperoodon ampullatus* (northern bottlenosed whale), *Kogia breviceps* (pygmy sperm whale), *Stenella coeruleoalba* (striped dolphin) and *Ziphius cavirostris* (Cuvier's beaked whale). Not of interest to fisheries.

Distribution: Mediterranean Sea. Widely distributed in the temperate eastern Atlantic from 60°N to approximately 23°S; abundant in Mauritanian upwelling region, ranging southward to Namibia and South African west coast, and east to 35°S 23°E and 44°S 26°E; northwestern Atlantic from subarctic (±52°N) to Suriname. Apparently absent from the Gulf of Mexico, Caribbean Sea and South Atlantic Central water mass.



JOUBINITEUTHIDAE

Joubin's squids

This monotypic family contains a single species. Consequently, diagnostic characters, habitat, biology and interest to fisheries coincide.

***Joubiniteuthis portieri* (Joubin, 1916)**

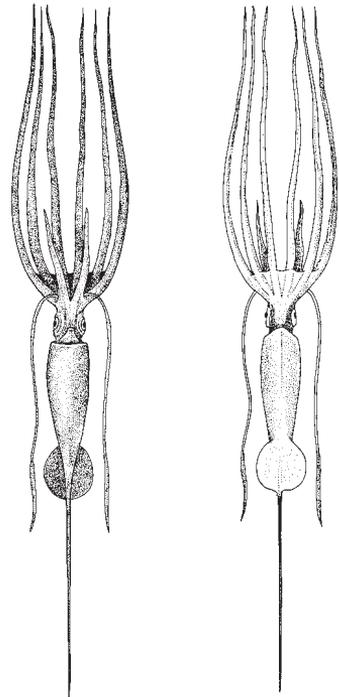
Frequent synonyms / misidentifications: *Valdemaria danae* Joubin, 1931 / None.

FAO names: En – Joubin's squid; Fr – Loutène de Joubin; Sp – Luria de Joubin.

Diagnostic characters: Mantle long and slender. Extremely long, slender tail, slightly longer than mantle length. **Arms very long (greater than 2 times ML), slender and whip-like**; suckers are biserially arranged at the bases of arms I-III, but they increase to 4, then 6, often irregularly arranged rows until the tips; **ventral arms short** (length one-third or less than length of other arms) **with suckers in 4 series**; arms joined by low web. Tentacles much thinner than arms; **tentacular club laterally compressed**; **bears suckers in 5 to 12 series**. Funnel locking apparatus with oval depression. Light organs absent.



tentacular club



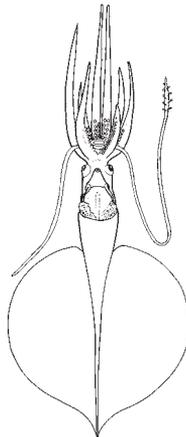
ventral view

dorsal view

(after Roper & Young, 1969)

Similar families occurring in the area

Squids of the family Magnapinnidae have recently been videotaped in deep water (greater than 1 000 m) worldwide. These squid have extremely long arms and could be confused with joubiniteuthids. However, the fins are very large and all arms are extremely long and the tentacles are practically indistinguishable from the arms, making the magnapinnid squids appear to have 10 identical arms.



dorsal view

Magnapinnidae

Size: Up to 105 mm mantle length.

Habitat, biology, and fisheries: Oceanic, meso- to bathypelagic squids. All specimens captured in open nets from the surface to 3 500 m. Little is known about the biology of this species, which is represented by few specimens. Not of interest to fisheries.

Distribution: Circumglobally in tropical and subtropical waters.



References

- Norman, M.** 2000. *Cephalopods. A World Guide*. Hackenheim, Germany, Conchbooks, 320 pp.
- Roper, C.F.E. & Clarke, M.R.** 1992. Family Joubiniteuthidae Naef, 1922. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. "Larval" and Juvenile Cephalopods: A manual for their identification. *Smithsonian Contributions to Zoology*, 513: 179–180.
- Roper, C.F.E. & Jereb, P.** 2010. Family Joubiniteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 237–238.
- Vecchione, M.** 2002. Cephalopods. In K.E. Carpenter, ed. *The Living Marine Resources of the Western Central Atlantic*. Vol. 1: Introduction, molluscs, crustaceans, hagfishes, sharks, batoid fishes and chimaeras. *FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5*. Rome, FAO. pp. 149–244.
- Vecchione, M. & Young, R.E.** 2006. The squid family Magnapinnidae (Mollusca: Cephalopoda) in the Atlantic Ocean, with a description of a new species. *Proceedings of the Biological Society of Washington*, 119(3): 365–372.
- Vecchione, M., Young, R.E., Guerra A., Lindsay D. J., Clague D.A., Bernhard, J.M., Sager W.W, González A.F., Rocha F.J. & Segonzac M.** 2001. Worldwide observations of remarkable deep-sea squids. *Science*, 294: 2505–2506.
- Young, R.E.** 2009. Joubiniteuthidae Naef, 1922. *Joubiniteuthis portieri* Joubin, 1916. Version 11 September 2009. http://tolweb.org/Joubiniteuthis_portieri/19450/2009.09.11 in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E. & Roper, C.F.E.** 1969. A Monograph of the Cephalopoda of the North Atlantic: The family Joubiniteuthidae. *Smithsonian Contributions to Zoology*, 15: 10 pp.

LEPIDOTEUTHIDAE

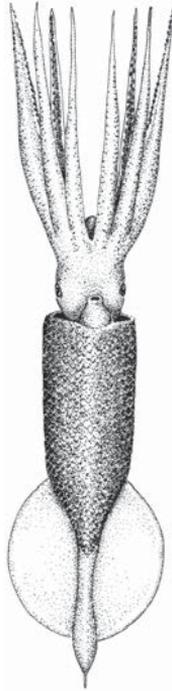
Soft-scaled squids

This monotypic family contains a single species. Consequently, diagnostic characters, habitat, biology and interest to fisheries coincide.

Lepidoteuthis grimaldii Joubin, 1895

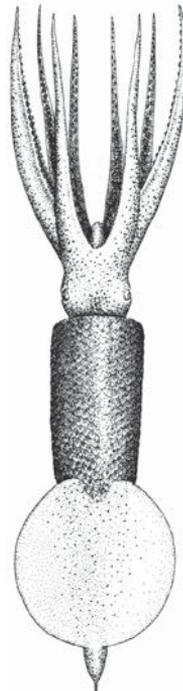
Frequent synonyms / misidentifications: None / None

FAO names: **En** – Grimaldi's soft-scaled squid; **Fr** – Loutène écaillé-doux de Grimaldi; **Sp** – Luria escamuda blanda de Grimaldi.



ventral view

(after Guerra, 1992)



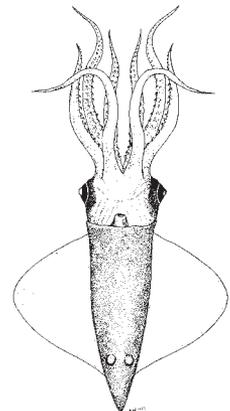
dorsal view

Diagnostic characters: Mantle mostly covered with dermal cushions (= 'scales'). Tentacles absent in subadults and adults, greatly reduced in juveniles. Arm suckers in 2 rows, some of them enlarged in males, which are equipped with a pair of grossly enlarged sabre-like hooks. Fins large and terminal. Light organs absent.

Similar families occurring in the area

Octopoteuthidae: lacks dermal cushions.

Size: Maximum mantle length 1 000 mm, weight ± 11 kg, estimated from beaks; maximum recorded female mantle length 970 mm; male mantle length 422 mm; at maturity females attain twice the size of males.



Octopoteuthidae

Habitat, biology, and fisheries: This squid is rarely captured and little is known of its biology. Tropical and subtropical cosmopolitan, mesopelagic, bathyal and demersal. Collected in depths of 0 to 1 100 m; paralarvae and juveniles at 0 to 700 m at night, 0 to 585 m by day. The paralarvae reaches a rather large size (at least 10 mm ML). Large, thick tentacles are present in the paralarvae but they are lost during the early subadult stage. Until very recently, adults were known only from stomachs of predators, mainly the sperm whales; also known from stomachs of *Grampus griseus* (Risso's dolphin), *Aphanopus carbo* (black scabbardfish), a tuna (*Tunnus obesus*), *Alepisaurus ferox* (longnose lancetfish) and *Diomedea exulans* (wandering albatross). No interest to fisheries.

Distribution: Madeira, Canary Islands; northwestern Atlantic from Bermuda and Nova Scotia, northeastern Atlantic from Ireland to Spain and the Azores; western, central and eastern South Atlantic; South Georgia; southern Indian Ocean, western, central and eastern Pacific, south Tasmania.



References

- Clarke, M.R. 1964. Young stages of *Lepidoteuthis grimaldi* (Cephalopoda, Decapoda). *Proceedings of the Malacological Society of London*, 36: 69–78.
- Clarke, M.R. 1992. Family Lepidoteuthidae Pfeffer, 1912. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. Larval and juvenile cephalopods: A manual for their identification. *Smithsonian Contributions to Zoology*, 513: 167–168.
- Clarke, M.R. & Maul, G.E. 1962. A description of the “scaled” squid *Lepidoteuthis grimaldi* Joubin 1895. *Proceedings of the Zoological Society of London*, 139: 97–118.
- Guerra, A. 1992. Mollusca, Cephalopoda. In M. A. Ramos *et al.*, ed. Vol. 1. *Fauna Ibérica*. Museo Nacional de Ciencias Naturales. CSIC. Madrid, 327 pp.
- Jackson, G.D. & O’Shea, S.J. 2003. Unique hooks in the male scaled squid *Lepidoteuthis grimaldi*. *Journal of the Marine Biological Association of the United Kingdom*, 83: 1099–1100.
- Nesis, K.N. & Nikitina, I.V. 1990. Revisión of the squid family Lepidoteuthidae. *Zool. Zhur.*, 69(10): 38–49. In Sweeney, M.J. (comp.) English Translations of Selected Publications on Cephalopods by Kir N.Nesis. 2003. Vol. 1(2): 773–787. Selected Translated Publications, 1965–1994: 419–847.
- Roper, C.F.E. & Jereb, P. 2010. Family Lepidoteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 239–240.
- Roper, C.F.E. & Lu, C.C. 1989. Systematic status of *Lepidoteuthis*, *Pholidoteuthis* and *Tetronychoteuthis* (Cephalopoda: Oegopsida). *Proceedings of the Biological Society of Washington*, 102(3): 805–807.
- Young, R.E. & Vecchione, M. 2012. Lepidoteuthidae Pfeffer 1912. *Lepidoteuthis grimaldii* Joubin, 1895. The scaled squid. Version 10 November 2012 (under construction). http://tolweb.org/Lepidoteuthis_grimaldii/19833/2012.11.10 in The Tree of Life Web Project, <http://tolweb.org/>

LYCOTEUTHIDAE

Firefly squids

Diagnostic characters: Mostly small, muscular squids. **Suckers present** on arms and clubs, **hooks absent**. **Four or 5 oval light organs on ventral surface of eyeball (ocular photophores)**. **Visceral light organs: anal, branchial and postero-abdominal organs.** Spherical light organs **embedded in tentacles**.

Habitat, biology, and fisheries: Occurring from the surface to 3 300 m. Occupying mesopelagic depths during the day and migrating into near-surface waters at night. They are mainly tropical and subtropical in distribution. They possess a large variety of luminous organs. Strong sexual dimorphism in general morphology occurs in some species.

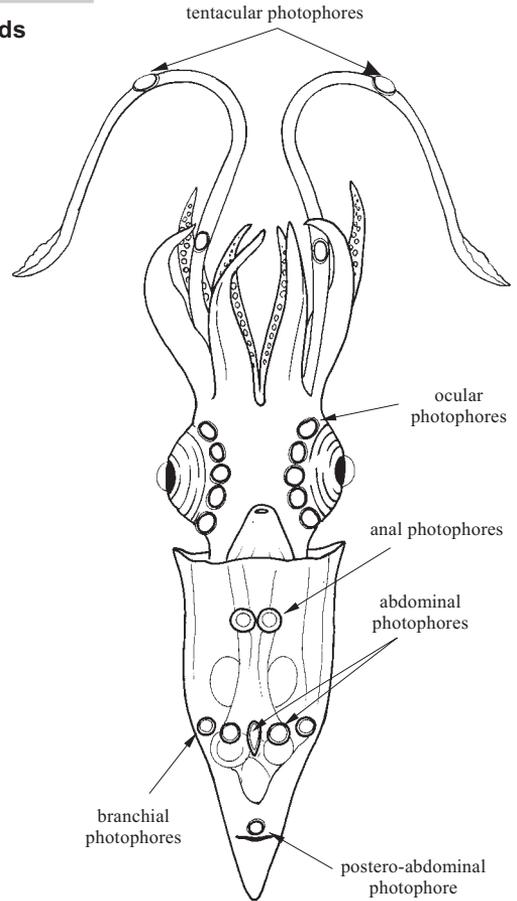
Remarks: Two subfamilies are recognized, the Lycoteuthinae and the Lampadioteuthinae.

Similar families occurring in the area

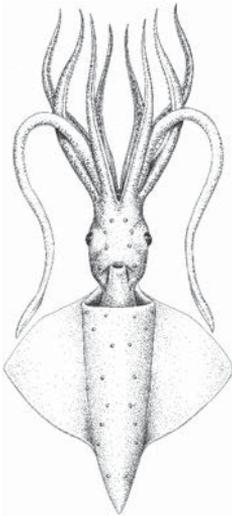
Ancistrocheiridae: lack light organs on the eyeballs and have large light organs on the ventral surfaces of the head and mantle.

Octopoteuthidae: lack tentacles.

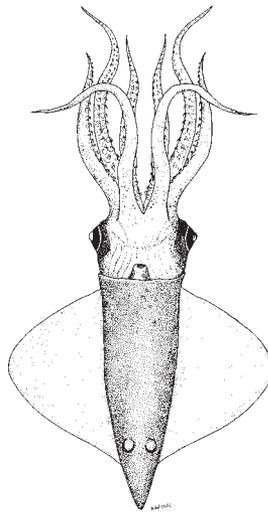
Pyroteuthidae: have hooks on arms.



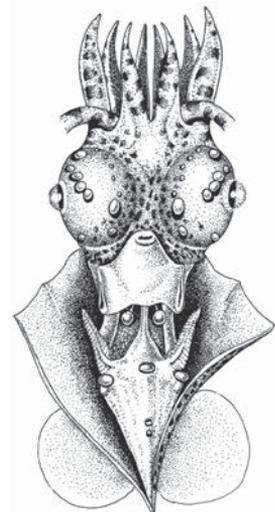
ventral view



Ancistrocheiridae
(after Guerra, 1992)



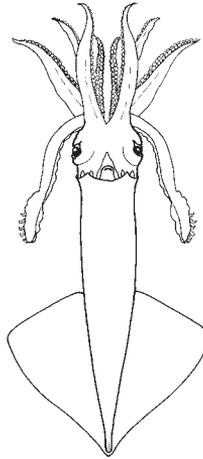
Octopoteuthidae



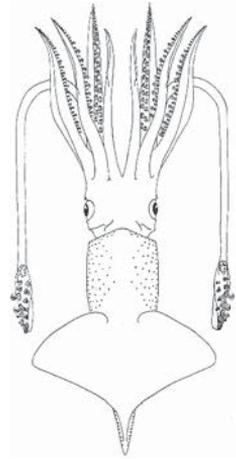
Pyroteuthidae
(after Guerra, 1992)

Onychoteuthidae: have hooks on tentacular clubs.

Enoploteuthidae: have hooks on arms; have light organs on ventral surfaces of head and mantle.



Onychoteuthidae



Enoploteuthidae

Key to the species of Lycoteuthidae occurring in the area

- 1a. Four ocular light organs and 5 light organs in mantle cavity *Lampadioteuthis megaleia*
 1b. Five ocular light organs and 10 light organs in mantle cavity → 2
- 2a. No spherical tail light organ located between fins *Lycoteuthis lorigera*
 2b. Spherical tail light organ present at end of mantle, projecting beyond fins . *Selenoteuthis scintillans*

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Lampadioteuthis megaleia* Berry, 1916.

 *Lycoteuthis lorigera* (Steenstrup, 1875).

 *Selenoteuthis scintillans* Voss, 1959

References

- Arocha, F.** 2003. A new species of *Nematolampas* (cephalopoda: Oegopsida) from the Western Central Atlantic with an overview of the family Lycoteuthidae. *Bulletin of Marine Science*, 72: 941–953.
- Guerra, A.** 1992. *Mollusca, Cephalopoda*. In M.A. Ramos *et al.*, eds. *Fauna Ibérica*. Vol. 1. Museo Nacional de Ciencias Naturales. CSIC, Madrid, 327 pp.
- Hoving, H.J.T., Lipinski, M.R., Roeleveld, M.A.C. & Durholtz, M.D.Y.** 2007. Growth and mating of southern African *Lycoteuthis lorigera* (Steenstrup, 1875) (Cephalopoda; Lycoteuthidae). *Reviews in Fish Biology and Fisheries*, 17(2–3): 259–270.
- Lipinski, M.R., Payne, A.I.L. & Rose, B.** 1992. The importance of cephalopods as prey for hake and other groundfish in South African waters. In A.I.L. Payne, K.H. Brink, K.H. Mann & R. Hilborn, eds. Benguela trophic functioning. *South African Journal of Marine Science*, 12: 651–662.

- Roper, C.F.E., & Jereb, P.** 2010. Family Lycoteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and oegopsid squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 241–246.
- Sweeney, M.J. & Roper, C.F.E.** 1998. Classification, type localities and type repositories of Recent Cephalopoda. *Smithsonian Contributions to Zoology*, 586: 561–599.
- Toll, R.B.** 1983. The lycoteuthid genus *Oregoniateuthis* Voss, 1956, a synonym of *Lycoteuthis* Pfeffer, 1900 (Cephalopoda:Teuthoidea). *Proceedings of the Biological Society of Washington*, 96(3): 365–369.
- Vecchione, M. & Young, R.E.** 1999. Lycoteuthidae Pfeffer, 1908. Version 01 January 1999. <http://tolweb.org/Lycoteuthidae/19636/1999.01.01> in The Tree of Life Web Project, <http://tolweb.org/>
- Villanueva, R. & Sánchez, P.** 1993. Cephalopods of the Beguela Current off Namibia: new additions and considerations on the genus *Lycoteuthis*. *Journal of Natural History*, 27: 15–46.
- Voss, G. L.** 1962. A monograph of the Cephalopoda of the North Atlantic. I. The family Lycoteuthidae. *Bulletin of Marine Science Gulf Carib.*, 12(2):264–305.
- Voss, G.L. & Stephen, S.J.** 1992. Lycoteuthidae. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. "Larval" and Juvenile Cephalopods: A Manual for Their Identification. *Smithsonian Contributions to Zoology*, 513: 67–71.
- Young R.E.** 1964. A note on three specimens of the squid *Lampadioteuthis megaleia* Berry, 1916 (Cephalopoda : Oegopsida) from the Atlantic ocean, with a description of the male. *Bulletin of Marine Science of the Gulf and Caribbean*, 14(3): 444–452.

***Lampadioteuthis megaleia* Berry, 1916**

Frequent synonyms / misidentifications: None / None.

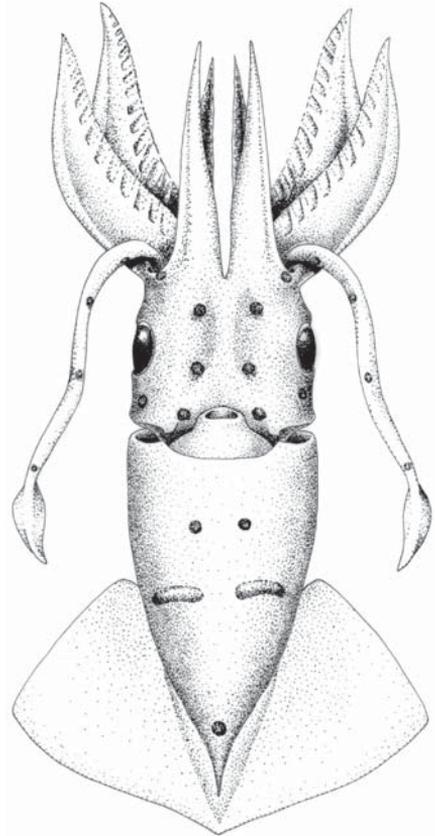
FAO names: **En** – Wonderful firefly squid;
Fr – Encornet luciole merveilleux; **Sp** – Lucernaluria maravillosa.

Diagnostic characters: **Four ocular photophores present:** 3 ventral in a line, 1 lateral, all 4 set far apart. **One light organ on base** of each tentacle and **4 on stalks.** **Five light organs inside the mantle cavity:** 2 anal, 2 branchial and 1 posterior. **No light organs** on mantle, head and arms. **Male genitalia organs unpaired.** **Right ventral arm hectocotyized.**

Size: Maximum mantle length 40 mm.

Habitat, biology, and fisheries: Its biology is practically unknown. Pelagic and oceanic species. Occurring at depths from 50 to 290 m by day, 0 to 200 m at night. Not of interest to fisheries.

Distribution: Portugal, Morocco to Cape Verde Islands; northwestern Atlantic at the periphery of Sargasso Sea; southwestern Pacific.



ventral view (from Guerra, 1992)



***Lycoteuthis lorigera* (Steenstrup, 1875)**

Frequent synonyms / misidentifications: *Lycoteuthis diadema* (Chun, 1900) / None.

FAO names: **En** – Crowned firefly squid; **Fr** – Encornet luciole couronné; **Sp** – Luciernaluria coronada.

Diagnostic characters: Five light organs on ventral side of eyeball, arranged in 1 row. Tentacular stalk **with 2 light organs** and mantle cavity **with 8 to 10 luminous organs**. Arm tips without globular light organs, attenuated in adults. **In adult males** (mantle length above 80 to 90 mm) **the dorsolateral (II) arms are very elongated** and **attenuated** into spidery whip (sometimes twice exceeding the mantle length) devoid of suckers and bearing many light organs along the base of the swimming membrane (lateral keel) over the entire arm length; in young squids they are normal, without light organs. **Posterior abdominal photophores fused into a single organ**. **Male genitalia organs paired**; hectocotylus absent.

Size: Maximum mantle length 190 mm (mature male).

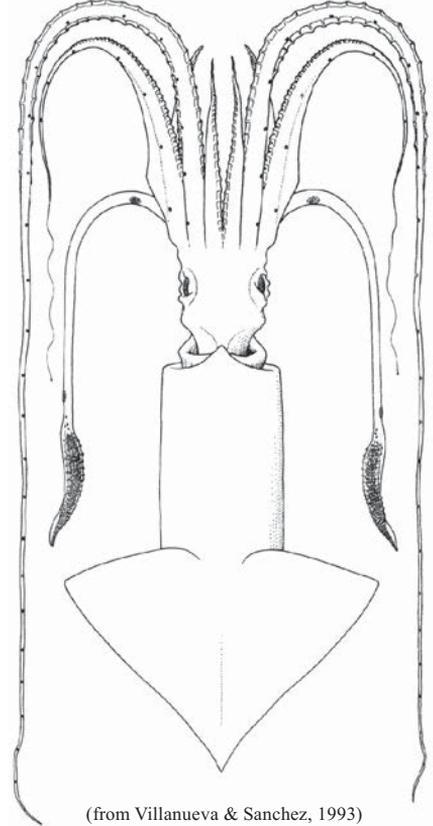
Habitat, biology, and fisheries: Bathyal, mesopelagic species, probably does not ascend into the pelagic zone in large numbers but forms aggregations at 500 to 1 000. Found from the surface to 3 000 m. Known predators are *Holohalaelurus regani* (Izak catshark), *Merluccius capensis* (Cape hake), *M. paradoxus* (deepwater Cape hake), *Thunnus albacares* (yellowfin tuna), *T. maccoyii* (southern bluefin tuna), *Procellaria parkinsoni* (petrel), *Arctocephalus pusillus* (Cape fur seal), *Globicephala melas* (long-finned pilot whale), *Kogia breviceps*, (pygmy sperm whale), *K. simus* (dwarf sperm whale), *Mirounga leonina* (southern elephant seal), *Orcinus orca* (killer whale) and *Physeter catodon* (sperm whale). Not of interest to fisheries.

Distribution: Central South Atlantic: off Brazil and Argentina; off Namibia and South African west coast. Pacific Ocean: South of Australia, eastern Tasmania and New Zealand.

Remarks: The long-used name for this species, familiar to most teuthologists even currently, was *Lycoteuthis diadema* (Chun, 1900). This species was designated a junior synonym to *L. lorigera* (Steenstrup, 1875) by Villanueva and Sanchez (1993: 31). Females of this species are indistinguishable from those of *L. springeri* (a species described from the Gulf of Mexico) except for a single large photophore in the musculature of the apex of the fins slightly dorsoposteriorly to the convex surface of the conus of the gladius, present in both sexes of *L. springeri* but absent in both sexes of *L. lorigera*.



right arm III



(from Villanueva & Sanchez, 1993)

dorsal view (male)



***Selenoteuthis scintillans* Voss, 1958**

Frequent synonyms / misidentifications: None / None.

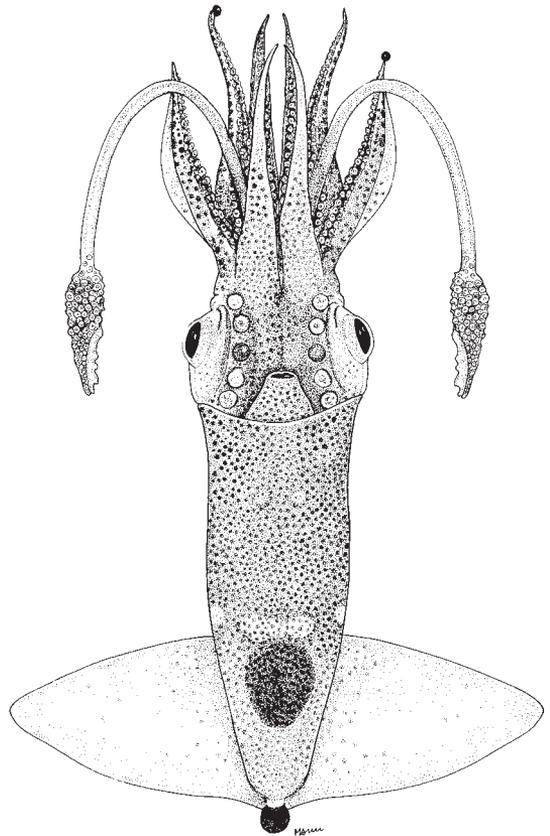
FAO names: **En** – Shining firefly squid; **Fr** – Encornet luciole scintillant; **Sp** – Lucernaluria centelleante.

Diagnostic characters: Five light organs on ventral side of eyeball, arranged in 1 row. Tentacular stalk with 3 light organs and mantle cavity with 8 to 10 luminous organs. Arm tips without globular light organs, not attenuated. **Single globular light organ on tip of each II and III arms** in mature males, which are absent in females. **One large and globular light organ on the posterior end of the body.** Male genitalia organs paired; hectocotylus absent.

Size: Maximum mantle length 45 mm

Habitat, biology, and fisheries: Tropical-subtropical Atlantic in the lower mesopelagic to upper bathypelagic, migrating diurnally to the epipelagic at night (0 to 3 290 m, 0 to 770 m by day, 0 to 154 m at night). Known predators are *Globicephala macrorhynchus* (short-finned pilot whale) and *G. melas* (long-finned pilot whale). Not of interest to fisheries.

Distribution: Tropical and subtropical western and eastern North Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Records of confidence off Morocco and Canary Islands.



ventral view



MAGNAPINNIDAE

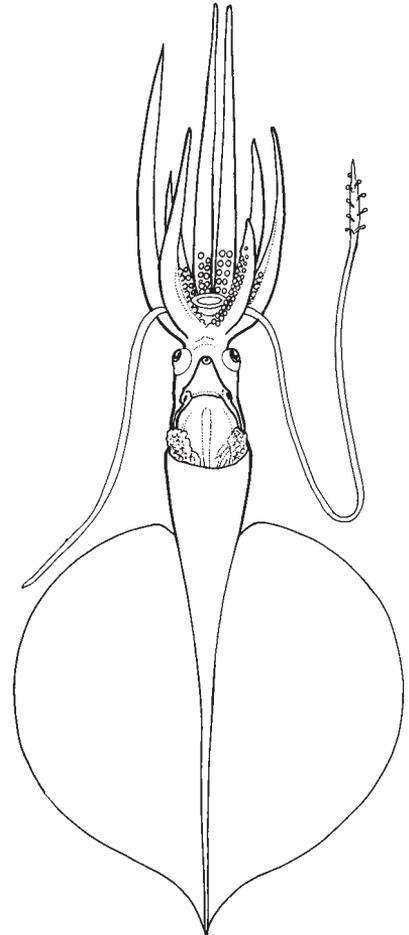
Bigfin squids

Diagnostic characters: Rough estimates from videos indicate total lengths up to 7 m. Eyes large. Head short without distinct neck or brachial pillar. **Fins terminal and very large, about 70 to 90% of mantle length.** Muscular mantle restricted to the anterior 10 to 15% of the sessile region (fins without the free anterior fin lobes) of the fins. Short tail usually present. **Arms with 2 regions: short, proximal-arms with large suckers and long, very slender distal-arms covered with minute suckers. Arms suckers with bi- to quadriserial suckers on proximal-arms. Tentacles with 2 regions: short, proximal-tentacles that may or may not bear numerous suckers and long, very slender distal-tentacles covered with numerous minute suckers.** Tentacles without keels, pads or locking apparatuses. **Arms and tentacles are approximately equal in thickness and length.** Buccal connectives attach to ventral margins of arms IV. Funnel with oval locking-apparatus without tragus or antitragus. Photophores absent.

Habitat, biology, and fisheries: This seems a cosmopolitan family; specimens were recorded in the eastern Atlantic, off Africa (3°40'N to 2°30'W); in the western Atlantic, off Brazil and the Gulf of Mexico; in the Indian Ocean and in the central Pacific. Very little is known about the biology of this bathypelagic family, occurring between depths of 1 940 and 4 735 m. Most described specimens are based on paralarvae or juveniles. The adult and subadult squids, observed from submersibles or ROVs, have the following features: the arms and tentacles typically are held in an unusual position: they extend at sharp angles to the body axis then abruptly (sometimes at a 90° angle) turn anteriorly. The “elbow” is, roughly, two-thirds of the length of the mantle away from the body axis. The tentacles are usually not easily recognizable in videos; the arms and tentacles, therefore, appear as 10 equal appendages. Length of the arms/tentacles of the squid are about 10 to 20 times the mantle length although they are highly contractile. It was estimated the fin length of their specimen at about two-thirds of the mantle length. Not of interest to fisheries.

Species occurring in the area

The family Magnapinnidae was originally based on a single species, *Magnapinna pacifica* Vecchione and Young, 1998. However, the discovery of a second species, *M. atlantica* Vecchione and Young, 2006, and the understanding that other known specimens and species belong in the family indicate that this poorly known deep-sea family may have as many as 5 species based on only 11 specimens (Vecchione and Young, 2013). Two of the species are well-described and 4 of them are weakly separated from one another. At present, only *M. talismani* can be reported from the area. Therefore, and until more information is acquired, the other specimens filmed off Africa remain *Magnapinna* sp.



ventral view

Similar families occurring in the area

Based on similarity, this family seems to be closely related to the group known as “chiroteuthid families”. These families include the Chiroteuthidae, Mastigoteuthidae, Joubiniteuthidae, Batoteuthidae and Promachoteuthidae (Vecchione and Young, 2008). Of these, only the first 3 families were recorded in the area. Magnapinnidae differs from them in the following characters: narrow, very elongate (filiform) distal-arms and distal-tentacles; very large fins; relative length of the arms/tentacles, which is far greater than in any other squid.

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Magnapinna talismani* (Fischer and Joubin, 1907)

References

- Guerra, A., González, A.F., Rocha, F., Segonzac, M. & Gracia, J.** 2002. Observations from submersibles of rare long-arm bathypelagic squids. *Sarsia*, 87: 189–192.
- Roper, C.F.E. & Jereb, P.** 2010. Family Magnapinnidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 247–249.
- Vecchione, M. & Young R.E.** 1998. The Magnapinnidae, a newly discovered family of oceanic squid (Cephalopoda: Oegopsida). *South African Journal of Marine Science*, 20: 429–437.
- Vecchione, M. & Young, R.E.** 2006. The squid family Magnapinnidae (Mollusca; Cephalopoda) in the North Atlantic with a description of *Magnapinna atlantica*, n. sp. *Proceeding of the Biological Society of Washington*, 119(3): 365–372.
- Vecchione, M. & Young, R.E.** 2007. *Magnapinna talismani* (Fischer and Joubin, 1907). Version 08 February 2007 (under construction). http://tolweb.org/Magnapinna_talismani/52212/2007.02.08 in The Tree of Life Web Project, <http://tolweb.org/>
- Vecchione, M. & Young R.E.** 2013. Magnapinnidae Vecchione and Young, 1998. *Magnapinna* Vecchione and Young, 1998. Bigfin squid. Version 08 January 2013 (under construction). <http://tolweb.org/Magnapinna/52203/2013.01.08> in The Tree of Life Web Project, <http://tolweb.org/>
- Vecchione, M., Young, R.E., Guerra, A., Lindsay, D.J., Clague, D.A., Bernhard, J.M., Sager, W.W, Gonzalez A.F., Rocha F.J., & Segonzac, M.** 2001. Worldwide observations of remarkable deep-sea squids. *Science*, 294: 2505–2506.

Magnapinna talismani (Fischer and Joubin, 1907)

Frequent synonyms / misidentifications: *Mastigoteuthis talismani* Fischer and Joubin, 1907 / None.

FAO names: **En** – Talisman bigfin squid; **Fr** – Encornet ailé du Talisman; **Sp** – Luria alada del Talisman.

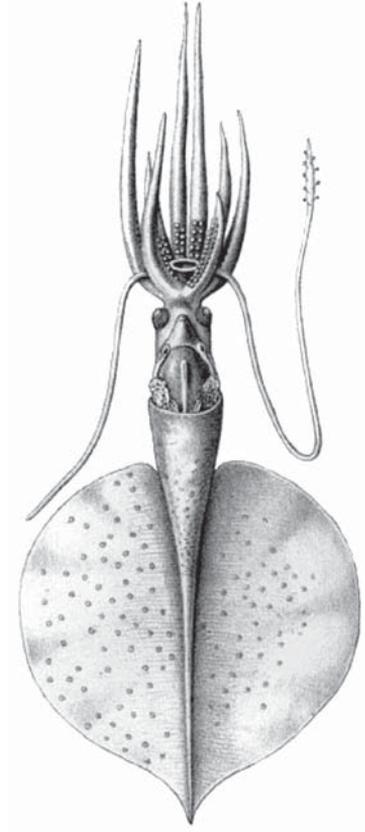
Diagnostic characters: **Fin length 90% mantle length.** Ventral surface of fins covered with white nodules. Funnel locking apparatus with oval depression and possible tragus. Suckers on proximal-arm in 2 series and closely packed. Proximal-arm suckers with smooth inner rings. Tentacles long, thin and cylindrical; much thinner than the arms at their base; no evidence of a discreet club is present; no distinct transition between proximal- and distal-tentacle; distal-tentacle apparently with numerous, small suckers.

Size: Maximum mantle length 61 mm.

Habitat, biology, and fisheries: Very rare bathypelagic squids. Caught in open bottom trawl to a depth of 3 175 m. Not of interest to fisheries.

Distribution: Tropical and northern subtropical Atlantic: area off the Azores and Cape Verde Islands.

Remarks: *Mastigoteuthis talismani* was placed in *Magnapinna* (family Magnapinnidae) by Vecchione and Young (2006).



ventral view
(from Fischer & Joubin, 1907)



MASTIGOTEUTHIDAE

Whiplash squids

Diagnostic characters: Fins large (about 50% of ML) to very large (about 90% of ML) and in terminal position. Short tail present (often absent due to damage during capture). **Arms IV longest**, thickest and with expanded lateral membranes. **Funnel locking apparatus oval**, usually with knobs (tragus, antitragus) affecting the shape of the depression in the funnel component in different species; specific shape varies with species. The **tentacles are elongate and whip-like** with tentacular clubs that are **little differentiated from the tentacular stalks** except that they are covered with thousands of extremely small suckers in numerous (30 or more) irregular series. **Light organs present on eyeball or eyelid and /or skin integument or absent**. Weakly muscled and reddish in colour.

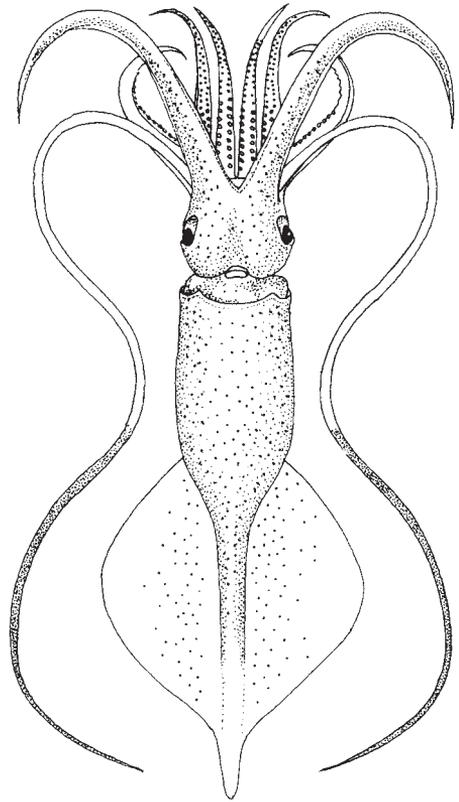
Habitat, biology, and fisheries: Deepwater pelagic and benthopelagic. The biology of all the species of this family is very poorly known. Some species have been observed from submersibles drifting just above the ocean floor and dangling tentacles within a few millimetres of the bottom, presumably, to capture copepods and other small components of the epibenthic zooplankton. Vesiculate tissue in the squid, especially in the ventral arms, reduces negative buoyancy. Complex actions of large fins maintain the head-down posture in spite of the concentration of buoyant tissue at the anterior end. None of the species have interest to fisheries.

Remarks: This family is among the most taxonomically confused families of all deepsea squid mainly because many characters are based on the tentacles and light organs, structures often lost and abraded during capture. For these reasons, it is difficult to distinguish between species. Several genera and subgenera have been erected for various entities of mastigoteuthids, and the systematics of the family has been in a state of flux for many years. Because the family includes many poorly known species that cannot be confidently divided at the generic level, yet we, here, recognize only the single genus *Mastigoteuthis*, in agreement with Vecchione *et al.* (2007) and Roper and Jereb (2010).

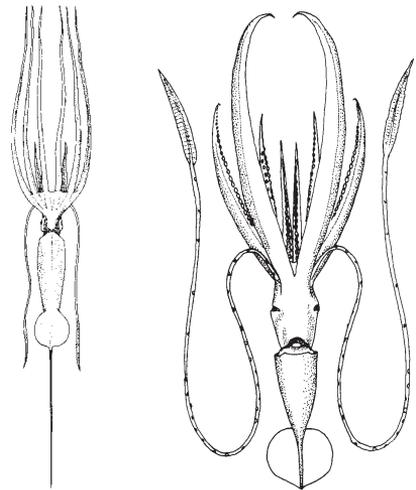
Similar families present in the area

Chiroteuthidae: tentacle suckers usually in 4 series or absent.

Joubiniteuthidae: tentacles are distinguishable from the arms and possesses slender needle-like tail.



ventral view



dorsal view
Joubiniteuthidae

ventral view
Chiroteuthidae

Key to the species of Mastigoteuthidae occurring in the area

- 1a. No light organs on ventral side of eyeball → 2
 1b. Two large light organs on ventral side of eyeball *Mastigoteuthis hjorti*
- 2a. Numerous small integumental black light organs surrounded by a light ring scattered over surface of body, especially on ventral side; arms sucker rings smooth or with a few slightly obtuse teeth → 3
 2b. Body surface devoid of light organs *Mastigoteuthis agassizii*
- 3a. Arm sucker rings without teeth; no funnel pockets → 4
 3b. Arms sucker rings with teeth; with funnel pockets *Mastigoteuthis glaukopis*
- 4a. Skin without tubercles *Mastigoteuthis magna*
 4b. Mantle and other skin, except fins, covered with small tubercle *Mastigoteuthis danae*

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Mastigoteuthis agassizii* Verrill, 1881.
 *Mastigoteuthis danae* (Joubin, 1933).
 *Mastigoteuthis glaukopis* Chun 1908.
 *Mastigoteuthis hjorti* Chun, 1913.
 *Mastigoteuthis magna* Joubin, 1913.

References

- Joubin, L. 1920. Céphalopodes provenant des Campagnes de la Princesse Alice (1898–1910). *Resultats des campagnes scientifiques sur son yacht par Albert I Prince souverain de Monaco*, 54: 1–95, 16 pls.
- Nesis, K.N. 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), Cephalopods of the world. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Okutani, T. 2005. *Cuttlefishes and squid of the world*. Publication for the 40th Anniversary of the Foundation of the National Cooperative Association of Squid Processors. Tokyo, Japan, 253 pp.
- Rancurel, P. 1971. *Mastigoteuthis grimaldii* (Joubin, 1895) Chiroteuthidae peu connu de l'Atlantique tropical (Cephalopoda: Oegopsida). *Cah. ORSTOM* (Sér. Oceanogr.), 9(2): 125–146.
- Rancurel, P. 1972. *Mastigoteuthis inermis* espèce nouvelle de Chiroteuthidae du Golfe de Guinée (Cephalopoda-Oegopsida). *Bulletin de la Societe Zoologique de France*, 97(1): 25–34.
- Rancurel, P. 1973. *Mastigoteuthis hjorti* Chun 1913. Description de trois échantillons provenant du Golfe du Guinée (Cephalopoda-Oegopsida). *Cah. ORSTOM* (Sér. Oceanogr.), 11(1): 27–32.
- Roper, C.F.E. & Jereb, P. 2010. Family Mastigoteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 250–256.

- Roper, C.F.E. & Sweeney, M.J.** 1992. Family Mastigoteuthidae. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. "Larval" and Juvenile Cephalopods: A manual for their identification. *Smithsonian Contributions to Zoology*, 513: 175-178.
- Roper, C.F.E. & Vecchione, M.** 1997. In-situ observations test hypotheses of functional morphology in *Mastigoteuthis* (Cephalopoda, Oegopsida). *Vie Milieu*, 47: 87–93.
- Salcedo-Vargas, M.A.** 1997. Cephalopods from the Netherlands Indian Ocean Programme (NIOP)-II. Mastigoteuthid lineage and related forms. *Beaufortia*, 47(3): 91–108.
- Salcedo-Vargas, M.A. & Okutani, T.** 1994. New classification of the squid family Mastigoteuthidae (Cephalopoda: Oegopsida). *Venus*, 53 (2): 119–127.
- Vecchione, M. & Young, R.E.** 2007a. *Mastigoteuthis agassizii* Verrill, 1881. Version 19 November 2007. http://tolweb.org/Mastigoteuthis_agassizii/19508/2007.11.19 in The Tree of Life Web Project, <http://tolweb.org/>
- Vecchione, M. & Young, R.E.** 2007b. *Mastigoteuthis hjorti* Chun, 1913. Version 19 November 2007. http://tolweb.org/Mastigoteuthis_hjorti/19517/2007.11.19 in The Tree of Life Web Project, <http://tolweb.org/>
- Vecchione, M., Young, R.E. & Lindgren, A.** 2007. Mastigoteuthidae Verrill, 1881. *Mastigoteuthis* Verrill, 1881. Whip-lash squid. Version 19 November 2007 (under construction). <http://tolweb.org/Mastigoteuthis/19453/2007.11.19> in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R. E., Vecchione, M. & Donovan, D.** 1999. The evolution of coleoid cephalopods and their present biodiversity and ecology. *South African Journal of Marine Science* , 20: 393–420.

***Mastigoteuthis agassizii* Verrill, 1881**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Agassiz's whiplash squid; **Fr** – Loutène filamentoux de Agassizi; **Sp** – Flageloluria de Agassizi.

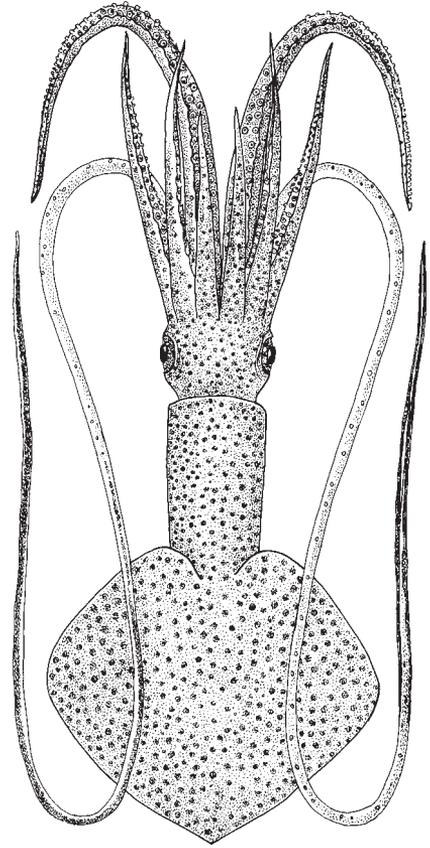
Diagnostic characters: Tubercles absent from mantle and other skin integument. **Fin length 67% mantle length.** Arm suckers with oblique apertures on inner rings and smooth inner margins. Tentacular club covers half of tentacle length; club base with scattered suckers mostly in 2 series for some distance; club suckers with circular aperture often with 2 or 3 teeth on one side. Integumental light organs on dorsal and ventral mantle, dorsal fin, head and arms; a small light organ inside on eyelid.

Size: Maximum mantle length 100 mm.

Habitat, biology, and fisheries: The only recorded prey items were crustaceans and predator was *Alepisaurus ferox* (lancetfish). Captured in open nets in 900 to 3 557 m. Not of interest to fisheries.

Distribution: Madeira and southwest of Tenerife; northwestern Atlantic.

Remarks: Another form has been described from the area, that cannot be separated with certainty from *Mastigoteuthis agassizii* at present (Vecchione and Young 2007): *M. grimaldii* Joubin, 1895, the original description of which was based on a damaged 38 mm ML specimen, caught near the Azores. This is considered of incertus status at present, but may prove to be a distinct species as well as a synonym of *M. agassizii* in the future.



dorsal view

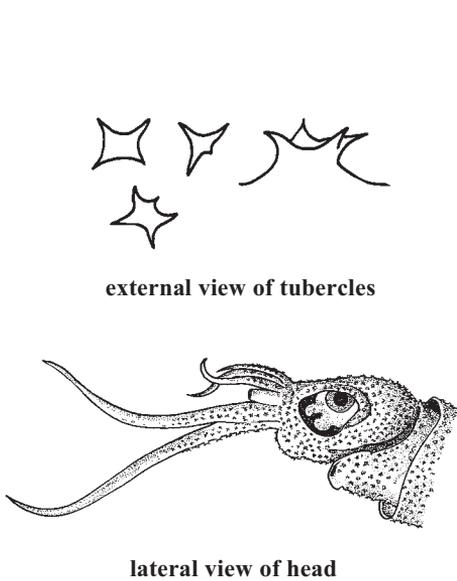
(after Okutani, 2005)



Mastigoteuthis danae (Joubin, 1933)

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Dana's whiplash squid; **Fr** – Loutène filamentoux de Dana; **Sp** – Flageloluria de Dana.



external view of tubercles

lateral view of head

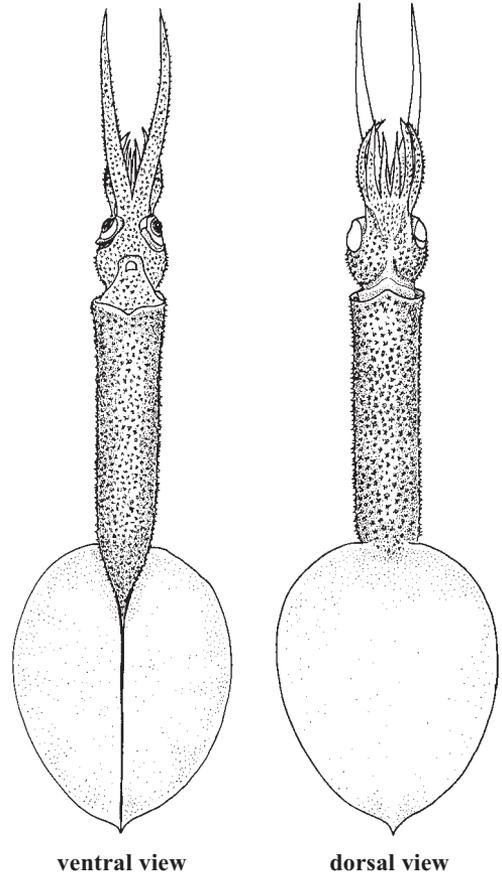
(all illustrations after Vechione, Young & Salcedo-Vargas, 2004)

Diagnostic characters: Mantle and other skin, except fins, covered with small, cartilaginous stellate tubercles. Funnel locking apparatus with a very large tragus and a distinct antitragus. Arm suckers without teeth. Tentacles stalk about 2 mm in length and slender; club enlarged in diameter, about 7 mm long; club tip slender, about 3 mm long, with sucker buds. Light organs absent.

Size: Maximum mantle length 30 mm.

Habitat, biology, and fisheries: Occurring at depths of 60 to 2 680 m, 100 to 298 m at night. Not of interest to fisheries.

Distribution: Canary islands, Cape Verde; Azores, Bermuda, Antilles; northwestern Indian Ocean.



ventral view

dorsal view



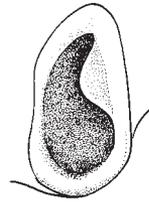
***Mastigoteuthis glaukopsis* Chun, 1908**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Glaucous / Blue whiplash squid; **Fr** – Loutène filamentoux glauque; **Sp** – Flageloluria glauca.



tentacular club



funnel-locking apparatus

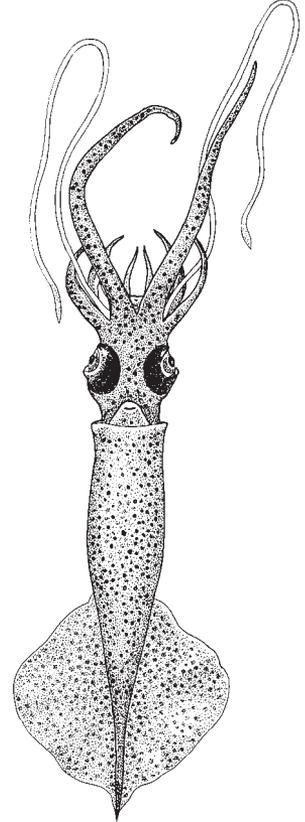
(all illustrations after Chun, 1910)

Diagnostic characters: Tubercles absent from mantle and elsewhere. Fin length about half of mantle length; fins nearly rhomboidal in shape. Eyes large (15% of ML); occupy most of head. **Arm suckers with blunt, conical teeth around opening, with 5 to 7 slightly larger teeth distally.** Funnel-locking apparatus with tragus but no antitragus. Tentacular club not wider than stalk; club 70% of tentacle length; club with indistinct undulating protective membrane; proximally club with very small, scattered suckers; club then widens to occupy half the tentacle surface; distally club extends to leave only about one-third of circumference bare with suckers situated close together, nearly touching one another; club suckers become slightly larger distally except near tip; club suckers with 10 to 12 small teeth at approximately regular intervals around inner ring. Integumental light organs absent; eyelid light organ present. Vivid reddish brown colour.

Size: Maximum mantle length 112 mm.

Habitat, biology, and fisheries: Bathypelagic. Found at depths between 500 and 1 000 m. Not of interest to fisheries

Distribution: Madeira; northwest Indian Ocean; western Indian Ocean and Flores Sea; Indo-Pacific.



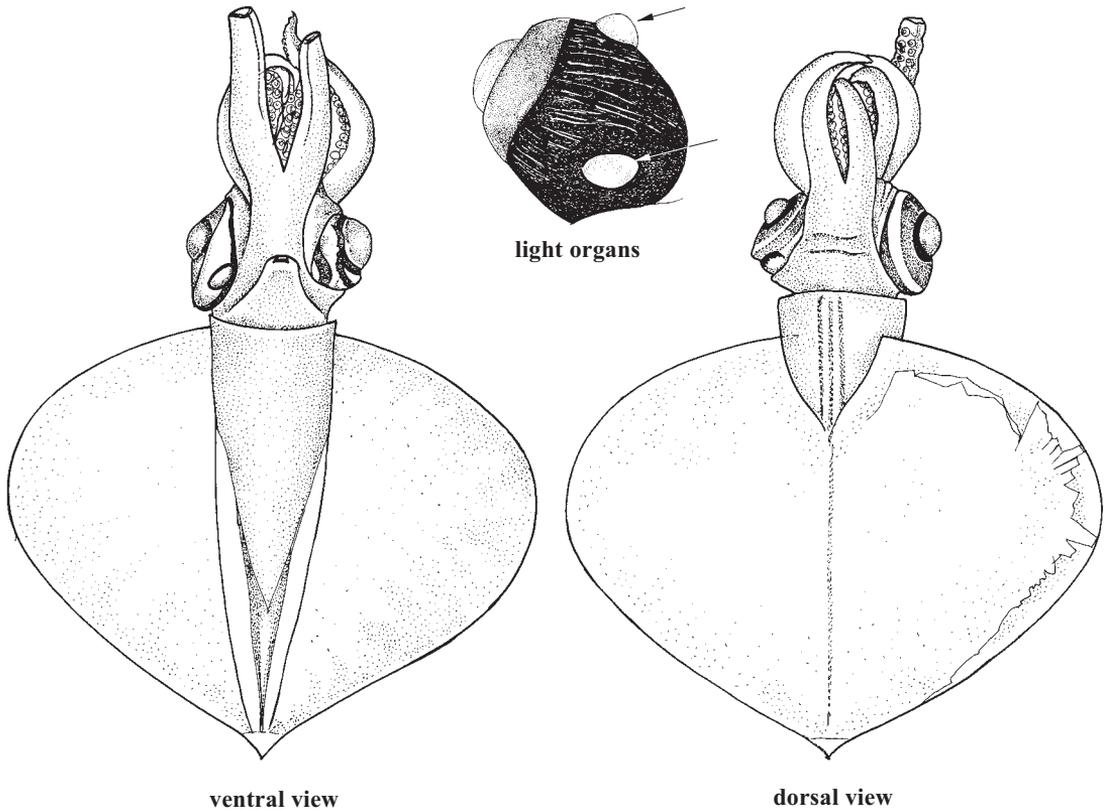
ventral view



***Mastigoteuthis hjorti* Chun, 1913**

Frequent synonyms / misidentifications: None / None.

FAO names: En – Hjort's whiplash squid; Fr – Loutène filamentoux de Hjort; Sp – Flageloluria de Hjort.



Diagnostic characters: Large tubercles cover mantle, head, funnel and aboral surface of arms in subadults (tubercles are often lost during capture). Fins large, nearly the full length of the mantle. Funnel locking apparatus with oval, slightly curved depression, posterolateral sides protrude; without tragus or antitragus; depression undercuts posterior margin. **Two large circular light organs on ventral surface of eyeball.**

Size: Maximum mantle length 100 mm.

Habitat, biology, and fisheries: A rare oceanic, mesopelagic and bathypelagic species. Found from the surface to 1 500 m, 0 to 760 m at night, 0 to 1 250 m by day. The only known predator is *Lagenodelphis hosei* (Fraser's dolphin). Not of interest to fisheries.

Distribution: Atlantis Seamount, Madeira, Gulf of Guinea; central North Atlantic and Bermuda; South Africa; Indian Ocean; Tasman Sea; central Pacific.



***Mastigoteuthis magna* Joubin, 1913**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Big whiplash squid; **Fr** – Grande loutène filamentoux; **Sp** – Gran flageloluria.

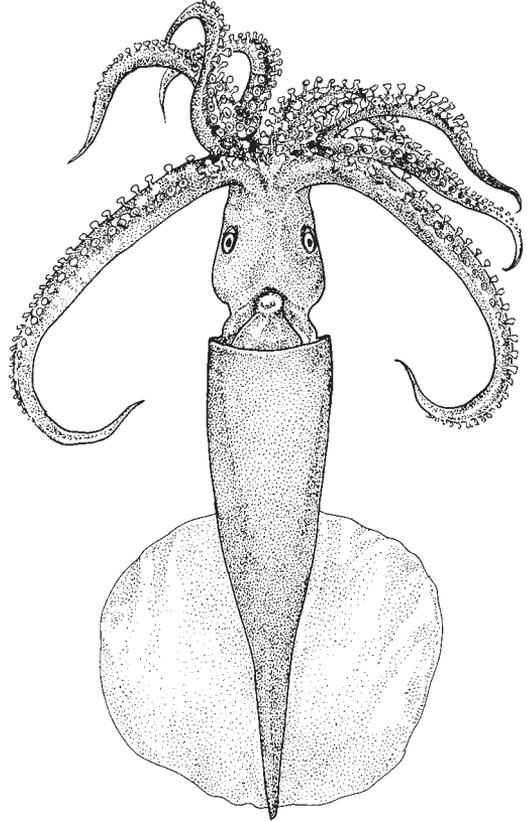
Diagnostic characters: Tubercles absent from mantle and elsewhere. Fin length (without tail) 66% of mantle length. **Fin width 79% of mantle length (without tail).** Mantle component of the funnel locking apparatus a rectilinear ridge narrow anteriorly and slightly wider posteriorly; funnel component an auricular-like groove. **Arm suckers with smooth inner rings.** Club length 80% of tentacle length; proximally club suckers in narrow band that gradually broadens; at midclub suckers cover three-fourths of tentacle; club suckers minute with smooth inner rings. Light organs absent.

Size: Maximum mantle length 160 mm.

Habitat, biology, and fisheries: Bathypelagic and bathyal, at night ascend to mesopelagic zone. commonly found at depths of 500 to 1 500 m. Not of interest to fisheries.

Distribution: Tropical and northern subtropical Atlantic. Indian Ocean and Tasman Sea.

Remarks: Another species, *Mastigoteuthis inermis* Rancurel, 1972, was described off the Côte d'Ivoire coast, based on a single specimen, 142 mm ML. At present, it is considered to be a junior synonym of *M. magna* (Vecchione *et al.*, 2007).



ventral view

(after Joubin, 1920)



NEOTEUTHIDAE

Neosquids

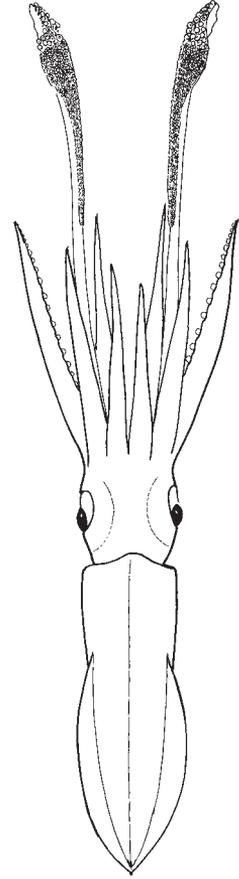
Diagnostic characters: Weakly muscled species of small to moderate size. Anterior fin lobes absent; posterior fin lobes free and convexes; fins attach laterally on mantle muscle. Buccal connectives attach to dorsal margins of ventral arms. Arms with biserial suckers. **Tentacular club bears in its proximal part a large number of mall suckers arranged in more than 10 rows; in the central part of the club are 4 rows of large suckers of equal or different size, while on the distal end are 3 or 4 rows of gradually smaller suckers;** carpal knobs in a single dorsal row or absent. Light organs absent.

Habitat, biology, and fisheries: Little is known about the biology of this group. Oceanic, meso-bathypelagic species. Captured with open nets between 200 and 3 500 m. No interest to fisheries.

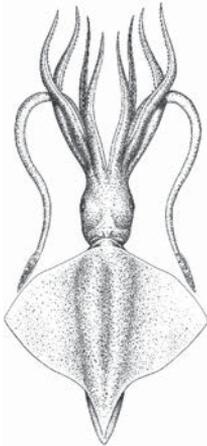
Similar families occurring in the area

Architeuthidae: posterior borders of fins are concave; carpal knobs in a cluster rather than a single row, or absent.

Brachiateuthidae: free anterior fin lobes and concave posterior fin borders; buccal membrane connectives attach to ventral, rather than dorsal, sides of ventral arms.

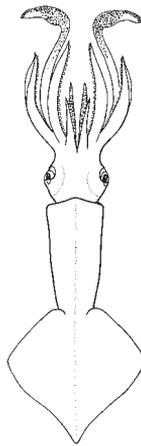


dorsal view



Ancistrocheiridae

(from Guerra, 1992)



Brachiateuthidae

List of species occurring in the area

The symbol is given when species accounts are included.

Narrowteuthis nesis Young and Vecchione, 2005.

Neoteuthis thielei Naef, 1921.

Remarks: This family, which was know as Alluroteuthidae Odner, 1923, contains 4 genera. One species of *Neoteuthis* is still undescribed.

References

- Adam, W.** 1984. Cephalopoda from West and South Africa. *Atlantide Report*, 13: 151–180.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Nesis, K.N. & Nikitina, I.V.** 1986. New genus and species of squid of the family Neoteuthidae (Cephalopoda, Oegopsida) from the south-eastern part of the Pacific Ocean. *Zool. Zhur.*, 65 (2): 290–294. In M.J. Sweeney, (comp.) *English Translations of Selected Publications on Cephalopods by Kir N. Nesis*. 2003. Vol. 1(2): 719–725. *Selected Translated Publications, 1965–1994*: 419–847.
- Roper, C.F.E.** 1992. Family Neoteuthidae Naef, 1921. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. "Larval" and Juvenile Cephalopods: A manual for their identification. *Smithsonian Contributions to Zoology*, 513: 101–103.
- Roper, C.F.E. & Jereb, P.** 2010. Family Neoteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 257–261.
- Vecchione, M. & Young, R.E.** 2008. Neoteuthidae Naef, 1921. Version 08 September 2008 (under construction). <http://tolweb.org/Neoteuthidae/19417/2008.09.08> in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R. E.** 1972. The systematics and areal distribution of pelagic cephalopods from the seas off Southern California. *Smithsonian Contributions to Zoology*, 97: 1–159.
- Young, R.E & Vecchione, M.** 2005a. *Narrowteuthis nesis*, a new genus and new species of the squid family Neoteuthidae (Mollusca: Cephalopoda). *Proceedings of the Biological Society of Washington*, 118(3): 566–569.
- Young, R.E. & Vecchione, M.** 2005b. *Narrowteuthis* Young and Vecchione, 2005. *Narrowteuthis nesis* Young and Vecchione, 2005. Version 12 September 2005 (under construction). http://tolweb.org/Narrowteuthis_nesis/19928/2005.09.12 in Tree of Life Project. <http://tolweb.org/>

***Narrowteuthis nesis* Young and Vecchione, 2005**

Frequent synonyms / misidentifications: None / None.

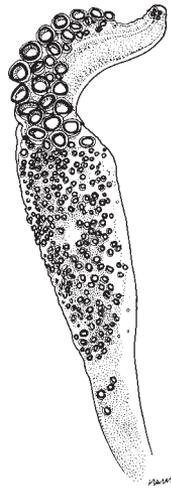
FAO names: **En** – Nesis' narrow squid; **Fr** – Loutène nouveau de Nesis; **Sp** – Neoluria de Nesis.

Diagnostics characters: Fins narrow, short (35% of ML) and attached to mantle (rather than gladius) over most of length. Tentacles long and slender. Clubs short (20% of the mantle length); with proximal suckers laterally compressed in the manus of the tentacular club; **large club suckers of the distal part of the manus with 19 or 20 slender, pointed teeth around entire margin of inner ring**; proximal teeth slightly shorter than distal teeth and size difference accentuates distally; suckers in 4 or 5 irregular series at proximal end of distal manus becoming 4 series on dactylus and 1 or 2 series on neck-like region of dactylus, which tapers to a slender, neck-like distal portion and expanded terminal pad; terminal pad with 6 or 7 suckers of varying sizes forming a circle or partial circle around a central bare space.

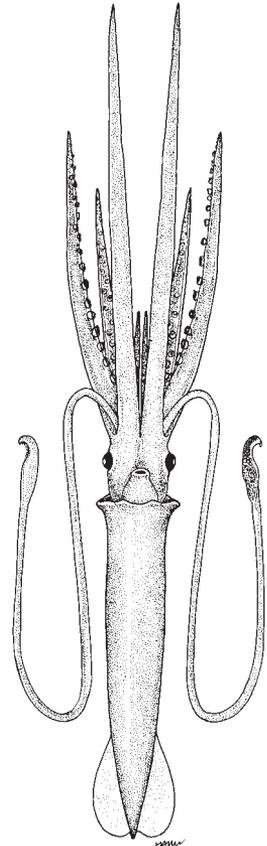
Size: Mantle length 100 mm.

Habitat, biology, and fisheries: Only 2 specimen are known; caught between 1 750 and 2 000 m. No interest to fisheries.

Distribution: Around the Canary Archipelago (eastern North Atlantic Ocean).



tentacular club



ventral view

(illustrations after Young & Vecchione, 2005)



Neoteuthis thielei Naef, 1921

Frequent synonyms / misidentifications: None / None.

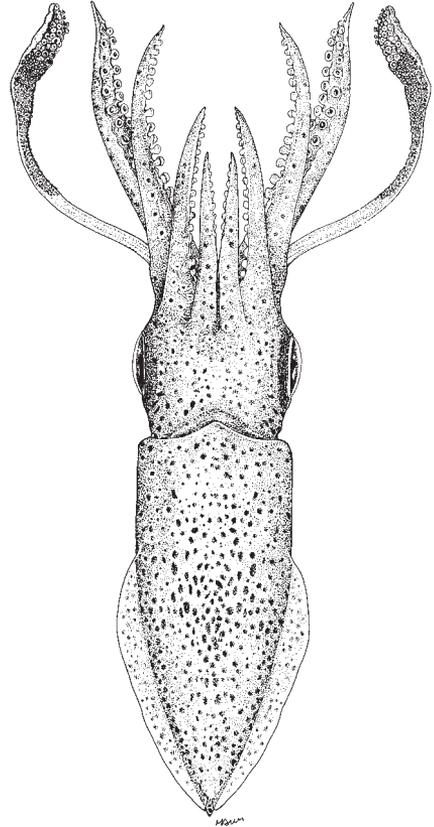
FAO names: **En** – Thiele's neosquid; **Fr** – Loutène de Thiele; **Sp** – Neoluria de Thiele.

Diagnostic characters: Fins in form of lateral narrow fringe; fin length is much more than half of mantle length; fin width much smaller than its length. Tentacles long, strong, with widened carpal part. No hooks on the arms. **Carpal part of the club occupies 67 to 80% of its length. Four rows of suckers in central part of club, median ones not larger than lateral.** Fixing apparatus located along the margin of carpal part of club, not reaching the stalk of the tentacles and consists of modified suckers only.

Size: Maximum mantle length 170 mm.

Habitat, biology, and fisheries: Very poorly-known species. Occurring in depths of 55 to 203 m by day, 0 to 400 m at night. Only known predator is *Thunnus obesus* (bigeye tuna). Not of interest to fisheries.

Distribution: Madeira to Gulf of Guinea; Caribbean Sea; central South Atlantic; northern and eastern Pacific.



dorsal view



OCTOPOTEUTHIDAE

Octopus squids

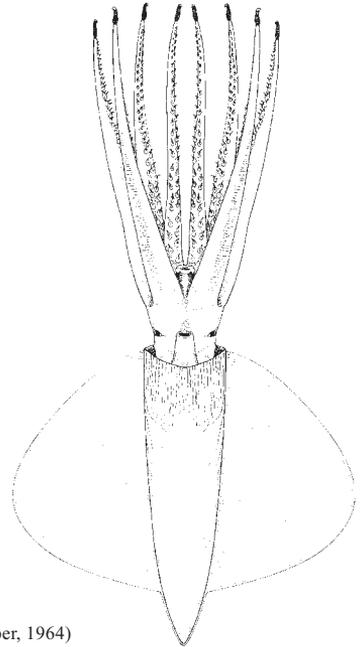
Diagnostic characters: The mantle is broad and weakly muscled. Tentacles reduced or absent in subadults and absent in adults. Arms with hooks in 2 series, replaced by suckers near armtips. Fins large, broad, muscular; fused to one another along dorsal mantle midline; length nearly equals mantle length. Some or all arms terminate in light organs. Mature males lack a hectocotylus but have a large penis that can extend well beyond the mantle opening.

Habitat, biology, and fisheries: Large muscular fins apparently provide most of the force for swimming. At least 1 species, *Taningia danae*, potentially interesting for fisheries purposes.

Remarks: Armtips of *Octopoteuthis* are frequently lost during capture. Systematic of this genus is very confused and revision is essential.

Similar families occurring in the area

Other families of large-finned squids (Ancistrocheiridae, Cycloteuthidae, Magnapinnidae, Thysanoteuthidae) have tentacles. Lepidoteuthids lack tentacles but have scales in the mantle.



(after Roper, 1964)

ventral view

Key the to genera and species of Octopoteuthidae occurring in the area

- 1a. Dorsolateral arm tips with very large oval light organs; remaining arm tips without large light organs (Fig. 1) *Taningia danae*
- 1b. All arm tips with slender light organs; dorsolateral arm-tip light organs not particularly enlarged *Octopoteuthis* → 2
- 2a. One or 2 light organs in transparent tissues at posterior end of mantle ventrally; 2 light organs inside mantle cavity, on either side of ink sac, dorsal to funnel retractor muscles → 3
- 2b. No light organs on tail, head, nor in mantle cavity, only elongated light organs on arm tips; fin reaches posterior end of mantle in juveniles, but adults have a short tail; arm hooks of large specimens with 2 accessory cusps *Octopoteuthis rugosa*
- 3a. One large light organ in transparent tissues at posterior end of mantle ventrally; fin terminates just beyond tail light organ, not reaching posterior end of mantle; arm hooks of small specimens without accessory cusps *Octopoteuthis* sp. A Young, 1972
- 3b. Two large light organs in transparent tissues at posterior end of mantle ventrally, one on each side of midline. → 4
- 4a. Tail light organs located on border between middle and posterior thirds of mantle; no light organs on bases of arms III and IV → 5
- 4b. Two tail light organs located at 20 to 25% mantle length from posterior end; fin reaches posterior end of mantle; tail short, almost indistinct in juveniles; light organs present on bases of arms III and IV *Octopoteuthis sicula*

- 5a. Fin reaches posterior end of mantle *Octopoteuthis danae*
 5b. Fin does not reach posterior end of mantle, its posterior margin somewhat further back than tail light organs; fin length $\pm 75\%$ mantle length; tail long, acuminate, flattened from above, with narrow lateral fringes *Octopoteuthis megaptera*

Remarks to the key of species

According to Young (1972, <http://tolweb.org/Octopoteuthis/19839>) the systematics within this genus rests primarily on 3 features: (1) the number of tail photophores; (2) the size of the tail in small specimens; (3) the presence of accessory cusps on the hooks in small specimens.

In the North Atlantic, 3 forms are known: *Octopoteuthis* sp. A, with a single tail photophore, absence of accessory cusps on the arm hooks, and a long tail, and two forms with 2 tail photophores. One of the latter, *O. danae*, has a tail of moderate length while the other, *O. megaptera*, has a long tail. The type species of the genus, *O. sicula*, is likely the senior synonym of either *Octopoteuthis* sp. A or *O. danae*. *O. rugosa*, from the waters off South Africa and south Australia, is described only from very large specimens (14.5–23 cm ML) and cannot be adequately compared to many of the other species.

Nesis (1987) indicates that the presence of arm base photophores on arms III and IV is another specific character and these are absent in *O. danae* and *O. megaptera*.

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Octopoteuthis danae* Joubin, 1931.
-  *Octopoteuthis megaptera* (Verrill, 1885).
-  *Octopoteuthis rugosa* Clarke, 1980.
-  *Octopoteuthis sicula* Ruppell, 1844.
-  *Taningia danae* Joubin, 1931.

References

- Adam, W. 1952. Céphalopodes. Résultats scientifiques des expéditions océanographiques Belge dans les eaux cotières africaines de l'Atlantique Sud (1948–1949), Céphalopodes. *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique*, 3(3): 1–142.
- Adam, W. 1960. Les céphalopodes de l'Institut Français d'Afrique noire II. *Bulletin de l'Institut français d'Afrique Noire*, 22: 465–511.
- Clarke, M.R. 1967. A deep-sea squid, *Taningia danae* Joubin, 1931. *Symposia of the Zoological Society of London*, 19: 127–143.
- González, A.F., Guerra, A. & Rocha, F. 2003. New data on the life history and ecology of the deep-sea hooked squid *Taningia danae*. *Sarsia*, 88: 297–301.
- Guerra, A. 1992. Mollusca: Cephalopoda. In M.A. Ramos, *et al.*, eds. *Fauna Ibérica* Vol. 1. Museo Nacional de Ciencias Naturales CSIC Madrid, pp. 1–327.
- Joubin, L. 1931. Notes préliminaires sur les céphalopodes de croisières du Dana (1921–1922) 3^e Partie. *Annals de l'Institut Oceanographique, Monaco*, 10: 169–211.
- Nesis, K.N. 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.

- Okutani, T.** 2005. *Cuttlefishes and squid of the world*. Publication for the 40th Anniversary of the Foundation of National Cooperative Association of Squid Processors. Tokyo, 253 pp.
- Roper, C.F.E., & Jereb, P.** 2010. Family Octopoteuthidae. In P. Jereb & C.F.E Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and oegopsid squids*. FAO species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO pp. 262–268.
- Roper, C.F.E. & Vecchione, M.** 1993. A geographic and taxonomic review of *Taningia danae* Joubin, 1931 (Cephalopoda: Octopoteuthidae), with new records and observations on bioluminescence. In T. Okutani, R.K. O'Dor & T. Kubodera, eds. *Recent Advances in Cephalopod Fishery Biology*. Tokyo: Tokai University Press, pp. 441–456.
- Stephen, S.J.** 1991. Systematics of the pelagic squid genus *Octopoteuthis* Rüppell, 1844 (Cephalopoda: Teuthoidea) with emphasis on species in the North Atlantic. *Bulletin of Marine Science*, 49: 668.
- Stephen, S.J. & Jefferts, K.** 1992. Octopoteuthidae. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. "Larval" and Juvenile Cephalopods: A Manual for Their Identification. *Smithsonian Contributions to Zoology*, 513: 165–166.
- Villanueva, R. & Sánchez, P.** 1993. Cephalopods of the Benguela Current off Namibia: new additions and considerations on the genus *Lycoteuthis*. *Journal of Natural History*, 27(1): 15–46.
- Young, R.E.** 1972. The systematics and areal distribution of pelagic cephalopods from the seas off Southern California. *Smithsonian Contributions to Zoology*, 97: 1–159.

Octopoteuthis danae Joubin, 1931

Frequent synonyms / misidentifications: None / None.

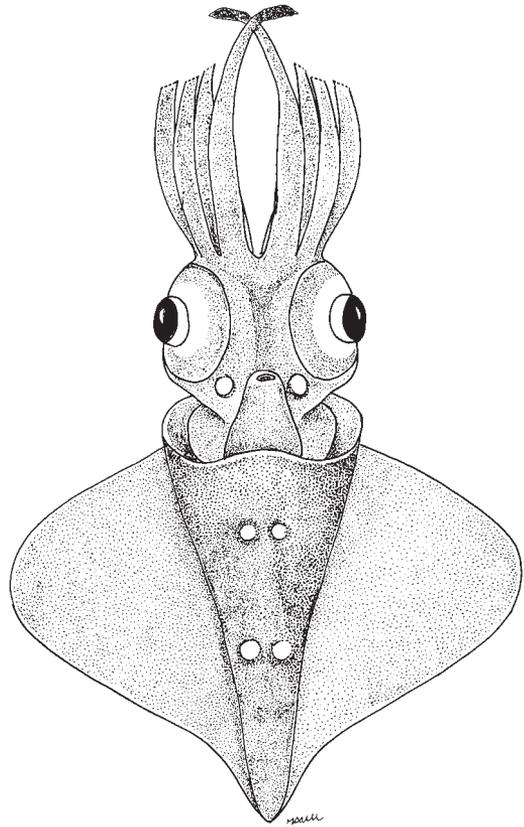
FAO names: **En** – Dana's octopus squid;
Fr – Encornet-poulpe de Dana; **Sp** – Pulpota de Dana.

Diagnostic characters: **Paired light organs** in tissues at posterior end of the mantle on ventral side of the body. The mantle tissue, which covers these light organs, is transparent. A pair of light organs inside the mantle cavity on both sides of the ink sac, most concretely located on dorsal sides of the funnel retractor muscles. A pair of large light organs in tissue of posterior ventral surface of the mantle, one on each side midline. **Tail light organs located on the border between middle and posterior third of the mantle. No light organs at the bases of arms III and IV. Fin reaching the posterior end of the mantle.**

Size: Maximum mantle length 52 mm.

Habitat, biology, and fisheries: Biology unknown. Not of interest to fisheries.

Distribution: Northern subtropical Atlantic: Guinea Bissau; Bermuda.



ventral view



***Octopoteuthis megaptera* (Verrill, 1885)**

Frequent synonyms / misidentifications: None / None.

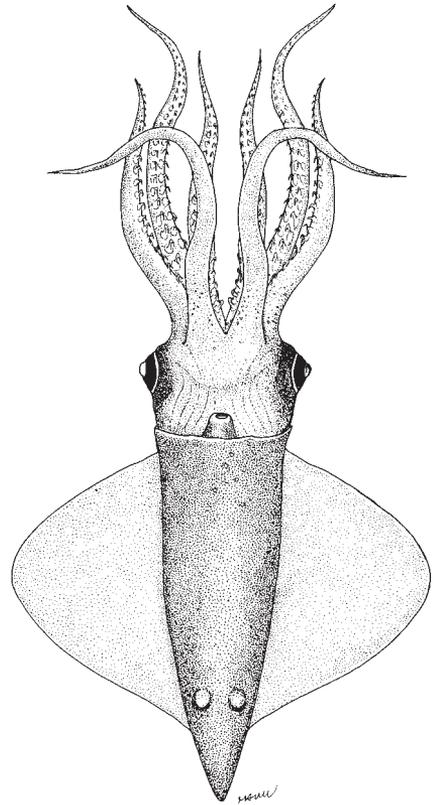
FAO names: **En** – Large-fin octopus squid; **Fr** – Encornet-poulpe ailé; **Sp** – Pulpota alada.

Diagnostic characters: Paired light organs in tissues at posterior end of the mantle on ventral side of the body. The mantle tissue, which covers these light organs, is transparent. A pair of light organs inside the mantle cavity on both sides of the ink sac. A pair of large light organs in tissue of posterior ventral surface of the mantle, one on each side midline. Tail light organs located on the border between middle and posterior third of the mantle. **No light organs at the bases of arms III and IV. Fin not reaching the posterior end of the mantle, its rear edge located somewhat farther than level of tail light organ. Fin length about 75% mantle length. Tail long, acuminate, flattened from above, with narrow lateral fringes.**

Size: Maximum mantle length 200 mm; more often 80 to 100 mm.

Habitat, biology, and fisheries: Occurring at depths between 50 and 1 100 m. Female weight 100 g at approximately 80 mm mantle length. Tropical-subtropical cosmopolitan, mesopelagic to bathypelagic and bathyal, ascending to the epipelagic zone at night. Located at 37 to 278 km from shore off Namibia. Males maturing from 45 to 87 mm, females from 57 to 100 mm; fully mature at more than 100 mm mantle length. Not of interest to fisheries.

Distribution: Gulf of Guinea, Namibia; central Atlantic; western Atlantic from Nova Scotia to Suriname; Somalia; Japan; eastern central Pacific.



ventral view



***Octopoteuthis rugosa* Clarke, 1980**

Frequent synonyms / misidentifications: None / None.

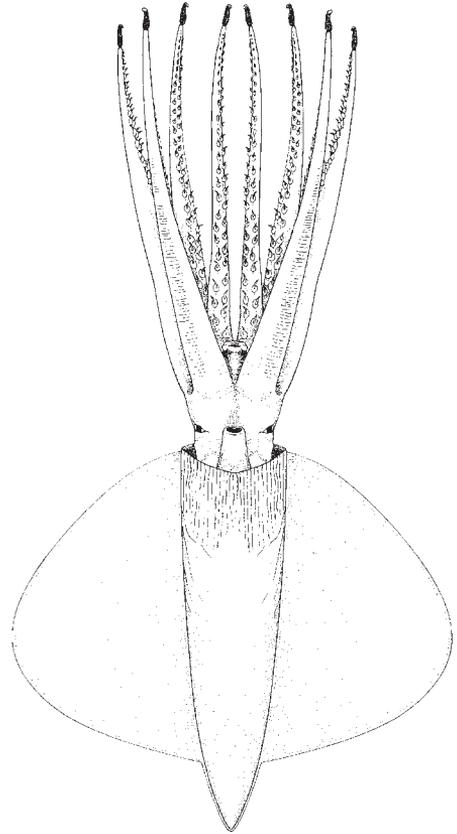
FAO names: **En** – Rough-skin octopus squid; **Fr** – Encornet-poulpe rugueux; **Sp** – Pulpota rugosa.

Diagnostic characters: No light organs on tail or head nor in mantle cavity, only elongated light organs on arm tips. In juveniles, fin reaching posterior end of the mantle, but adults have a short tail. **Ventrally, the anterior mantle of females shows longitudinal grooves in the gelatinous layer.**

Size: Maximum mantle length 230 mm (female); maximum size estimated from beaks ranges from 210 to 270 mm mantle length and 550 g total weight.

Habitat, biology, and fisheries: Tropical-subtropical Atlantic and Indo-West Pacific, mesopelagic. Found at depths of 503 to 700 m. Known predators are *Prionace glauca* (blue shark), *Xiphias gladius* (swordfish), *Hyperoodon planifrons* (southern bottlenose whale), *Mesoplodon layardii* (strap-toothed whale), *Physeter catodon* (sperm whale) and *Diomedea exulans* (wandering albatross). Not of interest to fisheries.

Distribution: Morocco, Mauritania; Equatorial Atlantic; Namibia and South Africa; Nova Scotia; Bay of Biscay; south Georgia; Sulu and Flores seas; southwestern Australia and Tasman Sea.



ventral view

(after Roper, 1964)



***Octopoteuthis sicula* Rüppell, 1844**

Frequent synonyms / misidentifications: None / None.

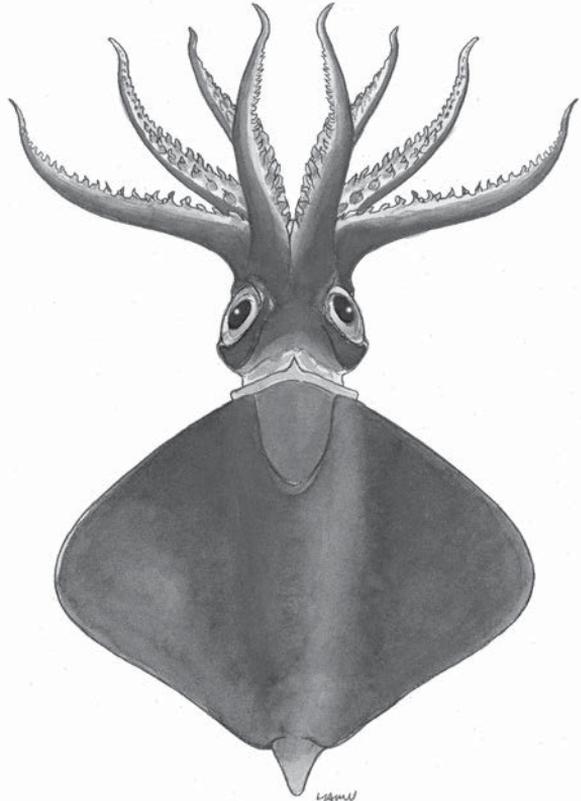
FAO names: **En** – Rüppell's octopus squid; **Fr** – Encornet-poulpe de Rüppell; **Sp** – Pulpito volador.

Diagnostic characters: Paired light organs in tissues at posterior end of the mantle on ventral side of the body one on each side midline. The mantle tissue, which covers these light organs, is transparent. A pair of light organs inside the mantle cavity on both sides of the ink sac. Tail light organs located at distance of 20 to 25% of mantle length from posterior end of the body. Fin reaches posterior end of the mantle. Light organs present at bases of arms III and IV. Tail short, almost indistinct in juveniles.

Size: Maximum mantle length 500 mm; more frequent sizes 200 mm in females and about 130 mm mantle length in males.

Habitat, biology, and fisheries: Tropical and subtropical Atlantic, Indian and Pacific oceans and Mediterranean Sea; mesopelagic and bathypelagic, ascending to the epipelagic zone at night (0 to 2 500 m; 750 to 1 110 m by day and 692 to 1 478 m at night), 80 km from shore off Oregon. Known predators include *Coryphaenoides armatus* (abyssal grenadier), *C. filifer* (filamented rattail), *Thunnus alalunga* (albacore), *T. thynnus* (bluefin tuna), *Stenella coeruleoalba* (striped dolphin) and *Ziphius cavirostris* (Cuvier's beaked whale). Males mature from mantle length 122 mm and females from 234 mm. Potential interest to fisheries.

Distribution: Central North Atlantic, Senegal, Côte d'Ivoire, Gulf of Guinea, Angola; North Atlantic from Labrador Current, northwest of Newfoundland to Nova Scotia and Scotland to Galicia and Azores; southwest Atlantic; southern Africa; Mediterranean; Indian and Pacific oceans.



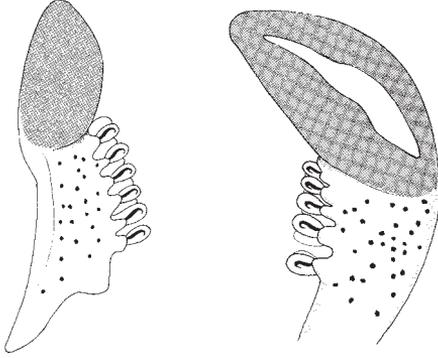
dorsal view



Taningia danae Joubin 1931

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Taning's octopus squid; **Fr** – Encornet-poulpe de Taning; **Sp** – Pulpota de Taning.



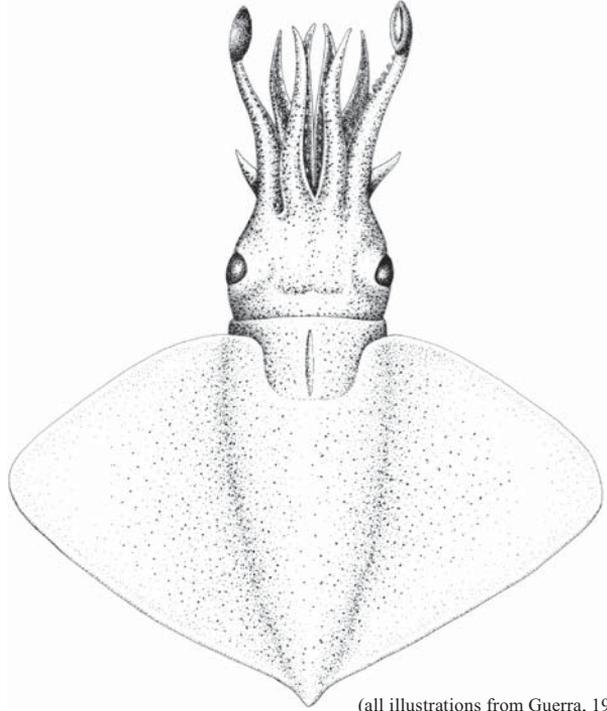
light organs in arms II

Diagnostic characters: Mantle broad and robust. Fins very large and thick, occupying approximately 75% mantle length. Its width is 130% of mantle length. Adults without tentacles. **Arms with 2 rows of strong hooks. Second pair of arms each with a large, distinct, black light organ at the tip,** which luminescence surface is covered by an eyelid-type mechanism.

Size: Maximum mantle length 170 cm.

Habitat, biology, and fisheries: The biology of this species is poorly known. It is an oceanic and mesopelagic species that probably spawns on the seafloor. Occurring in depths between 200 and 1 500 m. It feeds on epipelagic and upper mesopelagic finfishes, crustaceans and cephalopods and is heavily preyed upon by marine mammals and pelagic fishes. Females considerably larger than males. Assuming a daily periodicity in the deposition of growth increments in the statoliths, the maximum estimated age of 2 specimens of 66 and 124 kg would be 21 and 33 months, respectively. The most remarkable feature of a 16 kg and 700 mm mantle length male was the presence of a long penis with a total length of 730 mm that protruded 230 mm outside the mantle. Spermatophores long, up to 170 mm. The estimated potential fecundity was close to 5 million oocytes and the size range of the oval oocytes varied from 0.4 to 1.0 mm. The reproductive strategy adopted by this species seems to rely on multiple spawning, which is characteristic of a relative environmental stability. Potentially interesting species for fisheries purposes. Most catches were taken by demersal and bottom trawlers.

Distribution: It is a cosmopolitan species, mainly found in tropical and subtropical waters, but also in boreal and notalian waters.



(all illustrations from Guerra, 1992)

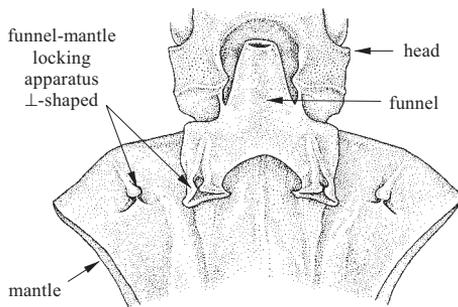
dorsal view



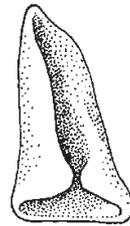
OMMASTREPHIDAE

Flying squids and arrow squids

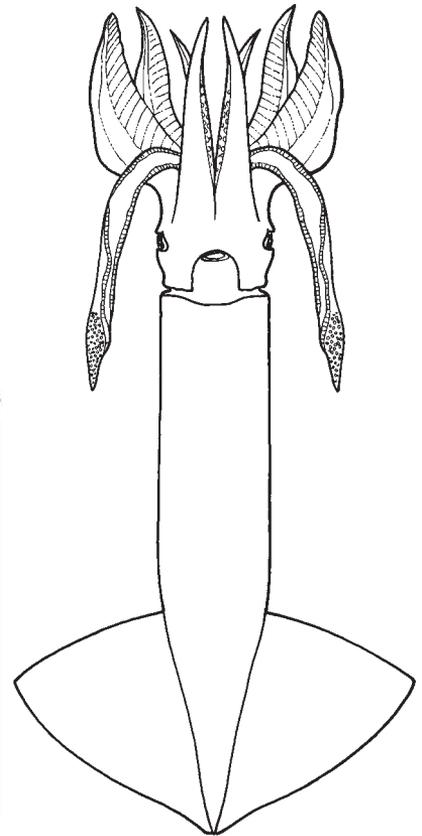
Diagnostic characters: Medium- to large-sized squids (common between 200 and 500 mm ML). **Funnel locking cartilage with an inverted T-shaped groove.** Arms with biserial suckers. Four rows of suckers on tentacular clubs (club dactylus with 8 sucker series in *Illex*). Hooks never present on arms or clubs. One of the ventral pair of arms usually hectocotylized in males. Buccal connectives attach to dorsal borders of ventral arms. Gladius distinctive, slender. Paralarvae with fused tentacles forming a trunk-like proboscis.



internal view of mantle



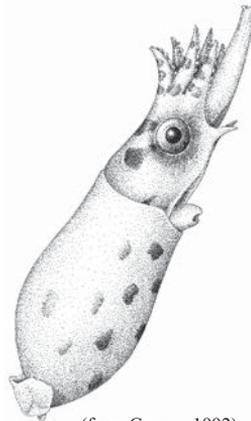
funnel cartilage



ventral view

Habitat, biology, and fisheries:

Oceanic and neritic. Found from the surface to 2 500 m. This is one of the most widely distributed and conspicuous families of squids in the world. Ommastrephids are powerful swimmers and some species form large schools. Large numbers of small eggs are produced, encapsulated in gelatinous masses that either float on or near the surface or settle on the bottom. Hatching of the 'Rhynchoteuthion' paralarvae occurs after a few days to a few weeks.



(from Guerra, 1992)

**Rhynchoteuthion
paralarva**

Post spawning mortality is high. Growth is very fast; in many species the lifespan does not exceed 1 year. Flying squids are very active predators on many kind of prey (fish, pelagic crustacean and other squids); cannibalism is common. They are preyed upon by sea birds, marine mammals and large fishes. Some neritic species exhibit strong seasonal migrations, wherein they occur in huge numbers in inshore waters where they are accessible to fisheries activities. Most species are exploited commercially. *Todarodes pacificus* makes up the bulk of the squid landings in Japan, and the captures of *Illex argentinus* on the Patagonian shelf and around the Falkland islands reach up to 300 000 tonnes some years). Trawling and jigging improved by light attraction are by the far the most common fishing methods. The large size of most species and the heavily muscled structure, make them ideal for human consumption. They are marketed fresh, frozen, or processed in various ways, such as dried, salted, salted-fermented.

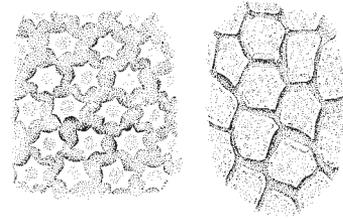
Similar families occurring in the area

Lepidoteuthidae: distinct “scales” on surface of mantle; funnel-locking apparatus a simple, straight groove.

Loliginidae: eyes covered with a transparent corneal membrane; funnel-locking apparatus a simple, straight groove; small suckers on buccal lappets.

Onychoteuthidae: tentacular clubs with claw-like hooks; funnel-locking apparatus a simple, straight groove.

Thysanoteuthidae: funnel-locking apparatus a long, narrow longitudinal groove with a short broad transverse groove at midlevel; fins broad, rhomboidal, extending nearly full length of mantle.

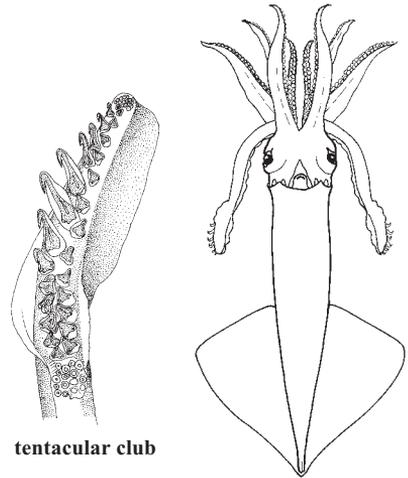


scales on surface of mantle
Lepidoteuthidae



simple, straight
Lepidoteuthidae, Loliginidae
T-shaped
Thysanoteuthidae
L-shaped
Ommastrephidae

funnel locking apparatus

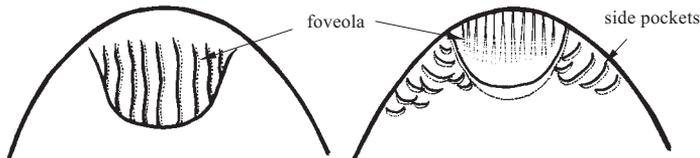


tentacular club

Onychoteuthidae

Key to the subfamilies, genera and species of Ommastrephidae occurring in the area

- 1a. Funnel groove without foveola or with foveola but without lateral pockets (Fig. 1a); funnel cartilage short, with almost straight longitudinal groove; tentacular fixing apparatus weakly developed, without tubercle-like knobs → 2
- 1b. Funnel groove with foveola and lateral pockets (Fig. 1b) (the latter sometimes absent in *Eucleoteuthis* and *Hyaloteuthis*); funnel cartilage elongate, its longitudinal groove slightly bent anteriorly; tentacular fixing apparatus with 1 or several knobs alternating with suckers **Subfamily Ommastrephinae** → 6

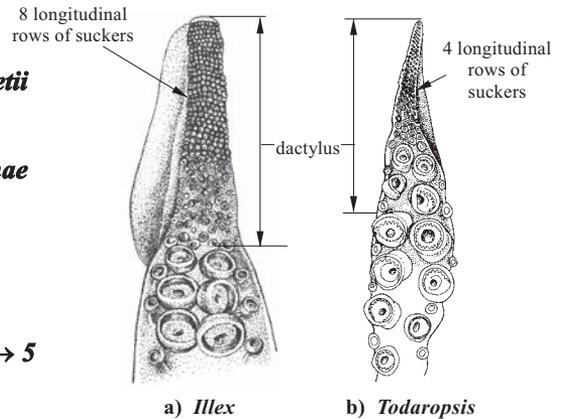


a) subfamily **Todarodinae** b) subfamily **Ommastrephinae**

Fig. 1 funnel groove

- 2a. Funnel groove simple, without foveola **Subfamily Illicinae** → 3
- 2b. Funnel groove with foveola (Fig. 1) and as rule with longitudinal cutaneous ridges (not always conspicuous in *Ornithoteuthis*) but always without lateral pockets → 4

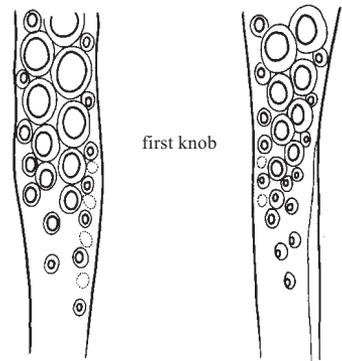
- 3a. With 8 longitudinal rows of small suckers at the end of tentacular club (Fig. 2a) ***Illex coindetii***
- 3b. With 4 longitudinal rows of suckers at the end of the tentacular club (Fig. 2b) ***Todaropsis eblanae***
- 4a. Mantle cylindrical, without tail; carpal of suckers on club long, occupying considerable part of the tentacular stalk; no light organs on viscera **Subfamily Todarodinae → 5**
- 4b. Mantle narrow, conical, attenuate posteriorly into thin tail; carpal group of club suckers short; 2 light organs on viscera . . . ***Ornithoteuthis antillarum***



a) *Illex* b) *Todaropsis*
(from Guerra, 1992)
Fig. 2 tentacular club

- 5a. Fin width 54 to 57% mantle length; length of dorsal arms 39 to 44% mantle length; tentacle length 60 to 68%, club length 49 to 55% mantle length; manus length 36 to 41% mantle length ***Todarodes sagittatus***
- 5b. Fin width 61 to 63% mantle length; length of dorsal arms 46 to 51% mantle length; tentacle length 88 to 97%, club length 63 to 71% mantle length; manus length 45 to 50% mantle length ***Todarodes angolensis***
- 6a. Ventral surface of mantle with external light organs → 7
- 6b. Ventral surface of mantle without external light organs → 8
- 7a. Pair of long stripes of subcutaneous, bioluminescent tissue (large elongate photophores) along ventral side of mantle, 1 on each side of midline, each stripe broken posteriorly by gap level of maximum width of fin; 2 oval bioluminescent spots on head near anterior margin of mantle aligned with the base of each ventral arm ***Eucleoteuthis luminosa***
- 7b. Nineteen round, bioluminescent patches arranged in a fixed pattern on ventral side of mantle, which form convergent or separate pairs; bioluminescent patches at base, in middle and near tip of each ventral arm ***Hyaloteuthis pelagica***

- 8a. No more than 2 suckers in carpal part of club proximal to first knob (Fig. 3a); dorsal light organ present subcutaneously on mantle. ***Sthenoteuthis pteropus***
- 8b. From 4 to 7 suckers in carpal part of club proximal to first knob (Fig. 3b); dorsal light organ absent subcutaneously on mantle ***Ommastrephes bartramii***



a) *Sthenoteuthis* b) *Ommastrephes*
Fig. 3 tentacular club

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Eucleoteuthis luminosa* (Sasaki, 1915).
-  *Hyaloteuthis pelagica* (Bosc, 1802).
-  *Illex coindetii* (Vérany, 1839).
-  *Ommastrephes bartramii* (Lesueur, 1821).
-  *Ornithoteuthis antillarum* Adam, 1957.
-  *Sthenoteuthis pteropus* (Steenstrup, 1855).
-  *Todarodes angolensis* Adam, 1962.
-  *Todarodes sagittatus* (Lamarck, 1798).
-  *Todaropsis eblanae* (Ball, 1841).

References

- Dillane, E., Galvin, P., Coughlan, J., Lipinski, M. & Cross, T.F.** 2005. Genetic variation in the lesser flying squid *Todaropsis eblanae* (Cephalopoda, Ommastrephidae) in east Atlantic and Mediterranean waters. *Marine Ecology Progress Series*, 292: 225–232.
- Dunning, M.** 1998. 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). In N.A. Voss, M. Vecchione, R.B. Toll M.J. & Sweeney, eds. Systematics and Biogeography of Cephalopods. *Smithsonian Contributions to Zoology*, 586: 425–433.
- Dunning, M.C. & Wormuth, J.H.** 1998. The ommastrephid squid genus *Todarodes*: a review of systematics, distribution and biology (Cephalopoda; Teuthoidea). In N.A. Voss, M. Vecchione, R.B. Toll M.J. & Sweeney, eds. Systematics and Biogeography of Cephalopods. *Smithsonian Contributions to Zoology*, 586: 385–391.
- Guerra, A.** 1992. *Mollusca, Cephalopoda*. In M.A. Ramos et al., eds. *Fauna Ibérica*. Vol. 1. Museo Nacional de Ciencias Naturales. CSIC, Madrid, 327 pp.
- Jorgensen, E.M.** 2009. *Field guide to squids and octopods of the eastern North Pacific and Bering Sea*. Alaska Sea Grant College Program University of Alaska Fairbanks.
- Lipinski, M.R.** 1992. Cephalopods and the Benguela ecosystem: trophic relationships and impact. *South African Journal of Marine Science*, 12: 791–802.
- Martinez, P., Sanjuan, A. & Guerra, A.** 2002. Identification of *Illex coindetii*, *I. illecebrosus* and *I. argentinus* (Cephalopoda: Ommastrephidae) throughout the Atlantic Ocean; by body and beak characters. *Marine Biology*, 141: 131–143.
- Martinez, P., Pérez-Losada, M., Guerra, A. & Sanjuan, A.** 2005. First genetic validation and diagnosis of the short-finned squid species of the genus *Illex* (Cephalopoda: Ommastrephidae). *Marine Biology*, 148: 97–108.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Nigmatullin, Ch.M.** 1984. Taxonomy, phylogeny and ecological radiation of squids of family Ommastrephidae. *Malacological Review*, 17: 117–118.
- Okutani, T.** 2005. *Cuttlefishes and squids of the world*. Publication for the 40th Anniversary of the Foundation of National Cooperative Association of Squid Processors, 253 pp.

- Roeleveld, M.A.C.** 1988. Generic interrelationships within the Ommastrephidae (Cephalopoda). In M.R. Clarke E.R. & Trueman, eds. *The Mollusca. Paleontology and Neontology of Cephalopods*. Academic Press, New York, 12(16): 277–291.
- Roper, C.F.E. & Mangold, K.** 1998. Systematic and distributional relationships of *Illex coindetii* to the genus *Illex* (Cephalopoda; Ommastrephidae). In P.G. Rodhouse, E.G. Dawe & R.K. O'Dor, eds. Squid recruitment dynamics. The genus *Illex* as a model. The commercial *Illex* species. Influences on variability. *FAO Fisheries Technical Paper*, 376: 13–26.
- Roper, C.F.E., Nigmatullin, C. & Jereb, P.** 2010. Family Ommastrephidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and oegopsid squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 269–347.
- Wormuth, J.H., O'Dor, R.K., Balch, N., Dunning, M.C., Forch, E.C., Harman, R.F. & Rowell, T.W.** 1992. Family Ommastrephidae Steenstrup, 1857. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. 'Larval' and juvenile cephalopods: A manual for their identification. *Smithsonian Contributions to Zoology*, 513: 105–119.
- Wakabayashi, T., Saito, K., Tsuchiya, K. & Segawa, S.** 2002. Descriptions of *Eucleoteuthis luminosa* (Sasaki, 1915) and *Ornithoteuthis volatilis* (Sasaki, 1915) paralarvae in the Northwestern Pacific. *Venus*, 60(4): 237–260.
- Wormuth, J.H.** 1998. Workshop deliberations on the Ommastrephidae: A brief history of their systematics and a review of the systematics, distribution and biology of the genera *Martialia* Rochebrune and Mabile, 1889, *Todaropsis* Girard, 1890, *Dosidicus* Steenstrup, 1857, *Hyaloteuthis* Gray, 1849 and *Eucleoteuthis* Berry, 1916. In N.A. Voss, M. Vecchione, R.B. Toll & M.J. Sweeney, eds. Systematics and Biogeography of Cephalopods. *Smithsonian Contributions to Zoology*, 586: 373–383.
- Young, R. E., Vecchione, M. & Compagno Roeleveld, M.A.** 2012. Ommastrephidae Steenstrup 1857. Version 10 November 2012. <http://tolweb.org/Ommastrephidae/19418/2012.11.10> in The Tree of Life Web Project, <http://tolweb.org/>
- Zuev, G.V., Nigmatullin, Ch.M., Chesalin, M.V. & Nesis, K.N.** 2002. Main results of long-term worldwide studies on tropical nektonic oceanic squid genus *Sthenoteuthis*: an overview of the soviet investigations. *Bulletin of Marine Science*, 71(2): 1019–1060.

***Eucleoteuthis luminosa* (Sasaki, 1915)**

Frequent synonyms / misidentifications: *Symplectoteuthis luminosa* Sasaki, 1915 / None.

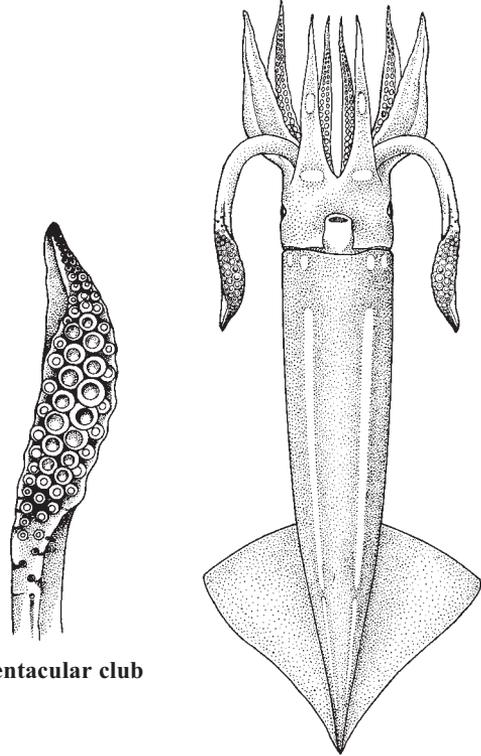
FAO names: **En** – Luminous flying squid; **Fr** – Encornet lumineux; **Sp** – Pota luminosa.

Diagnostic characters: Mantle muscular, conical, tapering to moderately sharp tail. Fins sagittate, length about 50% mantle length; width about 50% mantle length; single fin angle 35° to 50°; **2 sets of vivid longitudinal stripes along ventral surface of the mantle (light organs); a large photophoric patch at the bases of each arm IV.** Left arm hectocotylized at distal end with absence of suckers: paired papillae are remnants of sucker stalks.

Size: Maximum mantle length 180 mm in females, about 227 mm in males.

Habitat, biology, and fisheries: An oceanic species which biology is practically unknown. Occurring probably from the surface to 1 300 m. It spawns egg masses that resemble large gelatinous balls. The paralarvae range from 1.4 to 12.4 mm mantle length and are characterized by having subocular and intestinal light organs, a relatively long proboscis index (length of proboscis/mantle length = 0.70). It does not appear to school as the majority of ommastrephid squids. Incidentally caught in the jigging fishery for *Todarodes pacificus*, but it is not utilized currently. Apparently abundant in mixing waters between Kurishio and the Oyashio off Japanese waters.

Distribution: Bi-peripheral oceanic species with ranges in the North Pacific Ocean and the southern hemisphere. Absent in the North Atlantic. Distributed in the southeastern Atlantic, between 10°S and 36°S. Pacific Ocean: subtropical and temperate waters. Indian Ocean: between 15°S and 34°S.



tentacular club

ventral view



***Hyaloteuthis pelagica* (Bosc, 1802)**

Frequent synonyms / misidentifications: *Sepia pelagica* Bosc, 1802; *Ommastrephes pelagicus* d'Orbigny, 1834–1848; *Ommatostrephes pelagicus* Steestrup, 1880.

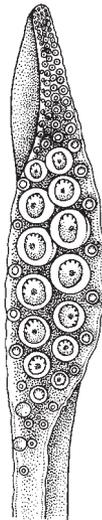
FAO names: En – Glassy flying squid; Fr – Encomet vitreux; Sp – Pota estrellada.

Diagnostic characters: The funnel groove has a **foveola with 7 to 9 longitudinal folds and 0 to 3 side pockets**, often obscure. **Large cutaneous photophores present** on the ventral surface of the mantle and arms in the form of round, yellow, reflective patches: **3 situated along each ventral arm and 19 arranged in a fixed pattern on the ventral surface of the mantle**, where they form pairs, either closely set or well-separated. **A single, round photophore on ventral surface of each eye and 1 round photophore on the intestine.** Dactylus of tentacular club with 4 series of small suckers. Carpal-locking apparatus on tentacular stalk with 1 knob and 1 smooth-ringed sucker. Largest medial suckers on manus of club with 1 large, pointed tooth at distal margin. Protective membrane of tentacular club very poorly developed. Tips of all arms not attenuate. Arms have 15 to 22 pairs of suckers. **Right, or rarely left, ventral arm has a hectocotylus of the smooth type**, with the absence of suckers on the modified portion. Fins rhomboidal with straight or very slightly convex posterior edges. Fin length 35 to 40% and fin width 55 to 62% of mantle length; fin angle 45° to 55°. Mantle-funnel locking cartilage not fused.

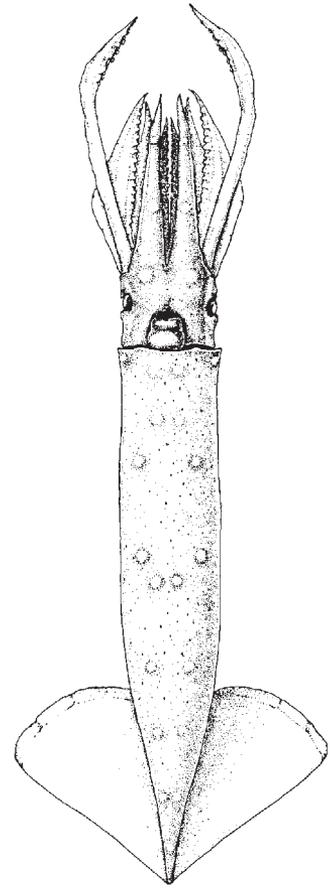
Size: Maximum mantle length 105 mm.

Habitat, biology, and fisheries: This species is distributed mainly in zones of trade-wind currents and adjoining parts of the central waters of the cyclonic circulations; it is absent from zones of equatorial divergence. This epipelagic to mesopelagic and upper bathypelagic species inhabits open waters over great depths of more than 400 m. Paralarvae and juveniles inhabit the upper 50 m at night and from 100 to 200 m during the day. Subadult and adult squids inhabit subsurface layers from 15 to 20 m to 150 m at night. During the daytime they inhabit depths from 200 to 800 m. Males reach maturity at 50 to 65 mm mantle length (age 80 to 100 days), and females mature from 50 to 90 mm (age 80 to 135 days). The life span is half a year. Spawning occurs throughout the year with some seasonal variability in activity. Egg size is 0.9 to 1.0 mm, and female potential fecundity varies between 30 000 and 100 000 ova. Oviducts of mature females contain a maximum of 500 ripe eggs. The species is an intermittent, multibatch spawner. It feeds mainly on juvenile teleosts and squid, hyperiid amphipods, crab larvae, chaetognathes and to a lesser degree on copepods, shrimps, euphausiids and teleost larvae. Its predators include several oceanic species of ommastrephid squids, lancet fish, different species of tunas, marlins, sea birds and dolphins. The species is not fished commercially.

Distribution: All tropical and subtropical oceans. In the eastern Atlantic Ocean from 10°N to 28°N and between 5°S and 15°S.



tentacular club



ventral view



Illex coindetii (Vérany, 1839)

Frequent synonyms / misidentifications: None / None.

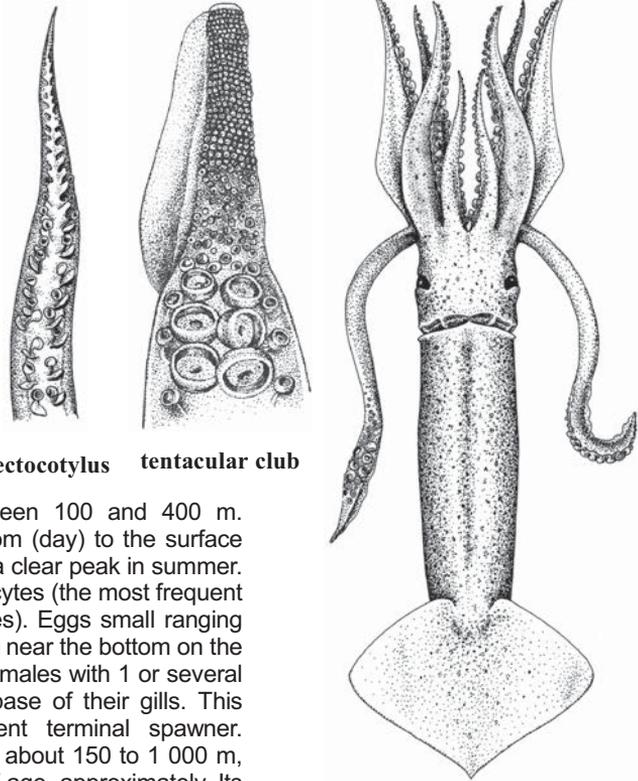
FAO names: **En** – Broadtail shortfin squid; **Fr** – Encornet rouge; **Sp** – Pota voladora.

Diagnostic characters: Funnel groove without foveola or lateral pockets. Rhomboid fins, width-to-length ratio 1,4 to 1,5; fin angle obtuse (90 to 100° or more). Arms with 2 rows of suckers. Tentacular club with 8 longitudinal rows of minute subequal suckers. Left or right ventral arm of male hectocotylized with a modified length ranging from 15 to 33% of its arm length, distal trabeculae modified to papillose flaps.

Size: Maximum mantle length 380 mm in females and 280 mm in males.

Habitat, biology, and fisheries: The species live at the bottom in the middle and lower sublittoral and upper bathyal, in temperate latitudes. Occurring from the surface to 1 100 m, most frequent between 100 and 400 m. Undertake vertical migrations from the bottom (day) to the surface (daytime). Spawns throughout the year with a clear peak in summer. Fecundity ranging from 3 500 to 300 000 oocytes (the most frequent range being from 30 000 to 200 000 oocytes). Eggs small ranging from 0.8 to 1.2 mm (major axis), possibly laid near the bottom on the continental slope at midwaters. Copulated females with 1 or several spermatophore packages attached at the base of their gills. This species can be considered as intermittent terminal spawner. Juveniles and adults have been collected at about 150 to 1 000 m, and they recruit to the fishery at 3 months of age, approximately. Its diet was composed by, in decreasing order of importance, fish, crustaceans and cephalopods. It was also noted the presence of cannibalism. *Illex coindetii* is mainly neritic nekto-benthic predator with wide spectra of preys. Mantle length instantaneous relative growth rate were 0.72% for males and 0.84% for females. Its life span is about 1 year for males and females. The age at which individuals mature is variable, ranging from 140 to 271 days in males and from 183 and 285 in females. Growth rates in both sexes were dependent of the season of hatching. Squids hatched in winter attained larger sizes for the same age than squids hatched in other seasons. These seasonal differences in growth were only evident after squids reached 8 months of age. No population or subpopulation differentiation was apparent for Atlantic and Mediterranean samples comparison. This species is taken throughout the year as bycatch in bottom and pelagic trawls, and, in lesser extent, with gill and trammel nets, in depths between 100 and 400 m in the Mediterranean, off West Africa and the northeastern Atlantic. It has an increasingly fisheries value. No separate statistics are reported.

Distribution: Supposedly the only amphiatlantic *Illex* species. Its distribution extends over the Mediterranean Sea and eastern Atlantic from 60°N to 17°S and 30°W, and in the western Atlantic waters, from the waters of Virginia to Venezuela.



hectocotylus tentacular club

dorsal view

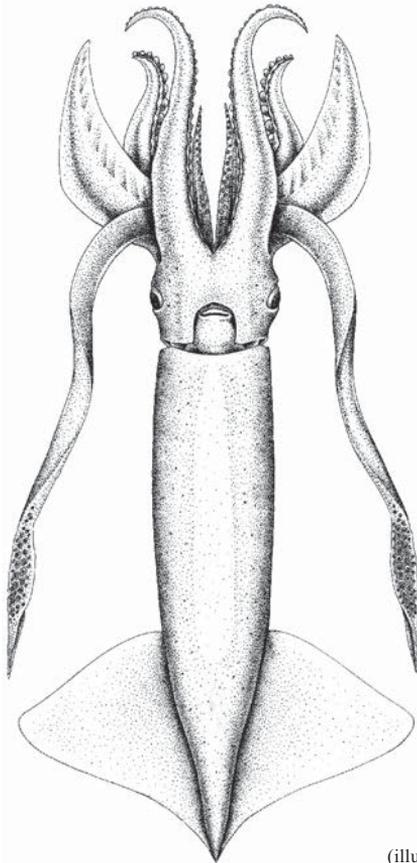
(all illustrations from Guerra, 1992)



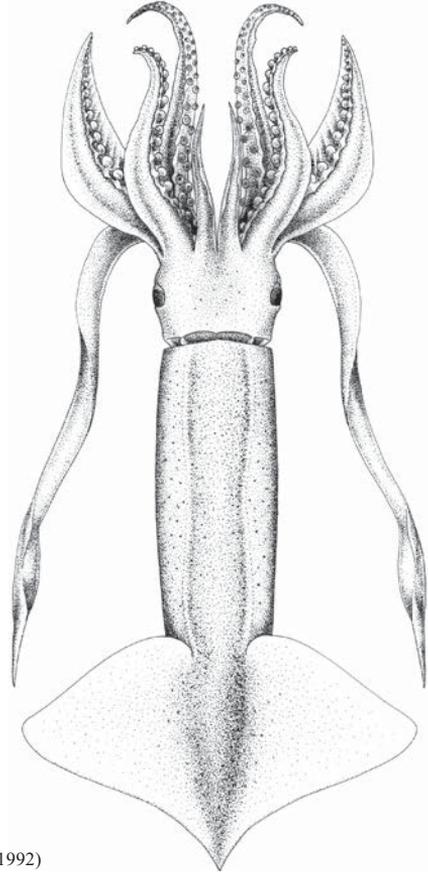
Ommastrephes bartramii (Lesueur, 1821)

Frequent synonyms / misidentifications: *Ommastrephes caroli* (Furtado, 1887) / None.

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



ventral view



dorsal view

(illustrations from Guerra, 1992)

Diagnostic characters: Mantle muscular, robust, cylindrical in the anterior part and not drawn out posteriorly into a pointed tail. **Funnel groove with foveola and 2 to 5 side pockets.** Square-shaped head with 4 folds in each side of neck region. Fins muscular, length 35 to 45% of mantle length, width about 60% of the mantle length and single angle 45 to 50°. Arms with 2 rows of suckers, which central suckers have 20 to 25 quitinous conical teeth of different sizes. The distal suckers possess 7 large conical teeth. **In all individuals, but especially in adults, the specimens possess a wide triangular membrane (269 to 34% of the ML) resembling a sail in the ventral side of the ventrolateral arms, which length surpasses 50% of the arm length.** Tentacle robust, longest than the mantle, with a club with 4 longitudinal rows of suckers, the central ones being larger than the marginal ones. Suckers of dactylus small and disposed in 4 to 6 rows. The suckers of the manus are disposed in 4 rows. Four to 6 small suckers on the tentacular stalk proximal to the first smooth knob of the fixing apparatus. **A long golden or silvery stripe along the ventral midline from mantle opening to level of fin insertion (probably it is a luminescence organ). Similar golden tissue on ventral surface of head and ventral arms. Numerous closely-packed, small, very irregular shaped, often interconnected, light organs embedded under the skin in muscle of mantle ventrally. Similar light organs occur in patches on ventral surface to head.**

Size: Maximum mantle length 900 mm but more often within the range 300 to 400 mm.

Habitat, biology, and fisheries: Mesopelagic and epipelagic cosmopolitan species inhabiting from the surface up to 1 500 m depth. Excellent swimmer species. Undertakes important seasonal horizontal migrations in schools and also day/night vertical movements. Spawning season in the Pacific extended from January to June with 2 main annual cohorts growing at different rates. Two spawning peaks in the Atlantic populations in summer and autumn, with different growth rates. Potential fecundity was estimated to about 400 000 oocytes. It is considered as a multiple spawner. Life span of 1.5 to 2 year. Feeds mainly on teleostean fish and crustaceans, and in a lesser extent of cephalopods, even cannibalism. With the decline of the stocks of *Todarodes pacificus*, the effort of the Japanese squid fishery shifted towards the exploitation of flying squids with trammel nets. There are no fisheries directed at this species outside the Pacific, although several authors have demonstrated the importance as a potential resource in the Atlantic, as shown its presence as an important part of the diet of large teleosts and marine mammals. A recent estimation of the potential biomass of *Ommastrephes bartramii* is about 10 to 13 million tonnes.

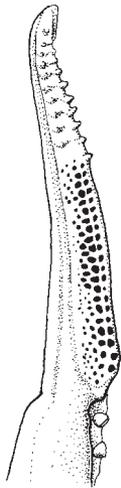
Distribution: Worldwide in subtropical and temperate oceanic waters, but distribution discontinuous (apparently non-tropical and absent in equatorial waters).



***Ornithoteuthis antillarum* Adam, 1957**

Frequent synonyms / misidentifications: None / *Ornithoteuthis volatilis* Silva-Mello, 1998.

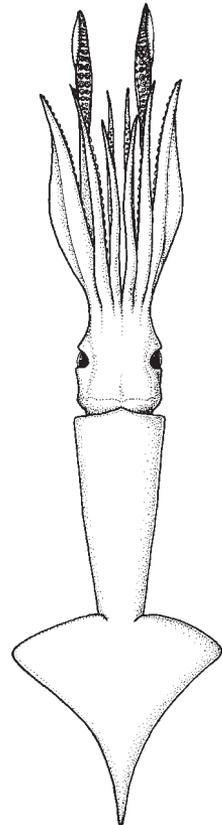
FAO names: **En** – Atlantic bird squid; **Fr** – Encornet oiseau; **Sp** – Pota pájaro.



hectocotylus



tentacular club



dorsal view

Diagnostic characters: Mantle drawn out posteriorly as a pointed tail; foveola of funnel groove with 7 to 12 very indistinct folds, side pockets often obscure. Suckers on tip of tentacular clubs in 4 longitudinal rows. A long, thin strip of luminous tissue along ventral midline of viscera posterior to heart. No external light organs; discrete light organs on the ink sac and rectum. No distinct fixing apparatus on tentacular club. Purplish maroon, darkest on dorsal surface.

Size: Maximum mantle length up to 300 mm.

Habitat, biology, and fisheries: May inhabit continental shelf and slope waters or be associated with islands. It has been seen frequently from submersibles at 600 to 1 000 m depth. The species is infrequently caught but its rarity in collections undoubtedly is a reflection of the animal's rapid, powerful swimming ability. Specimens have been captured in bottom fishing with trawls during the day at 585 to 1 100 m (mostly 640 to 825 m); night-time captures were made in large midwater trawls at 100 to 600 m over very deep water and by dip net at the surface in the open ocean. Not currently fished commercially; too few data are available on distribution, abundance and biology to allow prediction of fishing potential. The species is edible.

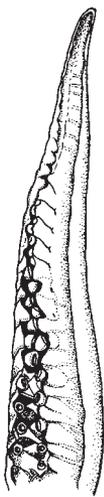
Distribution: Tropical and subtropical ampho-Atlantic species. Recorded from 45°–40°N to 40°S in the western Atlantic and from 20°N to about 28°S in the eastern Atlantic.



***Sthenoteuthis pteropus* (Steenstrup, 1855)**

Frequent synonyms / misidentifications: *Ommatostrephes pteropus* Steenstrup, 1855 / None.

FAO names: **En** – Orangeback flying squid; **Fr** – Encornet orange; **Sp** – Pota naranja.

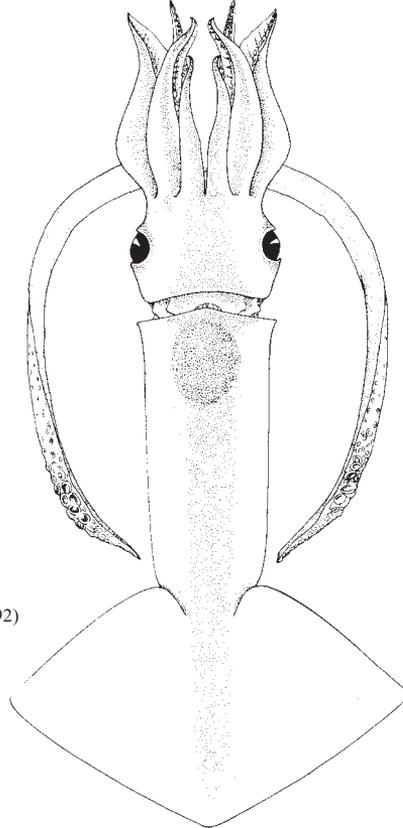


hectocotylus



tentacular club

(all illustrations from Guerra, 1992)



dorsal view

Diagnostic characters: Mantle robust and muscular, cylindrical anteriorly and conical posteriorly, not drawn out into a pointed tail. **Funnel groove with foveola and 2 to 5 side pockets.** Fins muscular, length 45 to 50% of mantle length, width 75 to 85% of mantle length; single fin angle 55° to 60°. Tentacles robust with a pointed club. Manus with 2 fleshy knobs and 0 to 2 tiny suckers below the first knob. Suckers of manus disposed in 4 longitudinal rows, which central ones are enlarged. The quitinous rings of the enlarged suckers with 16 to 28 sharp and conical teeth. Rings of large club suckers with 1 large tooth on distal edge. **Two light organs on intestine, one at border of middle and posterior thirds and the remaining one, only visible in juveniles, in the posterior end. Luminous spots and stripes on ventral side of mantle, head and ventral arms. A large, oval patch on the anterodorsal part of the mantle just beneath the skin consisting of numerous densely packed, small light organs. Orange in colour.**

Size: Females reach 650 mm mantle length. Males somewhat smaller.

Habitat, biology, and fisheries: An oceanic and nektonic species represented by a number of regional self-reproducing intraspecific populations, which inhabit oceanic large-scale circulatory systems extending for hundreds and thousands of miles. It ranges from the surface to about 1 500 m and undertakes daily vertical and important horizontal migrations. The paralarvae, juveniles and adults are selectively distributed in distinct ecological niches, which are characterized by different oceanographic conditions. The spawning area in the eastern equatorial Atlantic in June–November occupies warm waters to the north of the equator and the Lomonosov current in its southern border. Paralarvae are quickly transported out of the spawning area and spread widely in the equatorial zone. The larval stage lasts 32 to 38 days. At ages from 14 to 38 days, the daily relative growth rates of mantle length decrease from 7.5 to 2.8%. The mean value of raw mortality at ages 12

to 24 days was 0.258. During the proboscis division at age 25 to 35 days, a sharp decrease in larval growth rates and a simultaneous increase of mortality were observed. The southern branch waters of the south equatorial current (SEC) are the main feeding ground. The lower temperature of this branch possibly inhibits maturation of females, which migrate into warmer waters to spawn. Populations from different geographic areas form subpopulations that differ also genetically. The egg masses of about 150 000 to 200 000 eggs are deposited in the water column. The life span is about 1 to 2 years for both sexes. Myctophids, macroplanktonic crustaceans, squids are the main prey of this species. Cannibalism has been observed. Frequently preyed by swordfish, tunas, other large teleosteans and sperm whales. The instantaneous biomass of *Sthenoteuthis pteropus* was estimated from 4 to 6 million tonnes. per year. This species is mainly caught off shore, over the slope. Of potential commercial importance.

Distribution: In tropical and temperate Atlantic waters.



***Todarodes angolensis* Adam, 1962**

Frequent synonyms / misidentifications: None / *Todarodes sagittatus* Sanchez (1981, 1982, 1988), Sanchez and Moli (1984).

FAO names: En – Angola flying squid; Fr – Toutenon angolais; Sp – Pota angolense.

Diagnostic characters: Funnel groove with foveola and without side pockets. Arms with 2 rows of suckers. Arm suckers rings large distal teeth alternating with very small teeth. Tentacular club with 4 longitudinal rows of suckers, the central rows being larger than the marginal ones; **carpal area of the club very short with 4 pairs of suckers**. Not light organs on viscera.

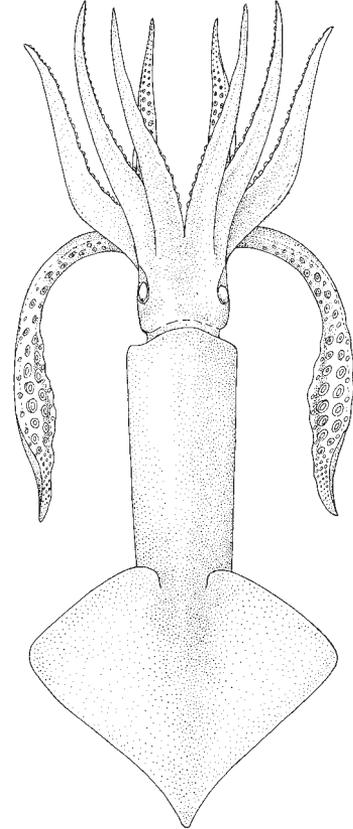
Size: Maximum mantle length 433 mm (females).

Habitat, biology, and fisheries: The biology of this species is practically unknown. Occurring from the surface to about 1 500 m, more abundant from 150 to 400 m. From weight–length relationships it has been observed that the pattern of weight gain differs between the sexes. The onset of female sexual maturity is reached from 300 to 350 mm mantle length in Namibian waters. During copulation the sperm is deposited by the male in the buccal membrane of female. It seems to have a patchy spatial distribution off Namibian waters, where it undertakes vertical migrations, towards the surface at night and towards the bottom during the day. There is not direct fishery for this species; it is caught as bycatch in other trawl fisheries. No separate statistics are reported.

Distribution: In the eastern Atlantic limited to south of 13°S; it occurs around South Africa and reaches into the Indian Ocean where limits are unknown.



tentacular club



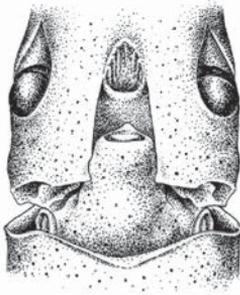
dorsal view



***Todarodes sagittatus* (Lamarck, 1798)**

Frequent synonyms / misidentifications: *Loligo sagittata* Lamarck, 1798; *Ommastrephes sagittatus* Lamarck, 1798 / None.

FAO names: **En** – European flying squid; **Fr** – Toutenon commun; **Sp** – Pota europea.

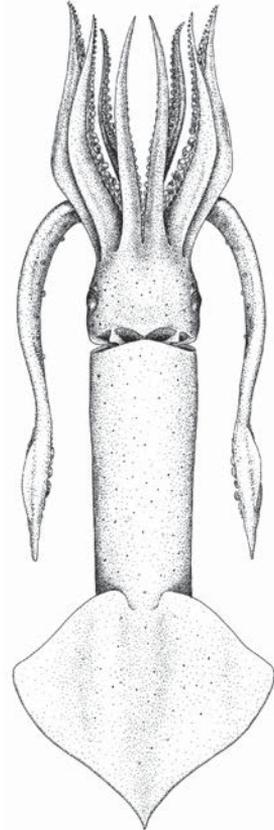


foveola



tentacular club

(all illustrations from Guerra, 1992)



dorsal view

Diagnostic characters: Funnel groove with foveola and without side pockets. Arms with 2 rows of suckers. Arm suckers with enlarged central tooth, 8 to 10 regular teeth and no small alternating teeth. Tentacular club with 4 longitudinal rows of suckers, the central rows being larger than the marginal ones; **tentacular club extending along stalk and occupying from 75 to 83% of the arm length; suckers on elongate carpus in 10 to 12 pairs.** No light organs on viscera.

Size: Maximum reported mantle length 750 mm but more often within the range 300 to 400 mm.

Habitat, biology, and fisheries: It is a typical neritic-oceanic species on the whole but its North African population has a shelf-slope lifestyle. Found at depths less than 50 to about 4 500 m. Undertake important vertical migrations from the bottom (day) to the surface (daytime). Also form large schools and undertake horizontal migrations. The spawning area in the northeastern Atlantic extends from 45°N to the Azores. Animals follow the main currents in these areas and they are transported towards Norway or to the south and remain concentrated above the thermocline (13°C in the north and 20°C in the south). Mature animals seem to distribute at lower depths. Spawning peaks takes place from late winter to spring in northern European waters, spring in southern European waters, from September to December in the Mediterranean Sea and in winter in North African waters. This species form a separate and isolated population that inhabits the outer shelf and upper slope waters off the coast of North west Africa between 10° and 26°N. The mantle length of mature males off Africa are 200 to 280 mm and females 250 to 350 mm mantle length, while in the North Atlantic, the mantle length of mature males and females are 270 to 400 mm and 360 to 750 mm, respectively. These, and other differences, suggest that the North African population of *Todarodes sagittatus* represents a separate population for fishery-biological management purposes. On the contrary, there are many similarities between *T. sagittatus* and *T. angolensis* from South Africa, nicely adapted to habitats of North and South upwelling systems. The life span is about 12 to 15 months. Potential fecundity ranges from 205 000 to

525 000 oocytes, egg size ranging from 1.0 to 1.2 mm in North African waters. Females grow faster than females in mantle length and weight but males attain maximal growth rates than females at a younger age than females. This species feed mainly upon fishes, euphausiids, amphipods, and other cephalopods, and it is an important prey for pelagic fishes and marine mammals. This species was extensively exploited in specific jigging fisheries of some north countries, particularly near the Norwegian coast with annual catches of about 22 000 tonnes before 1986; these catches were mainly used for bait in the cod fishery. In the North African waters, this species was targeted in summer time mainly by Soviet trawlers operating around the Cape Blanc area.

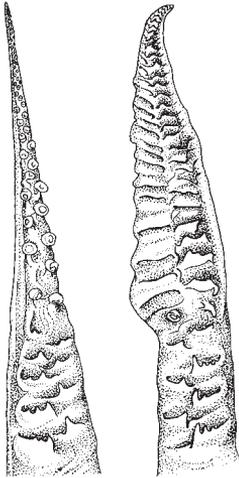
Distribution: Mediterranean Sea. Eastern Atlantic: entire area to approximately 40°W and from 11°N to the Arctic Ocean.



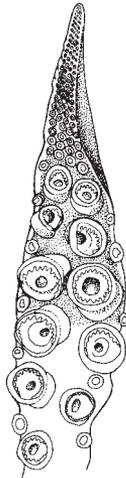
***Todaropsis eblanae* (Ball, 1841)**

Frequent synonyms / misidentifications: None / None.

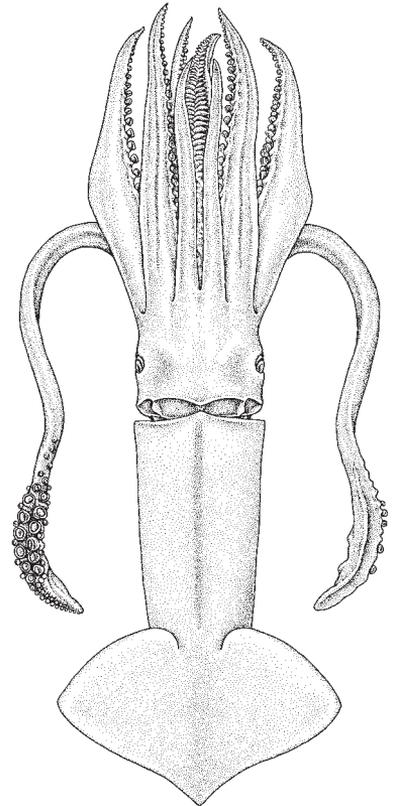
FAO names: En – Lesser flying squid; Fr – Toutenon souffleur; Sp – Pota costera.



hectocotylus



tentacular club



dorsal view

(illustration: K. Hollis/ABRS)

Diagnostic characters: Inverse T-shaped funnel cartilage. Funnel groove without foveola or lateral pockets. Head wide and robust with 4 folds in neck region. Rhomboid fins, which width range from 75 to 85% of the mantle length. Mantle width higher than 33% of the mantle length. Arms with 2 rows of suckers. **Dactylus of tentacular club with 4 longitudinal rows of minute subequal suckers.** Left and right ventral arms of male **hectocotylized by modification of suckers into cirrated lappets with transverse lamellae and expanded protective membranae.** Left and right ventral arms (IV) hectocotylized by modification of suckers into cirrate lappets with transverse lamellae and expanded protective membrane.

Size: Maximum mantle length 290 mm and 220 mm for females and males, respectively.

Habitat, biology, and fisheries: A demersal species associated to sandy and muddy bottoms mainly in lower sublittoral and upper bathyal over the continental shelf, not ascending to the surface or approaching the shore. Spawning season extends throughout the year with a clear peak in spring-summer and other less important in autumn. Fecundity was estimated to be from 5 000 to 123 000 oocytes. Mature oocytes diameters in the oviducts ranged from 1.0 to 1.8 mm. Eggs possibly laid near the bottom on the continental slope at midwaters. Sexual maturity starts at a larger size in females than in males. This species can be considered as intermittent terminal spawner. The maximum number of the spermatophores in the Needham sac was around 250, and it was observed that the number and the length of spermatophores tended to increase with the size of the males. Spent females were hardly found, which indicates that the degeneration process after spawning is extraordinarily fast. Males copulate several times, while spermatophores continued to be produced for further mating. Juveniles and adults have been collected at about 150 to 700 m, and they recruit to the fishery at 3 months of age, approximately. Its diet was composed by, in decreasing order of importance, fish, crustaceans and cephalopods. It was also noted the presence of cannibalism. Weight-at-length of mature males was greater than that of immature males and mature and immature females. Mantle length instantaneous relative growth rate ranged from 0.38 to 1.55% for males and from 0.43 to 1.74% for females. Its life span is about 1 year for males and females. Size at first maturity was 158 and 130 for males and females, respectively.

Growth rates in both sexes were dependent of the season of hatching. Growth rates are higher in later hatched individuals. This appears to be related with a gradual increase in water temperature during the spawning season. The abundance indices of this species off the northwestern Spain (30 to 500 m depth) related significantly with the upwelling index. This positive relationship could be due to the increased survival rate of hatchlings and prerecruits when abundance of prey augments, as consequence of higher productivity caused by upwelling. Individuals caught in fall cruises were mainly juveniles, indicating a strong autumn recruitment. This species is taken throughout the year as bycatch in otter trawl fisheries, and, in lesser extent, with gill and trammel nets, longlines and jigging in depths between 100 and 400 m in the Mediterranean, off West Africa and the northeastern Atlantic. No official statistics are available for this species.

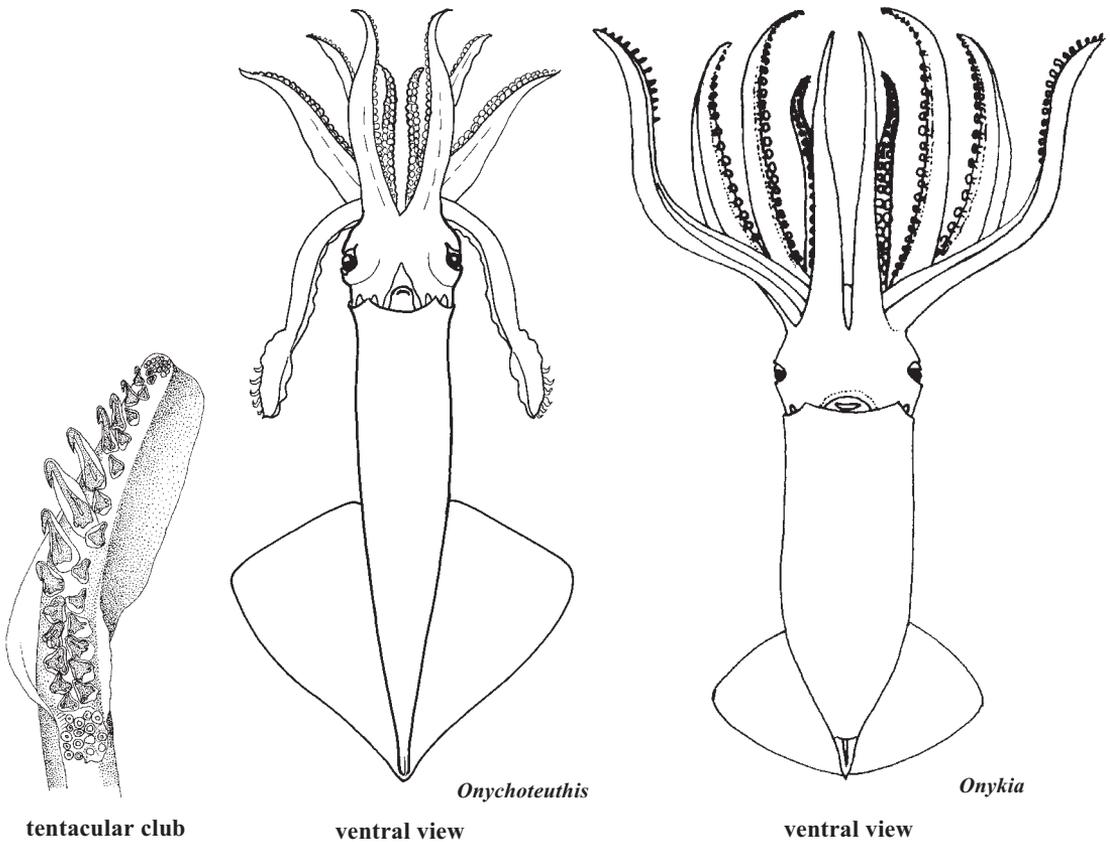
Distribution: *Todaropsis eblanae* distribution extends over the Mediterranean Sea and eastern Atlantic from the Arctic to 36°S. Also present in the western Pacific Ocean, South China Sea and Australian waters.



ONYCHOTEUTHIDAE

Clubhook squids

Diagnostic characters: Muscular squids. **Tentacle clubs with 2 rows of strong hooks** (with or without marginal suckers) on manus, well-defined discoidal locking apparatus on the carpus. Arm suckers biserial with smooth rings. **Neck often with numerous nuchal folds.** Buccal connectives attach to ventral side of ventral arms. Funnel locking apparatus straight and simple.



Habitat, biology, and fisheries: Some species are common in the open ocean (e.g. *Onychoteuthis* spp.); others live near the ocean floor along continental or island slopes (e.g. *Moroteuthis* spp.).

Remarks: The systematic of this family, still unstable, has undergone important changes in the last few years. Morphological characters of squids currently considered to be *Onychoteuthis banksii* are quite variable and it is likely that this “species” actually comprises a species-complex. Current thought consider *Moroteuthis* as a synonym of *Onykia* (e.g. Wakabayashi *et al.*, 2007, Vecchione *et al.*, 2007b, Bolstad, 2010). This issue was first addressed by Tsuchiya and Okutani (1992), but it has not been universally accepted afterwards (e.g. Nesis, 2000, 2002). According to a recent revision of the Onychoteuthidae by Bolstad (2010), *Walvisteuthis virilis* was removed from the family and it is considered species of unresolved status (Sweeney *et al.*, 2010). It is treated here in absence of further indications on a systematic placement.

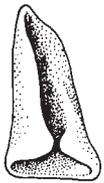
Similar families occurring in the area

Ommastrephidae: funnel-locking apparatus inverted T-shaped; tentacular clubs usually with 4, exceptionally with 8 (*Illex*) longitudinal rows of suckers at tips, no hooks; buccal connectives attached to dorsal borders of ventral arms.

Loliginidae: eyes covered with a transparent corneal membrane; tentacular clubs with no hooks.

Enoploteuthidae and Ancistrocheiridae: hooks on arms; light organs on surfaces of head and mantle.

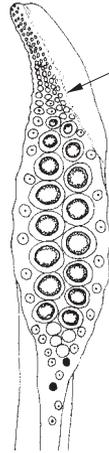
Pyroteuthidae: hooks on arms; light organs on tentacles.



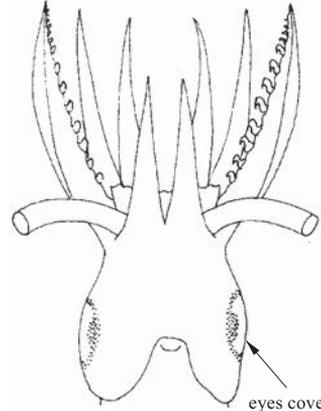
⊥-shaped
Ommastrephidae
types of funnel locking apparatus



simple, straight
Onychoteuthidae,



tentacular club
Ommastrephidae



Loliginidae

Key to the species of Onychoteuthidae occurring in the area

- 1a. Skin smooth; secondary occipital folds present → **2**
- 1b. Skin with warts; secondary occipital folds absent **Onykia** → **3**

- 2a. Two intestinal photophores, the anterior photophore close to the 75% diameter of the posterior one; ocular photophore a long patch on ventral surface of each eyeball **Onychoteuthis banksii**
- 2b. No intestinal photophores **Ancistroteuthis lichtensteinii**

- 3a. Fin much wider than long, their length up to 50% of mantle length; no tail **Onykia carriboea**
- 3b. Fins realitively narrow, their length 60–70% of mantle length **Onykia robsoni**

List of species occurring in the area

The symbol is given when species accounts are included.

- Ancistroteuthis lichtensteini* (Férussac, 1835).
- Onychoteuthis banksii* (Leach, 1817).
- Onykia carriboea* Lesueur, 1821.
- Onykia robsoni* (Adam, 1962).
- Walvisteuthis virilis* Nesis and Nikitina, 1986* (see Remarks in the family).

References

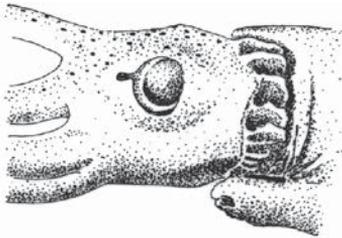
- Bolstad, K.S.** 2007. Systematics and distribution of the New Zealand onychoteuthid fauna (Cephalopoda: Oegopsida), including a new species, *Notonykia nesisi* sp. nov. *Reviews in Fish Biology and Fisheries*, 17(2–3): 305–335.
- Bolstad, K.S.** 2008. Two new species and a review of the squid genus *Onychoteuthis* Lichtenstein, 1818 (Oegopsida: Onychoteuthidae) from the Pacific Ocean. *Bulletin of Marine Science*, 83: 481–529.
- Bolstad K.S.** 2009. Systematics of the Onychoteuthidae Gray, 1847 (Cephalopoda: Oegopsida). CIAC Symposium, Abstract book, pp. 33.
- Bolstad, K.S.R.** 2010. Systematics of the Onychoteuthidae Gray, 1847 (Cephalopoda: Oegopsida). *Zootaxa*, 9626: 186 pp.
- Bolstad, K.S.R., Vecchione, M. & Young, R.E.** 2010. Onychoteuthidae Gray, 1847. Hooked squids. Version 23 December 2010. <http://tolweb.org/Onychoteuthidae/19419/2010.12.23> in The Tree of Life Web Project, <http://tolweb.org/>
- Bolstad, K.S.R., Vecchione, M., Young, R.E. & Tsuchiya, K.** 2010a. *Onychoteuthis* Lichtenstein, 1818. Version 23 December 2010 (under construction). <http://tolweb.org/Onychoteuthis/19955/2010.12.23> in The Tree of Life Web Project, <http://tolweb.org/>
- Bolstad, K.S.R., Vecchione, M., Young, R.E. & Tsuchiya, K.** 2010b. *Onychoteuthis banksii* Leach, 1817. Version 23 December 2010 (under construction). http://tolweb.org/Onychoteuthis_banksii/19962/2010.12.23 in The Tree of Life Web Project, <http://tolweb.org/>
- Bonnaud, L., Rodhouse, P.G. & Boucher-Rodoni, R.** 1998. A phylogenetic study of the squid family Onychoteuthidae (Cephalopoda: Oegopsida). *Proceedings of the Royal Society of London, Series B*, 265: 1761–1770.
- Kubodera, T., Piatkowski, U. Okutani, T. & Clarke, M.R.** 1998. Taxonomy and zoogeography of the family Onychoteuthidae. In N.A. Voss, M. Vecchione, R.B. Toll & M.J. Sweeney, eds. Systematics and Biogeography of Cephalopods. *Smithsonian Contributions to Zoology*, 586: 277–291.
- Nesis, K.N.** 2000. Squid family Onychoteuthidae: phylogeny, biogeography, and way of life. *Zoological Zhurnal*, 79(3): 272–281 [in Russian, English summary].
- Nesis, K.N.** 2002. Life style strategies of recent cephalopods: a review. In P.R. Boyle, M.A. Collins & G.J. Pierce, eds. Cephalopod biomass and production. *Bulletin of Marine Science*, 71(2): 561–579.
- Nesis, K.N. & Nikitina, I.V.** 1986. New genus and species of the family Neoteuthidae (Cephalopoda, Oegopsida) from the Southeast Pacific. *Zoological Zhurnal*, 65(2): 290–294.
- Rasero, M., González, A.F. & Guerra, A.** 1993. First record of *Ancistroteuthis lichtensteini* (Cephalopoda, Onychoteuthidae) in the European Atlantic waters. *Scientia Marina Barcelona*, 57: 91–94.
- Roper, C.F.E. & Jereb, P.** 2010. Family Onychoteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 348–369.
- Sweeney, M.J., Bolstad, K.S.R. & Young, E.** 2010. Taxa associated with the family Onychoteuthidae Gray, 1847. http://tolweb.org/accessory/Taxa_Associated_with_the_Family_Onychoteuthidae?acc_id=1358.
- Tsuchiya, K. & Okutani, T.** 1992. Growth stages of *Moroteuthis robusta* (Verrill, 1881) with the re-evaluation of the genus. *Bulletin of Marine Science*, 49(1–2): 137–147.
- Vecchione, M., Young, R.E. & Tsuchiya, K.** 2003. *Onykia carriboea* Lesueur, 1821. Version 23 June 2003 (under construction). http://tolweb.org/Onykia_carriboea/19971/2003.06.23 in The Tree of Life Web Project, <http://tolweb.org/>

- Vecchione, M., Young, R.E. & Tsuchiya, K.** 2010. *Ancistroteuthis* Gray 1849. *Ancistroteuthis lichtensteinii* (Férussac 1835). Version 23 December 2010 (under construction). http://tolweb.org/Ancistroteuthis_lichtensteinii/19952/2010.12.23 in The Tree of Life Web Project, <http://tolweb.org/>
- Wakabayashi, T., Kubodera, T., Sakai, M., Ichii, T. & Chow, S.** 2007. Molecular evidence for synonymy in the genera *Moroteuthis* and *Onykia* and identification of their paralarvae from northern Hawaiian waters. *Journal of the Marine Biological Association of the United Kingdom*, 87: 959–965.
- Young, R.E.** 1972a. The systematics and areal distribution of pelagic cephalopods from the seas off Southern California. *Smithsonian Contributions to Zoology*, 97: 159 pp.
- Young, R.E. & Harman, R.F.** 1987. Descriptions of the larvae of three species of the *Onychoteuthis banksii* complex from Hawaiian waters. *Veliger*, 29(3): 313–321.
- Young, R.E., Vecchione, M. & Tsuchiya, K.** 2003. *Walvisteuthis* Nesis and Nikitina 1986. *Walvisteuthis rancureli* (Okutani, 1981). Stubby hooksquid. Version 23 June 2003 (under construction). http://tolweb.org/Walvisteuthis_rancureli/19957/2003.06.23 in The Tree of Life Web Project, <http://tolweb.org/>

***Ancistroteuthis lichtensteini* (Férussac, 1835)**

Frequent synonyms / misidentifications: None / None.

FAO names: En – Angel squid; Fr – Cornet archangel; Sp – Luria paloma.



nuchal folds



tentacular club

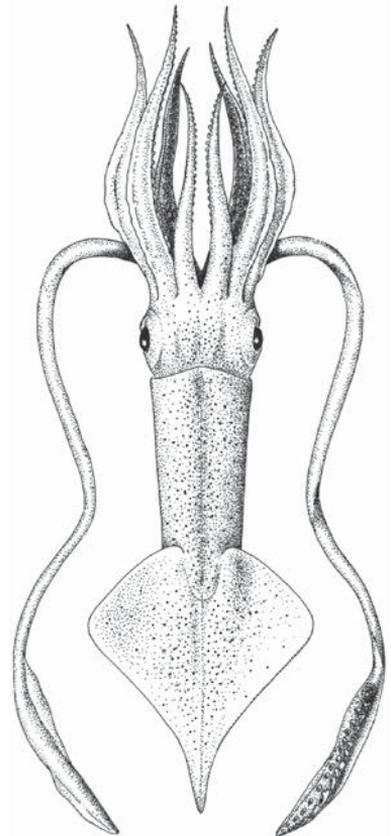
(all illustrations from Guerra, 1992)

Diagnostic characters: Mantle slender, muscular and pointed posteriorly, fins strong, lanceolated. From 6 to 10 nuchal folds present. Tentacular clubs in adults with 2 median manus series of 10 to 12 hooks each; lateral series of suckers absent. Carpal pad of club elliptical with 9 to 10 suckers and 9 to 10 pads. Rachis of pen visible along dorsal midline in adults but not in subadults. No light organs on intestinal tract; photogenic patch present on ventral surface of eyeball.

Size: Maximum mantle length 300 mm.

Habitat, biology, and fisheries: Its biology is poorly known. It is a pelagic species. Found from the surface to 1 300 m depth. In the Mediterranean it is associated with gravel bottoms during spring and summer and spawning occurs in summer. It feeds on epipelagic and upper mesopelagic finfishes and crustaceans, and is preyed upon by marine mammals and pelagic fishes. Of minor value for fisheries. All catches are taken by demersal and bottom trawls.

Distribution: In the eastern Atlantic, it has been reported from northwestern Spanish waters, Angola and Saharan Bank; Mediterranean Sea. Distribution appears very disjunct because only a few specimens have been reported in the scientific literature outside the Mediterranean. Also reported from the Gulf of Mexico and Melanesia, but these identifications are questionable.



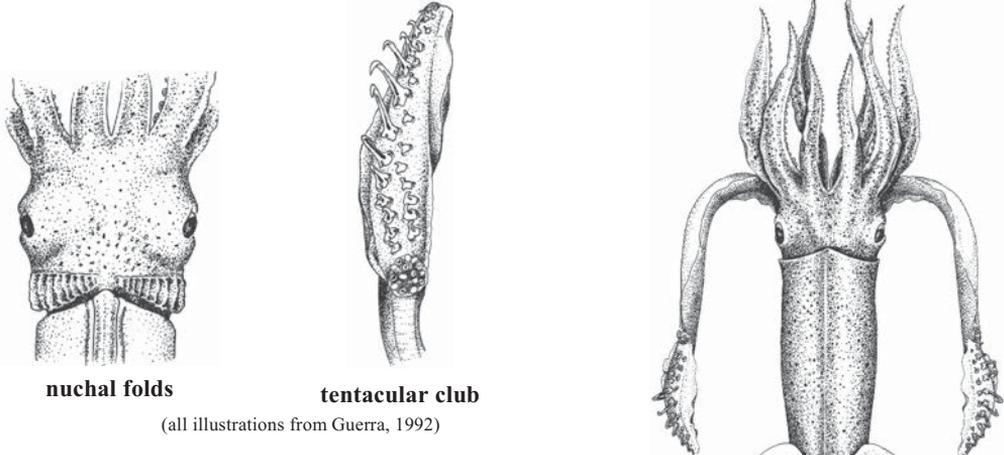
dorsal view



***Onychoteuthis banksii* (Leach, 1817)**

Frequent synonyms / misidentifications: *Chaunoteuthis mollis* Appelof, 1891; *Teleoteuthis caroli* Joubin, 1900 / None.

FAO names: **En** – Common clubhook squid; **Fr** – Cornet crochu; **Sp** – Luria ganchuda.



(all illustrations from Guerra, 1992)

Diagnostic characters: Mantle muscular cylindrical and tail pointed. **Nine or 10 well-developed nuchal folds present.** Rhomboid muscular fins of about 50 to 60% of the mantle length, with sharp lateral angles. **The gladius is visible as a dark line through the skin along midline of mantle.** **Tentacles short with club with 20 to 22 large, claw-like hooks in 2 rows.** Clubs with a wide membrane, dactylus with 14 tiny suckers and carpus with a well-developed fixation apparatus consisting in 8 to 10 suckers and 7 to 9 pads. The manus of the tentacular club with hooks only. Arms robust with suckers disposed in 2 rows. **Two large, round, bulbous light organs along ventral midline on intestinal tract and 1 light organ in the ventral side of each eye.**

Size: Mantle length up to 300 mm (370 mm only in the northern Pacific Ocean, Nesis, 1987).

Habitat, biology, and fisheries: An oceanic species forming small schools. Most common from the surface to 150 m depth, occasionally found in deeper waters (1 record from 4 000 m depth). High respiration rates suggest it is fast-growing. Larvae and juveniles are abundant in the eastern Atlantic during winter and summer, which points out to an extended hatching season. It is important in the diet of several large fishes, cetaceans and seabirds. Currently, there is not directed fisheries, but is frequently caught as bycatch at night. The quality for human consumption is judged to be good.

Distribution: Cosmopolitan in warm and temperate oceanic waters.

Remarks: Until recently, *Onychoteuthis banksii* was thought to be a common circumglobal species, although the name, as generally applied, was suspected to encompass a species complex (e.g., Young, 1972, Kubodera *et al.*, 1998) Bolstad (2008) partially resolved the species complex in the Pacific Ocean, redescribing *O. banksii* from the Atlantic in the process. Subsequently, the same author sorted out another species, *O. horstkottei* (Bolstad, 2010), but it is likely that additional, still unrecognized species, exist.

dorsal view



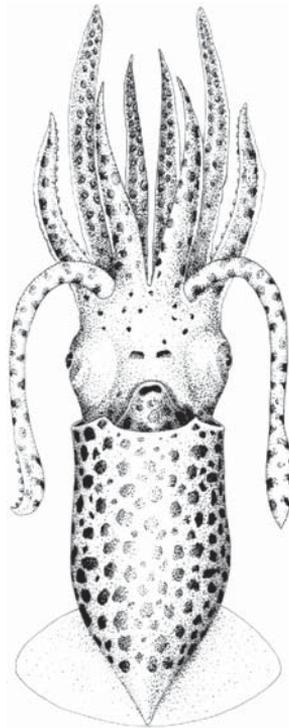
Onykia carriboea Lesueur, 1821

Frequent synonyms / misidentifications: *Steenstrupiola atlantica* Pfeffer, 1884; *Teleoteuthis carriboea* Verrill, 1885; *T. jattai* Joubin, 1900 / None.

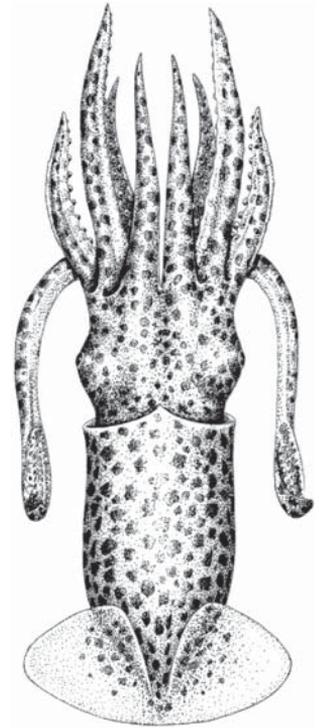
FAO names: **En** – Caribbean clubhook squid; **Fr** – Cornet crochu de Caraïbes; **Sp** – Luria ganchuda del Caribe.



tentacular club



ventral view



dorsal view

Diagnostic characters: Body muscular and cylinder-conical, slightly pointed posteriorly. Fins much wider than long, their length up to 50% of mantle length; arms with 2 longitudinal rows of suckers. Short tentacles. Tentacle club poorly expanded with 2 rows of marginal suckers and 2 rows of hooks in the manus. Dorsally dark with bluish shade.

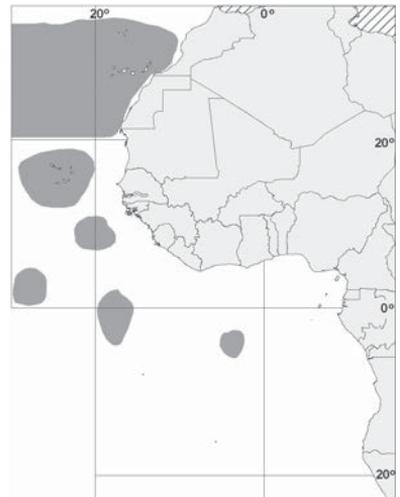
Size: Maximum mantle length possibly 145 mm.

(all illustrations from Guerra, 1992)

Habitat, biology, and fisheries: Tropical to warm temperate Atlantic and Indo-Pacific. Juveniles live near the surface, often in the hyponeuston, subadults in lower epipelagic and uppermost mesopelagic zones, not ascending to the surface (depth range from 0 to 200 m, 0 to 20 m day and night.). Known predators include *Alepisaurus ferox* (longnose lancetfish) and *Sthenoteuthis oualaniensis* (purpleback flying squid). Mature specimens not known. Not of interest to fisheries.

Distribution: Eastern central Atlantic from about Madeira to the Gulf of Guinea; northwest Atlantic from New England to Caribbean; central North Atlantic; northeastern Atlantic from Bay of Biscay to Azores; central South Atlantic; South and East Africa, central and eastern Indian Ocean, Japan, Hawaii, eastern and southwestern Pacific.

Remarks: *Onykia carriboea* is known, with certainty, only from small juveniles: no adult, mature specimen has been found/described. This suggests that the name could represent the immature growth stage of other onychoteuthid species (Kubodera *et al.*, 1998, Bolstad, 2007).



Onykia robsoni (Adam, 1962)

Frequent synonyms / misidentifications: *Moroteuthis robsoni* Adam, 1962 / None.

FAO names: **En** – Rugose hooked squid; **Fr** – Cornet rugueux; **Sp** – Lurión rugoso.

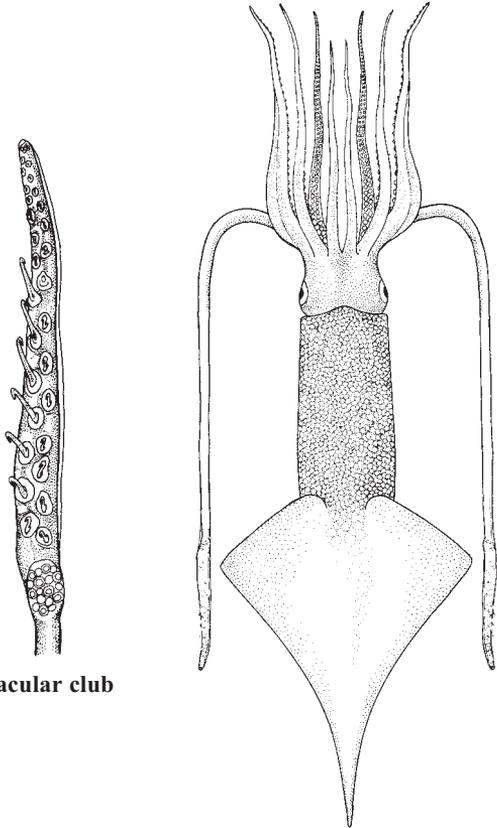
Diagnostic characters: Mantle firm, muscular, long and slender, covered with fleshy warts, reddish coloration, tip drawn out to a long, sharp tail. Tentacles present. Nuchal folds absent. Fins relatively narrow, their length about 60 to 70% of the mantle length, forming a very sharp pointed lanceolate tail, fin angle 30° to 40° each. **Tentacular clubs very narrow**, unexpanded, manus with 26 to 32 hooks in 2 median series. Arms attenuate, longest (IV) about 57 to 68% of the mantle length. Rostrum of gladius triangular in cross-section.

Size: Maximum mantle length 750 mm.

Habitat, biology, and fisheries: An oceanic species, taken with open nets. Its exact depth distribution is unknown; at least from 250 to 550 m. One of the squid species heavily preyed upon by sperm whales and large pelagic fishes. This species prey upon the euphausiid *Euphausia superba*.

Distribution: Circumglobal in southern subtropical and notalian pelagic regions.

Remarks: Its muscular tissues contains large amount of ammonium.



tentacular club

dorsal view



***Walvisteuthis virilis* Nesis and Nikitina, 1986**

Frequent synonyms / misidentifications: None / *Onykia rancureli* Okutani, 1981.

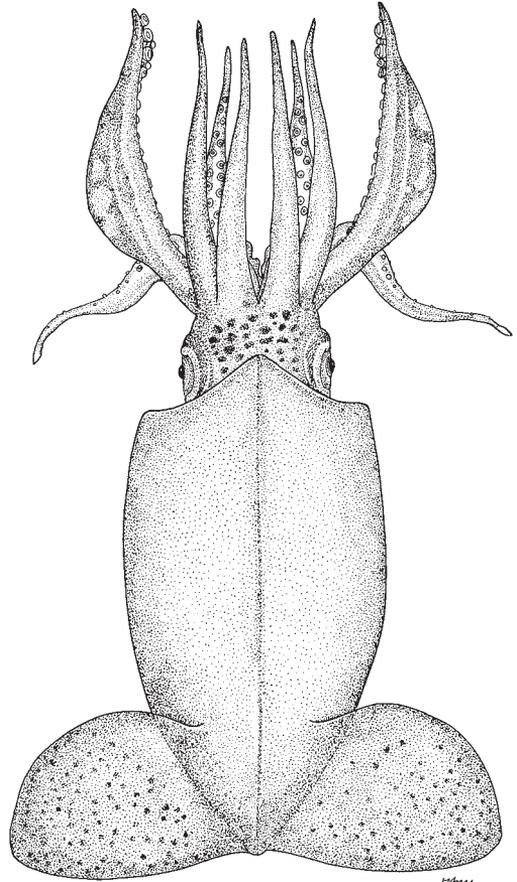
FAO names: En – Whale squid; Fr – Encornet baleine; Sp – Luria ballena.

Diagnostic characters: Tissues of semigelatinous consistence. Mantle smooth, broadly conical, bluntly rounded posteriorly, not drawn out into a tail. Fins very short, broad and oval, **width about 90% of mantle length**; posterior lobes meet in midline. Nuchal folds absent. Funnel-locking cartilage a simple, straight groove, slightly broader distally. **Arms short**, about half the mantle length; broad keel in distal portion. Arm suckers biserial, large, short-stalked, flattened, no hooks; **especially significant are the 3 or 4 pairs of greatly enlarged suckers on the midportion of arms III**, globe-shaped and twice as large as the normal suckers. Tentacles very thin and weak; club occupies more than half the tentacle length; carpus with well-developed, dispersed, locking apparatus, 8 or 9 suckers, less than half the diameter of the normal arm suckers; 5 or 6 pairs of minute, widely spaced, medial suckers in 2 series on long stalks on manus; a few marginal suckers may occur. No visceral photophores. Gladius with short, thin, blunt rounded rostrum oriented perpendicular to the gladius.

Size: Small-sized species; maximum mantle length to 103 mm.

Habitat, biology, and fisheries: Epipelagic to upper mesopelagic species. Paralarvae are known as small as 1.9 mm mantle length. None interest to fisheries.

Distribution: Worldwide in tropical to temperate seas.



dorsal view



PYROTEUTHIDAE

Fire squids

Diagnostic characters: Funnel-mantle locking apparatus a simple, straight groove and ridge. **Arms and tentacles with suckers and/or hooks arranged in 2 rows. Tentacular clubs without hooks. Large light organs on eyeballs and viscera;** no light organs on head, arms and mantle. Most easily recognized by the **sharply pointed “tail” and fins that are separate, each with a nearly circular outline.** They also have large buccal membranes with unusual attachments to the 4 dorsal arms. Peculiar tentacular bases have a permanent bend that presumably increase the degree of retraction (i.e. shortening) of the tentacles.

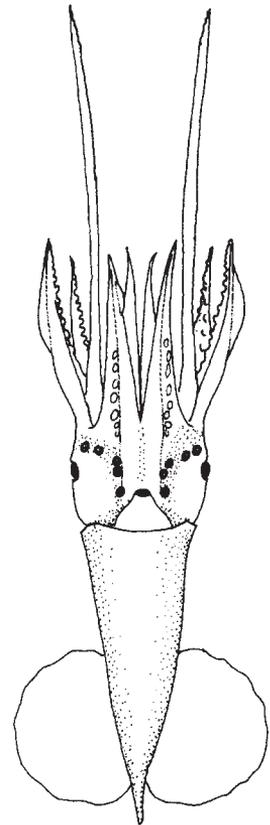
Habitat, biology, and fisheries: Small, muscular squids that occur in mesopelagic depths during the day and migrate into near-surface waters (0 to 200 m) at night. Among the more common squids in the midwaters of the open ocean. Where known, pyroteuthids feed on copepods and other small crustacea. Presumably, short-lived species. Mating and spawning have never been observed in members of this family. All members, however, have a specialized pouch located dorsal to the digestive gland and opening between the stellate ganglia. Spermatangia (discharged spermatophores) are commonly found attached to the opening of this pouch.

Remarks: Until recently, this family was considered to be a subfamily of the Enopteuthidae. Clarke (1988) erected a new family from this subfamily.

Similar families occurring in the area

Enopoteuthidae and Ancistrocheiridae have hooks on arms; light organs on surfaces of head and mantle but not on viscera.

Lycoteuthidae has hooks absent both in arms and tentacular clubs, which have quadriserial suckers; photophores present on eyeball and viscera and tentacles.



ventral view

Key to the species of Pyroteuthidae occurring in the area

- 1a. Tentacular clubs with hooks; 12 light organs on eyeball. *Pyroteuthis margaritifera*
- 1b. Tentacular clubs without hooks; 14 or 15 light organs on eyeball *Pterygioteuthis* → 2

- 2a. Arms I-III middle sections with 2 to 8 hooks present only in the ventral row
 *Pterygioteuthis gemmata*
- 2b. Arms I-III middle sections with 2 to 5 pairs of hooks present in both ventral and dorsal
 rows *Pterygioteuthis giardi*

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Pterygioteuthis gemmata* Chun, 1908.

 *Pterygioteuthis giardi* Fischer, 1896.

 *Pyroteuthis margaritifera* (Rüppell, 1844).

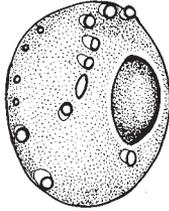
References

- Clarke, M.R.** 1988. *Classification of the genera of recent cephalopods*. In K.M. Wilburg, ed. *The Mollusca*, vol 12. M.R. Clarke & E.R. Trueman, eds. *Paleontology and Neontology of Cephalopods*. Academic Press, San Diego: 1–10.
- Lindgren, A.R.** 2010. Systematics and distribution of the squid genus *Pterygioteuthis* (Cephalopoda: Oegopsida) in the eastern tropical Pacific Ocean. *Journal of Molluscan Studies*, 76: 389–398.
- Lindgren, A., Young, R.E. & Mangold, K.M.** 2013. Pyroteuthidae Pfeffer 1912. The fire squid. Version 07 January 2013. <http://tolweb.org/Pyroteuthidae/19637/2013.01.07> in The Tree of Life Web Project, <http://tolweb.org/>
- Naef, A.** 1921/1923. *Cephalopoda. Fauna e Flora del Golfo di Napoli*. Monograph, no. 35. English translation: A. Mercado (1972). Israel Program for Scientific Translations Ltd. IPST Cat. No. 5110/1,2.
- Nesis, K.N.** 1982/87. *Abridged key to the cephalopod mollusks of the world's ocean*. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Pfeffer, G.** 1912. *Die Cephalopoden der Plankton-Expedition. Ergebnisse der Plankton-Expedition der Humboldt-Stiftung*. 2: 1–815.
- Riddell, D.J.** 1985. *Enoploteuthidae of the New Zealand Region*. *Fisheries Research Bulletin. New Zealand Ministry of Agriculture and Fisheries*, No. 27: 1–52.
- Roper, C.F.E. & Jereb, P.** 2010. Family Pyroteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 379–383.
- Young, R.E.** 1972. The systematics and areal distribution of pelagic cephalopods from the seas off Southern California. *Smithsonian Contributions to Zoology*, 97: 1–159.
- Young, R.E. & Harman, R.F.** 1998. Phylogeny of the “enoploteuthid” families. *Smithsonian Contributions to Zoology*, 568: 257–270.
- Young, R.E., Burgess, L.A., Roper, C.F.E., Sweeney M.J. & Stephen S.J.** 1998. Classification of Enoploteuthidae, Pyroteuthidae and Ancistrocheiridae. *Smithsonian Contributions to Zoology*, 586: 239–256.

Pterygioteuthis gemmata Chun, 1908

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Jewel fire squid; **Fr** – Encornet perle; **Sp** – Fuegoluria gemada.



light organs on eyeball

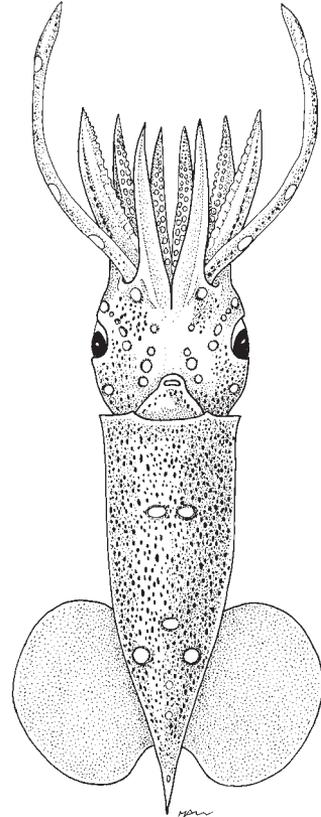
(all illustrations after Young, 1972)

Diagnostic characters: Arms I-III middle sections with 2 to 8 hooks present only in the ventral row. Arms IV with 2 rows of very small suckers. Hectocotylized arm (IV left) bearing to non-pigmented glandular areas of subequal length between which is located a comb-like plate with several conical teeth. Tip of the hectocotylized arm with few very tiny suckers. Fourteen (rarely 15) light organs on eyeball.

Size: Maximum mantle length 36 mm (sex unknown), 28 mm in males and 33 mm in females.

Habitat, biology, and fisheries: Mesopelagic ascending at night to the epipelagic zone. In the Gulf of Guinea paralarvae and small juveniles live in warm surface waters; juveniles >10 mm mantle length begin diurnal vertical migration. This species is apparently the shortest-lived and most rapidly maturing of oegopsid squids. Rather fast-growing, maximum age estimated at 78 days (30 mm mantle length, female); males live up to 75 days. Sexual maturity was reached at 50 days in males and 62 days in females. In the northwest Atlantic a peak of mature and maturing animals in spring indicate spawning in late spring or early summer; a peak of larvae and juveniles in autumn may produce a second spawning from early spring. In the Gulf of Guinea spawning is thought to occur in the upper epipelagic zone; hatching ranged from May to August, with a peak in July. Not of interest to fisheries.

Distribution: Morocco, Mauritania, Guinea Bissau, Gulf of Guinea, central Atlantic; South Atlantic North of Tristan da Cunha, Namibia, South Africa, southeast Indian Ocean; Gulf of Maine, Delaware Bay, Straits of Florida, Brazil; northeastern and southern Pacific.



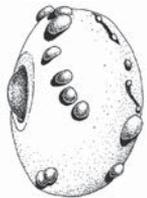
ventral view



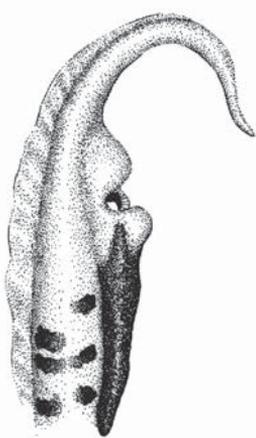
***Pterygioteuthis giardi* Fischer, 1896**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Roundear enope squid; **Fr** – Encornet boubou; **Sp** – Enoploluria orejuda.



light organs on
eyeball



hectocotylus



tentacular club

(after Guerra, 1992)



ventral view

Diagnostic characters: Arms I-III middle sections with 2 to 5 pairs of hooks present in both ventral and dorsal rows. Arms IV of females without suckers and 1 or 2 hooks in the IV arm of male. Hectocotylied arm (IV left) with 2 glandular areas of which, the proximal is bright orange-red and much longer than non-pigmented distal area. Two bent hook-like teeth between both areas. Fifteen light organs on eyeball.

Size: Up to about 40 mm mantle length.

Habitat, biology, and fisheries: In Hawaiian waters, this species vertically migrates from upper mesopelagic depths during the day to the upper 50 m at night. Off Bermuda most captures were from 50 to 100 m at night while the few daytime captures suggested a depth range from 327 to 475 m. In the eastern North Atlantic captures were made mostly at 300 to 400 m during the day and 50 to 200 m at night. Eggs are small (about 0.7 mm) but large in comparison to the small size of the spawning females. The oviduct holds only a few eggs (e.g. 11 in a 21 mm ML female). Presumably eggs are spawned in small batches and at frequent intervals due to the small storage capacity. The age at maturity and life span are unknown. Not of interest to fisheries.

Distribution: This species was first described from the North Atlantic off Morocco (Fischer, 1896). It is the most widely distributed member of the Pyroteuthidae. Tropical-subtropical cosmopolitan species.

Remarks: Recent investigation (Lindgren, 2010) uncovered notable differences between the 2 subspecies *Pterygioteuthis giardi giardi* and *P. giardi hoylei* (Pfeffer, 1912), leading to the elevation of *P. hoylei* to specific status.



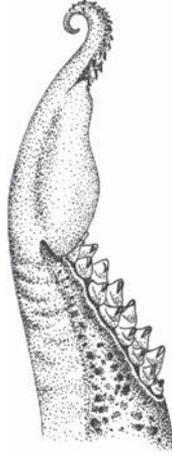
***Pyroteuthis margaritifera* (Rüppell, 1844)**

Frequent synonyms / misidentifications: None / None.

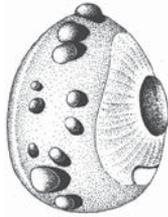
FAO names: En – Jewel enope squid; Fr – Encornet-bijouter; Sp – Enoploluria joyera.



hectocotylus



tentacular club



light organs on eyeball

(after Guerra, 1992)



dorsal view

(after Okutani, 1995)

Diagnostic characters: Longitudinal membrane of hectocotylus about 33% of arm length measured from first hook; membrane starting after seventh to ninth pair of hooks. Usually no additional small light organs on tentacular stalk between the first and the second light organs. Both dorsal arms (I) bearing 12 pairs of hooks and 10 to 12 pairs of suckers on the apex; arms II with 4 suckers on the base followed by 9 pairs of hooks and 2 small suckers on the apex, arms III with 9 or 10 pairs of hooks and 2 small suckers on the apex; arms IV with 14 pairs of hooks and 7 pairs of suckers on the apex.

Size: Maximum mantle length 50 mm.

Habitat, biology, and fisheries: Mesopelagic in the tropical and temperate Atlantic and Indo-West-Pacific Oceans. The only known predator is *Alepisaurus ferox* (longnose lancetfish). Not of interest to fisheries.

Distribution: Madeira, Morocco, Canary Islands, Mauritania; Mediterranean; Nova Scotia to Brazil; South Atlantic and southern Africa to southeastern Indian Ocean; southwestern and central Pacific.



THYSANOTEUTHIDAE

Rhomboid squids, diamondback squids

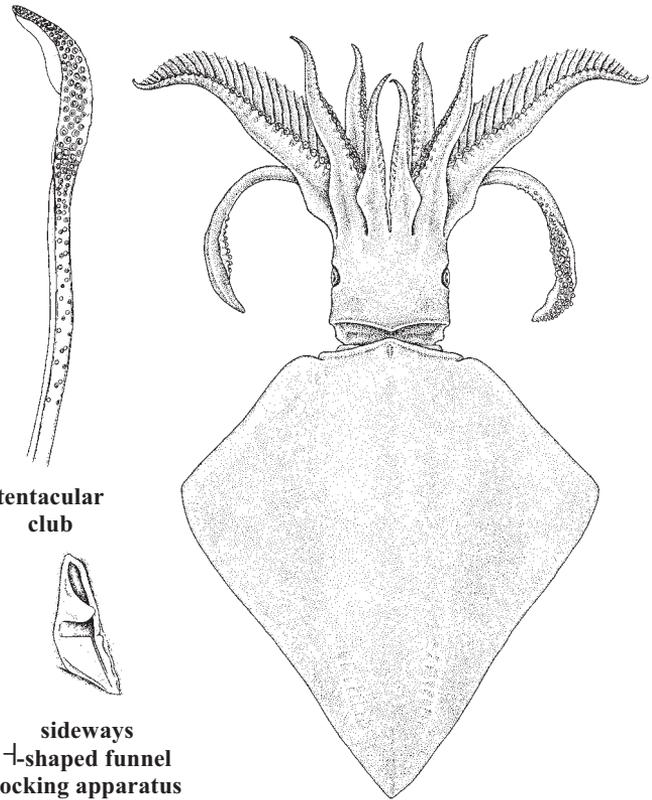
This monotypic family contains a single species. Consequently, diagnostic characters, habitat, biology and interest to fisheries coincide.

Thysanoteuthis rhombus Troschel, 1857

Frequent synonyms / misidentifications: *Cirrobrachium filiferum* Hoyle 1904; *C. danae* Joubin, 1933 / None.

FAO names: **En** – Diamondback squid; Rhomboid squid; **Fr** – Chipiloua commun; **Sp** – Chipirón volantin, Calamar losange.

Diagnostic characters: Mantle thick, muscular, tapering to a blunt tip posteriorly. **Fins long, broad, rhombic, occupying entire length of mantle, their width 70% of mantle length. Mantle-funnel locking apparatus sideways T-shaped.** Nuchal cartilage with 2 projections entering grooves on anterior edge of mantle. Tentacular clubs with 4 rows of suckers. Fixing apparatus present on tentacles. Arms short with 2 rows of suckers and highly developed protective membranes expanded into long cirri-like trabeculae. Buccal connectives attached to ventral borders of arms IV. Left ventral arm of males hectocotylized. Light organs absent.



(illustration: K. Hollis/ABRS)

dorsal view

Similar families occurring in the area

Other families also have species with fins extending the entire length of the mantle (e.g. Mastigoteuthidae, Ancistrocheiridae, Cycloteuthidae); all can easily be eliminated, however, by the distinctive funnel locking apparatus peculiar to the Thysanoteuthidae.

Size: Maximum mantle length 100 to 130 cm; maximum total weight about 25 to 30 kg.

Habitat, biology, and fisheries: An epipelagic, oceanic species. Its distribution and migration is related to surface circulation of oceanic currents. Found from surface to 750 m, especially 450 to 650 m. This species is characterized by low population densities and appears to have a unique social organization for squids: they live a great part of their life cycle in couples of 1 male and 1 female of similar size. Males are more precocious than females; mature males were observed at 39 cm mantle length aged 150 to 170 days, whereas females' maturation occurred later, at 50 to 62 cm mantle length (215 to 240 days). Although females have a high potential fecundity (up to 4.8 millions of oocytes) their eggs masses contain from 24 000 to 76 000 eggs. This indicated that spawning is intermittent. Egg masses are planktonic and they have been found drifting in the surface layers in different geographic areas. The egg masses are dense, gelatinous, oblong cylinders with rounded tips and their maximum length and diameter range from 600 to 1 800 mm and 100 to 300 mm, respectively. The spawning season of this species extends throughout the year in tropical waters (sea surface

temperature 23 to 26°C) but from January to September, with peaks in March and May, in peripheral regions. The average mantle length of the planktonic paralarvae ranges from 1.6 to 2.0 mm. This species has one of the fastest growth rates among squids; by an age of 300 days they reached 750 to 800 mm mantle length. Its life span is estimated to be about 1 year. Predators included sperm whales, sword fish, tuna and blue marlin. The species has been found dying in nearshore waters or stranded ashore at the outer edges of the species range. This species has commercial importance mainly in Japan where it is caught by small vessels using drifting jigs, setnets and longlines. It is consumed fresh and frozen.

Distribution: Cosmopolitan in warm and warm temperate waters, between approximately 50°N and 50°S, including the Mediterranean Sea.



References

- Bower, J.R. & Miyahara, K.** 2005. The diamond squid (*Thysanoteuthis rhombus*): A review of the fishery and recent research in Japan. *Fisheries Research*, 73: 1–11.
- Escáñez, A., Riera, R., González, A.F. & Guerra, A.** 2012. On the occurrence of diamond-shaped squid (*Thysanoteuthis rhombus* Troschel, 1857) egg masses in the subtropical eastern Atlantic (Canary Islands). A potential species to capture? *ZooKeys*, 222: 69–76.
- Guerra, A.** 1992. *Mollusca, Cephalopoda*. In M.A. Ramos M.A. et al. eds. *Fauna Ibérica*. Vol. 1. Museo Nacional de Ciencias Naturales. CSIC, Madrid, 327 pp.
- Guerra, A., González, A.F., Rocha, F., Sagarminaga, R. & Cañadas, A.** 2002. Planktonic egg masses of the diamond-shaped squid *Thysanoteuthis rhombus* in the eastern Atlantic and the Mediterranean Sea. *Journal of Plankton Research*, 24(4): 333–338.
- Nigmatullin, Ch.M. & Arkhipkin, A.I.** 1998. A review of the biology of the diamondback squid, *Thysanoteuthis rhombus* (Oegopsida: Thysanoteuthidae). In T. Okutani ed. *Large pelagic squids*. *Japan Marine Fishery Resource Research Center*, Tokyo: 115–181.
- Roeleveld, M.A. & Pheiffer, F.** 1987. The diamond squid. *Sagittarius*, 2(4): 20–22.
- Roper, C.F.E. & Jereb, P.** 2010. Family Thysanoteuthidae. In P. Jereb & C.F.E. Roper, eds. *Cephalopods of the world. An annotated and illustrated catalogue of species known to date. Volume 2. Myopsid and Oegopsid Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2. Rome, FAO. pp. 384–387.
- Wakabayashi, T., Tsuchiya, K. & Segawa, S.** 2005. Morphological changes with growth in the paralarvae of the diamondback squid *Thysanoteuthis rhombus* Troschel, 1857. In Ch. Chotiyaputta, E.M.C Hatfield & C.C. Lu eds. *Cephalopod Biology, Recruitment and Culture*. *Phuket Marine Biological Center Research Bulletin*, 66: 167–174.

VAMPIRES

VAMPYROTEUTHIDAE

Vampire squids

A single species in the family.

Vampyroteuthis infernalis Chun, 1903

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Vampire squid; **Fr** – Calmar vampire; **Sp** – Calamar vampiro.

Diagnostic characters: Medium size gelatinous animals. Mantle widely conical, fused with the wide head in the occipital area without nuchal constriction. Mantle opening wide. Eyes large, without sinus. No buccal membrane, funnel completely embedded in the tissue of ventral side of head. **Two large composite light organs of facet structure are located dorsally in posterior part of mantle on sides midline behind the fins.** The second pair of arms is modified into retractile filaments, presumable with sensory function; they can extend in length in excess of the total animal length and can be retracted into pockets within the web. **Eight arms short, connected by a deep web, with 1 row of suckers and 2 rows of short cirri on both sides of suckers.** Mantle and outer side of arms dark violet or dark purple, while inner side of arms velvet black.

Similar families occurring in the area

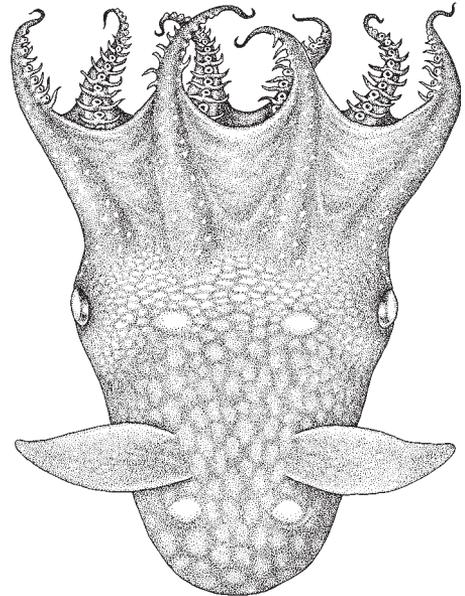
None.

Size: Up to 130 mm mantle length.

Habitat, biology, and fisheries: Bathypelagic species, descending also to the abyssopelagic zone. Lives mainly at depths of 700 to 1 500 m, although the juveniles can be found sometimes between 300 and 350 m depth. Not gregarious animals. They do not perform important diel vertical migrations and their movements resemble the ones undertaken by cirrate octopods. This species lacks sexual dimorphism. Probably swim with their head down. Eggs are large 3 to 4 mm in diameter, shed singly into the water. The larvae resemble adult specimen. *Vampyroteuthis infernalis* has little capacity for jet propulsion and has the lowest metabolic rate ever measured for a cephalopod. Of no importance for the fisheries.

Distribution: Cosmopolitan in tropical and subtropical waters.

Remarks: Fin development in vampire squids is unique among cephalopods; the pair of fins present at hatching, in fact, is eventually reabsorbed and replaced by another pair, more anterior, as development proceeds. Therefore, at a certain stage of development, animals have 2 pair of fins. This unusual fin ontogeny is partially responsible for the early description of 3 families and many species, where only 1 species exists (Young, 2012).



(illustration: K. Hollis/ABRS)



References

- Bizikov, V.A.** 2004. The shell in Vampyropoda (Cephalopoda): morphology, functional role and evolution. *Ruthenica*, suppl. 3: 88 pp.
- Healy, J.M.** 1989. Spermatozoa of the deep-sea cephalopod *Vampyroteuthis infernalis* Chun: ultrastructure and possible phylogenetic significance. *Philosophical Transactions of the Royal Society of London. Series B. Biological Sciences*, 323: 589–600.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Pickford, G.E.** 1946. *Vampyroteuthis infernalis* Chun. An Archaic dibranchiate Cephalopod. I. Natural History and distribution. *Dana Report, Carlsberg Foundation*, 29: 38 pp.
- Pickford, G.E.** 1949. *Vampyroteuthis infernalis* Chun. An Archaic dibranchiate Cephalopod. II. External Anatomy. *Dana Report, Carlsberg Foundation*, 32: 131 pp.
- Pickford, G.E.** 1952. The Vampyromorpha of the Discovery Expeditions. *Discovery Report*, 26: 197–210.
- Seibel, B.A., Thuesen, E.V. & Childress, J.J.** 1998. Flight of the Vampire: ontogenetic gait-transition in *Vampyroteuthis infernalis* (Cephalopoda: Vampyromorpha). *The Journal of Experimental Biology*, 201: 2413–2424.
- Young, R.E.** 1967. Homology of retractile filaments of vampire squid. *Science*, 156(3782): 1633–1634.
- Young, R.E.** 1972. The systematics and areal distribution of pelagic cephalopods from the seas off Southern California. *Smithsonian Contributions to Zoology*, 97: 1–159.
- Young, R.E.** 2012. Vampyroteuthidae Thiele, in Chun, 1915. *Vampyroteuthis infernalis* Chun, 1903. The Vampire Squid. Version 04 July 2012. http://tolweb.org/Vampyroteuthis_infernalis/20084/2012.07.04 in The Tree of Life Web Project, <http://tolweb.org/>

Cirrate OCTOPODS

CIRROTEUTHIDAE

Cirroctopods

Diagnostic characters: Small-to-large cirrate octopods (maximum known ML 330 mm; total length: 1 700 mm), with extended bell-shaped body. **Web or umbrella complex, with secondary web** linking arms to primary web. Digestive gland entire. **Cirri extremely long.** **Gill form sepioid.** Without radula and posterior salivary glands.

Habitat, biology, and fisheries: Benthic to benthopelagic range animals. Occurs in depths from 200 to 5 000 m. Little is known about habitat preferences, and many aspects of the biology of these deep-sea cephalopods are poorly known and understood. Males produce small spermatophores (or 'sperm packets') characteristic of the cirrate octopods, located in the seminal vesicle and terminal organ. There is a continuous production of eggs and spermatophores over the adult life span. Fertilization is internal and the eggs are incapsulated. Growth is slow and the life cycle may last several years. Finned octopods prey mainly upon suprabenthic and benthopelagic crustacean and polychaetes. Known predators: Patagonian toothfish (*Dissostichus eleginoides*), different species of sharks, fur seals and sperm whales. They show different aptitudes and modes of locomotion. Of no interest to fisheries.

Similar families occurring in the area

Opisthoteuthidae: differ from Cirroteuthidae in having a simple web (so lacking of secondary web or umbrella), because they have short cirri, gills are 'half-orange' in form and the fins are small and subterminal.

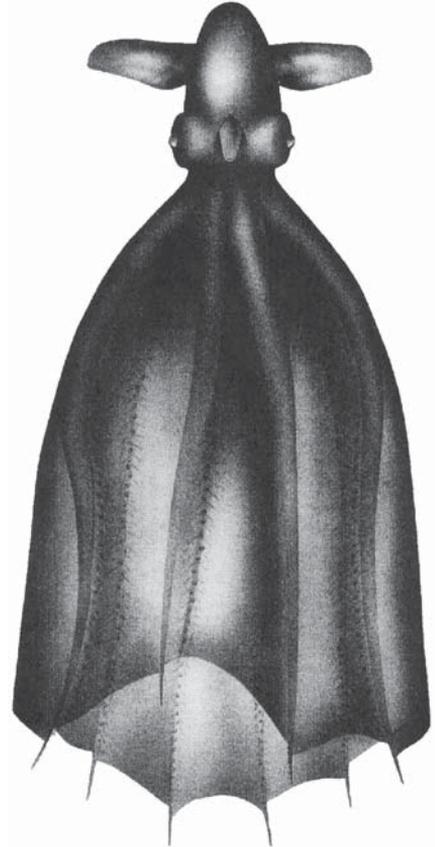
List of species occurring in the area

The symbol 🦑 is given when species accounts are included.

🦑 *Cirrothauma magna* (Hoyle, 1885) .

Remarks

It is possible that the blind cirrate octopod *Cirrothauma murrayi* Chun, 1911 is present in the area. However, the assumed worldwide distribution of this species requires a deep review.



(from Guerra, 1998)

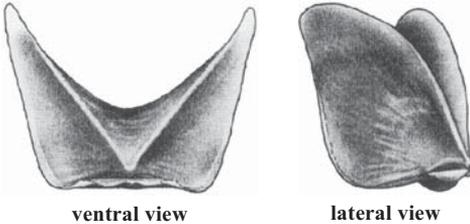
References

- Collins, M.A. & Villanueva, R.** 2006. Taxonomy, ecology and behaviour of cirrate octopod. *Oceanography and Marine Biology: An Annual Review*, 44: 277–322.
- Collins, M.A., O' Dea, M. & Henriques, C.** 2001. A large *Cirroteuthis magna* (Cephalopoda: Cirroctopoda) caught on the Cape Verde Terrace (North Atlantic). *Journal of the Marine Biological Association of the United Kingdom*, 81: 357–358.
- Guerra, A., Villanueva, R. Nesis, K. & Bedoya, J.** 1998. Redescription of the deep-sea cirrate octopod *Cirroteuthis magna* Hoyle, 1885, and considerations on the genus *Cirroteuthis* (Mollusca, Cephalopoda). *Bulletin of Marine Science*, 63(1): 51–81.
- O'Shea, S.** 1999. The Marine Fauna of New Zealand Octopoda (Mollusca: Cephalopoda). *NIWA Biodiversity Memoir*, 112: 280 pp.
- Vecchione, M., Young, R.E. & Mangold, K.M.** 2008. Cirroteuthidae Keferstein, 1866. Version 28 April 2008 (under construction). <http://tolweb.org/Cirroteuthidae/20091/2008.04.28> in The Tree of Life Web Project, <http://tolweb.org/>
- Villanueva, R., Segonzac, M. & Guerra A.** 1997. Locomotion modes of deep-sea cirrate octopods (Cephalopoda) based on observations from video recordings on the mid-Atlantic Ridge. *Marine Biology*, 129: 113–122.

***Cirrothauma magna* (Hoyle, 1885)**

Frequent synonyms / misidentifications: *Cirroteuthis magna* Hoyle, 1885 / None.

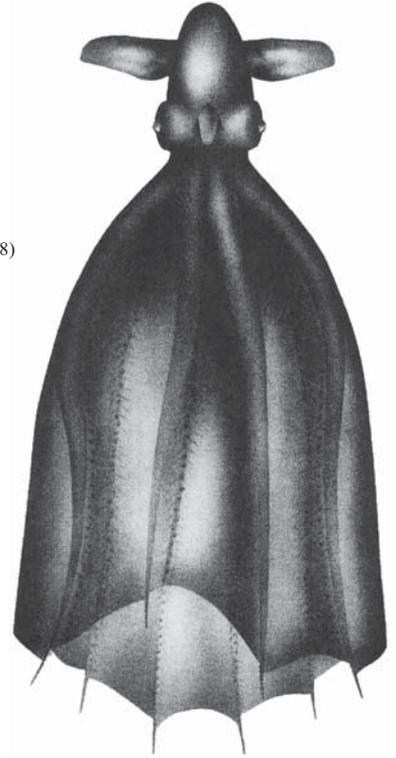
FAO names: **En** – Large cirroctopod; **Fr** – Grand cirropoulp; **Sp** – Gran cirropulpo.



internal shell

(all illustrations from Guerra, 1998)

Diagnostic characters: **Body gelatinous.** Mantle short, oblong, relatively elongated and gently rounded posteriorly. Mantle aperture narrow and slightly larger than base of funnel, which is relatively long. **Fins paddle-shaped large and wide, slightly longer than the interocular width.** Very voluminous eyes with large lenses. Arm length 73 to 79% of the total length. Primary web inserting at different levels on the oral and aboral ends of dorsolateral (II) and ventrolateral (III) arms on both sides, and at the same levels on both ends of the dorsal and ventral arms (I and IV). Each arm is not directly connected to the primary web except at its distal margin and at the base of the arms, but each arm is connected with the **primary web by an intermediate or secondary web** that is attached along the aboral side of the arms; absence of a nodule at the fusion point of both webs. Very long not retractile cirri; the first cirri commence between the fourth and fifth suckers. Three type of suckers on the arms: cylindroconical form and those with the acetabulum highly deformable on the first two-thirds and barrel-shaped on the rest of the arm; no enlarged suckers in male or females. **Butterfly-like internal shell;** shell width index 26 to 31. Between 5 and 6 gill lamellae per outer demibranch.



Size: Maximum mantle length 350 mm.

Habitat, biology, and fisheries: Deep-sea benthopelagic octopods inhabiting abyssal ecosystems and ascending in the upwelling off Cape Blanc (central-east Atlantic). Found at depths from 1 350 to 3 350 m. These gelatinous animals are neutrally buoyant. They can be considered abyssopelagic octopods, although they can also rest on the bottom, where they probably feed. This species, and other related ones, have been observed to swim between 2.2 km h⁻¹ and 0.46 km h⁻¹ using the fins. A ballooning response was observed in a high-stress situation when 1 specimen was captured. The spermatozooids are in the interior of typical structured called "sperm sacs". The ovary of the gravity female caught was enormous (100 x 80 mm) and it was full of practical spherical oocytes of different sizes, up to 11 mm in diameter. No interest to fisheries.

Distribution: Only 4 specimens have been described: a female captured at 45° 46'S, 45° 31'W between Price Edward and Crozet Islands; a female caught at 23°00'N–17°34' (eastern Atlantic Ocean), a male collected at 17°28.75'N–46°33.36'W (central Atlantic Ocean), and a female on the Cape Verde Terrace off the west African coast. Central-East Atlantic Ocean.

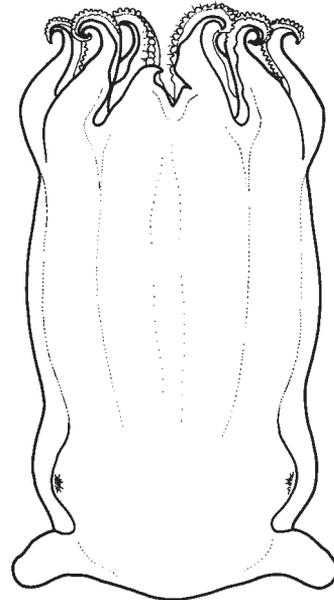


OPISTHOTEUTHIDAE

Flapjack octopods

Diagnostic characters: Moderate-sized gelatinous cirroctopods with small, subterminal fins. **Shell a flaring U-shape, lateral walls tapering to fine points;** optic nerves pass through white body in 2 to 4 bundles. **Two fields of enlarged suckers in mature males.** Digestive gland entire or bilobed. Radula and posterior salivary glands absent. **Web deep, single.** Gills of 'half-orange' from.

Habitat, biology, and fisheries: Benthic animals. Found from 152 to 2 287 m. Males have enlarged modified suckers of unknown function, in 1 or 2 fields from 1 to all arm pairs, a character absent in females. Enlargement of suckers discriminates between mature and immature males. Males produce small spermatophores or 'sperm packets'. There is a follicular sheath around each maturing egg that remains attached to the ovary after mature eggs are released into the proximal oviduct. Absolute fecundity is relatively low (no more than 3 300 eggs per individual). Fertilization is internal. The fertilized eggs are large and encapsulated; the egg capsule, produced by the oviducal gland, is hard. Mating behaviour is unknown. Flapjack octopods have a single, extended and continuous period of egg maturation and spawning, which occupies a long period of their life span. This seems to be an adaptation to non-seasonal deep-sea environments. Some species attach their eggs to substrata fixed onto the bottom. The duration of the embryonic development is unknown. These octopods prey upon different species of polychaeta and suprabenthic crustaceans. The cirri play an important role in chemo- and mechanoreception. Several attitudes and locomotion modes have been described. Main predators are deep-sea sharks, teleostean fishes and marine mammals. Members of this family seem to have low growth rates and life span of several years, adapted to cold deep-sea waters. Of no interest to fisheries.



dorsal view

Similar families occurring in the area

Cirrotheutidae differ from Opisthoteuthidae in possessing a complex (secondary) web and extremely long cirri.

Key to the genera occurring in the area

- 1a. Fin of proximately the same length as mantle length; optic lobe circular in cross section; sucker in males not greatly enlarged and do not form 2 fields **Grimpoteuthis**
- 1b. Fin length approximately half of mantle length; optic lobe kidney-shaped in cross section; arms of males generally with modified suckers in 2 clear fields (proximal and distal) **Opisthoteuthis**

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Grimpoteuthis boylei* Collins, 2003.
-  *Grimpoteuthis wuelkeri* (Grimpe, 1920).
-  *Opisthoteuthis calypso* Villanueva, Collins, Sánchez and Voss, 2002.
-  *Opisthoteuthis grimaldii* (Joubin, 1903).
-  *Opisthoteuthis massyae* (Grimpe, 1920).

Remarks: No key to species are presented due to the complexity of the characters and the absence of females in 1 species.

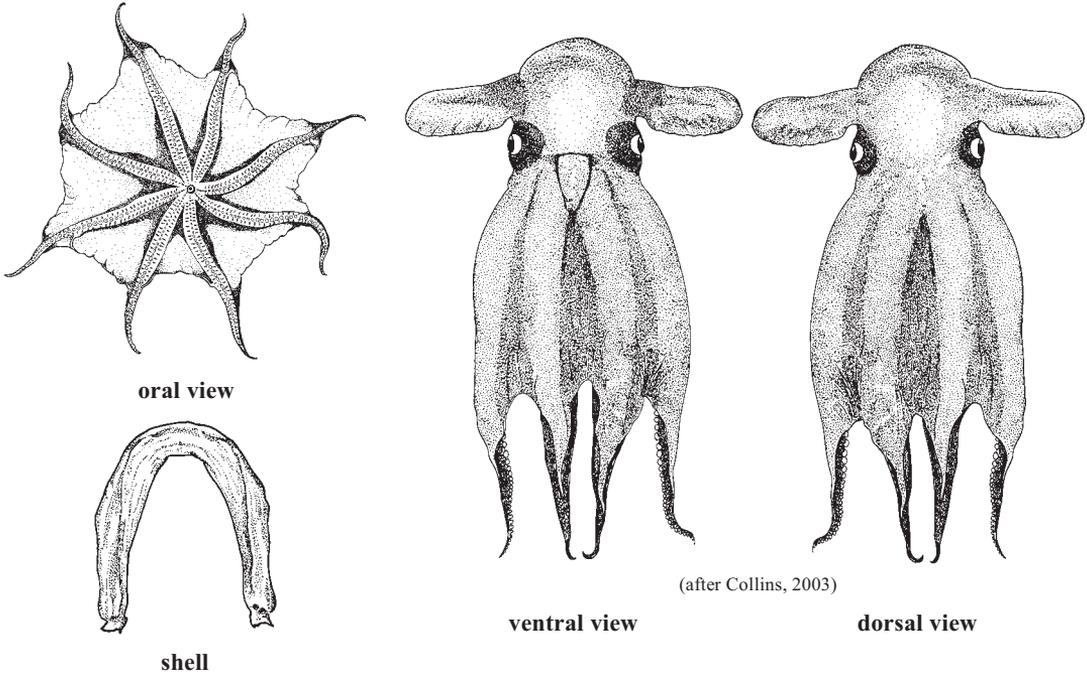
References

- Collins, M.A.** 2003. The genus *Grimpoteuthis* (Octopoda: Grimpoteuthidae) in the north-east Atlantic, with descriptions of three new species. *Zoological Journal of the Linnean Society*, 139: 93–127.
- Collins, M.A. & Villanueva, R.** 2006. Taxonomy, ecology and behaviour of cirrate octopod. *Oceanography and Marine Biology: An Annual Review*, 44: 277–322.
- Collins, M.A., Vecchione, M. & Young, R.E.** 2003a. *Grimpoteuthis boylei* Collins, 2003. Version 13 May 2003 (under construction). http://tolweb.org/Grimpoteuthis_boylei/20119/2003.05.13 in The Tree of Life Web Project, <http://tolweb.org/>
- Collins, M.A., Vecchione, M. & Young, R.E.** 2003b. *Grimpoteuthis wuelkeri* (Grimpe, 1920). Version 13 May 2013 (under construction). http://tolweb.org/Grimpoteuthis_wuelkeri/20130/2003.05.13 in The Tree of Life Web Project, <http://tolweb.org/>
- Sánchez, P. & Guerra, A.** 1989. A new species of cirrate octopod *Opisthoteuthis vossi*, from the southeast Atlantic (Cephalopoda: Octopoda). *Bulletin of Marine Science*, 44(3): 1159–1165.
- Vecchione, M., Mangold, K. M. & Young, R.E.** 2008. Opisthoteuthidae Verrill 1896. Version 21 May 2008 (under construction). <http://tolweb.org/Opisthoteuthidae/20089/2008.05.21> in The Tree of Life Web Project, <http://tolweb.org/>
- Villanueva, R.** 1992. Continuous spawning in the cirrate octopods *Opisthoteuthis agassizii* and *O. vossi*: features of sexual maturation defining a reproductive strategy in cephalopods. *Marine Biology*, 114: 265–275.
- Villanueva, R. & Guerra, A.** 1991. Food and prey detection of two deep-sea cephalopods: *Opisthoteuthis agassizii* and *O. vossi* (Octopoda: Cirrata) from southeastern Atlantic. *Bulletin of Marine Science*, 49(1–2): 288–299.
- Villanueva, R., Segonzac, M. & Guerra, A.** 1997. Locomotion modes of deep-sea cirrate octopods (Cephalopoda) based on observations from video recordings on the mid-Atlantic Ridge. *Marine Biology*, 129: 113–122.
- Villanueva, R., Vecchione, M., & Young, R.E.** 2003. *Opisthoteuthis grimaldii* Joubin 1903. http://tolweb.org/Opisthoteuthis_grimaldii/20159/2003.05.13 in The Tree of Life Web Project, <http://tolweb.org/>
- Villanueva, R., Vecchione, M. & Young, R.E.** 2006a. *Opisthoteuthis calypso* Villanueva, Collins, Sanchez and Voss 2002. Version 17 July 2006 (under construction). http://tolweb.org/Opisthoteuthis_calypso/20154/2006.07.17 in The Tree of Life Web Project, <http://tolweb.org/>
- Villanueva, R., Vecchione, M. & Young, R.E.** 2006b. *Opisthoteuthis massyae* (Grimpe 1920). Version 22 July 2006 (under construction). http://tolweb.org/Opisthoteuthis_massyae/20161/2006.07.22 in The Tree of Life Web Project, <http://tolweb.org/>
- Villanueva, R., Collins, M.A., Sánchez, P. & Voss, N.A.** 2002. Systematics, distribution and biology of the cirrate octopods of the genus *Opisthoteuthis* (Mollusca, Cephalopoda) in the Atlantic Ocean, with description of two new species. *Bulletin of Marine Science*, 71(2): 933–985.
- Young, R.E. & Vecchione, M.** 2008. *Grimpoteuthis* Robson, 1932. Version 28 April 2008 (under construction). <http://tolweb.org/Grimpoteuthis/20104/2008.04.28> in The Tree of Life Web Project, <http://tolweb.org/>

***Grimpoteuthis boylei* Collins, 2003**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Boyle's flapjack octopod; **Fr** – Discopoulpe de Boyle; **Sp** – Discopulpo de Boyle.



Diagnostic characters: Cirri long and suckers large (52 to 58% head width), cylindrical; area where suckers are largest (maximum diameter) at web margin. Gills large, with 7 or 8 broad lamellae. Radula present; teeth homodont. Posterior salivary glands present. **Fin-supporting cartilage (shell) U-shaped, smooth, with distinct depression in the posterior surface of the basal portion; outer edges of lateral walls parallel, with blunt termination.**

Size: Maximum mantle length 115, total length 440 mm (female).

Habitat, biology, and fisheries: Abyssal species. Found at depths from 4 000 to 4 900 m. Of no interest to fisheries.

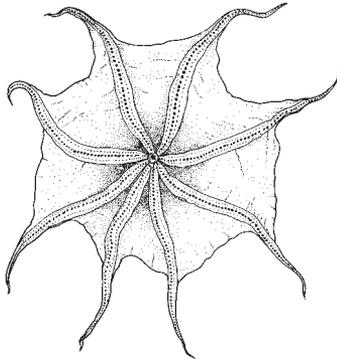
Distribution: From the Porcupine Seabight and Madeira Abyssal Plain. Probably distributed from 20° to 50°N in the northeast Atlantic.



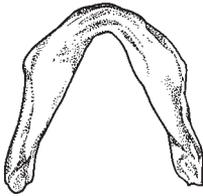
***Grimpoteuthis wuelkeri* (Grimpe, 1920)**

Frequent synonyms / misidentifications: *Stauroteuthis wuelkeri* Grimpe, 1920; *Cirroteuthis umbellata* (Chun, 1913; in part); *Stauroteuthis umbellata* (Ebersbach, 1915); *Enigmatiteuthis wulkeri* (O'Shea, 1999) / None.

FAO names: **En** – Wülker's flapjack octopod; **Fr** – Discopoulpe de Wülker; **Sp** – Discopulpo de Wülker.

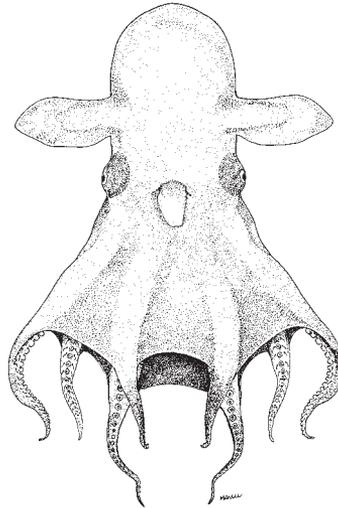


oral view

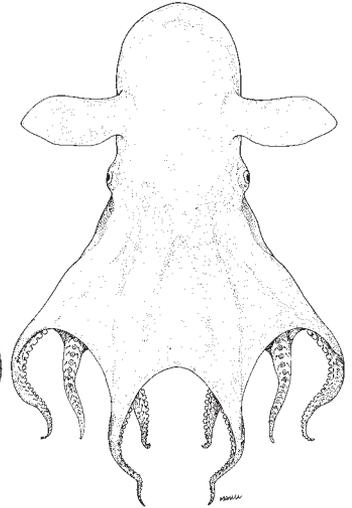


(after Collins, 2003)

shell



ventral view



dorsal view

(after Collins, 2003)

Diagnostic characters: Cirri short. From 60 to 70 suckers deeply embedded in each of the arms, with suckers large present over broad range of arms. Radula present, all teeth homodont (equals). Posterior salivary glands small. **Shell U-shaped, robust, with thickened basal portion and fin attachment area strengthened; lateral wings terminate in 2 lobes, one of which extends to fine point;** gills large, with 6 or 7 broad lamellae.

Size: Maximum mantle length known 115 mm, total length 400 mm (females).

Habitat, biology, and fisheries: Abyssal species. Known from 1 500 to 2 500 m. Egg length 14 mm. No other information is available on the biology of this species. Of no interest to fisheries.

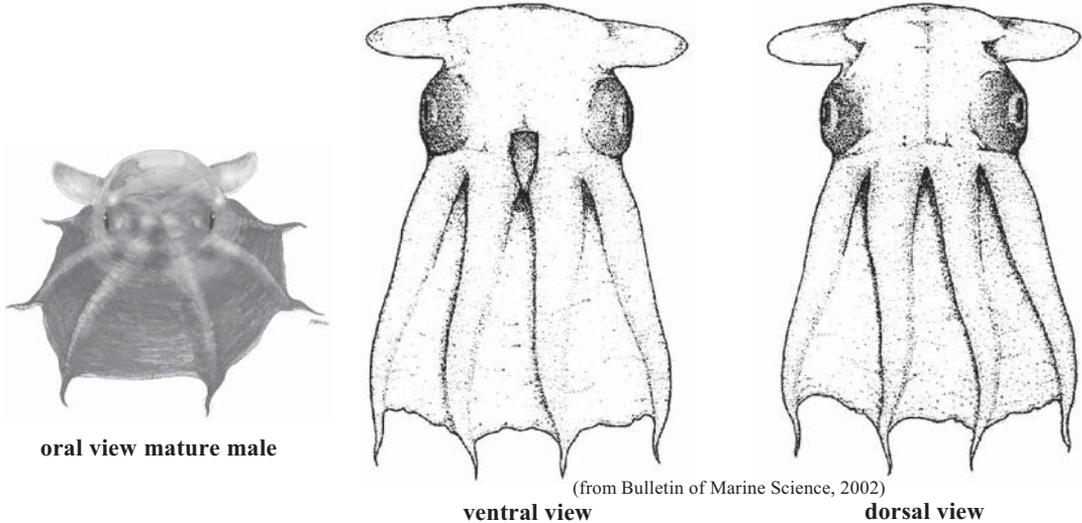
Distribution: Northwest and northwest Atlantic. the type locality is located off the coast of Morocco.



Opisthoteuthis calypso Villanueva, Collins, Sánchez and Voss, 2002

Frequent synonyms / misidentifications: *Opisthoteuthis agassizii* (non Verrill, 1833) / None.

FAO names: **En** – Calypso flapjack octopod; **Fr** – Discopoulpe de Calypso; **Sp** – Discopulpo de Calypso.



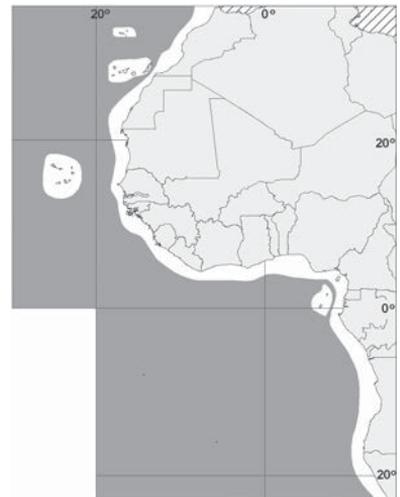
Diagnostic characters: No increased robustness of arm I in mature male. From the ventral margins of all the arms, a single muscular nodule extends into the web to its outer edge at the approximate level of the maximum depth of the web between arms, typically at suckers 22 to 27. **In mature males, sucker enlargement in proximal field greatest on arm III. The distal enlarged sucker field comprises 2 or 3 (exceptionally 4) contiguous suckers, usually beginning at about sucker 23 to 24 with sucker 26 largest.** In mature males, maximum distal enlarged sucker diameter equals or exceeds that of proximal enlarged suckers. **Sucker enlargement in distal field greatest on arm III and IV. First cirrus usually occurs between suckers 1 and 2.** Basal portion of the shell slightly concave outer surface and convex inner surface. Eggs relatively small; eggs from oviducal gland and distal oviduct range in height between 5.1 (in the oviducal gland) and 7.5 mm (in the distal oviduct).

Size: Total length in males 482 mm (5 400 g of total weight) and 342 in females (1 650 g total weight).

Habitat, biology, and fisheries: Benthic species inhabiting muddy bottoms from 365 to 2 208 m depth. In the southeastern Atlantic it was collected by trawl at densities of 6 to 23 individuals per km⁻² with no difference between day and night abundance. Animals feed upon small epibenthic and suprabenthic crustaceans and polychaetes. Predators are unknown. Mature individuals of both sexes are collected in all seasons of the year. All males from 95 to 5 400 g total weight and females from 190 to 1 650 g are mature, indicating that considerable growth take place after onset of sexual maturity. Egg production is continuous over the entire adult life span. Of no interest to fisheries.

Distribution: Mediterranean and eastern Atlantic, from Ireland to Namibia and possibly South Africa.

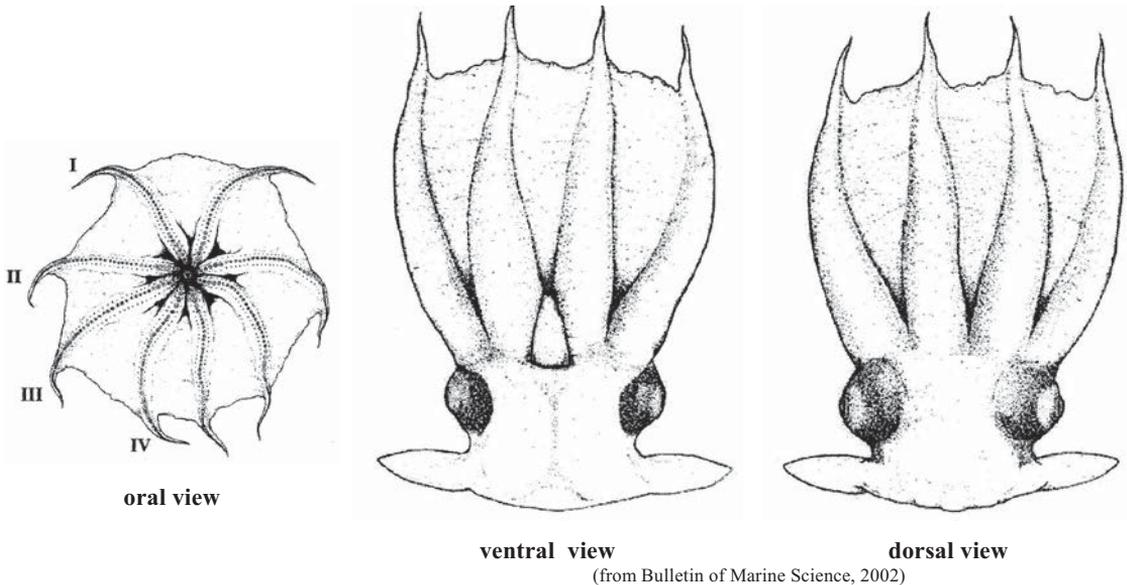
Remarks: Several authors identified specimens from the Mediterranean, North Atlantic and central-east Atlantic as *Opisthoteuthis agassizii*. However, these records belong to *O. calypso*.



Opisthoteuthis grimaldii (Joubin, 1903)

Frequent synonyms / misidentifications: *Cirrotheuthis grimaldii* Joubin, 1900; *Grimpoteuthis grimaldii* (Joubin), Robson, 1932; *Opistoteuthis grimaldi* (Joubin), Voss, 1988 / None.

FAO names: **En** – Grimaldi's flapjack octopod; **Fr** – Discopoulpe de Grimaldi; **Sp** – Discopulpo de Grimaldi.



Diagnostic characters: No increased robustness of arm I in mature male. From the ventral-lateral margins of all the arms, a single muscular nodule extends into the web to its outer edge at typically occurs at the level of suckers 25 to 30, and 1 to 4 suckers prior to the enlarged distal sucker. **In mature males, sucker enlargement in proximal field greatest on arm III. The distal enlarged sucker field in mature males is less than proximal. The distal enlarged fields typically comprises 9 or 10 suckers, usually beginning at about sucker 22 to 31 and ending at sucker 31 to 39, with suckers 29 to 31 usually largest. The sucker enlargement in distal field is approximately equal on all arms.** First cirrus usually occurs between suckers 2 and 3. Basal portion of the shell with essentially flat outer surface and convex inner surface.

Size: Up to 54 mm mantle length. At present known only from mature male specimens.

Habitat, biology, and fisheries: This is a benthic species inhabiting muddy bottoms. Found at depths from 1 135 to 2 287 m, probably the deepest occurring *Opisthoteuthis* in the Atlantic. Its biology is unknown. Of no interest to fisheries.

Distribution: Known for certain only from the eastern Atlantic: Rockall Through, Açores islands and off Cape Blanc in the North Atlantic; off Namibia in the South Atlantic. Possible presence off northwest of Bermuda.

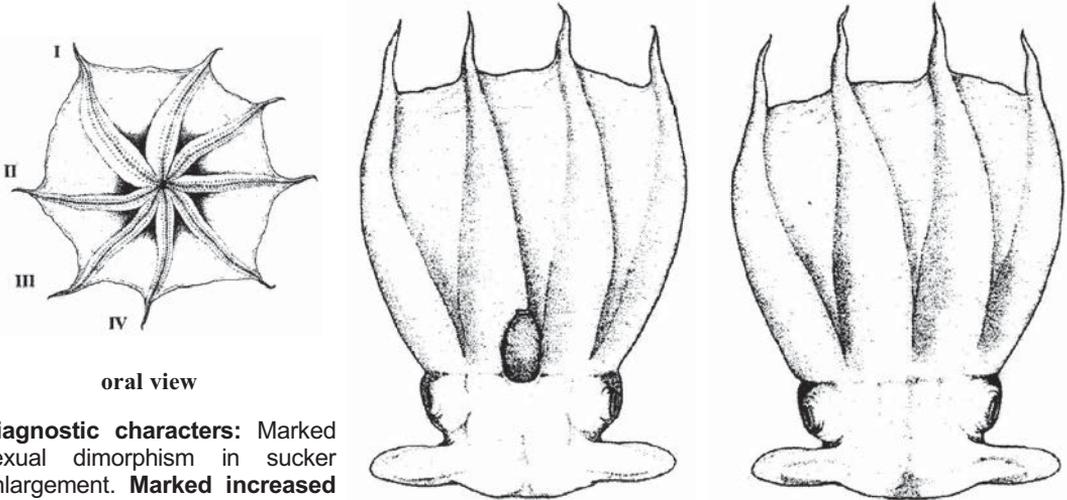
Remarks: The diagnosis is based on mature male specimens. No females have been unquestionably identified to this species.



***Opisthoteuthis massyae* (Grimpe, 1920)**

Frequent synonyms / misidentifications: *Cirroteuthis umbellata* Massy, 1909; *Cirroteuthopsis massyae* Grimpe, 1920; *Opistoteuthis vossi* Sánchez and Guerra, 1989 / None.

FAO names: **En** – Massy's flapjack octopod; **Fr** – Discopoulpe de Massy; **Sp** – Discopulpo de Massy.



(from Bulletin of Marine Science, 2002)

ventral view

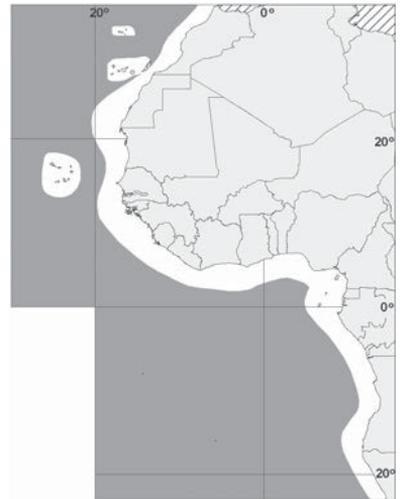
dorsal view

Diagnostic characters: Marked sexual dimorphism in sucker enlargement. **Marked increased thickness of arms I in mature male.** A series of muscular, web supports, of which proximal support is stout and more distal ones weak, extend from the ventral margins of all arms to web margin beginning at level of greatest deep of web, typically occurs at the level of suckers 35 to 37, the level of first distal enlarged suckers in males. **In mature males, maximum proximal enlarged sucker diameter exceeds that of distal enlarged suckers. Distal sucker enlargement absent on arms I, slight on arms II, greatest on arms III and IV. The distal enlarged fields comprises 9 to 11 contiguous suckers, beginning at about sucker 34 to 40, with suckers 40 or 41 usually largest.** First cirrus usually occurs between suckers 3 and 4 or 4 and 5. Basal portion of the shell with concave outer surface and convex inner surface.

Size: Total weight reaches 5 650 g in males of 350 mm total length (TL) and 2 959 g in females of 285 mm total length.

Habitat, biology, and fisheries: Benthic species, inhabiting muddy bottoms, from 788 to 1 450 m. The diet is composed of small epibenthic and suprabenthic crustaceans and polychaetes. No conspicuous feeding rhythm was detected. The higher capture abundances recorded during night time could imply a change in activity independent of feeding. Behaviour displays such as bottom resting, flat-spreading, web-inversion and ballooning response were observed. Mature males and females are collected in all seasons of the year, both in the northern and southern Atlantic. Potential fecundity is 3 200 eggs. Eggs are probably released at 1 or 2 at a time. Mineral composition of egg shell indicates that sulphur (27%) and phosphorus (20%) are the major components. Embryonic development and juvenile life are unknown. Of not interest to fisheries.

Distribution: Eastern Atlantic, from off Ireland to Namibia and possibly to South Africa.



ALLOPOSIDAE

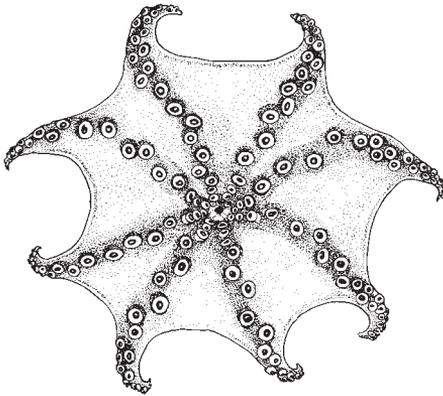
Gelatinous giant octopods

This monotypic family contains a single species. Consequently, diagnostic characters, habitat, biology and interest to fisheries coincide.

Haliphron atlanticus Steenstrup, 1861

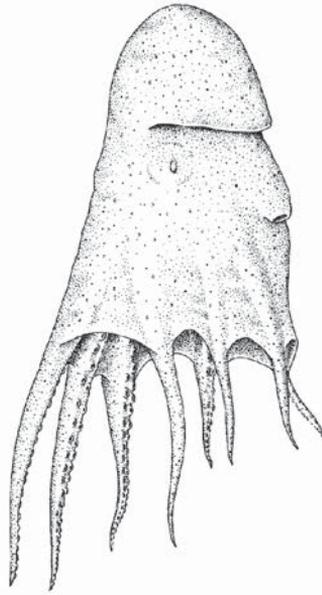
Frequent synonyms / misidentifications: *Alloposus mollis* Verrill, 1880 / None.

FAO names: En – Gelatinous giant octopod; Fr – Poulpe gelée géant; Sp – Megapulpo gelatinoso.



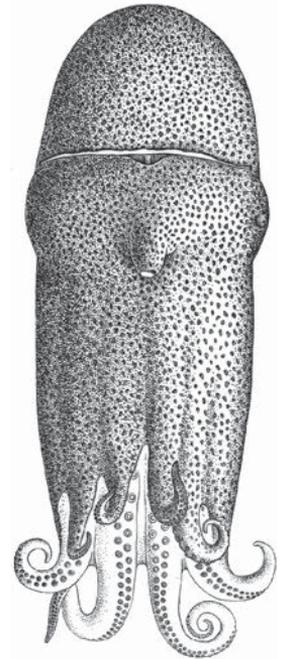
(after Guerra, 1992)

oral view



(from Guerra, 1992)

lateral view



ventral view

Diagnostic characters: Body gelatinous and sac-shaped; mantle short; head wide, not narrower than mantle. Mantle aperture very wide. Extensive web between arms. The funnel is embedded in the mantle tissue; it opens in front of the eyes. Complex funnel locking apparatus. Eyes very big, approximately 30% of mantle length. Suckers mostly in 2 series but grade to single series near mouth. No enlarged arm suckers. Third right arm of male hectocotylized. **The hectocotylus is developed in a sac in front of the right eye, it breaks off at mating.** A total of 18 lamellae per demibranch. Hydrostatic organ (swim bladder) present dorsal to digestive system. A remnant of the true shell, a short, thick almost gelatinous stylet, is present. **Purplish violet coloration of the skin.**

Similar families occurring in the area

This family was included by Naef (1923) in the superfamily Argonautoidae together with Argonautidae, Ocythoidae and Tremoctopodidae. These 4 families are primarily distinguished from the rest of octopods by an unusual means of copulation which involves transferring a detached hectocotylus from the male to the female. Also, males usually are much smaller than females and dwarf in 3 over 4 families. The gelatinous Alloposidae females do not produce calcareous shells as Argonautidae females do. They can be distinguished from Tremoctopodidae because they do not have a well-developed web between arms I and II. Ocythoidae females have the ventral surface of the mantle covered by tubercles interconnected ridges.

Size: Females up to over 400 mm mantle length and up to an estimated 4 m total length (TL) (O'Shea, 2004). Males are much smaller than females (i.e. about 100 mm ML, about 300 mm TL), but larger for argonautoids.

Habitat, biology, and fisheries: Meso- to bathypelagic octopod. Occurring from the surface to a few thousand metres depth. Larvae and juveniles inhabit pelagic waters from epipelagic to bathypelagic, mainly above slopes and submarine canyons; adults are frequently found close to the bottom in bathyal depths. Females carry their eggs within the web and near the mouth. Spawning seems to be benthic. The habitat of this octopod is unusual. Brooding females have been captured in bottom trawls and videotaped swimming within centimetres of the ocean floor, suggesting a benthopelagic habitat along the slope. However, it has been taken also from the open ocean, thousands of metres from the ocean floor and hundreds of miles from the nearest slope. Common food item of blue sharks and sperm whales. Not of interest to fisheries.

Distribution: A very widely distributed cosmopolitan species, from tropical to high latitudes.



References

- Bizikov, V.A.** 2004. The shell in Vampyropoda (Cephalopoda): Morphology, functional role and evolution. *Ruthenica. Supplement*, 3: 1–88.
- Guerra, A.** 1992. Mollusca, Cephalopoda. In: M.A. Ramos et al., eds. *Fauna Ibérica*. Vol. 1. Museo Nacional de Ciencias Naturales. CSIC, Madrid, 327 pp.
- Naef, A.** 1921/1923. Cephalopoda. Fauna e Flora del Golfo di Napoli. Monograph, no. 35. English translation: A. Mercado (1972). Israel Program for Scientific Translations Ltd. IPST Cat. No. 5110/1,2.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), Cephalopods of the world. T.F.H. Publications, Neptune City, NJ, 351 pp.
- O'Shea, S.** 2004. The giant octopus *Haliphron atlanticus* (Mollusca: Octopoda) in New Zealand waters. *New Zealand Journal of Zoology*, 31: 7–13.
- Sasaki, M.** 1929. A monograph of the dibranchiate cephalopods of the Japanese and adjacent waters. J. College of Agriculture, Hokkaido Imperial University, 20 (Supp. number): 1–357.
- Vecchione, M. & Pohle, G.** 2002. Midwater cephalopods in the western North Atlantic Ocean off Nova Scotia. *Bulletin of Marine Science*, 71: 833–892.
- Young, R.E.** 2013. Alloposidae Verrill 1881. *Haliphron atlanticus* Steenstrup 1861. Version 08 January 2013 (under construction). http://tolweb.org/Haliphron_atlanticus/20200/2013.01.08 in The Tree of Life Web Project, <http://tolweb.org/>

AMPHITRETIDAE

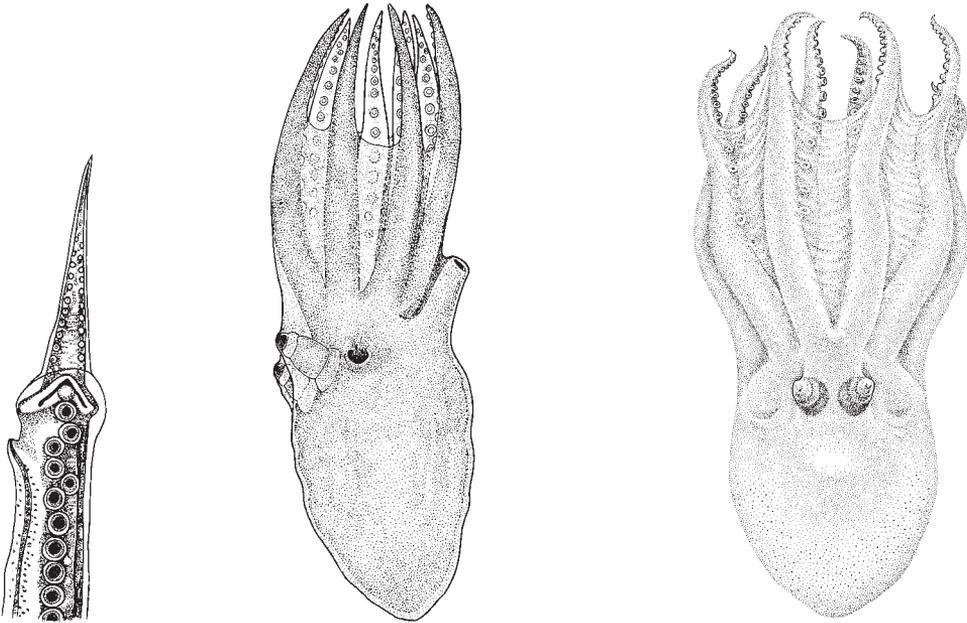
Telescope octopods

A single species occurring in the area.

Amphitretus pelagicus Hoyle, 1885

Frequent synonyms / misidentifications: Probably *Idioctopus gracilipes* Taki, 1962 / None.

FAO names: **En** – Telescope octopod; **Fr** – Poulpe télescope; **Sp** – Pulpo telescópico.



hectocotylus

lateral view

dorsal view

Diagnostic characters: Gelatinous, transparent. Eyes tubular in shape. Funnel fused ventrally to mantle. Mantle opening reduced to broad pores lateral to funnel. Arm suckers in **single series proximally, double series distally**. Right arm III of male hectocotylized. **Ligula with 2 series of papillae; 27 or 28 suckers on the hectocotylized arm**. Stomach lies dorsal to digestive gland. Radula is ctenoglossan.

Size: Maximum mantle length 100 mm.

Habitat, biology, and fisheries: Very little is known about the habitat and biology of this meso- and bathypelagic species. Found from about 150 to 2 000 m. Members of this species are able to rotate their eyes and digestive gland to keep them in a vertical orientation. Of no interest to fisheries.

Distribution: Tropical and subtropical, probably cosmopolitan.

Remarks: At the time of going to print, Strugnell *et al.* (2013) used molecular evidence to merge the families Amphitretinae, Bolitaeninae and Vitreledonellinae into a single family, Amphitretidae.



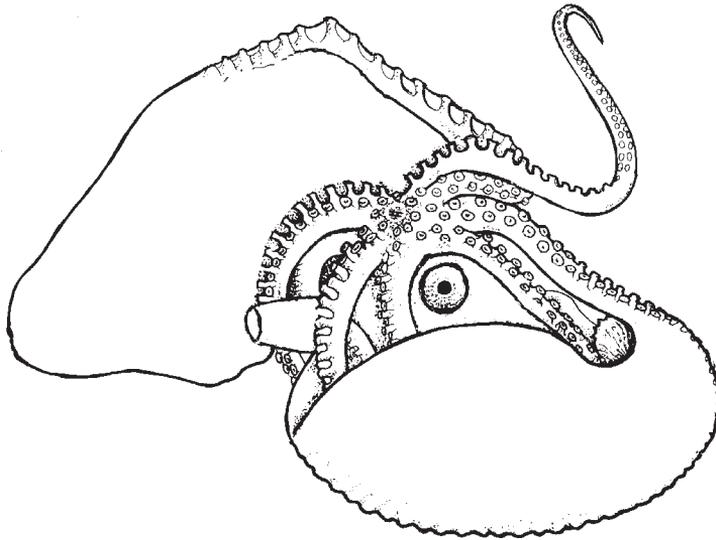
References

- Hochberg, F.G., Nixon, M. & Toll, R.B.** 1992. Order Octopoda Leach, 1818. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. 'Larval' and juvenile cephalopods: A manual for their identification. *Smithsonian Contributions to Zoology*, 513: 1–282.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- O'Shea, S.** 1999. The Marine Fauna of New Zealand: Octopoda (Mollusca: Cephalopoda). *NIWA Biodiversity Memoir*, 112: 280 pp.
- Thore, S.** 1949. Investigations of the 'DANA' Octopoda. Part.1. Bolitaenidae, Amphitretidae, Vitreledonellidae and Alloposidae. *Dana Report, Carlsberg Foundation*, 33: 85 pp.
- Young, R.E., Mangold, K.M., & Vecchione, M.** 2013. Amphitretidae Hoyle, 1886 *Amphitretus* Hoyle, 1885. Version 07 January 2013 (under construction). <http://tolweb.org/Amphitretidae/20191/2013.01.07> in The Tree of Life Web Project, <http://tolweb.org/>

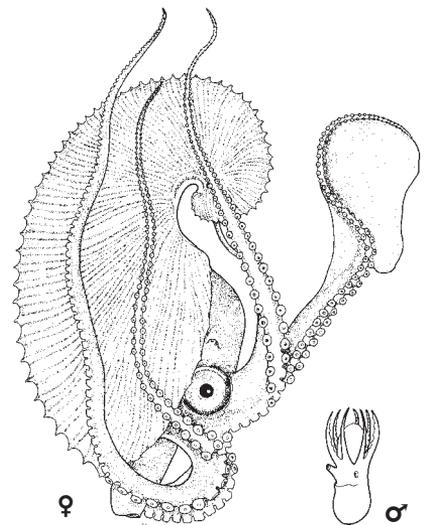
ARGONAUTIDAE

Paper nautilus

Diagnostic characters: Males maximum total length about 30 mm, 10 to 12 mm mantle length. Calcareous shell of females 250 to 300 mm of diameter; the female reaches up to 450 mm total length and 90 mm mantle length. Muscular, pelagic octopods. **Females secrete a thin calcareous 'shell' in which they reside.** The dorsal arms of females are modified with large, flag-like membranes that expand over the shell and are responsible for the secretion of the shell. Eyes are very large and webs very small. The mantle-funnel locking apparatus consists of knob-like cartilages (mantle) and matching depressions (funnel). **Males are dwarfs.**



Habitat, biology, and fisheries: Pelagic octopods. Some species live near the coasts but others are oceanic animals. They live in tropical and subtropical waters worldwide from the surface down to about 500 m. The entire third right arm is hectocotylized in males and carried in a special sac. At mating, the hectocotylus, which carries 1 large spermatophore, breaks out of its sac and then from the male body. The free hectocotylus invades, or is deposited in, the female's mantle cavity, where it remains viable and active for some time. The hectocotylus was first described as a worm parasitic on the female. The calcareous shell secreted by the arms of the female is not a true shell but an incubatory or brood chamber, paper-thin where the female reside. A female with a shell length of 88 mm was estimated to be carrying 48 800 eggs. The eggs are very small (0.6 to 1.2 mm). The female broods the eggs in the shell until larvae are hatched. Spawning is intermittent. Paper nautilus prey upon pelagic crustacean, gastropoda, bivalve and cephalopod larvae. They cling to any object floating on the surface of the sea, mainly jellyfishes. Main predators are tuna, lancefishes, seabirds and marine mammals. Of no interest to fisheries, although some shell trade exists in some countries.



lateral view

Argonautidae

Similar families occurring in the area

This family was included by Naef (1912) in the superfamily Argonautoidea together with Alloposidae, Tremoctopodidae and Ocythoidae. These 4 families are primarily distinguished from the rest of octopods by an unusual means of copulation which involves transferring a detached hectocotylus from the male to the female. Also, males usually are much smaller than females and dwarf in 3 over 4 families. In none of the 3 other families females produce calcareous shells. Females do not produce calcareous shells in the other 3 families.

Key to the species occurring in the area (only for females shell)

- 1a. Shell large (diameter up to 250 to 300 mm), laterally flattened, with narrow keel (width up to 15% of shell diameter) and numerous ribs, close together, often split into 2 → 2
- 1b. Shell small (diameter up to 100 mm), laterally not flattened, keel wide (width 10 to 15% of shell diameter) and ribs not numerous ***Argonauta hians***
- 2a. Keel very narrow, its width equals, rarely exceeds 6% of shell diameter; ribs smooth, more than 50 in large shells; each ribs terminating on the keel in an acute tubercle ***Argonauta argo***
- 2b. Keel wide, its width 10 to 15% of shell diameter; ribs representing chains of separate tubercles or nodules, 30 to 40 ribs on large shells. ***Argonauta nodosus***

List of species occurring in the area

The symbol 🐙 is given when species accounts are included.

- 🐙 *Argonauta argo* Linnaeus, 1758.
- 🐙 *Argonauta hians* Lightfoot, 1786.
- 🐙 *Argonauta nodosus* Lightfoot, 1786.

Remarks: At least 4 species of argonauts exist (Nesis, 1987). However, intraspecific variation in females shell shape generated confusion in the species identification. Therefore, a large number of species names exist, currently of unresolved status (Sweeney & Young, 2004). Also, the geographical distribution of some species can be biased due to the fact that the empty shells are frequently transported by winds and currents. A revision is needed.

References

Guerra, A. 1992. Mollusca: Cephalopoda. In M.A. Ramos *et al.*, eds. Fauna Ibérica, vol 1. Museo Nacional de Ciencias Naturales. CSIC. Madrid. 327 pp.

Guerra, A., González, A.F. & Rocha, F. 2002. Appearance of the common paper nautilus *Argonauta argo* related to the increase of the sea surface temperature in the north-eastern Atlantic. *Journal of the Marine Biological Association of the United Kingdom*, 82: 855–858.

Hochberg, F.G., Nixon M. & Toll, R.B. 1992. Oder Octopoda Leach, 1818. In M.J. Sweeney *et al.*, eds. "Larval" and juvenile cephalopods: A manual for their identifications. *Smithsonian Contributions to Zoology*, 513: 213–279.

Laptikhovskiy, V.V. & Salman, A. 2003. On reproductive strategies of the epipelagic octopods of the superfamily Argonautoidea (Cephalopoda: Octopoda). *Marine Biology*, 142: 321–326.

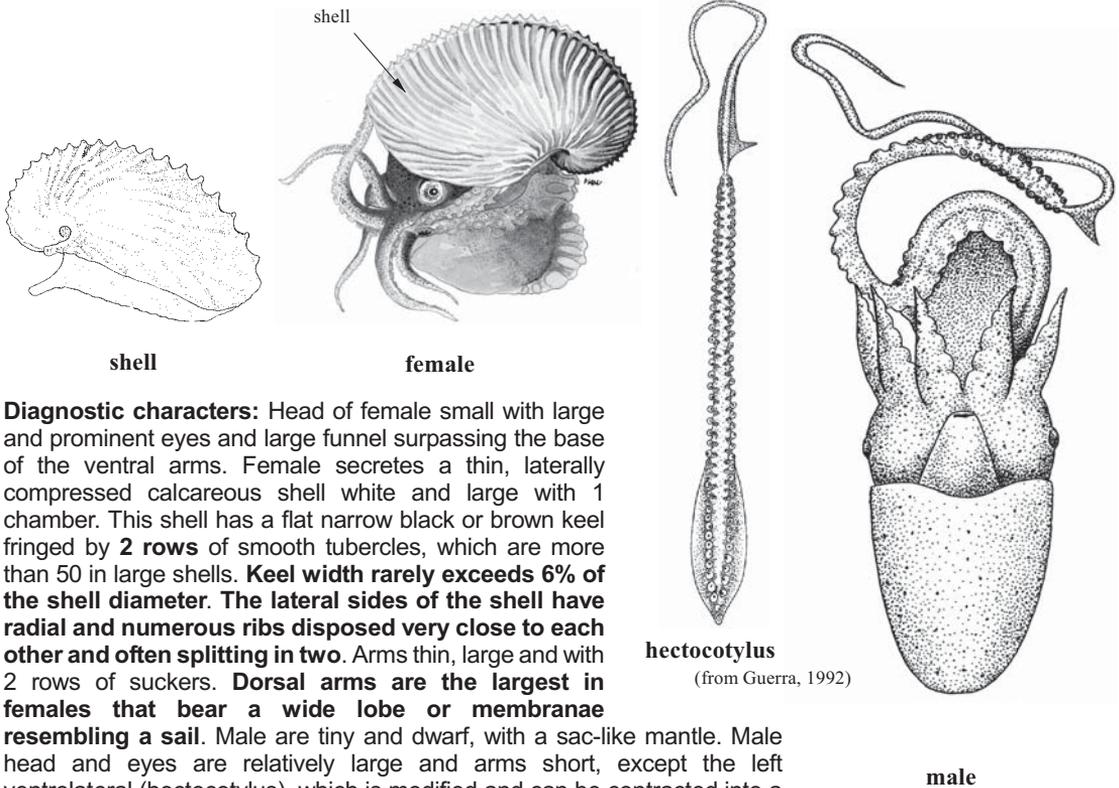
Mangold, K.M., Vecchione, M. & Young, R.E. 2010. Argonautidae Tryon, 1879. *Argonauta* Linnaeus, 1758. Paper nautilus. Version 03 February 2010 (under construction). <http://tolweb.org/Argonauta/20204/2010.02.03> in The Tree of Life Web Project, <http://tolweb.org/>

- Naef, A.** 1921/1923. Cephalopoda. Fauna e Flora del Golfo di Napoli. Monograph, no. 35. English translation: A. Mercado (1972). Israel Program for Scientific Translations Ltd. IPST Cat. No. 5110/1,2.
- Nesis, K.N.** 1977. The biology of paper nautilus, *Argonauta boettgeri* and *Argonauta hians* (Cephalopoda, Octopoda) in the western Pacific Ocean and the seas of the East Indian Archipelago. *Zool. Zhur.*, 56(7): 1004-1014. In M.J. Sweeney, (comp.) English Translations of Selected Publications on Cephalopods by Kir N.Nesis. 2003. Vol. 2: 457–473. Selected Translated Publications, 1965–1994: 419–847.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), Cephalopods of the world. T.F.H. Publications, Neptune City, NJ, 351 pp.
- O'Shea, S.** 1999. The marine fauna of New Zealand Octopoda (Mollusca: Cephalopoda). *NIWA Biodiversity Memoir*, 112: 280 pp.
- Robson, G.C.** 1926. The Deep-Sea Octopoda. *Proceedings of the Zoological Society of London*: 1323–1355.
- Roper, C.F.E., Sweeney, M.J. & Nauen, C.E.** 1984. FAO species catalogue. Cephalopods of the world. An annotated and illustrated catalogue of species of interest to fisheries. *FAO Fisheries Synopsis*, 3(125): 277 pp.
- Smale, M.J., Clarke, M.R., Klages, N.T.W. & Roeleveld, M.A.C.** 1993. Octopod beak identification – resolution at a regional level (Cephalopoda, Octopoda: Southern Africa). *South African Journal of Marine Science*, 13: 269–293.
- Sweeney, M.J. & Young, R.E.** 2004. Taxa associated with the Family Argonautidae. Tree of Life Project. <http://tolweb.org/>

Argonauta argo Linnaeus, 1758

Frequent synonyms / misidentifications: None / None.

FAO names: En – Greater argonaut; Fr – Argonaute papier; Sp – Argonauta común.



hectocotylus
(from Guerra, 1992)

Diagnostic characters: Head of female small with large and prominent eyes and large funnel surpassing the base of the ventral arms. Female secretes a thin, laterally compressed calcareous shell white and large with 1 chamber. This shell has a flat narrow black or brown keel fringed by **2 rows** of smooth tubercles, which are more than 50 in large shells. **Keel width rarely exceeds 6% of the shell diameter. The lateral sides of the shell have radial and numerous ribs disposed very close to each other and often splitting in two.** Arms thin, large and with 2 rows of suckers. **Dorsal arms are the largest in females that bear a wide lobe or membranæ resembling a sail.** Male are tiny and dwarf, with a sac-like mantle. Male head and eyes are relatively large and arms short, except the left ventrolateral (hectocotylus), which is modified and can be contracted into a sac. Hectocotylus with a **long slender “penis”** and about 65 suckers in 2 rows.

Size: Maximum mantle length 120 mm in females (shell diameter up to over 250 mm) and 10 mm in males.

Habitat, biology, and fisheries: Epipelagic octopod, inhabits mainly coastal waters (from the surface to about 500 m). Females mature at about 25 mm mantle length, whereas males at about 8 mm. Eggs are very small (0.6 to 0.8 mm) and females brood them in the shell until the hatching. This species tends to adhere to solid substrates. Spawning seems to take place in summer and winter. Occasionally, massive occurrences are reported near shore as a result of currents shifting. Greater argonauts are preyed upon by pelagic fishes, seabirds and marine mammals. Occasionally found in markets of India and Japan, as a result, probably, of fortuitous catches. Of no interest to fisheries in the eastern Atlantic.

Distribution: Worldwide in temperate and tropical subtropical seas. In the western Atlantic, its distribution extends from Cape Cod to waters off Venezuela, whereas in the eastern Atlantic, this species is distributed from the Portuguese coast to South Africa. *Argonauta argo* has been recorded in the Azores and Madeira Archipelagos. The northern boundary of this species is situated in Galician waters (northwestern Spain).



***Argonauta hians* Lightfoot, 1786**

Frequent synonyms / misidentifications: None / None.

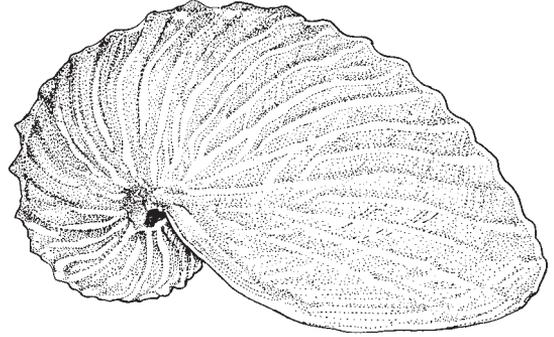
FAO names: **En** – Lesser argonaut; **Fr** – Argonaute mineur; **Sp** – Argonauta menor.

Diagnostic characters: Shell small (diameter up to 100 mm), laterally not flattened. Keel wide (10 to 15% of shell diameter). Ribs not numerous. Shell surface usually smooth. Centre of spiral not compressed, "horn" in centre of the shell either present or absent. Tubercles on keel brown, ususally 15 to 20.

Size: Shell diameter to over 100 mm. Maximum mantle length 40 mm in females.

Habitat, biology, and fisheries: Epi-mesopelagic oceanic octopods. The larvae are broadly distributed in the water column to about 500 m, predominantly in upper 100 m. Late juveniles and adults at the surface. Males mature at about 6 mm mantle length and females at approximately 18 to 20 mm mantle length. The period of maturation is very extended. Egg size ranges from 0.8 to 1.1 mm in length. Of no interest to fisheries.

Distribution: Tropical cosmopolitan species. South equatorial counter-current, off Cape Palmas in Liberian waters and Gulf of Guinea at 10°N 7°W.



shell



***Argonauta nodosus* Lightfoot, 1786**

Frequent synonymys / misidentifications: *Argonauta tuberculata* Shaw, 1791; *A. gracilis* Kirk, 1885; *A. boettgeri* (not Maltzan): Massy, 1916 / None.

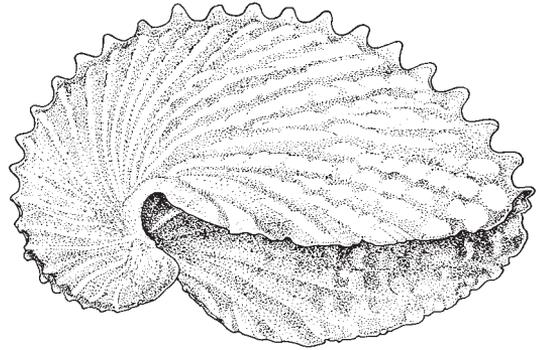
FAO names: **En** – Knobbed argonautid; **Fr** – Argonaute noueux; **Sp** – Argonauta nodoso.

Diagnostic characters: Shell large, laterally flattened; keel width 10 to 15% of shell diameter. **Ribs tuberculated; 30 to 40 ribs on large shells.** Outer demibranch gill lamellae 14 to 17.

Size: Males are tiny, dwarf (10 to 12 mm ML). Females to over 130 mm mantle length. Calcareous shell secreted by the females 250 to over 300 mm of diameter.

Habitat, biology, and fisheries: Epipelagic octopod, mainly inhabiting coastal waters. Found from surface to 485 m on bottom depth of 4 850 m. Eggs are very small (1.3 x 0.5 mm). Females brood the eggs in the shell until the hatching. Hectocotylus of males autonomous (self-amputating) into the egg mass. This species tends to adhere to solid substrates. *Argonauta nodosus* is preyed upon by pelagic fishes, seabirds and marine mammals. Spawning seems to take place, at least in summer and winter. Occasionally mass occurrences are reported near shore as a result of changed currents. No directed fisheries do exist.

Distribution: Cosmopolitan. In the southeastern Atlantic off Namibian and South African waters. Tropical Indo-Pacific from Red Sea and southeastern Africa to southern Japan. Eastward to Polynesia and perhaps to Chilean waters. Most common in Australia – New Zealand region.



shell

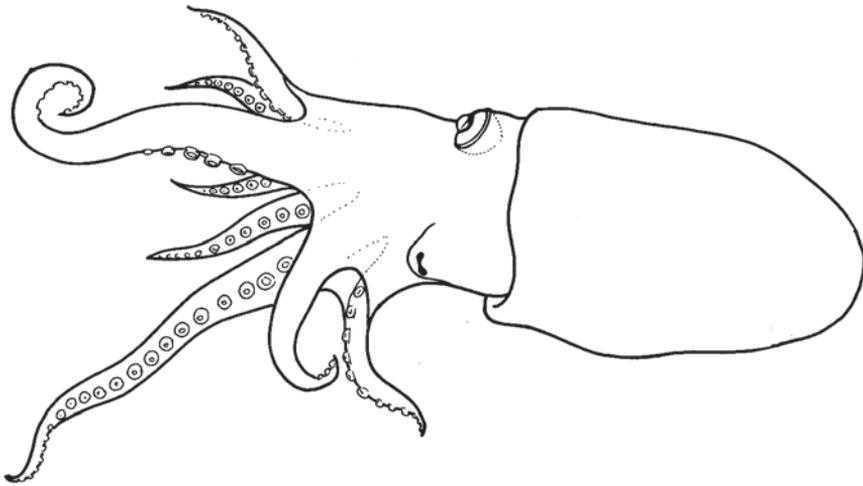


Incirrate OCTOPODS

BOLITAENIDAE

Pelagic octopods

Diagnostic characters: Gelatinous semitransparent octopods. Mantle aperture wide. Arms short, with length less than mantle length. Suckers in a single row. Eyes laterally compressed. Long axis of digestive gland (which can be seen by transparency in live) in parallel to body axis. Stomach posterior to digestive gland. Radula with multicuspid teeth (ctenoglossa). Third right arm in *Bolitaena* hectocotylized (*Japetella* apparently lacks hectocotylization although some sexual dimorphism of arms III occurs). Mature females with a circular light organ surrounding the mouth. Numerous chromatophores are present all over the mantle.



Habitat, biology, and fisheries: Common meso- to bathypelagic octopods, occurring from 100 to 2 500 m. Secretions from the posterior salivary gland of males could act as a pheromone to attract females. The oral light organ in females seems to serve as a signal to attract males for mating. Of no interest to fisheries.

Remarks: The family comprises 2 genera, *Japetella* and *Bolitaena*, both probably represented by 1 single species (monotypic). Immature specimens of the 2 genera can be difficult to distinguish. The most obvious features are the size of the eyes (larger in *Japetella*) and the distance between the eyes (larger in *Bolitaena*). When comparing adjacent octopods, these differences are distinct. However, with isolated specimens, the differences are not always obvious. For this reason, a key to the species is not presented here.

Similar families occurring in the area

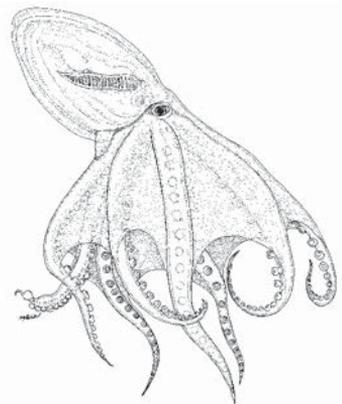
Vitreledonellidae: a glassy gelatinous uncoloured and transparent body, and the optic lobes at a distance from the brain, which leads to very long optic nerves.

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Bolitaena pygmaea* (Verrill, 1884).

 *Japetella diaphana* Hoyle, 1885.



Vitreledonellidae

Remarks: At the time of going to print, Strugnell *et al.* (2013) used molecular evidence to merge the families Amphitretinae, Bolitaeninae and Vitreledonellinae into a single family, Amphitretidae.

References

- Guerra, A.** 1992. Mollusca, Cephalopoda. In M.A. Ramos *et al.*, eds. Fauna Ibérica. Vol. 1. Museo Nacional de Ciencias Naturales. CSIC, Madrid, 327 pp.
- Hochberg, F. G., Nixon M. & Toll, R.B.** 1992. Order Octopoda Leach, 1818. In M.J. Sweeney, C.F.E. Roper, K.M. Mangold, M.R. Clarke & S.v. Boletzky, eds. "Larval" and juvenile cephalopods: A manual for their identification. *Smithsonian Contributions to Zoology*, 513: 1–282.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), Cephalopods of the world. T.F.H. Publications, Neptune City, NJ, 351 pp.
- O'Shea, S.** 1999. The Marine Fauna of New Zealand Octopoda (Mollusca: Cephalopoda). *NIWA Biodiversity Memoir*, 112: 280 pp.
- Roeleveld, M.A.** 1977. Cephalopoda from the tropical eastern Atlantic Ocean. *Galathea Report*, 14: 123–132.
- Thore, S.** 1949. Investigations of the 'DANA' Octopoda. Part.1. Bolitaenidae, Amphitretidae, Vitreledonellidae and Alloposidae. *Dana Report, Carlsberg Foundation*, 33: 85 pp.
- Young, R.E.** 2008a. Bolitaenidae Chun, 1911. Version 28 April 2008 (under construction). <http://tolweb.org/Bolitaenidae/20193/2008.04.28> in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E.** 2008b. *Bolitaena pygmaea* (Verrill 1884). *Bolitaena* Steenstrup 1859. Version 28 April 2008. http://tolweb.org/Bolitaena_pygmaea/20223/2008.04.28 in The Tree of Life Web Project, <http://tolweb.org/>
- Young, R.E.** 2013. *Japetella diaphana* Hoyle 1885. Version 08 January 2013 (under construction). http://tolweb.org/Japetella_diaphana/20224/2013.01.08 in The Tree of Life Web Project, <http://tolweb.org/>

Bolitaena pygmaea (Verrill, 1884)

Frequent synonyms / misidentifications: *Bolitaena microcotyla* Steenstrup in Hoyle, 1886: 16 / None.

FAO names: **En** – Pygmy pelagic octopod; **Fr** – Poulpe pélagique pygmée; **Sp** – Pelagopulpo pigmeo.



(from Chun, 1910)

Diagnostic characters: Eyes small, 9.12% of mantle length in juveniles. **Arms III are longer than the others.** In males, left arm III hectocotylized, with an elongate ligula; third right arm sexually dimorphic with 1 to 3 greatly enlarged suckers. **Maximum depth of the web 50 to 67% of longest arm length.** Suckers in 1 row set wide apart within web and close to each other outside the web, in distal part of arms. **A luminous organ in the form of a thick ring around the mouth is present in adult, mature females.** Ink sac present, but small. Optic nerves long, optic ganglia remote from brain. **Body coloration light purple, web inside dark purple.**

Size: Up to 60 mm mantle length.

Habitat, biology, and fisheries: Rare tropical-subtropical cosmopolitan meso-bathypelagic species. Hatchlings are found at about 200 m depth, adults at about 1 400 m. Eggs large, are carried by the female on arms until hatching. Females do not feed during incubation. Species of no interest to fisheries.

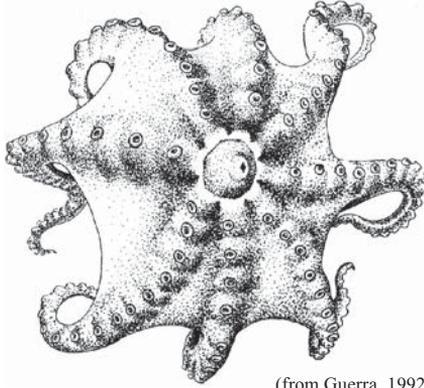
Distribution: Tropical-subtropical cosmopolitan species.



***Japetella diaphana* Hoyle, 1885**

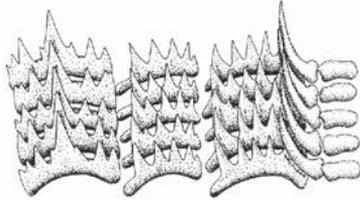
Frequent Synonyms / misidentifications: *Dorsopsis taningi* Thore, 1949 / None.

FAO names: En – Diaphanous pelagic octopod; Fr – Poulpe pélagique translucide; Sp – Pelagopulpo translúcido.



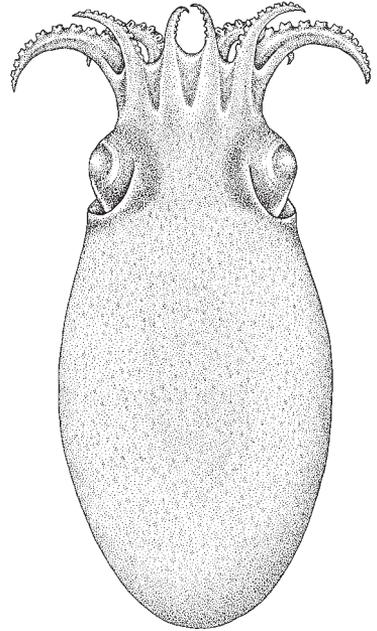
(from Guerra, 1992)

oral view



(from Guerra, 1992)

radula



(illustration: K. Hollis/ABRS)

dorsal view

Diagnostic characters: Eyes relatively large, diameter exceeds 18% of the mantle length. Optic nerves short, optic ganglia in close proximity to brain. Suckers large, diameter on the average 6% of mantle length, distance between neighbouring suckers shorter than suckers diameter. **Maximum depth of umbrella 25 to 35% of longest arm length. No hectocotylus, only some enlarged suckers in middle part of right third arm in male. Adult, mature, female with a light organ surrounding the mouth; this ring-shaped organ is bright yellow in live animals and pale pink in fixed animals.** Brown chromatophores located along the whole mantle and arms.

Size: Up to 85 mm mantle length.

Habitat, biology, and fisheries: A common bathypelagic species; juveniles also found in epipelagic and mesopelagic waters between 100 and 300 m depth while adults are mainly concentrated between 1 750 and 2 500 m depth. Eggs small and connected by stalks. This species live within the minimum oxygen layer off Hawaii. Frequently found in the stomach contents of tunas and swordfishes. Of no interest to fisheries.

Distribution: Cosmopolitan in tropical and subtropical waters.



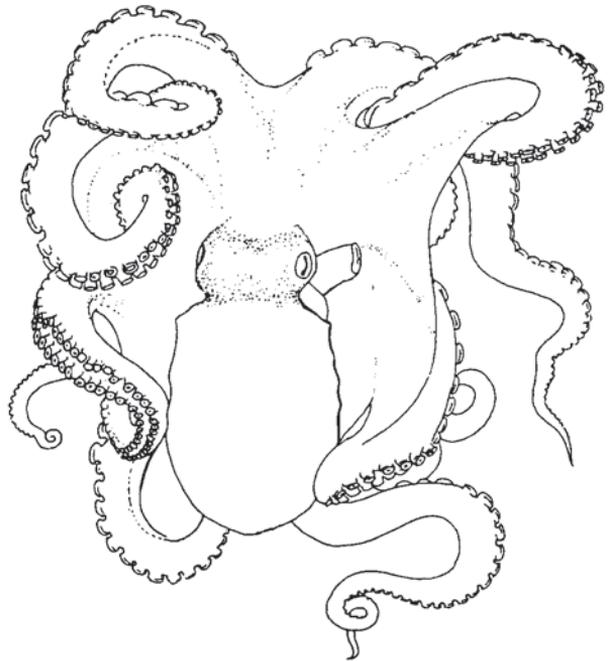
OCTOPODIDAE

Benthic octopods

Diagnostic characters: Body short, muscular, sac-like, without lateral fins. Eight arms around the mouth, no tentacles. Suckers in 1 or 2 rows, and **no cirri on arms**; suckers lack chitinous rings and are set on the arms without stalks. **Mantle-funnel locking apparatus absent. Water pores on head absent.** One of the third arms modified in males (hectocotylus), as an open sperm groove (running along ventral edge of the arm) and a modified **terminal tip** (ligula), typically **spoon-like. Hectocotylus not detachable.** Internal shell reduced to a pair of stylets or lost. Stomach and caecum posterior to digestive gland. Lateral radula teeth (if present) simple, with single cusp.

Size: Benthic octopods range in size from pygmy species, mature at less than 1 gr total weight, to the giant Pacific octopus of the North Pacific reaching weights in excess of 150 kg, with an arm span of over 5 m.

Habitat, biology, and fisheries: Members of this family are the best known of the octopods. They are mostly benthic animals living in all oceans of the world from the equator to polar latitudes. There is considerable diversity within this family. Benthic octopods occupy a wide range of habitats from coral and rocky reefs, seagrass and algal beds, to sand and mud soft substrates, from intertidal zones to the deep sea (to at least 5 000 m). Mating occurs by males transferring sperm packages (spermatophores) to the females using the hectocotylus. Some species lay relatively large eggs, other small eggs, but all are brooded by the female during a prolonged period of incubation. Eggs are typically laid in strings or festoons, where the egg stalks are interwoven or glued together. Most species attach the eggs to the substrate, shells or man-made objects. Females of several species carry the egg strings on their arms, enveloping them within the webs. In most species females brood tending the eggs until hatching and during this period almost cease feeding; hence, females mortality is high soon after the hatching of the eggs. Hatching behaviour and mode of life depends on egg size. Species with small eggs (up to 2 mm long) produce many tiny planktonic offsprings (paralarvae) which spend some time transported in the water column prior of changing to benthic life of adults. The duration of this planktonic life is inversely related to water temperature. Species with large eggs (up to 30 mm long) produce few, large, benthic, "crawl-away" hatchlings. Members of this family prey on a wide range of animals: crabs, gastropods and bivalve molluscs, fish, polychaete worms and other octopods. As most cephalopods, octopuses are fast growing. The life span of members of this family ranges from about 6 months in small tropical species to several years (up to 5) in cold-water species. Many shallow-water octopods exhibit a remarkable primary defence or crypsis, which can be regarded as a mosaic varying in size, brightness, colour, shape and texture. Camouflage is the type of crypsis more used by benthic octopods. In this form of crypsis the animal takes on the appearance of the substrate or background. Camouflage is mainly produced by colour changes due to chromatophore combinations and passive reflexion of specialized cells (iridophores and leucophores). However, textural and postural components are also equally important for crypsis. Textural changes are produced by both integumental trellis components in the skin and musculature. Many Octopodidae have a great repertoire of sculptures formed by raises (even branched) muscular patches and papillae, and the skin structures provide different types of textures. This protective defence is completed by a wide range of species-specific body patterns. Some sand-dwelling octopuses can escape threatening situations by burying into the sand and emerging away from the burying spot. Other benthic octopods use extraneous material to improve camouflage. Thus, some species hold pebbles or sponge-covered and small rocks with suckers.



dorsal view

Another defence mechanisms in this family are ink dummy decors, ink smoke screens, arm-dropping and production of strong neurotoxins advertised by distinctive colour patterns. Among the secondary defences, some species are able to display alarm chromatic signals such as spots and a pair of false-eye (ocelli). These ocellate octopods extends web and show their ocelli producing the sensation of being the head of a large predator. Many benthic octopods are predominantly active during the day, but other species are active only at night. True territoriality has not been observed in benthic octopods.

Benthic octopods are one of the most traditional cephalopod resources, and many species have high fisheries profiles in different areas of the world. Some of these fisheries are industrial, but others are artisanal, small-scale fisheries. They are collected by several different kinds of gear from hooked poles or spears to the commercial trawl nets, multiple baited lines, traps or clay pots. The majority of the species are harvested for human consumption, although some species are collected primarily as bait for finfish fisheries. They are marketed fresh, frozen, or dried. According with the 2012 FAO Yearbook of Fisheries Statistics, the total harvested in 2010 for all Octopodidae species in the world were around 337 000 tonnes. The most important octopod fishery was located in the FAO Fishing Areas 61 (northwestern Pacific) and 71 (western central Pacific), where around 63% of the total Octopodidae were caught mainly by Japan, China, Korea, Russia, Taiwan (Province of China), Thailand and Philippines. Total landings from the northeastern Atlantic (Area 27) were around 19 000 tonnes being Portugal and Spain the most important fishing countries. Landings were around 18 300 tonnes in the Mediterranean Sea. The most important fishing ground to the common octopus (*Octopus vulgaris*) is located in Area 34 (eastern central Atlantic), where around 56 000 tonnes (16% of total Octopodidae landings) were recorded. The remaining Octopodidae landings are distributed among the rest of FAO fishing areas. There are, however, some potential resources in sub-Antarctic waters, yet to be determined.

Similar families occurring in the area

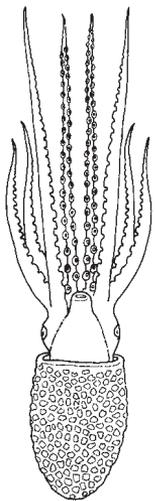
Ocythoidae, Tremoctopodidae and Argonautidae, all are families of pelagic octopods with muscular bodies, however, a funnel-locking apparatus is present in members of those families, males are dwarfs and detachable hectocotyli develop in sacs.

In addition, Tremoctopodidae have water pores on both dorsal and ventral sides of the head and females have an extensive membrane or web connecting the dorsal and the dorsolateral arms.

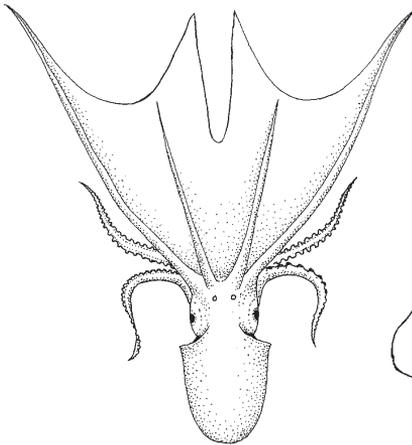
Argonautidae females have flaps on the dorsal arms which secrete and hold a shell-like egg case (shell).

Ocythoidae have water pores on the ventral side of the head, and females have permanent reticulate sculpturing on the ventral side of the mantle.

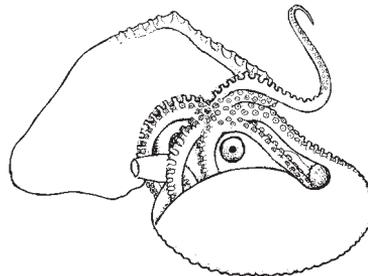
Alloposidae have a gelatinous consistency.



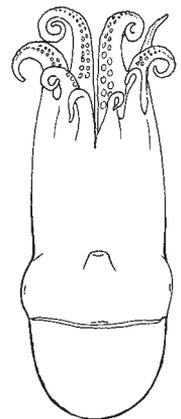
Ocythoidae



Tremoctopodidae



Argonautidae



Alloposidae

Remarks: Four subfamilies have been recognized on the basis of relatively few characters, the Octopodinae, the Eledoninae, the Bathypolypodinae and the Graneledoninae. The validity of these groupings has not been firmly established and as this Guide goes to printer, a paper is published on-line, which alters octopuses systematic (Strugnell *et al.*, 2013). Results of this study give evidence that the family Octopodidae is paraphyletic and contains the gelatinous pelagic families. The following taxa are assigned family taxonomic rank: Amphitretidae, Bathypolypodidae, Eledonidae, Enteroctopodidae, Megaleledonidae and Octopodidae sensu nov. They are placed in the superfamily Octopodoidea. In this guide we follow the taxonomic assignments given by Norman and Hochberg, 2005.

Key to the subfamilies occurring in the area

- 1a. Ink sac present (sometimes embedded in the digestive gland, but always functional) → 2
- 1b. Ink sac absent → 3
- 2a. Arm with 2 row of suckers **Octopodinae**
- 2b. Arm with a single row of suckers **Eledoninae**
- 3a. Arm with 1 row of suckers **Graneledoninae**
- 3b. Arm with 2 rows of suckers **Bathypolypodinae**

Key to species of the subfamily Octopodinae occurring in the area

- 1a. With permanent and erected papilla (ae) over each eye → 2
- 1b. No permanent and erected papilla (ae) over each eye → 3
- 2a. Paired narrow erected and very conspicuous papillae over each eye; skin ridge absent from lateral mantle ***Pteroctopus tetracirrhus***
- 2b. Single large erected and very conspicuous and papilla over each eye; lateral mantle skin ridge present ***Scaevurgus unicolor***
- 3a. Mantle, head and arms densely covered by small distinct rounded wart-papillae set closed together ***Amphioctopus burryi***
- 3b. Mantle, head and arms smooth or with separate scattered wart-papillae (mainly between eyes) → 4
- 4a. All arms of subequal length. ***Octopus vulgaris***
- 4b. Some arms longer than others → 5
- 5a. Dorsal arms (I) clearly longer and thicker than lateral and ventral arms; arms not conspicuously asymmetrical neither slender; many white spots on dorsal side of the mantle and arms over a red wine background colour ***Callistoctopus macropus***
- 5b. Ventrolateral (III) arms longer than others; arms often conspicuously asymmetrical (1 arm may be much longer than the opposite arm of the same pair) and slender; without spots on dorsal side of the mantle and arms ***Macrotritopus defilippi***

Key to the genera and species of Eledoninae in the area

- 1a. Hectocotylished arm tip of mature male fleshy and convoluted in the form of a walnut, no obvious calamus, distal suckers of normal arms of mature males modified into a fringe of long thin papillae ***Aphrodoctopus schultzei***
- 1b. Hectocotylished arm tip as normal ligula and calamus or may lack calamus; distal suckers of normal arms of mature males modified as regular ridges or as spongiform tissue → 2
- 2a. Whole body densely beset by minute papillae with large ones scattered between them; low peripheral skin fold or ridge along the side of the body ***Eledone cirrhosa***
- 2b. Body smooth or with scarce small papillae on dorsal side; no peripheral skin fold → 2

- 3a. Arms of subequal length ***Eledone moschata***
 3b. First arms (I) longer by 33 to 50% than the II, which are considerably longer than III and IV ***Eledone caparti***

Key to the genera and species of *Bathypolypodinae* occurring in the area

- 1a. Skin of the body covered by wart-papillae; ligula of mature males large (15 to 49 % of hectocotylized arm) and spoon-shaped, deeply excavated with a number of well-defined transverse ridges (laminae) ***Bathypolypus***
 1b. Skin smooth; ligula of moderate size (5 to 7% of hectocotylized arm), elongate, typically with a closed ligula groove; laminae absent ***Benthoctopus***

Key to the *Bathypolypus* species occurring in the area

- 1a. Supraocular papillae present, sharp, conical ***Bathypolypus valdiviae***
 1b. Supraocular papillae absent or slightly visible → 2
 2a. Hectocotylus with 70 to 85 suckers; other arms usually with over 200 suckers ***Bathypolypus ergasticus***
 2b. Hectocotylus with 50 to 65 suckers; other arms with 140 to 200 suckers ***Bathypolypus sponsalis***

List of species occurring in the area

The symbol  is given when species accounts are included.

-  *Amphioctopus burryi* (Voss, 1950).
 *Aphrodoctopus schultzei* (Hoyle, 1910).*
 *Bathypolypus ergasticus* (P. Fischer and H. Fischer, 1892).
 *Bathypolypus sponsalis* (P. Fischer and H. Fischer, 1892).
 *Bathypolypus valdiviae* Thiele in Chun 1915.
 *Benthoctopus januarii* (Hoyle, 1885).
 *Callistoctopus macropus* (Risso, 1826).
 *Eledone caparti* Adam, 1950.
 *Eledone cirrhosa* (Lamarck, 1798).
 *Eledone moschata* (Lamarck, 1798).
 *Graneledone verrucosa* (Verrill, 1881).
 *Macrotritopus defilippi* (Vérany, 1851).
 *Octopus vulgaris* Cuvier, 1797.
 *Pteroctopus tetracirrhus* (Delle Chiaje, 1830).
 *Scaergus unicirrhus* (Delle Chiaje, 1841).

***Remarks:** *Octopus schultzei* (Hoyle, 1910) was placed in the new genus *Aphrodoctopus* by Roper and Mangold (1992), on the base of “unusual characters not referred to in the original description”. These authors describe the most striking finger-like processes on all arm tips, except the hectocotylus, the very small terminal portion of the hectocotylized arm without a calamus and other distinguishing features, the systematic significance of which, according to them, supported the establishment of a new genus. The species was referred to as *A. schultzei* in several scientific papers subsequently (e.g., Voight, 1993; Norman, 2000), but it is placed back to *Eledone* by Norman and Hochberg (2005) and Norman *et al.* (2014) comment that the 2 rows of suckers on the arms is an artifact due to contraction in preserved specimens, also observed in other *Eledone* species. However, the genus *Aphrodoctopus* is retained in the recent most review by Strugnelli *et al.* (2013) and it is retained here as a cautionary approach, waiting for further studies and clarifications.

References

- Allcock, A.L., Collins, M.A. & Vecchione, M.** 2003. A redescription of *Graneledone verrucosa* (Verrill, 1881) (Octopoda: Octopodidae). *Journal of Molluscan Studies*, 69(2): 135–143.
- Boletzky, S.v.** 1977. Post-hatching behaviour and mode of life in cephalopods. In M. Nixon & J.B. Messenger, eds. *The Biology of Cephalopods. Symposia of the Zoological Society of London*, Vol. 38: 557–567.
- Boyle, P.R. ed.** 1983. *Cephalopod Life Cycles*, Vol 1. Species account. Academic Press, London, 475 pp.
- Boyle, P.R. ed.** 1987. *Cephalopod Life Cycles*. Vol 2. Comparative Reviews. Academic Press, London. 441 pp.
- Boyle, P.R. & Rodhouse, P.G.** 2005. *Cephalopods: Ecology and Fisheries*. Blackwell Science, Oxford: 452 pp.
- Guerra, A.** 1992. *Mollusca, Cephalopoda*. In M.A. Ramos M.A. et al., eds. *Fauna Ibérica*. Vol. 1. Museo Nacional de Ciencias Naturales. CSIC, Madrid, 327 pp.
- Guerra, A., Roura, A., Sieiro, M.P., Portela J.M. & Río, J.L del.** 2012. New insights on the morphology, reproduction and distribution of the large-tuberculate octopus *Graneledone macrotyla* from the Patagonian slope. *Scientia Marina*, 76: 319–328.
- Hanlon, R. & Messenger, J.B.** 1996. *Cephalopod behaviour*. Cambridge University Press, Cambridge, 232 pp.
- Hochberg, F.G., Nixon, M. & Toll, R.B.** 1992. Order Octopoda Leach, 1818. In M.J. Sweeney, C.F.E. Roper, K.M. Magnold, M.R. Clarke & S.v. Boletzky, eds. "Larval and juvenile cephalopods: a manual for their identification. *Smithsonian Contributions to Zoology*, 513: 213–280.
- Hoyle, W.E.** 1910. XV. Mollusca. A. Cephalopoda. In L. Schultze, ed. *Zoologische und antropologische Ergebnisse einer Forschungsreise im westlichen und zentralen Südafrika*, 16: 259–268. *Denkschriften der Medicinisch-Naturwissenschaftlichen Gesellschaft zu Jena*. 522 p.
- Mangold, K.** 1998. The Octopodinae from the eastern Atlantic Ocean and the Mediterranean Sea. In N.A. Voss, M. Vecchione, R.B. Toll & M.J. Sweeney, eds. *Systematics and Biogeography of Cephalopods. Smithsonian Contributions to Zoology*, 586: 521–528.
- Muus, B.** 2002. The *Bathypolypus-Benthoctopus* problem of the North Atlantic (Octopodidae, Cephalopoda). *Malacologia*, 44(2): 175–222.
- Naef, A.** 1921/1923. Cephalopoda. Fauna e Flora del Golfo di Napoli. Monograph, no. 35. English translation: A. Mercado (1972). Israel Program for Scientific Translations Ltd. IPST Cat. No. 5110/1,2.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), *Cephalopods of the world*. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Nixon, M. & Young, J.Z.** 2003. *The brains and lives of cephalopods*. Oxford University Press, 392 pp.
- Norman, M.D.** 2000. *Cephalopods. A world guide*. Hackenheim, Germany, Conchbooks, 320 pp.
- Norman, M.D. & Hochberg, F.G.** 2005. The current state of octopus taxonomy. In Ch. Chotiyaputta, E.M.C. Hatfield & C.C. Lu, eds. *Cephalopod Biology, Recruitment and Culture. Phuket Marine Biological Centre Research Bulletin*, 66: 127–154.
- Norman, M.D., Finn, J.K. & Hochberg, F.G.** 2014. Family Octopodidae. In P. Jereb, C.F.E. Roper, M.D. Norman & J.K. Finn, eds. *Cephalopods of the World. An annotated and illustrated catalogue of cephalopod species known to date. Volume 3. Octopods and Vampire Squids*. FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 3. Rome, FAO, 36–215.

- Norman M.D., Hochberg F.G & Boucher-Rodoni, R.** 2005. A revision of the deep-water *Octopus* genus *Scaeuurgus* (Cephalopoda: Octopodidae) with description of three new species from the southwest Pacific Ocean. *Journal of Molluscan Studies*, 71: 319–337.
- Norman, M.D., Hochberg, F.G., Huffard, C. & Mangold, K.M.** 2009. Octopodidae Orbigny, 1839. Octopods, octopuses, devilfishes. Version 29 December 2009 (under construction). <http://tolweb.org/Octopodidae/20194/2009.12.29> in The Tree of Life Web Project, <http://tolweb.org/>
- Pérez-Gándaras, G. & Guerra, A.** 1978. Estudio sobre algunas especies del género *Bathypolypus* (Cephalopoda, Octopoda) halladas en las costas de Galicia. *Investigación Pesquera*, 42(1): 189–211.
- Robson, G.C.** 1929. A monograph of the recent Cephalopoda. Part I. Octopodinae. *British Museum (Natural History)*, London, 250 pp.
- Robson, G.C.** 1932. A monograph of recent Cephalopoda. Part II. The *Octopoda* excluding Octopodinae. *British Museum (Natural History)*, London, 359 pp.
- Roper, C.F.E & Mangold, K.M.** 1991–92. *Octopus schultzei* (Hoyle, 1910): a redescription with designation of *Aphrodoctopus* new genus (Cephalopoda: Octopodinae). *Bulletin of Marine Science*, 49: 57–72.
- Roper, C.F.E., Sweeney, M.J. & Nauen, C.E.** 1984. FAO species catalogue. Vol.3. Cephalopods of the world. An annotated and illustrated catalogue of species of interest to fisheries. *FAO Fisheries Synopsis*, (125) Vol. 3, 277 pp.
- Strugnell, J.M., Norman, M.D., Vecchione, M., Guzik, M. & Allock, L.A.** 2013. The ink sac clouds octopod evolutionary history. *Hydrobiologia*, DOI 10.1007/s10750-013-1517-6
- Sweeney, M. J. and C. F. E. Roper** 1998. Classification, type localities and type repositories of recent Cephalopoda. *Smithsonian Contributions to Zoology*, No. 513: 561–599.
- Toll, R.** 1981. *Benthoctopus oregonae*, a new species of octopod (Mollusca, Cephalopoda) from the southern Caribbean with a redescription of *Benthoctopus januarii* (Hoyle, 1885). *Bulletin of Marine Science*, 31: 83–95.
- Vecchione., M.** 2002. Cephalopods. In K.E. Carpenter, ed. The living marine resources of the western central Atlantic. Vol. 1. Introductin, molluscs, crustaceans, hagfishes, sharks, batoid fishes and chimaeras. *FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists* No. 5. Rome, FAO. pp. 150–244.
- Villanueva, R. & Norman, M.D.** 2008. Biology of the planktonic stages of benthic octopuses. *Oceanography and Marine Biology: An Annual Review*, 46: 105-202.
- Voight, J.R.** 1993. The arrangement of suckers on octopodid arms as a continuous character. *Malacologia*, 35(2): 351–359.
- Voight, J.R.** 1998. An overview of shallow-water octopus biogeography. In N.A. Voss, M. Vecchione, G.L. Voss & R. Toll, eds. Systematics and Biogeography of Cephalopods. *Smithsonian Contributions to Zoology*, 586: 549–559.
- Voight, J.R.** 2001. The relationship between sperm reservoir and spermatophore length in benthic octopuses (Cephalopoda: Octopodidae). *Journal of the Marine Biological Association of the United Kingdom*, 81: 983–986.
- Voss, G. L.** 1951. Further description of *Octopus burryi* Voss with a note on its distribution. *Bulletin of Marine Science of the Gulf and Caribbean*, 1(3): 231–240.
- Voss, G.L.** 1988. Evolution and phylogenetic relationships of deep-sea octopods (Cirrata and Incirrata). In M.R. Clarke & E.R. Trueman, eds. The Mollusca, Vol. 12. Palaeontology and neontology of cephalopods. Academic Press, London: 253–276.

***Amphioctopus burryi* (Voss, 1950)**

Frequent synonyms / misidentifications: *Octopus burryi* Voss, 1950; *O. vincenti* Pickford, 1955 / None.

FAO names: En – Brownstriped octopus; Fr – Poulpe à rayures bleues; Sp – Pulpo granuloso.

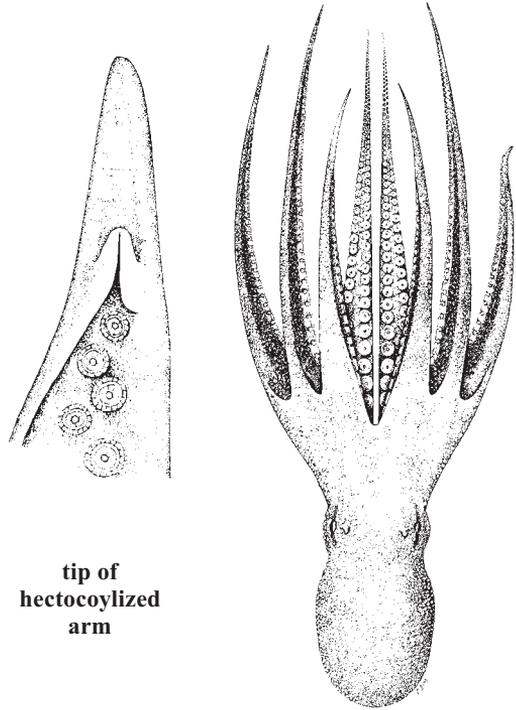
Diagnostic characters: Mantle, arms and head densely covered with closely set round papillae.

Gill lamellae 8 to 11 per outer demibranch. Right arm III in male hectocotyized. Ligula length 4 to 6% of hectocotyized arm length with weak laminae. Calamus with **deep groove**. Presence of a **dark-blue to purplish brown band along dorsolateral surface of each arm**. Web inside with white reticulated stripes on red background.

Size: Up to 70 mm mantle length.

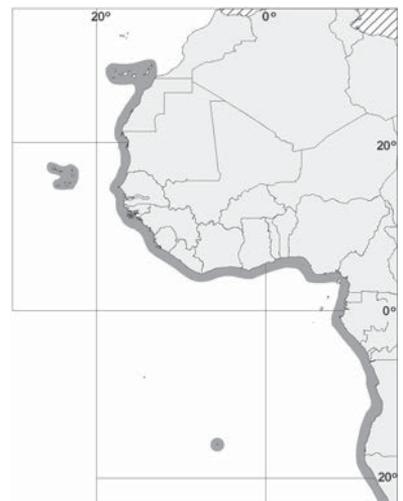
Habitat, biology, and fisheries: A benthic species taken on sandy bottoms, often covered by, broken coral and shells, from 0 to 200 m on the lower part of the continental shelf. Members of this species perform fast, efficient burying manoeuvres to hide and are ambush predator. The life cycle is estimated to range from 8 to 10 months at water temperatures ranging from 22° to 25°C. Females produce about 35 000 eggs. Egg length ranges from 2 to 2.5 mm. Females carry their eggs during the embryonic development. Currently taken only as bycatch in trawls. Of minor interest to fisheries.

Distribution: Tropical eastern and western Atlantic: from Georgia to the Gulf of Mexico, Caribbean Sea and northern Brazil, and off western Africa, from the Canary Islands, Senegal and Cape Verde Islands to Angola and St Helena.



tip of
hectocoylized
arm

dorsal view



***Aphrodoctopus schultzei* (Hoyle, 1910)**

Frequent synonyms / misidentifications: *Octopus shultzei* (Hoyle, 1910) / None.

FAO names: **En** – Brush-tip octopod; **Fr** – Poulpe de Aphrodite; **Sp** – Pulpo de Afrodita.

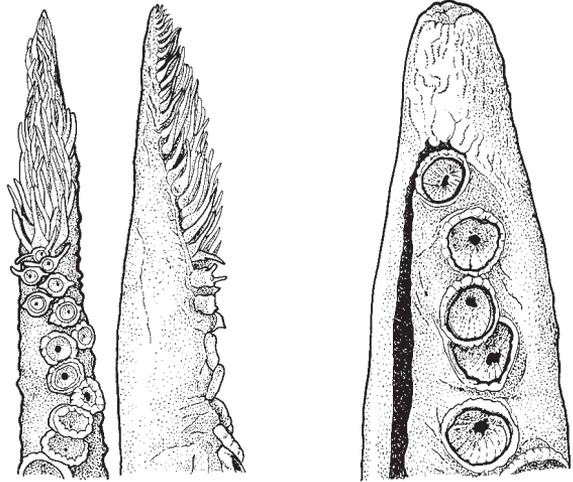
Diagnostic characters: Suckers on all non-hectocotylized arm tip of males modified into 4 transverse rows of flexible, tapered, finger-like processes.

Funnel organ inverted W-shaped with very short, rounded lateral lobes. Suckers on all arms in 2 rows. Several pairs of enlarged suckers on arm pairs I, II and III of males. Hectocotylus simple: **distal tip of the hectocotylus uniform, spongy, with irregular pit near the distal tip; without longitudinal groove, cross-striations, ridges and grooves; calamus absent.** Exposed terminal organ or penis very long, without a diverticulum.

Size: Up to 50 mm mantle length; 238 mm total length.

Habitat, biology, and fisheries: Benthic octopods. Found on rocky bottoms in shallow waters, from about 20 to 150 m. Of no interest to fisheries.

Distribution: Bay of Lüderitz (Namibia) to South Africa.



tip of arm

hectocotylized arm

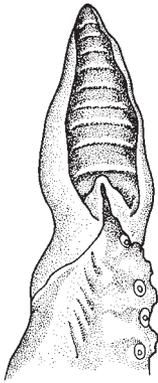
(all illustrations after Roper & Mangold, 1991)



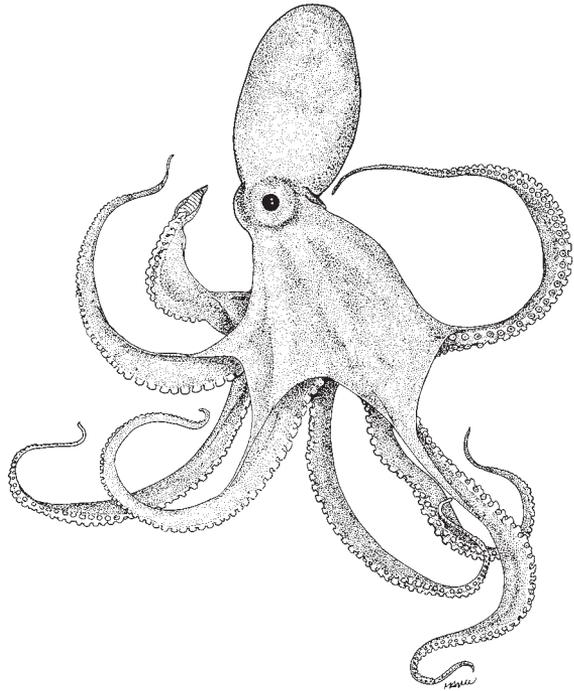
Bathypolypus ergasticus (P. Fischer and H. Fischer, 1892)

Frequent synonyms / misidentifications: *Benthoctopus ergasticus* (Fischer and Fischer, 1892); *B. lothei* (Chun, 1913) / None.

FAO names: **En** – Fischers' bathyal octopus; **Fr** – Bathypoulpe des Fischers; **Sp** – Batipulpo de los Fischers.



hectocotylus



Diagnostic characters: Mantle sac-like, as long as wide, smooth. Head narrower than mantle; neck constriction deep, **no supraocular papillae**. Arms subequals, from 77% to 87% of mantle length. Arm suckers in 2 rows. Web depth about 25% of the longest arm length. Ink sac absent. **Funnel organ consists of almost square-shaped pads**. No greatly enlarged suckers. Suckers diameter in both males and females about 6% of mantle length. Third right arm hectocotylized; **hectocotylus with 70 to 85 suckers; other arms usually with over 200 suckers**; ligula medium-sized (7% of hectocotylized arm length), with **7 strong transverse ridges**. Seven or 8 lamellae on outer demibranch. Spermatophores very large, longer than mantle length. Dark red in colour.

Size: Maximum mantle length about 100 mm.

Habitat, biology, and fisheries: A deep-living, benthic species, found at depths between 450 and 1 500 m. Habitat and biology are poorly known. It is caught as bycatch in trawl fishing gears. Of no interest to fisheries.

Distribution: Northeastern Atlantic from southwestern Ireland to Senegalese waters.



Bathypolypus sponsalis (P. Fischer and H. Fischer, 1892)

Frequent synonyms / misidentifications: None / None.

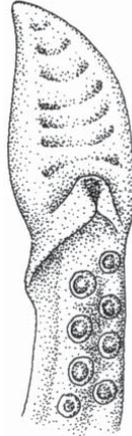
FAO names: **En** – Common bathyal octopus; **Fr** – Bathypoulpe commun; **Sp** – Batipulpo común.

Diagnostic characters: Mantle globe-shaped, with **smooth skin**. Large eyes (40 to 60% ML). Supraocular papillae slightly visible. Arms short (about 77% TL) with biserial small suckers. Third right arm hectocotylized in males, **shorter (about 68%)** than the opposite; ligula length from 10 to 11% of the hectocotylized arm length; calamus about 50% of the ligula, provided with **6 or 7 copulatory laminae**. **Hectocotylus with 50 to 65 suckers; other arms with 140 to 200 suckers**. Web extending on 17 to 33% of the arms length. **Funnel organ VV-shaped**. Spermatophores very large, but shorter than mantle length. Seven filaments per demibranch.

Size: Up to 100 mm mantle length, usually no more than 70 mm mantle length.

Habitat, biology, and fisheries: This is a bathybenthic species occurring on muddy bottoms at depths from 200 to 2 300 m, but it is most common in the depth range between 400 and 700 m. Males mature at smaller sizes between 27 and 45 mm mantle length than females (60 mm ML). In the western Mediterranean, mature individuals are found all year round, with peaks in winter and spring for males and in spring and summer for females. Eggs are large (from 13 to 15 mm long). Mature female brood an average of 100 eggs (from 72 to 135). Monthly growth rate ranges from 7 to 9 mm mantle length in the western Mediterranean (at a medium water temperature of 12°C). Females grow faster than males. Life span is about 14 to 15 months in males and 16 to 18 months in females. These octopods are opportunistic predators, feeding on a great variety of preys: crustaceans, ophiurids, other molluscs (including cephalopods) and bony fish. Females are more active predators than males. Juveniles perform an up-slope ontogenetic migration to depths shallower than 1 400 to 1 200 m. Caught as bycatch in trawl fisheries, but always discarded by fishermen.

Distribution: Mediterranean Sea: western basin and northern Aegean Sea; eastern Atlantic, from the Bay of Biscay to Cape Verde.



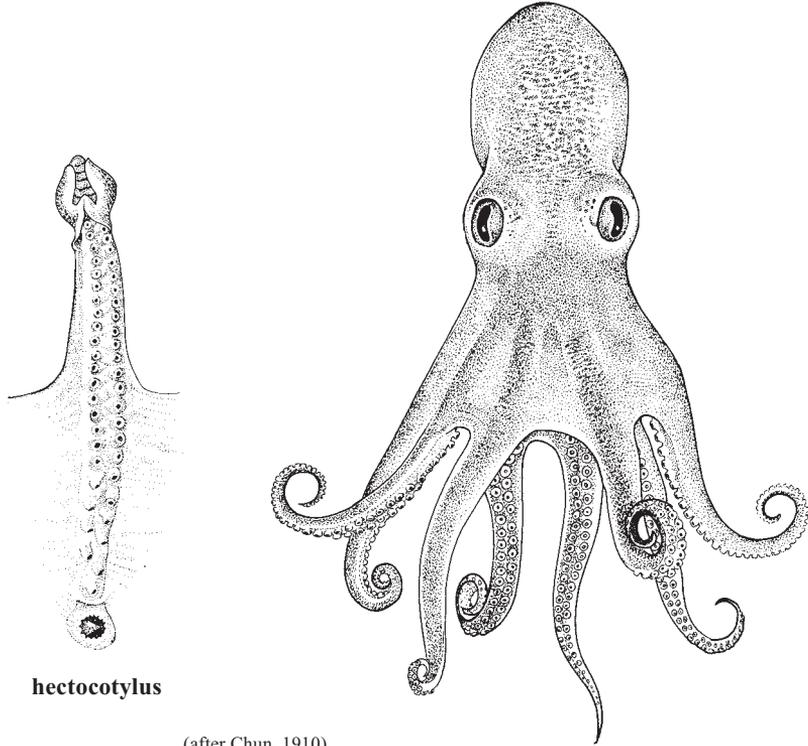
hectocotylus
(from Guerra, 1992)



Bathypolypus valdiviae (Thiele, in Chun, 1915)

Frequent synonyms / misidentifications: *Bathypolypus grimpei* Robson, 1924 / *Bathypolypus sponsalis* (Fischer and Fischer, 1892).

FAO names: **En** – Valdivia bathyal octopus; **Fr** – Bathypoulpe de Valdivia; **Sp** – Batipulpo de Valdivia.



hectocotylus

(after Chun, 1910)

Diagnostic characters: Head surface with a few tubercles or warts; supraocular papillae sharp and conical; web depth 33 to 40% of the longest arm length; arms short; **hectocotylus globose**, almost spherical with **distinct lateral lobes** in adults; ligula with 4 or 5 transverse ridges. Spermatophores very large.

Size: Mantle length 80 mm.

Habitat, biology, and fisheries: These bathyal octopods are found at depths ranging from about 300 to 1 500 m, but very little is known about their biology. Of no interest to fisheries.

Distribution: From Namibia, to Agulhas Bank and adjacent areas in South Africa.



***Benthoctopus januarii* (Hoyle, 1885)**

Frequent synonyms / misidentifications: None / *Macrotritopus defilippi* (Vérany, 1851).

FAO names: En – Long-arm bathyal octopus; Fr – Bathypoulpe bras-longues; Sp – Batipulpo patilargo.

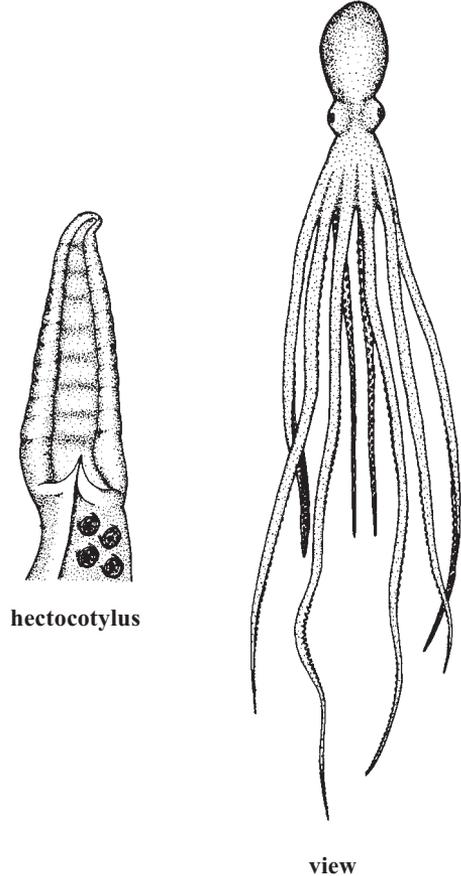
Diagnostic characters: Mantle saccular and elongated, smooth and devoid of sculpture. Funnel organ VV-shaped. Arms long, 3 to 4 times longer than the mantle; and attenuated towards the tips, becoming filiform. hectocotylyzed third right arm almost twice shorter than the opposite, ligula length from about 6 to 9% of the hectocotylyzed arm length, pointed and with a deep central groove. Calamus small (from 15 to 25% of the hectocotylyzed arm), but well defined. Gill with 7 or 8 lamellae on each demibranch. In preservation, the dorsal surface is pinkish grey to grey in colour; the ventral surface is slightly paler.

Size: Maximum known mantle length 63 mm (female).

Habitat, biology, and fisheries: This benthic- upper bathyal species inhabits muddy bottoms, at depths from 350 to 1 580 m). The eggs are elongate oval, 14 mm long and 3.5 mm wide with a short, narrow stalk. There are no further data on the biology and ecology of this species. Of no interest to fisheries.

Distribution: From Gulf of Mexico and Caribbean Sea to southern Brazil; possibly off Namibian waters.

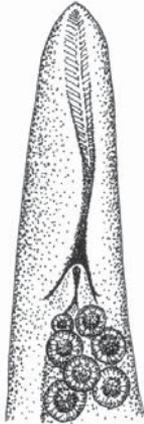
Remarks: This species is included here because a few specimens are very similar to the species described from the Western Atlantic were caught in Namibian waters. However, additional specimens in good condition and certified identity are needed before the species can be considered present in the area.



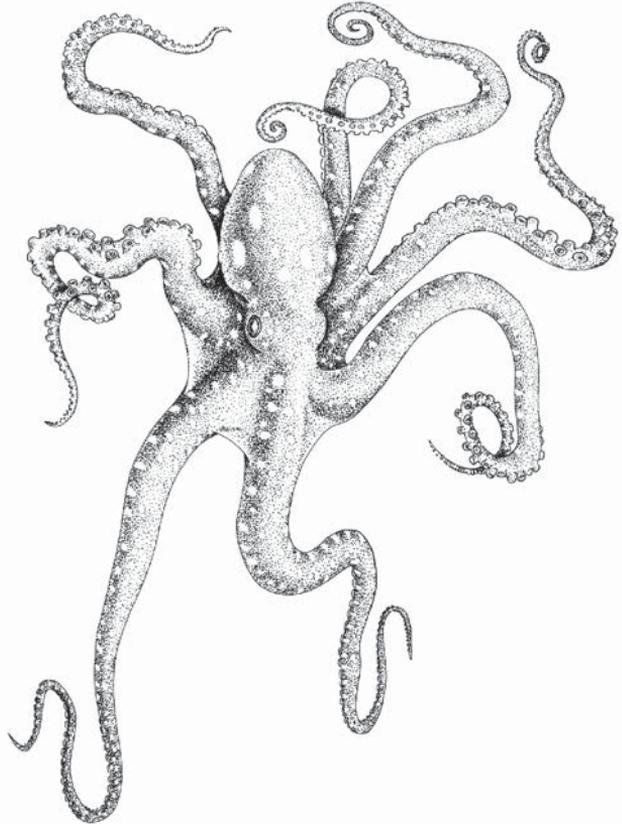
***Callistoctopus macropus* (Risso, 1826)**

Frequent synonyms / misidentifications: *Octopus macropus* Risso, 1826 / None.

FAO names: **En** – White-spotted octopod; **Fr** – Poulpe tacheté; **Sp** – Pulpo maculado.



hectocotylus



Diagnostic characters: Dorsal arms longer and thicker than lateral and ventral arms. Gills with 10 lamellae in outer demibranch. Third right arm hectocotylized in males, ligula relatively large (14% of the hectocotylized arm length) and tubular. **Typically with many white spots on dorsal side of the mantle and arms over a red wine background colour.**

Size: Maximum mantle length 155 mm; total length to 950 mm. Weight up to 2 Kg.

Habitat, biology, and fisheries: Occurs from 1 to 20 m. Few data on the biology and ecology of this species are available. In the Mediterranean Sea and the North Atlantic this benthic species lives on sand and bottoms covered with rubble; capable to bury in the sand. It is active mainly during the night. Feeds mainly on crustaceans, molluscs and occasionally fishes. In the western Mediterranean males are mature from April and females mature during the summer. In the western Atlantic spawning season extends from winter to early spring; fresh laid eggs measure 4.0 x 1.2 mm; hatchings are planktonic; life span is around 1 year. Of no commercial interest.

Distribution: This species was reported to be distributed widely around the world. However, such widespread reports are now considered to refer to a species complex. In the eastern central Atlantic it has been reported from Gibraltar Strait to Cape Town.



***Eledone caparti* Adam, 1950**

Frequent synonyms / misidentifications: None / *Eledone cirrhosa* (Lamarck, 1798); *E. moschata* and *E. nigra* (Hoyle, 1910).

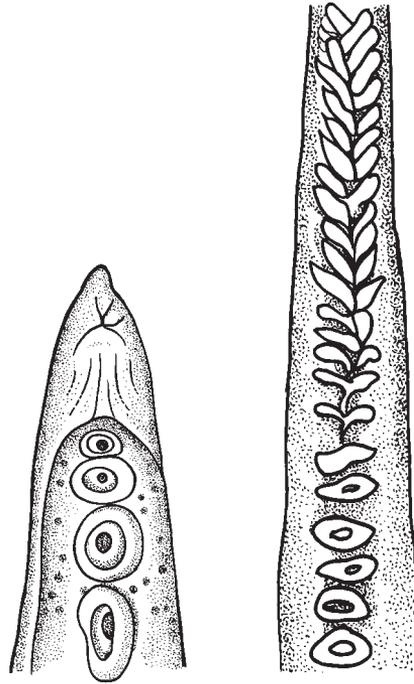
FAO names: En – Tropical octopus; Fr – Elédone tropicale; Sp – Pulpo tropical.

Diagnostic characters: Body smooth; no supraocular papillae. First arms (I) are from 33 to 50% longer than the second (II), and these considerably longer than III and IV arms. Two rows of flattened plates on end of all arms of male, except hectocotylized arm. Colour grey-lilac or reddish brown, without large dark spots.

Size: Up to 95 mm mantle length.

Habitat, biology, and fisheries: Found at depths from 40 to approximately 150 m. Very few is known about the biology of this benthic sublittoral species. Egg length 8 to 9 mm. Spermaphores without spines. Egg masses were recorded in the stomachs of blue sharks. Of no interest to fisheries.

Distribution: Tropical western Africa from Mauritania and Sierra Leone to Angola.



hectocotylus

modified suckers on arm

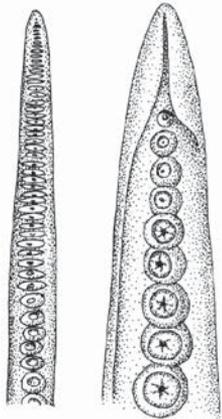
(after Nesis, 1987)



Eledone cirrhosa (Lamarck, 1798)

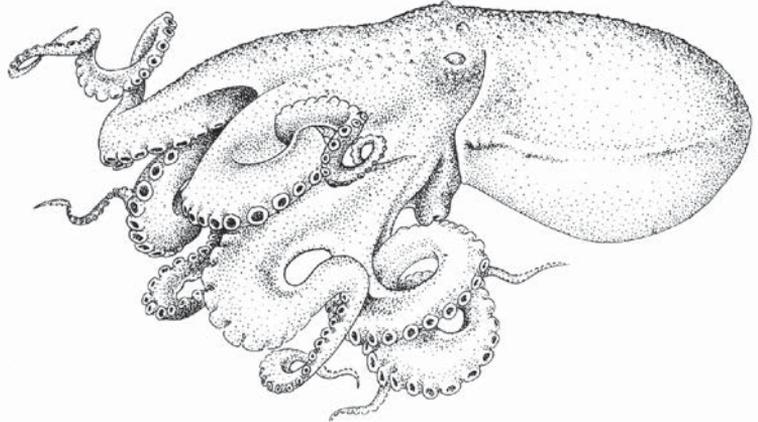
Frequent synonymy / misidentifications: *Eledone aldovrandi* Monfort, 1802 / *Eledone moschata* (Lamarck, 1798); *E. caparti* Adam, 1950.

FAO names: **En** – Horned octopus, **Fr** – Elédone commune, **Sp** – Pulpo blanco.



modified
suckers

ligula



(all illustrations from Guerra, 1992)

Diagnostic characters: Mantle ovoid, broad; **skin of mantle, head and arms covered with very fine closely-set granulations, interspersed with larger warts on the dorsal surface.** A pale-coloured ridge around the lateral side of the mantle delimits the dorsal and the ventral sides of the body. **One supraocular papilla on each eye.** Arms moderately short and subequal; suckers uniserial; **suckers of the distal tips of all arms except the hectocotylized (right arm III) modified by being compressed and drawn out into a row of low papillae.** Web moderately deep, from about 21 to 41% of arm length. Right arm III hectocotylized; shorter than the opposite (about 69 to 76%). Ligula very short, 3 to 4% arm length; calamus absent. Eleven filaments per demibranch. Living animals have a yellowish or reddish orange to reddish brown colour dorsally, with diffuse rust-brown patches.

Size: Up to 175 mm mantle length and 400 mm total length; maximum weight about 2 kg.

Habitat, biology, and fisheries: This coastal benthic species inhabits sandy, detritic and muddy bottoms. Found from 10 to 800 m, mainly abundant between 60 and 300 m. The spawning season extends from May to September, with a peak in July in the western Mediterranean. The reproductive period extends from July to September in the North Atlantic. Males are more precocious than females; mantle length at first maturity is about 125 mm in females while males start maturing at about 50 mm mantle length in the western Mediterranean. Reproductive offshore-inshore migrations were observed. Mature eggs measure 7.5 x 2.5 mm. They are fixed to different substrata on the bottom. Fecundity ranges from 800 to 1 500 eggs in the Mediterranean Sea and between 5 500 and 9 000 in the North Atlantic, depending of female size. Embryonic development lasts 3.5 months at 16°C. Newly hatched octopods measure about 4.5 mm and are planktonic during a period of time variable, related to sea temperature. Growth rates vary inversely with size and seasonally, being directly related to water temperature. In the western Mediterranean, juveniles of about 20 to 25 mm mantle length appear in demersal catches; in spring of the following year females have attained about 90 and 95 mm mantle length, males about 70 mm mantle length. A similar growth pattern was found in the North Sea, off Scotland, but due to overall lower temperature growth is slower maturation process takes longer and animals reach larger sizes. The diet is mainly composed by crustaceans (shrimps, crabs and lobsters), but *Eledone cirrhosa* also prey upon ophiurids, molluscans and fish. Cannibalism has been observed. Post-spawning mass mortality occurs. Life span ranges from 18 to 24 months in the Mediterranean Sea, and it is probably longer in the North Sea probably, but does not last more than 3 years. The unihorn

octopus is a relatively important commercial species. It is taken as bycatch in local trawl fisheries and it is sometimes pooled together with *Octopus vulgaris* in the fishery statistics.

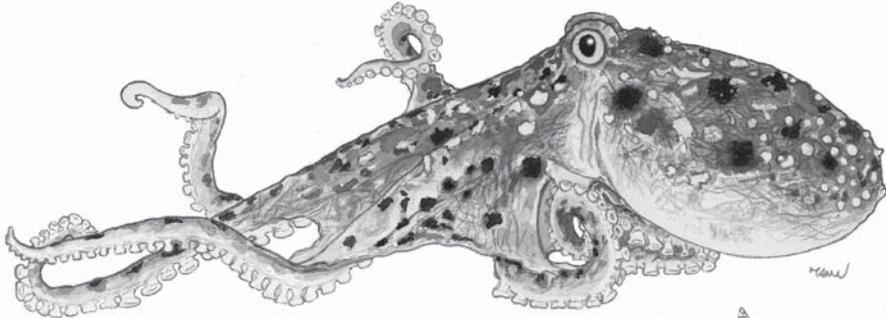
Distribution: Mediterranean Sea; eastern Atlantic from approximately 67°N to 33°N. The southern limits of the distribution are not well established; recently the species was recorded from the Canary Islands but this record has not been verified.



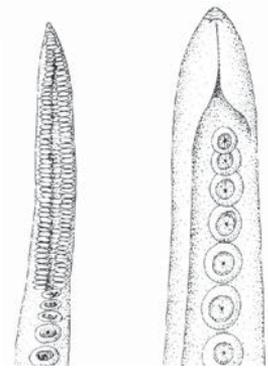
Eledone moschata (Lamarck, 1798)

Frequent synonyms / misidentifications: None / *Eledone cirrhosa* (Lamarck, 1798); *E. caparti* Adam, 1950.

FAO names: En – Musky octopus; Fr – Elédone musquée; Sp – Pulpo almizclado.



Diagnostic characters: Mantle ovoid, moderately broad; skin smooth on the ventral surface and finely granulose on the dorsal surface. **No ridge occurs around the lateral side of the mantle.** Arms subequal, moderately long, up to 22% of mantle length; suckers uniserial; **distal tips of all arms except the hectocotylied (right arm III) modified by subdivision of uniserial suckers into 2 parallel rows of flattened laminae or platelets.** Web moderately deep about 30% of arm length. Right arm III hectocotylied; shorter than the opposite (60 to 70%). Ligula very short, about 3% of the arm length; calamus absent. Eleven or 12 filaments per demibranch. The animals and their ink exude a prominent musk-like odour when alive. Live colour greyish brown, with blackish brown blotches on the dorsal surface of the body.



(from Guerra, 1992)

**modified
suckers**

ligula

Size: Maximum mantle length 188 mm and maximum weight about 1.4 kg.

Habitat, biology, and fisheries: This coastal benthic species inhabits sandy, detritic and muddy bottoms, from 10 to 350 m, with greatest abundance down to 100 m. The spawning season extend to most part of the year in some geographical areas, while it is more restricted in other areas, with peaks occurring in different seasons and months. Males are more precocious than females and maturity is reached at various different sizes in both sexes. Mating concentrations occur from 60 to 90 m in the western Mediterranean, were reproductive offshore-inshore migrations were observed. Mature eggs measure between 12 and 16 mm in length and 4 to 5 mm in width. They are fixed to different substrata on the bottom. Fecundity ranges between a few hundred and a few thousand eggs (up to 2 896 in a female from the Aegean Sea), depending on the females size. Embryonic development takes 6 months at 10 to 15°C. Newly hatched octopods have a mantle length from 10 to 12 mm and are benthic from the most early stages of development, their aspect form and behaviour resemble those of the adults. Life span of this species ranges between 15 and 23 months. The diet in mainly composed by crustaceans. Post-spawning mass mortality has been observed. Temperature limits seem to be comprised between 12° and 23°C. This species has a "social" behaviour and has been observed to form a size-based dominance hierarchy in captivity. It is a relatively important commercial species, mainly in the Mediterranean Sea. It is taken as bycatch in local trawl fisheries and it is sometimes pooled together with *Octopus vulgaris* in the fishery statistics. There are significant differences of abundance among major areas, depth strata and season.

Distribution: Mediterranean Sea; in the Atlantic Ocean it was recorded off the Portuguese coast in the Gulf of Cadiz and north of Morocco.



***Graneledone verrucosa* (Verrill, 1881)**

Frequent synonyms / misidentifications: *Graneledone verrucosa verrucosa* and *G. verrucosa media* Joubin, 1918 / None.

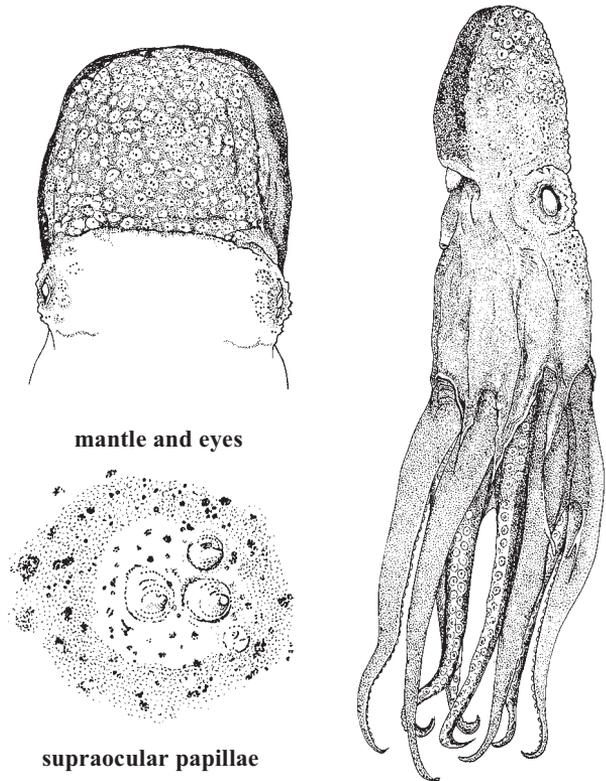
FAO names: **En** – Warty octopus; **Fr** – Poulpe verruqueux; **Sp** – Pulpo verrugoso.

Diagnostic characters: Ink sack absent; 1 row of suckers on arms. Mantle broadly ovoid. Arms 2.5 to 3 times as long as body. No enlarged suckers. Funnel organ VV-shaped. Third right arm hectocotylized. Hectocotylus of moderate size. Ligula small, simple, without transverse ridges, about 3.5 to 7% of the hectocotylized arm length. Gills small with 6 to 8 lamellae on each demibranch. Dorsal body surface covered in complex papillose warts. **These warts consist of approximately 4 to 10 cone-shaped tubercles, 22 to 26 clusters across dorsal mantle, 12 to 16 clusters in transverse line between orbits. Multiple warts surround the eye, and 2 or 3 particularly large supraocular warts.**

Size: Total length to 500 mm.

Habitat, biology, and fisheries: Benthic-bathyal species. Found approximately from 550 to 2 900 m. Biology unknown. Of no interest to fisheries.

Distribution: North Atlantic, on the mid-Atlantic Ridge; northeast Atlantic: off Iceland, Porcupine Seabight, Rockall Trough, west of Hebrides and Bassin du Cape Verde; northwest Atlantic: from southern New England to cape Hatteras.



(all illustrations after Allcock *et al.*, 1910)



***Macrotritopus defilippi* (Vérany, 1851)**

Frequent synonyms / misidentifications: *Macrotritopus dana* Robson, 1929; *M. kemp* Robson, 1921 / None.

FAO names: **En** – Lilliput longarm octopus; **Fr** – Poulpe à longs bras; **Sp** – Pulpo patilargo.

Diagnostic characters: Mantle small in relation to total length, elongate or saccular. Funnel organ W-shaped, slender, posterior angles rounded.

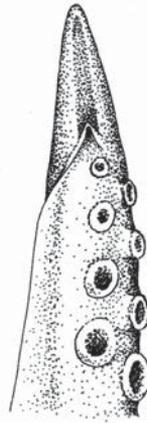
Arms very long, 85 to 90% of total length, slender, often conspicuously asymmetrical (each arm may be much longer than the opposite arm of same pair). Enlarged suckers absent in both sexes. Right arm III of male hectocotylized, shorter than the opposite, bears 60 to 100 suckers. Ligula short, 1.9 to 2.5% of the hectocotylized arm length. Gills with 11 lamellae per outer demibranch. Papillae transient except over eyes. Colour in life brown-yellow, grey brown or red-brown with dark transverse arm bars and hearth shaped pattern on dorsal mantle, often with greenish iridescence, especially around eyes.

Size: Up to 90 mm mantle length; total length to about 400 mm.

Habitat, biology, and fisheries: A benthic species taken on sandy and muddy bottoms. Usually it occurs from the littoral waters (about 6 m) to 200 m depth, but occasionally has been reported down to 350 m. Females lay over 10 000 eggs that may be brooded in the arms. Mature egg-size ranges between 0.9 and 1.6 mm. Larvae and juveniles are pelagic, and are characterized by extremely long ventrolateral arms. The characteristic long arms of the planktonic young seem to function in flotation, feeding, crawling and defense. No directed fisheries.

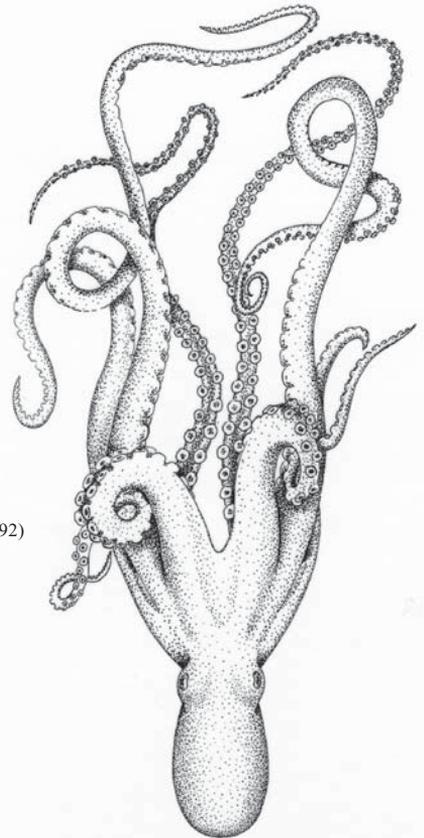
Distribution: Throughout the Mediterranean Sea, eastern Atlantic from South Portugal to Angola, Cape Verde Islands. Western Atlantic from the Bahamas to Brazil, in the Gulf of Mexico and the Caribbean Sea.

Remarks: The genus *Macrotritopus* needs revision. At present the only entirely described species is the one living in the Mediterranean and the eastern Atlantic, but the unresolved species of the western Atlantic are treated under the same name. The very characteristic "*Macrotritopus* larvae" have been found off South Africa and in the Indo-West Pacific, suggesting that several species may be comprised within this genus.



hectocotylus

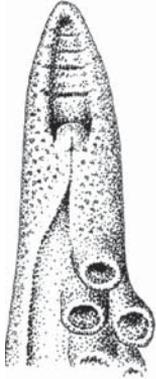
(illustrations from Guerra, 1992)



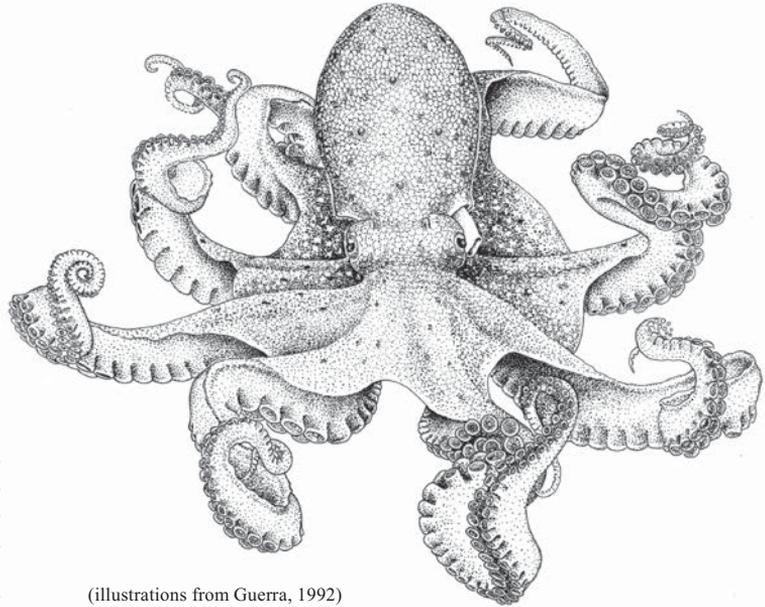
***Octopus vulgaris* Cuvier, 1797**

Frequent synonyms / misidentifications: None / None.

FAO names: **En** – Common octopus; **Fr** – Pieuvre; **Sp** – Pulpo común.



ligula



(illustrations from Guerra, 1992)

Diagnostic characters: Mantle muscular, sac-shaped. Mantle opening wide, surpassing the lateral edges of the mantle. Arms robust at the base, the lateral ones being the longest and the dorsal ones the shortest. Arms with 2 rows of suckers. **Suckers**

15 to 17 on the arms II and III enlarged in adults, especially in males. Right arm III of males hectocotylized; ligula short (2.5 times of the arm length) and spoon-shaped. A total of 7 to 11 lamellae on outer side of the gill. **Four papillae on the dorsal surface of the mantle** (in a diamond arrangement). One papilla over each eye. Reticulated skin with 4 whitish spots, 2 between the eyes and 2 below the first dorsal papilla.

Size: Up to 400 mm mantle length and 1.8 m total length in the eastern Atlantic. Up to 250 mm mantle length in the Mediterranean.

Habitat, biology, and fisheries: The common octopod occurs from very shallow, littoral waters (about 5 m depth) to the border of the continental shelf (200 m approximately). The majority of the available biological data on benthic octopods concern the common octopus. It undertakes limited seasonal migrations. No segregation between sexes was observed in the central-eastern Atlantic population. Potential fecundity in mature females ranges between 100 000 and 400 000 oocytes. Eggs are small, about 2.5 x 1 mm long. Females attach the eggs to several substrates, mainly rocks, and brood the eggs until hatching. The spawning season extends throughout the year, with 2 peaks in spring and autumn in the Atlantic populations. Egg stage duration depends on the temperature; it lasts from 20 to 25 days at 25° C and 125 days at 13° C. Hatchlings measure from 1 to 2 mm mantle length and stay in the water column (planktonic stage) for about 2 or 3 months. *Octopus vulgaris* are simultaneous terminal spawners, therefore populations are typically unstable and respond rapidly to changes in environmental conditions. The diet is composed by bony fishes, crustaceans, cephalopods, bivalves and polychaeta. The species is preyed upon by a variety of predators, including sharks, bony fishes, sea birds and marine mammals. Cannibalism has been observed. Growth is very fast and temperature dependent. Life span was estimated in 2 years for males and females. The natural mortality of cephalopods during the paralarval and settlement stages is high and it is associated with environmental factors, which ultimately control the abundance of food for the paralarvae (zooplankton). Upwelling conditions are related to strong recruitment of *Octopus vulgaris* in Mauritanian and Galician (northwest Spain) waters. *Octopus vulgaris* is the most abundant and ubiquitous cephalopod species occurring on the Saharan Bank (northwest Africa, from 21°N to 26°N). In this area, there are probably 2 stocks, 1 off Dakhla (26°N to 23°N) and the other off Cape Blanc (21°N to 19°N). The first one is overexploited

while the second one is relatively underexploited. The common octopus of the Nouakchott area probably constitutes a third stock. *Octopus vulgaris* is taken throughout the year as a target species by bottom trawls and by the creel artisanal coastal fishery, at depths between 20 and 200 m in the Mediterranean, off West Africa and the northeastern Atlantic. Most of the catches in the eastern central Atlantic were reported as *octopus nei*, but the majority corresponded to *O. vulgaris*. Some experiences of culture have been undertaken mainly in Spain and Japan.

Distribution: This species is especially abundant in the Mediterranean Sea and the eastern Atlantic. Although *O. vulgaris* was reported to be a cosmopolitan species from tropical, subtropical and temperate waters, its distribution is currently being redefined to conform to modern biogeographical boundaries.



***Pteroctopus tetracirrhus* (Delle Chiaje, 1830)**

Frequent synonyms / misidentifications: None / None.

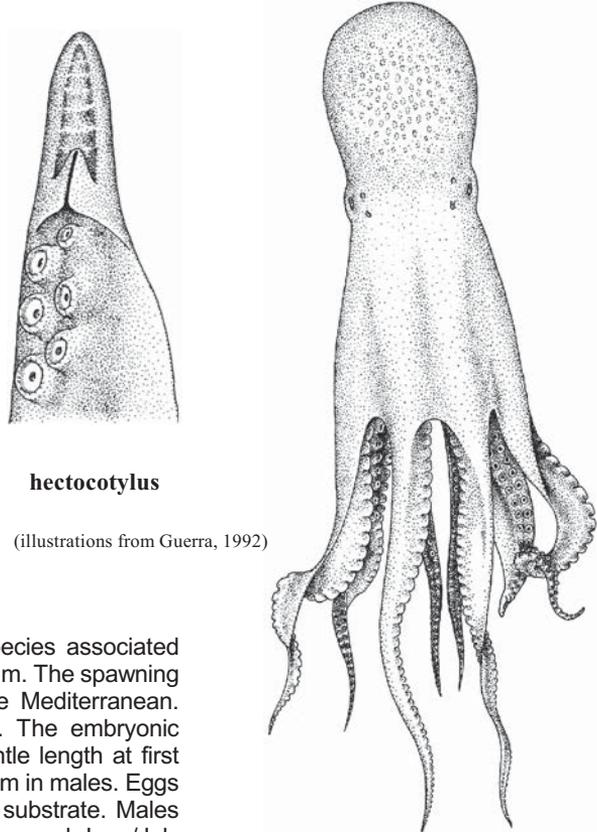
FAO names: En – Fourhorn octopus; Fr – Poulpe à quatre cornes; Sp – Pulpo cuatro cuernos.

Diagnostic characters: Mantle sac-like, usually as broad as long. **Skin and subcutaneous tissue gelatinous. Two long and slender papillae over each eye.** Funnel organ W-shaped. Mantle aperture narrow. Arms 3 to 4 times longer than mantle. Suckers in 2 rows with a maximum diameter 4 to 6% of mantle length. Web deep up to 40% of the longest arm. Body covered with low closely-set tubercles. Left third arm hectocotylized in males, stouter and shorter (from 69 to 80%) than the opposite one. Ligula large (5 to 11% of the arm length) and broadly conical, with shallow groove and faint transverse ridges. Calamus medium-sized, conical and deeply grooved. Nine or 10 filaments per outer demibranch of gill.

Size: Maximum mantle length 130 and 110 mm for females and males, respectively.

Habitat, biology, and fisheries: Benthic species associated with muddy bottoms, at depths from 25 to 720 m. The spawning season occurs mainly during summer in the Mediterranean. Egg-size ranges between 6.5 and 8.3 mm. The embryonic development lasts about 2 to 3 months. Mantle length at first maturity is about 110 mm in females and 85 mm in males. Eggs are hatched individually and attached to the substrate. Males and females mature subsequently in May/June and June/July respectively. Young immature individuals appear in the catches by November and December. Medium size individuals are taken in April in demersal catches. Life span is about 2 to 3 years. Species of minor interest to fisheries, taken as bycatch in shrimp or finfish trawling operations in the western Mediterranean and the western Atlantic. Not registered in the official statistics.

Distribution: Mediterranean and eastern Atlantic from 40°N to 4°S. It is reported in the western Atlantic from North Carolina to Uruguay, including the Caribbean Sea; however, these are probably related forms of unresolved status (Norman *et al.*, in preparation, FAO Catalogue vol. III).



hectocotylus

(illustrations from Guerra, 1992)

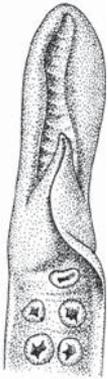
dorsal view



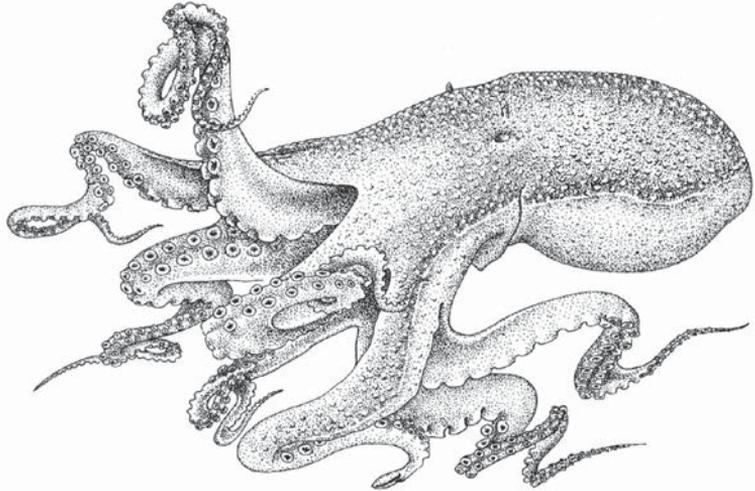
***Scaergus unicirrhus* (Delle Chiaje, 1841)**

Frequent synonyms / misidentifications: Unresolved issue, *Scaergus patagiatus* Berry, 1913 / None.

FAO names: **En** – Unihorn octopus; **Fr** – Poulpe licorne; **Sp** – Pulpo unicornio.



hectocotylus



(illustrations from Guerra, 1992)

Diagnostic characters: **Body covered with round papillae or warts that may coalesce and form linear ridges. A lateral skin ridge around the mantle separates the ventral and dorsal sides. Single papillae over each eye.** Arms moderately long (61 to 85% of the ML) and web deep (20 to 30% of the arm length). Left arm III of male hectocotylized and markedly shorter than the opposite one. Ligula large (8 to 10% of the arm length), spoon shaped with swollen heavily infolded margins, deep groove and transverse striae. Calamus large, acutely conical with a deep groove. Funnel organ W-shaped. Eleven to 14 gill lamellae per outer demibranch. Two pairs of large black spots may be present on the dorsal mantle. Translucent green iridescence on the ventral side of the mantle present in still alive or barely dead specimens.

Size: Maximum mantle length 120 mm. Common from 70 to 80 mm.

Habitat, biology, and fisheries: Benthic species associated with sandy and coralline bottoms of seamounts and continental slopes, at depths from 50 to 500 m. Males mature at 50 mm mantle length in the western Mediterranean and spawning seems to occur in summer although in tropical waters it could be extended all year round. Mature eggs are about 2 mm long. Hatchlings are planktonic. Spermatophores are long and the sperm mass makes up to about 72% of spermatophore length. This species feeds on small fishes, crustaceans and molluscs. The interest to fisheries is presently unassessed but a regional potential is believed to exist, in some regions.

Distribution: Mediterranean Sea and Atlantic Ocean. Present area: off Namibia.

Remarks: The species name is retained here as the valid one for specimens from Namibia waters, until the examination of additional material will help clarify the still not entirely clear situation of the genus and its species in the Atlantic Ocean.



OCYTHOIDAE

Football octopods

This monotypical famioy contains a single species. Consequently, diagnostic characters, habitat, biology and interest to fisheries coincide.

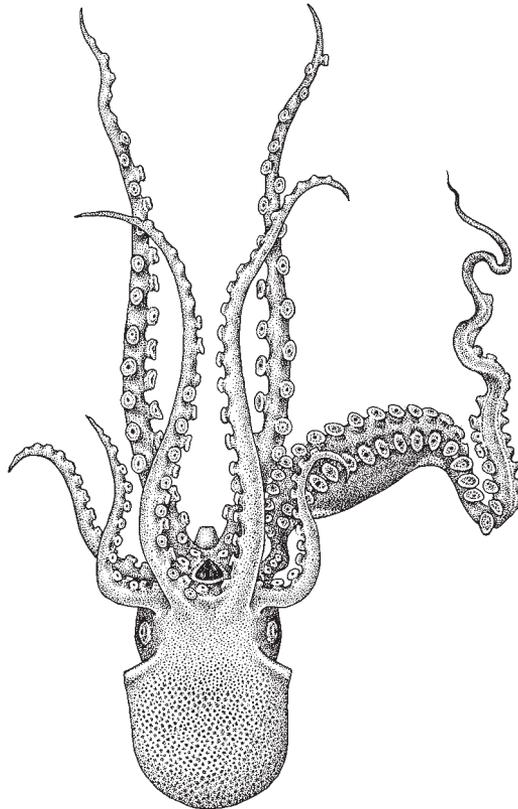
Ocythoe tuberculata Rafinesque, 1814

Frequent synonyms / misidentifications: None / None.

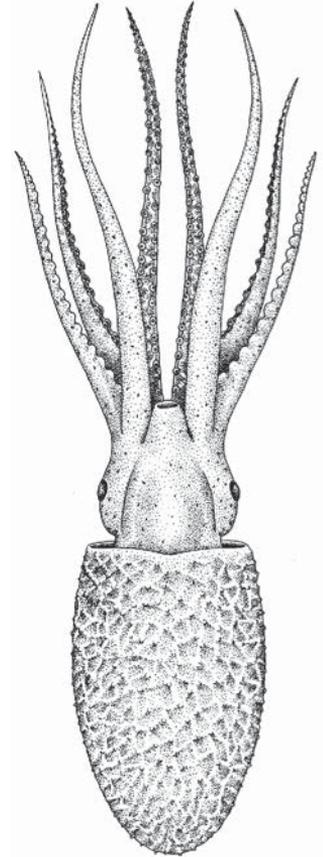
FAO names: En – Football octopod; Fr – Poulpe balonné; Sp – Pulpo abalonado.



hectocotylus



male
dorsal view



female
ventral view

(all illustrations from Guerra, 1992)

Diagnostic characters: Species with a marked sexual dimorphism. Females much larger than males with a firm, sac-like and muscular mantle. **Ventral side of mantle in adult females with reticular sculpture of crossing skin ridges and tubercles at crossing points.** A hydrostatic organ is reported to be located inside the mantle cavity on dorsal side. **One pair of cephalic water pores** on ventral part of head at the base of IV arms. Funnel very long, surpassing the base of the arms, locking cartilages knob-like. Arms long, I and IV much longer than II and III arms. Suckers small in 2 rows. No web, no arm fringe. Males small, III right arm hectocotylized. Hectocotylus with a very long slender “penis”, retracted in a sac and with suckers in 2 rows. Females with 34 and males with 21 gill lamellae.

Similar families occurring in the area

This family was included by Naef (1923) in the superfamily Argonautoidea together with Argonautidae, Alloposidae and Tremoctopodidae. These 4 families are primarily distinguished from the rest of octopods by an unusual means of copulation which involves transferring a detached hectocotylus from the male to the female. Also, males usually are much smaller than females and dwarf in 3 over 4 families. Ocythoidae females do not produce calcareous shells. They can be distinguished from Tremoctopodidae because they do not have a well-developed web between arms I and II. Alloposidae have a gelatinous consistency and the ventral surface of the mantle is not covered by tubercles interconnected by ridges.

Size: Up to 310 and 30 mm mantle length for females and males, respectively.

Habitat, biology, and fisheries: An epipelagic species; occurs from the surface down to 200 m. *Ocythoe* is the only known ovoviviparous cephalopod, i.e. gives birth to live young that hatch internally; females incubate eggs in the oviducts until paralarvae hatch. The hectocotylus is freed from males and penetrates actively in the mantle of the female. A female of 170 mm mantle length had about 170 000 oocytes at different stages of development in the ovary. The smallest oocytes measured 0.1 to 0.15 mm, oocytes of 0.2 mm predominated. There were about 28 000 eggs in the oviducts. Freshly fertilized eggs (2.3 to 2.5 x 1.2 to 1.3 mm) were situated in the proximal part of the oviducts. Total fecundity was about 200 000 oocytes. Larger animals could reach a total fecundity of about 1 million oocytes. Males utilize the test of salps to reside within the cavity. Of no interest to fisheries.

Distribution: Cosmopolitan in temperate latitudes.



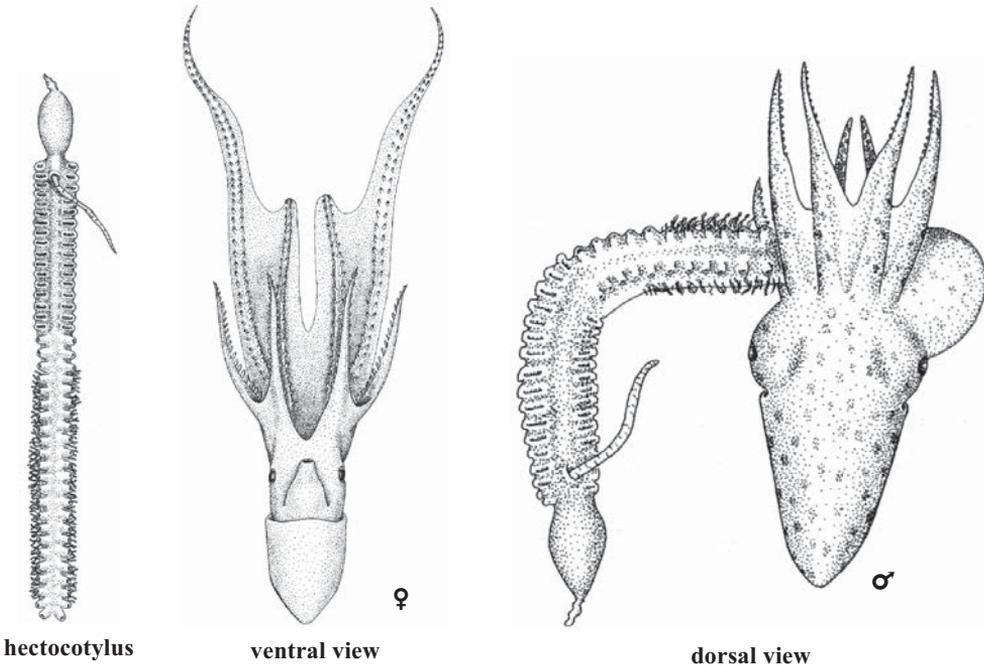
References

- Cardoso, F. & Paredes, C.** 1991. La familia Ocythoidae (Cephalopoda: Octopoda) en el Perú. *Revista Peruana de Biología*, 5: 129–137.
- Guerra, A.** 1992. Mollusca, Cephalopoda. In M.A. Ramos et al., eds. *Fauna Ibérica*. Vol. 1. Museo Nacional de Ciencias Naturales. CSIC, Madrid, 327 pp.
- Laptikhovskiy, V. & Salman, A.** 2003. On reproductive strategies of the epipelagic octopods of the superfamily Argonautoidea (Cephalopoda: Octopoda). *Marine Biology*, 142: 321–326.
- Mangold, K.M., Vecchione, M. & Young, R.E.** 2010. Ocythoidae Gray, 1849. *Ocythoe tuberculata* Rafinesque, 1814. Version 15 August 2010 (under construction). http://tolweb.org/Ocythoe_tuberculata/20205/2010.008.15 in The Tree of Life Web Project, <http://tolweb.org/>
- Naef, A.** 1921/1923. Cephalopoda. Fauna e Flora del Golfo di Napoli. Monograph, no. 35. English translation: A. Mercado (1972). Israel Program for Scientific Translations Ltd. IPST Cat. No. 5110/1,2.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), Cephalopods of the world. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Okutani, T. & Osuga, K.** 1986. A peculiar nesting behaviour of *Ocythoe tuberculata* in the test of a Gigantic Salp, *Tethys vagina*. *Venus*, 45: 67–69.
- Packard, A. & Wurtz, M.** 1994. An Octopus, *Ocythoe*, with a swimbladder and triple jets. *Philosophical Transactions of the Royal Society of London Series B. Biological Sciences*, 344: 261–275.
- Roper, C.F.E. & Sweeney, M.J.** 1976. The pelagic octopod *Ocythoe tuberculata* Rafinesque, 1814. *Bulletin of the American Malacological Union*: 21–26.

TREMOCTOPODIDAE

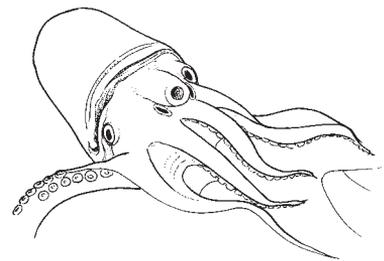
Blanket octopods

Diagnostic characters: In females the dorsal (I) and dorsolateral (II) arms are distinctly longer than arms III and IV and are connected by an extensive web which is absent from the other arms. Water pores present at base of dorsal and ventral arms. Males are dwarfs. Hectocotylus develops in sac buried beneath right eye; the proximal half of hectocotylus has papillate lateral fringes. Hydrostatic organ (swim bladder) present dorsal to digestive system.

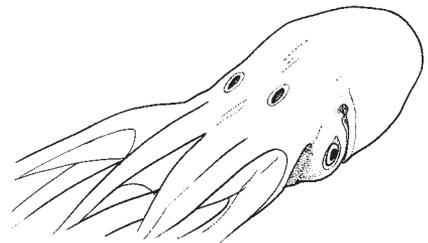


(from Guerra, 1992)

Habitat, biology, and fisheries: Most species occupy surface waters of tropical and subtropical oceans and seas. Females carry numerous (100 000 to 150 000) small eggs (0.9 X 1.5 mm in size). The eggs are attached to a sausage-shaped rod held at the base of the dorsal arms and carried by the female until hatching. The hatchling has the arm bases in a cuff. Young individuals carry broken tentacles of different species of jellyfish on the suckers of the dorsal 4 arms, which presumably have a defensive and/or offensive function. Large ocelli can be displayed on the dorsal web. This web and the slender tip of the arms can, apparently, be autotomized along visible "fracture" lines. Of no interest to fisheries.



female ventral water pores



female dorsal water pores

Remarks: The systematics of the Tremoctopodidae was review by Thomas (1977). He concluded that 2 species existed, *Tremoctopus violaceus* and his new species *T. gelatus* Thomas, 1977. The former species he divided into 2 subspecies, *Tremoctopus violaceus violaceus*, from the Atlantic Ocean and *Tremoctopus violaceus gracilis*, from the Pacific and Indian Oceans. In agreement with the decision by Mangold *et al.* (2010), we consider the 2 subspecies to be true species, and the family as composed by 4 species: *T. gelatus*, *T. gracilis*, *T. robsoni* and *T. violaceus* is the only species present in the area.

The main differences between Tremoctopodidae and the other 3 families of Argonautoidea Naef, 1912 are:

- a) Dorsal 4 arms (pairs I and II) much more longer than ventral 4 arms (III and IV).
- b) Presence of water pores at the base of dorsal and ventral arms versus water pores only present at the base of arms IV in both sexes (Ocythoidae) or no water pores (Argonautidae and Alloposidae).
- c) Deep web present between dorsal 4 arms (pairs I and II) versus no web in Argonautidae and Ocythoidae and extensive web between all arms.
- d) The morphology of hectocotyli.

List of species occurring in the area

The symbol  is given when species accounts are included.

 *Tremoctopus violaceus* Delle Chiaje, 1830.

References

- Bizikov, V.A.** 2004. The shell in Vampyropoda (Cephalopoda): Morphology, functional role and evolution. *Ruthenica. Supplement.*, 3: 1–88.
- Guerra, A.** 1992. Mollusca, Cephalopoda. In M.A. Ramos *et al.*, eds. Fauna Ibérica. Vol., 1. Museo Nacional de Ciencias Naturales. CSIC, Madrid: 327 pp.
- Laptikhovskiy, V. & Salman, A.** 2003. On reproductive strategies of the epipelagic octopods of the superfamily Argonautoidea (Cephalopoda: Octopoda). *Marine Biology*, 142: 321–326.
- Mangold, K.M., Vecchione, M. & Young, R.E.** 2010. Tremoctopodidae Tryon, 1879. *Tremoctopus* Chiaje 1830. Blanket octopus. Version 15 August 2010. <http://tolweb.org/Tremoctopus/20202/2010.08.15> in The Tree of Life Web Project, <http://tolweb.org/>
- Naef, A.** 1921/1923. Cephalopoda. Fauna e Flora del Golfo di Napoli. Monograph, no. 35. English translation: A. Mercado (1972). Israel Program for Scientific Translations Ltd. IPST Cat. No. 5110/1,2.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), Cephalopods of the world. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Orsi Relini, L.** 2009. Notes about colour displays observed in female specimens of *Tremoctopus* (Cephalopoda: Octopoda) and their taxonomic value. *Bollettino Malacologico*. 45: 13–16.
- Orsi Relini L., Belluscio A. & Ardizzone G.D.** 2004. Tracking the Indopacific pelagic octopus *Tremoctopus gracilis* in the Mediterranean. *Rapports et procès verbaux de la Commission Internationale pour l'exploration scientifique de la Mer Méditerranée*, 37: 415.
- O'Shea, S.** 1999. The Marine Fauna of New Zealand: Octopoda (Mollusca: Cephalopoda). *NIWA Biodiversity Memoir*, 112: 280pp.
- Thomas, R.F.** 1977. Systematics, distribution, and biology of cephalopods of the genus *Tremoctopus* (Octopoda:Tremoctopodidae). *Bulletin of Marine Science*, 27: 353–392.

Tremoctopus violaceus Delle Chiaje, 1830

Frequent synonyms / misidentifications: None / None.

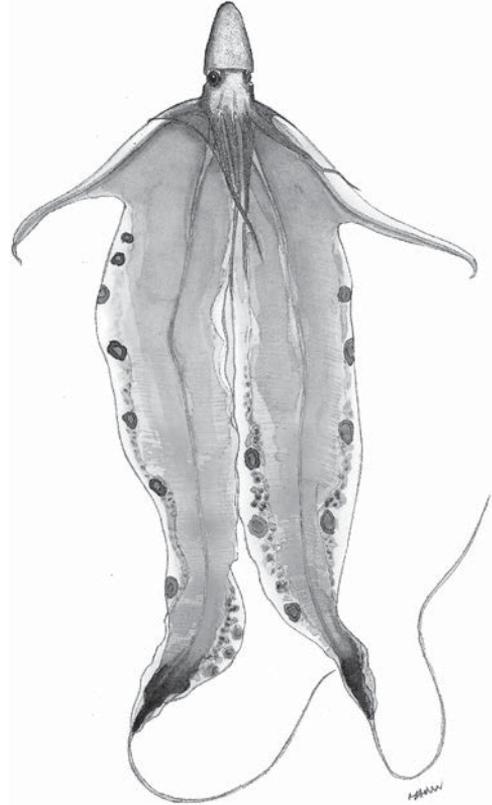
FAO names: **En** – Violet blanket octopus; **Fr** – Poulpe manteau violet; **Sp** – Pulpo manta violáceo.

Diagnostic characters: **Body muscular** with mantle ventrally smooth. Presence of 2 pairs of water pores at the bases of first and fourth pair of arms. Dorsal and dorsolateral arms much longer than third and fourth arms, enclosed in a bilobed web. A total of 13 to 16 gill filaments in demibrach of female and 9 to 11 in male. There are 15 to 19 pairs of transverse suckers on the distal portion of the hectocotylized arm. In adult females **ocellar spots arranged in 1 row outer side of fringe** of first pair of arms. Adult females dark blue-purple dorsally and light golden ventrally; males and juveniles bright with small dark points.

Size: Females up to approximately 1 m total length; males dwarfs, to at least 15 mm mantle length (maximum TL about 40 mm).

Habitat, biology, and fisheries: Epipelagic circumtropical species living in warm-temperate surface waters (from 0 to approximately 100 m). It has been observed swimming just above the shallow ocean floor with the web extended. Potential fecundity varies between 100 000 and 300 000 eggs. *Tremoctopus violaceus* is an intermittent terminal spawner. Batch fecundity is 10 000 to 30 000 eggs, but at the beginning and the end of spawning the batches are smaller. Generally, total duration of individual spawning might be estimated as no more than 0.5 to 1 months. Eggs are carried by the female on the first pair of arms until hatching. Juveniles have been observed to attach numerous fragments of tentacles of *Physalia* and other jellyfish species to the suckers of the dorsal arms. These fragments probably could be used as both defensive mechanisms and offensive weapons. It has been suggested that when in use, the web may form a straining mechanism and that with the *Physalia* tentacle fragments, it becomes armed with nematocysts. Of no interest to fisheries.

Distribution: Mediterranean Sea. Atlantic Ocean from 40°N to 35°S and Caribbean Seas.



female dorsal view



VITRELEDONELLIDAE

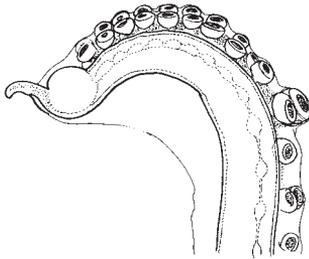
Glass octopods

A single species in the family.

Vitreledonella richardi Joubin, 1918

Frequent synonyms / misidentifications: None / None.

FAO names: En – Glass octopod; Fr – Poulpe vitreux; Sp – Pulpo vitreo.



hectocotylus

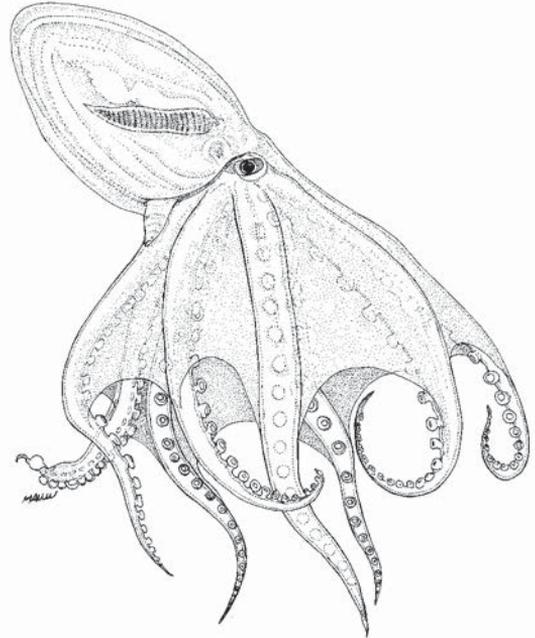
Diagnostic characters: Body transparent as glass and almost colourless, gelatinous. Mantle aperture very wide. **Eyes dark, almost rectangular, their length about 20% of the mantle length.** **Optic nerves** (which can be observed from transparency in life and well preserved specimens) **long and optic ganglia not in close proximity to brain.** Ink sac developed. Gill with external demibranch only. Arms of medium length, in adults about 2 or 3 times longer than mantle. Suckers in 1 row, widely apart within the web, closely set and largely enlarged outside the web. Web depth in adults 40 to 60% of the longest arm length. **Left ventrolateral (III) arm hectocotylized and smaller than opposite arm in males.** The hectocotylus has a spherical (oval) vesicle with a slender papilla at its tip. Ligula short. Digestive gland long and slender. Stomach dorsal to digestive gland.

Size: Up to 110 mm mantle length and 450 mm total length.

Habitat, biology, and fisheries: Epi-meso-bathypelagic species. Juveniles found between 100 and 200 m depth; adults around 1 000 m depth. This species inhabits waters within a range of temperature between 12 and 16°C. Animals do not undertake important diel vertical migrations; they maintain the digestive gland in a vertical orientation as they swim. Supposedly viviparous forms brooding the eggs up to the hatching of larvae. Frequently found in the stomach contents of tunas and swordfishes. Of no interest to fisheries.

Distribution: Tropical and subtropical cosmopolitan.

Remarks: At the time of going to print, Strugnell et al. (2013) used molecular evidence to merge the families Amphitretinae, Bolitaeninae and Vitreledonellinae into a single family, Amphitretidae.



References

- Guerra, A.** 1992. Mollusca, Cephalopoda. In M.A. Ramos *et al.*, eds. Fauna Ibérica. Vol. 1. Museo Nacional de Ciencias Naturales. CSIC, Madrid, 327 pp.
- Nesis, K.N.** 1982/87. Abridged key to the cephalopod mollusks of the world's ocean. 385 + ii pp. Light and Food Industry Publishing House, Moscow (In Russian). Translated into English by B.S. Levitov, ed. by L.A. Burgess (1987), Cephalopods of the world. T.F.H. Publications, Neptune City, NJ, 351 pp.
- Voight, J.R.** 1996. Male reproductive anatomy of *Vitreledonella* (Cephalopoda: Octopoda). *Amer. Malacol. Bull.*, 13: 61–64.
- Young, R.E., Mangold, K.M. & Vecchione, M.** 2010. Vitreledonellidae Robson, 1932. *Vitreledonella richardi* Joubin, 1918. Version 04 March 2010 (under construction). http://tolweb.org/Vitreledonella_richardi/20195/2010.03.04 in The Tree of Life Web Project, <http://tolweb.org>